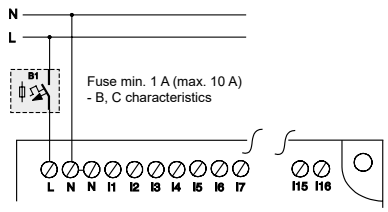
48x05
EC32
EC35
EC50
ES32
faston
G2M
G4
G4/2
GD35
GD50
GOP11
GOP14
GOP8
GS4
GUC11
GZ11
GZ14
GZ14U
GZ14Z
GZ2
GZ4
GZ8
GZM2
GZM3
GZM4
GZM80
GZM92
GZMB2
GZMB4
GZMB80

GZP11
GZP8
GZS11
GZS8
GZS80
GZS92
GZT2
GZT3
GZT4
GZT80
GZT92
GZU11
GZU8
GZY2G
inrush
MT-PI-
MT-T..-
MT-TSD-
MT-TUA-
MT-TUB-
PI6-1P
PI6-1T
PI6W-1P
PI84,GZM80
PI84,GZT80
PI85,GZM80
PI85,GZT80
PIR15
PIR2,GZM2
PIR2M,GZ2
PIR3,GZM3
PIR4,GZM4
PIR6W-1P-
PIR6W-1PS
PIR6WB-1PS
PIR6WBT-1Z-
PIR6WT-1Z
PS11
PW80
PZ11
PZ8
R15-2CO
R15-3CO
R15-4CO
R2
R20
R2M
R3
R30

R4
R4T-R4
RA2
RG25
RM40
RM50
RM699B
RM83
RM84
RM84SMT
RM85
RM85faston
RM85inrush
RM85SMT
RM87
RM87L
RM87N
RM87NSMT
RM87P
RM92
RM94
RM96
RM961CO
RMB841
RMB851
RS35,RS50
RSM822
RSM954
RSM957
RUC
RUC-M
RY2
S2M
SU4/2D
SU4/2L
SU4D
SU4L
T-R4
TR4N1CO,2CO
TR4N4CO
TR-EI1P-UNI
TR-EI2P-UNI
TR-EM1P-UNI
TR-EM2P-UNI
TR-ES2P-UNI

Connection diagram - supply connection



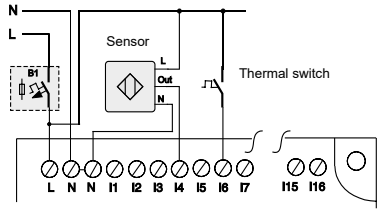
NEED-230AC-..-16-8R-.
230 V AC 50/60 Hz (95...260 V AC), L = 230 V AC, N = 0 V

NEED-12DC-..-16-8R-.
12 V DC (10,2...14,4 V DC), L = +12 V DC, N = 0 V

NEED-24DC-..-16-8.-.
24 V DC (19,6...28,8 V DC), L = +24 V DC, N = 0 V

NEED-220DC-..-16-8R-.
220 V DC (154...242 V DC), L = +220 V DC, N = 0 V

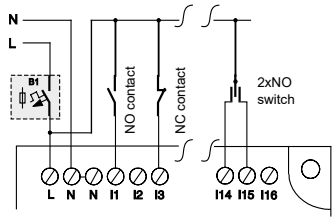
Connection diagrams - digital inputs



NEED-12DC-..-16-8R-. L = +12 V DC, N = 0 V
Logic state „1": 8...26 V DC **I1 - I13**: 3,3 mA, **I14 - I16**: 1,1 mA
Logic state „0": -1,5...4 V DC

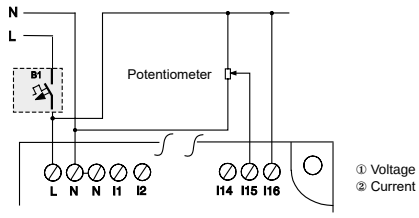
NEED-24DC-..-16-8.-. L = +24 V DC, N = 0 V
Logic state „1": 15...40 V DC **I1 - I13**: 3,3 mA, **I14 - I16**: 2,0 mA
Logic state „0": -3...5 V DC

NEED-220DC-..-16-8R-. L = +220 V DC, N = 0 V
Logic state „1": 80...260 V DC **I1 - I13**: 0,6 mA, **I14 - I16**: 1,1 mA
Logic state „0": 0...40 V DC



NEED-230AC-..-16-8R-. L = 230 V AC, N = 0 V
Logic state „1": 85...260 V AC 50 Hz **I1 - I11**: 0,6 mA
I12 - I13: 8,0 mA
I14 - I16: 1,5 mA
Logic state „0": 0...32 V AC 50 Hz

Connection diagram - analog-digital inputs



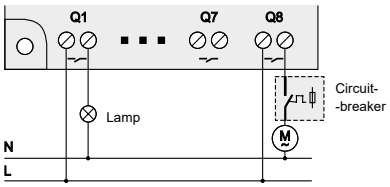
NEED-230AC-..-16-8R-.
0...255 V AC 50 Hz ① **I14 - I16**: 1,5 mA

NEED-12DC-..-16-8R-.
0...12,75 / 0...25,5 V DC ① **I14 - I16**: 1,1 mA
0...25,5 / 0...51 mA ② **I14 - I16**: 1,1 mA

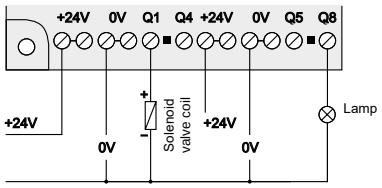
NEED-24DC-..-16-8.-.
0...12,75 / 0...25,5 V DC ① **I14 - I16**: 2,0 mA
0...25,5 / 0...51 mA ② **I14 - I16**: 2,0 mA

NEED-220DC-..-16-8R-.
0...255 V DC ① **I14 - I16**: 1,1 mA

Connection diagrams - digital outputs

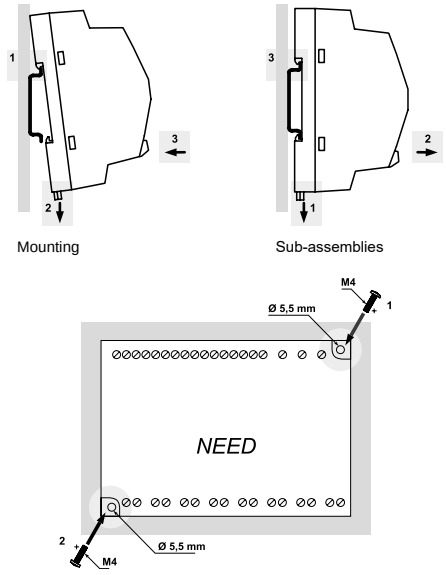


NEED-...-..-16-8R-.
relay outputs Q1 - Q8: 10 A, 250 V AC

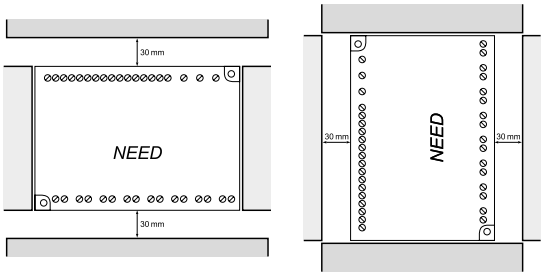


NEED-24DC-..-16-8T-.
transistor outputs Q1 - Q8: 0,5 A, 24 V DC

Mechanical mounting



Any operation position - mounting distances for walls with terminals



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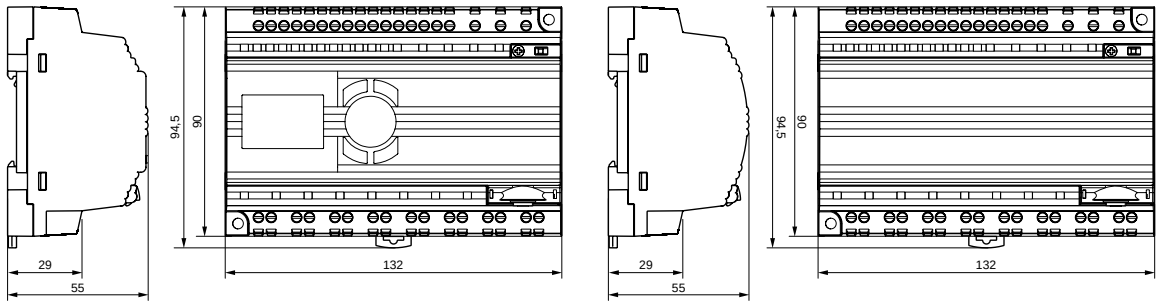
Dimensions



Mounting, connection to PC computer

Relays **NEED-...-16-8...** are designed for direct mounting on 35 mm rail mount acc. to PN-EN 60715 or on panel mounting with two M4 screws). Operational position - any. **Connections:** max. cross section of the cables: 1 x 2,5 mm^2 / 2 x 1,0 mm^2 (1 x 14 / 2 x 17 AWG).

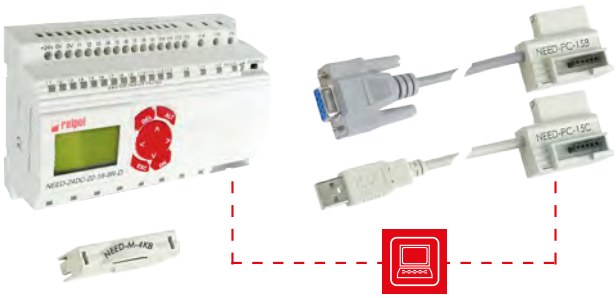


Table of codes

Table 1

Programmable relay code	Supply voltage	Version	Number of inputs	Number and type of outputs	Features
NEED-230AC-22-16-8R-D	230 V AC	22	16	8 relay	LCD display, keyboard
NEED-230AC-11-16-8R	230 V AC	11	16	8 relay	–
NEED-12DC-22-16-8R-D	12 V DC	22	16	8 relay	LCD display, keyboard
NEED-12DC-11-16-8R	12 V DC	11	16	8 relay	–
NEED-24DC-22-16-8R-D	**24 V DC**	**22**	**16**	**8 relay**	**LCD display, keyboard**
NEED-24DC-11-16-8R	**24 V DC**	**11**	**16**	**8 relay**	**–**
NEED-24DC-22-16-8T-D	24 V DC	22	16	8 transistor	LCD display, keyboard
NEED-24DC-11-16-8T	24 V DC	11	16	8 transistor	–
NEED-220DC-22-16-8R-D	220 V DC	22	16	8 relay	LCD display, keyboard
NEED-220DC-11-16-8R	220 V DC	11	16	8 relay	–

The data in bold type relate to the standard versions of the relays.

Exceptional simplicity of programming

Software PC NEED

A computer program which allows editing, compiling and downloading of a program to the memory of a programmable relay.

The resources of the relay may be monitored in course of operation, owing to which the user may be currently informed about the status of the inputs, outputs, timers, counters, clocks, comparators, etc.

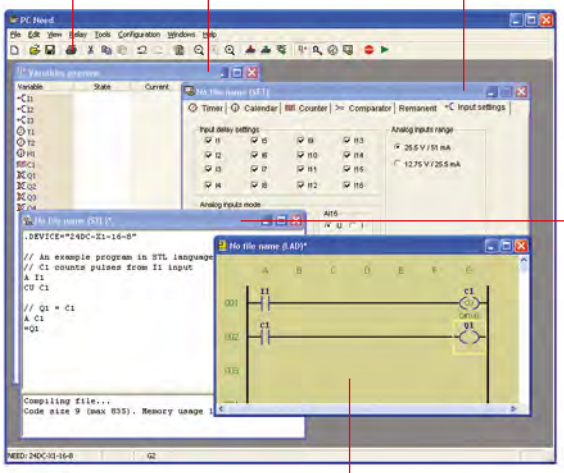
The simplicity and variety of the program edition (text or graphics) make the PC NEED a very convenient tool, owing to which even complex applications are made very quickly, and their start-up time is short.

Hardware requirements: any computer of PC class with RS232 or USB interface and VGA graphic card, operating system – Windows 2000®, Windows XP®, Windows Vista®, Windows 7®, Windows 8®.

Program printout:
- LAD or STL,
- configuration parameters.

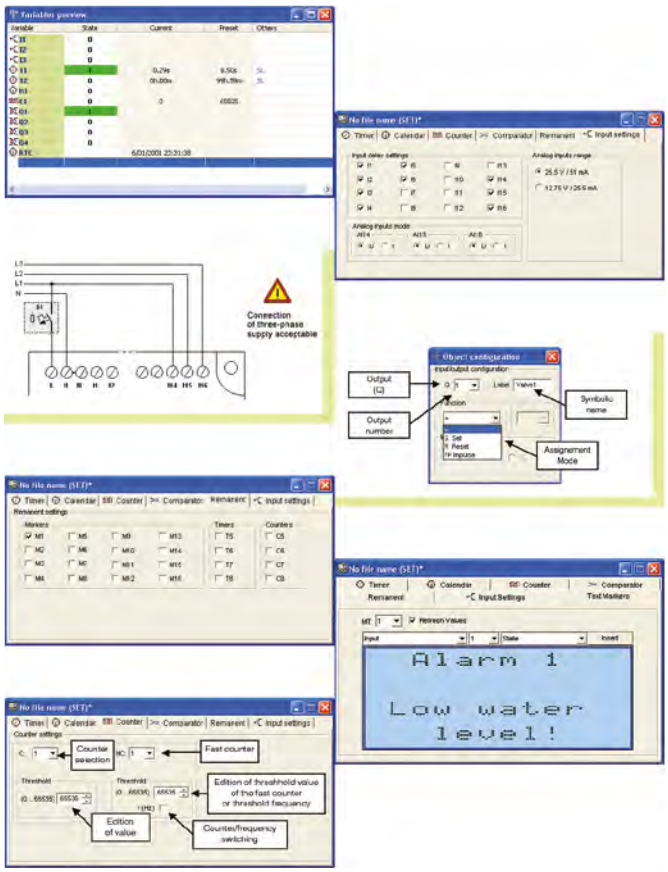
Preview of variables:
- possibility to monitor the relay's resources.

Resources settings:
- possibility to set the parameters of timers, counters, clocks, comparators, etc.,
- simple operation and understandable menu,
- editable alert texts and definitions of keyboard buttons.



STL language:
- possibility of conversion from LAD to text language,
- possibility of programming in text editor and further copying of the application,
- the language syntax highlighted,
- setting customized colors and fonts.

LAD language:
- simplicity of programming which allows quick application designing,
- symbolic labels of individual elements,
- easy creation of applications based upon an electrical chart,
- possibility of inserting comments, color and font configurations,
- ladder preview to facilitate the start of the software.



Functions of NEED relay

The NEED programmable relay is a product based on the Polish know-how which is perfectly implemented in applications of industrial automatics. The relay is an interesting alternative for similar solutions offered by other manufacturers due to its numerous outstanding advantages.

1) Preview of variables as a tool for monitoring all the resources in the relay.

2) A wide range of analog-digital inputs and possibility of configuration of DC inputs as voltage or current ones.

3) The mode of monitoring three-phase voltage for the 230AC-...-16-8R-. version.

4) Possibility to read the program structure existing in the relay, including the symbolic names assigned to individual elements.

5) Remanence mode - possibility of identifying some resources of the relay, which might be maintained when the supply voltage is off.

6) Fast bidirectional counter / meter of frequency - measurement up to 20 kHz.

7) Edition of texts of alerts shown on the display, which include the variables of the relay.

8) Four keys of the keyboard to be used in LAD or STL languages.

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Control of applications

Management of a parking lot with limited number of places

The parking lot may operate in timing mode (from ... to ...) or in permanent mode. The sensors at the entrance and exit help to define the number of cars in the parking lot and to compare the number with the preset number of places. When the maximum number of vehicles are parked, the information „NO PLACES AVAILABLE" is lit at the entrance. Additionally, the entrance gate remains closed as long as a vehicle leaves the parking lot.

Controller of two pumps – direct start-up

Alternate operation of pumps - automatic or manual. Sequence control of the pumps - two levels of switching on, one level of switching off. Automatic start-up of the second pump in case of a failure of the first one. Protection against dry operation. Outlets to the external alarm signaling (failure of the pump).

Control of a machine for wire mesh production

Control of the squashing unit which bends the end parts of the wires of the mesh so to avoid injuries. The design of the unit is based on two pneumatic servo-motors connected to the compressed air supply source. The control system protects also against failures in course of production.

Segregation of details in production process

Segregation of details on stroke feed according to their height. Two height sensors of the appropriate range.

Control of lighting and drives of ventilators

Voltage central switching on and off - manual or automatic switching according to timing schedule. Possibility of flexible shaping of the function of lighting for each room.

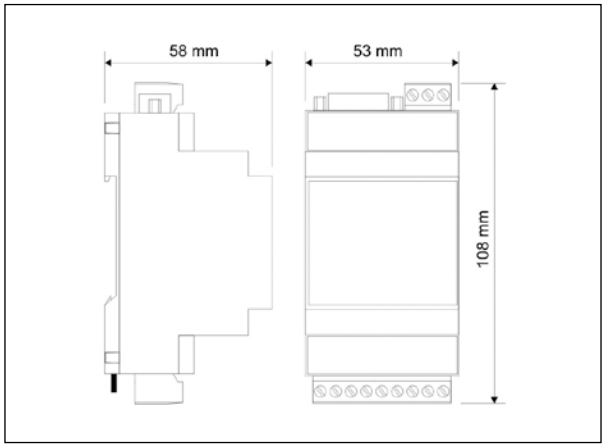
Control of moving stairways

Control of the direction of movement (up and down). Detection of passengers on the stairway on the basis of the signals from movement detectors.

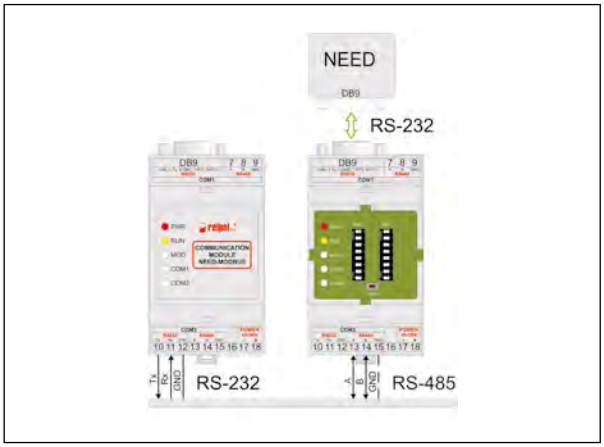
- **Appropriation**: data reading from NEED relays and availability of the data values with the ModBus RTU protocol; transmission of control commands to NEED; modification of the real time RTC clock setting; operation from COM1 side as NEED Master and from COM2 side as a device of ModBus RTU Slave type
- **Options**: operation mode change: STOP/RUN; RTC clock: current data reading (in the RUN mode) and setting change record (in the STOP mode); current data reading (in the RUN mode): status, program name and version, digital and analog inputs, digital outputs, phase sequence, timers, counters, fast counter current value, clocks, comparators, markers; setting reading and record (in the STOP mode): timers, counters, fast counter, comparators.

Input circuit		
Rated supply voltage	7....26 V AC 50/60 Hz	7…35 V DC
Max. power consumption	no load: 2 VA	
Max. power consumption		
Parameter memory	EEPROM	
Introduction of the basic parameter transmission	with the use of DIP SWITCH	
Transmission parameters for ModBus RTU Slave	9600 bits/s, 1 bit start, 8 bits of data, 1 bit stop, without parity control	
RS232	standard EIA/TIA-574	
• max. length of line	15 m	
RS485	standard EIA/TIA-485	
• max. length of line	1200 m	
• max. number of devices on the line	32	
• port protection	100 mA / 600 W surge and short circuit protection	
• port line terminator	yes	
Connections • RS232 (COM1)	SUB-D 9M connection	
• RS485/RS232 (COM2)	N/O connectors	
EMC electromagnet compatibility	according to EN-61000-6-1/2/3/4ABS	
General data		
Cover	ABS	
Insulation rated voltage	COM1: supply	COM2: 1 kV DC
Dimensions with connectors / Weight	108 x 53 x 58 mm / 116 g	
Ambient temperature • storage	-30…70 °C	
• operating	-30…60 °C	
Protection category	cover: IP 43	terminals: IP 20
Relative humidity	20...95%	

Dimensions



Connection manner



Mounting

Modules **NEED-MODBUS** are designed for direct mounting on 35 mm rail mount acc. to PN-EN 60715. **Connections:** max. cross section of the cables: 1 x 0,22...2,5 mm^2 (1 x 24...14 AWG).

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Relays
time

relpol® S.A.

Time relays are available in modular covers (MT-W...M with LED display, MT series, TR series) and in industrial covers (TR4N series, T-R4, PIR15...T).

Design features (depending on the type of relay): multifunctions, single-functions; with settings of T interval, with independent settings of T1 and T2 intervals, with independent settings of T1, T2 and T3 intervals (MT-W...M); contacts / outputs: 1 CO, 2 CO, 3 CO, 4 CO; supply: universal AC/DC; specified voltage.

Applications in low voltage systems: in industrial automation; in BMS automation; in air-conditioning, ventilation, heating systems; in protection, signalling, alarm systems; in lighting systems; various other applications.

They meet the requirements of RoHS Directive.
The relays are recognized and certified by:

CE EAC

modular covers

industrial covers

- **Universal, multifunction time relays with independently controled times T1, T2 and T3 (25 time functions + functions ON and OFF; quick times set with the accuracy of 0,1 s)**
- Two digit LED display • Programming with two buttons only • Cadmium - free contacts • AC/DC input voltages • Cover - modular, width 17,5 mm • Direct mounting on 35 mm rail mount acc. to PN-EN 60715
- Applications: in low-voltage systems • Compliance with standard PN-EN 61812-1 • Recognitions, certifications, directives: CE EAC

Output circuit - contact data

Number and type of contacts		1 CO
Contact material		$AgSnO_2$
Max. switching voltage		440 V AC / 300 V DC
Rated load	AC1	10 A / 250 V AC
	DC1	10 A / 24 V DC
Max. inrush current		16 A
Rated current		10 A
Max. breaking capacity	AC1	2 500 VA
Min. breaking capacity		1 W 10 V, 10 mA
Contact resistance		≤ 100 mΩ
Max. operating frequency		
• at rated load	AC1	600 cycles/hour
• no load		72 000 cycles/hour

Input circuit

Rated voltage	AC: 50/60 Hz AC/DC	12...240 V terminals (+)A1 – (-)A2
Operating range of supply voltage		0,9...1,1 U_n
Rated power consumption	AC	≤ 2,0 VA AC: 50 Hz
	DC	≤ 1,5 W
Range of supply frequency	AC	48...63 Hz
Residual ripple to DC		5%
Control contact S ❶		
• min. voltage ❷		0,9 U_n
• min. time of pulse duration ❷		≥ 30 ms
• max. length of control line		10 m

Insulation according to PN-EN 60664-1

Insulation rated voltage	250 V AC
Rated surge voltage	2 500 V 1,2 / 50 µs
Overvoltage category	II
Insulation pollution degree	1
Flammability class	V-0 UL94
Dielectric strength	
• input - output	2 500 V AC type of insulation: basic
• contact clearance	1 000 V AC type of clearance: micro-disconnection

General data

Electrical life		
• resistive AC1		> 0,5 x 10^5 10 A, 250 V AC
Mechanical life (cycles)		> 3 x 10^7
Dimensions (L x W x H)		90 ❸ x 17,5 x 65,5 mm
Weight		70 g
Ambient temperature	• storage	-40...+85 °C
	• operating	-20...+50 °C
Cover protection category		IP 20 PN-EN 60529
Environmental protection		RTI PN-EN 116000-3
Relative humidity		up to 85%
Shock resistance		15 g
Vibration resistance		0,35 mm DA 10...55 Hz

❶ The control terminal S is activated by connection to A1 terminal via the external control contact S.
❷ Where the control signal is recognizable.
❸ Length with 35 mm rail taps: 98,8 mm.

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Time module data

Functions	Es, E, E(S), E(r), R, Wu, Wu(S), Wu(r), Ws, Wa, B, Wi, ER, EWs, EWa, EWu, WsWa, EWf, Wt, Pi, Pi(S), Pp, Pp(S), Est, Esp, ON, OFF
Selection of function and settings of T1, T2, T3 intervals	with two buttons: „F/T" and „OK", to be with viewed on the LED display
Timing adjustments	0,1 s ... 99 h 59 min. 59,9 s
Setting accuracy / Repeatability	0,1 s / 0,12 s
Values affecting the timing adjustment	temperature: ≤ 0,01% / °C supply voltage: ≤ 0,1% / V
Recovery time	controlled by contact S / supply voltage: ≤ 50 ms / ≤ 650 ms

LED indicator

LEDs

green "U" - indication of supply voltage U
yellow "h" - indication of setting hours T1, T2, T3 times ❹
yellow "m" - indication of setting minutes T1, T2, T3 times ❹
yellow "s" - indication of setting seconds T1, T2, T3 times ❹
green "T2" - indication of setting T2 time ❹
green "T3" - indication of setting T3 time ❹ ❺
green "T3" flashing - measurement of T3 time / request for programming T3 time ❺
yellow "R" - status ON of operational relay R

LED display

strip spinning to the right - measurement of T1 time
strip spinning to the left - measurement of T2 time
message "End" - stop of the function being carried out
pulsating point during programming - indication of setting decimal parts of a second

Instruction of programming

1. Hold the lower button "F/T" for a longer time (> 2 s). A symbol of service function F0 will appear on LED display.
2. By pressing the button "F/T" choose the required number of function (F0 ... F21 - see table below).
3. Save the number of the selected function by shortly pressing the upper button "OK". The display will show two digits "Zero" and the yellow LED "h" will appear (T1 time hours setting). The first "Zero" is for tens of hours, the other "Zero" specifies the units of hours. Each number set has to be confirmed with the "OK" button. Note: similar situation applies for setting minutes and seconds.
4. By clicking the lower button "F/T" select the required number of T1 time hours.
5. After selecting the number of T1 time hours click the "OK" button in order to confirm the selection.
6. Again two digits "Zero" will appear and the yellow LED "m" will appear - setting minutes. Next, act accordingly to points 4 and 5. Similarly set seconds when the yellow LED "s" appears. Then set decimal parts of second when a point is pulsing on the display.
7. After confirming with the "OK" button the decimal parts of second the green LED "T2" will start flashing (if T2 time appears in a given function).
8. If we select T2 time, then we do everything accordingly to the way of T1 time setting.
9. Next the green LED "T3" will start flashing (if T3 time appears in a given function) - request for setting T3 time ❺. T3 time setting may be confirmed with "OK" or rejected with "F/T". T3 time is set similarly to T1 or T2.
10. Turn off feeding. After another provision of feeding the function will start. Some functions are started by the external control contact S ❶.
11. During carrying out of the function (lasting longer than 60 s) it is possible to check the used time [%] by shortly pressing the "OK" button. A longer pressing will show the "presentation" of settings (checking the set function and times).
12. In order to "exit" the set service function F0 or F1 press the lower button "F/T" for a longer time until the symbol of a given function disappears from the display.

Note: a new function can be programmed during the operation of the relay (during the operation of any function). The newly programmed function will be active only after turning on and providing feeding voltage.

Number	Name	Times ❺	Control ❶
F0	OFF	–	U
F1	ON	–	U
F2	Es	T1	U, S
F3	E E(S)	T1 T1	U U, S
F4	E(r)	T1	U, S
F5	R	T1	U, S
F6	Wu Wu(S)	T1 T1	U U, S
F7	Wu(r)	T1	U, S
F8	Ws	T1	U, S
F9	Wa	T1	U, S
F10	B Wi	T1 = 0 ❻ T1	U, S U, S
F11	ER	T1, T2	U, S
F12	EWs	T1, T2	U, S
F13	EWa	T1, T2	U, S
F14	EWu	T1, T2	U
F15	WsWa	T1, T2	U, S
F16	EWf	T1, T2	U, S
F17	Wt	T1, T2	U, S
F18	Pi Pi(S)	T1, T2, T3 T1, T2, T3	U U, S
F19	Pp Pp(S)	T1, T2, T3 T1, T2, T3	U U, S
F20	Est	T1	U, S
F21	Esp	T1	U, S

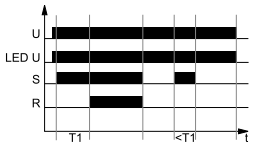
❶ The control terminal S is activated by connection to A1 terminal via the external control contact S. ❹ View on LED display. ❺ Option: possibility of turninig on or omitting T3 time. ❻ Time T1 has to be set with "Zero" value.

Time functions

F0 – OFF - Constant service off.
F0 function can be turned on at any time, during feeding the time relay with U_n voltage. Turning on F0 function during carrying out any time function will cause the function to stop as well as constant operating relay R off (LED diode "R" is off). Function F0 is activated by pressing "F/T" button for a longer time (more than 2 seconds) and selecting F0 function. Confirm this function with red button "OK" (after confirmation display will show digit 0). Exiting the service function needs a longer pressing of "F/T" button - until the display stops showing F0 function symbol. Next, after a short time, display will show "End". Going back to the function previously carried out is done by turning off feeding voltage U_n and turning it on again. If the "T/F" button is being pressed for too long and it will cause, after turning off F0 function symbol, showing the symbols of other functions, then going back to the function previously carried out (set before F0 function) is done by turning off feeding voltage U_n and turning it on again.

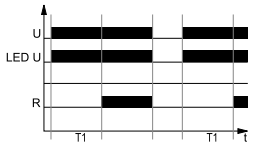
F1 – ON - Constant service on.
F1 function can be turned on at any time, during feeding the time relay with U_n voltage. Turning on F1 function during carrying out any time function will cause the function to stop as well as constant operating relay R on (LED diode "R" is on). Function F1 is activated by pressing "F/T" button for a longer time (more than 2 seconds) and selecting F1 function. Confirm this function with red button "OK" (after confirmation display will show digit 1). Exiting the service function needs a longer pressing of "F/T" button - until the display stops showing F1 function symbol. Next, after a short time, display will show "End". Going back to the function previously carried out is done by turning off feeding voltage U_n and turning it on again. If the "T/F" button is being pressed for too long and it will cause, after turning off F1 function symbol, showing the symbols of other functions, then going back to the function previously carried out (set before F1 function) is done by turning off feeding voltage U_n and turning it on again.

F2 – Es - ON delay with the control contact S.



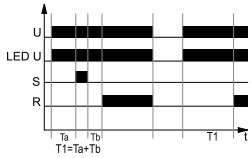
Feeding voltage U has to be put onto time relay in a constant way (LED diode "U" gives constant light). Turning off controlling contact S starts measuring the set time T1 (display shows a vertical strip spinning to the right). When T1 time is finished operating relay R turns on (display shows "End", LED diode "R" is on). Such state lasts until the moment of opening control contact S. Opening the control contact S causes immediate turning off the operating relay R (display still shows "End", and LED diode "R" is off). When the control contact S is open before T1 time is finished, the operating relay will not turn on and the measurement of T time will be cancelled.

F3 – E - ON delay.



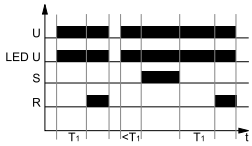
Turning on the feeding voltage U starts measuring set T1 time (display shows vertical strip spinning to the right). After measuring T1 time the operating relay R turns on and stays in this state until feeding U is turned off (display shows "End", and LED diode "R" is on).

F3 – E(S) - ON delay, with time measurement stopped with contact S.



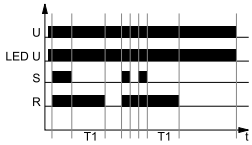
Turning on the feeding voltage U starts measuring set T1 time (display shows vertical strip spinning to the right). If during measuring T1 time control contact S is closed, measuring of T1 time is stopped for the time of closing contact S (display shows two horizontal strips). Opening of control contact S resumes measuring of T1 time (display shows a vertical strip spinning to the right). After finishing measuring T1 time the operating relay R turns on and stays in this state until feeding U is turned off (display shows "End", and LED diode "R" is on).

F4 – E(r) - ON delay with the Reset function.



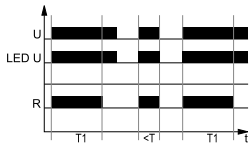
Turning on the feeding voltage U starts measuring set T1 time (display shows vertical strip spinning to the right). After measuring T1 time operating relay R turns on. If control contact S is closed during measuring T1 time measuring of T1 time is stopped for the time of closing contact S (display shows two horizontal strips). After opening contact S T1 time is measured from the start. After measuring T1 time operating relay R turns on (display shows "End", and LED diode "R" is on). and this state lasts until the moment of turning off feeding voltage U or when the control contact is closed again.

F5 – R - OFF delay with the control contact S.



Time relay input is powered by voltage U in a constant way. Closing the control contact S causes immediate turning on of the operating relay R (display shows two horizontal strips, LED diode "R" is on). Opening the control contact S starts measuring of the set T1 time (display shows vertical strip spinning to the right). After measuring T1 time the operating relay turns off (display shows "End", and LED diode "R" is off). If control contact S is closed before T1 time is finished, the previously measured time will be restarted and the operating relay will stay on. The delay of turning off the operating relay R will start at the moment of another opening of control contact S.

F6 – Wu - ON for the set interval.



Turning on the feeding voltage U causes immediate turning on the operating relay R at the set time T1 (display shows vertical strip spinning to the right, LED diode "R" is on). After measuring T1 time the operating relay R turns off (display shows "End", and LED diode "R" is off).

U - supply voltage; **R** - output state of the relay; **S** - control contact state; **T1, T2, T3** - measured times;
Ts - pause in function performance - time measurement stop period (applies to F18 and F19); **t** - time axis

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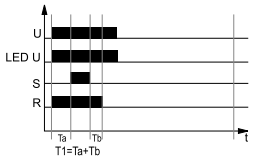
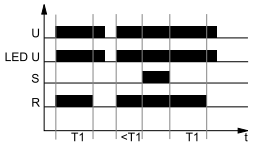
Time functions

F6 – Wu(S) - ON for the set interval, with time measurement stopped with contact S closing.



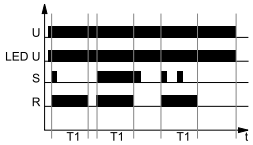
Turning on the feeding voltage U causes immediate turning on the operating relay R at the set time T1 (display shows vertical strip spinning to the right, LED diode "R" is on). If the control contact S is closed, measuring T1 time will be stopped (display shows two horizontal strips) until the moment when control contact is opened. Opening contact S starts further measuring of T1 time. After finishing measuring T1 time the operating relay turns off (display shows "End", and LED diode "R" is off).

F7 – Wu(r) - ON for the set interval with the Reset function.



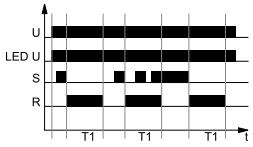
Turning on feeding voltage U causes immediate turning on the operating relay R at the set time T1 (display shows vertical strip spinning to the right, LED diode "R" is on). When control contact S is closed, measuring time T1 is stopped for the time of closing contact S (with operating relay being on, and display showing two horizontal strips). After opening contact S T1 time is measured from the start. After measuring T1 time the operating relay R turns off (display shows "End", and LED diode "R" is off).

F8 – Ws - Single shot for the set interval triggered by closing of the control contact S.



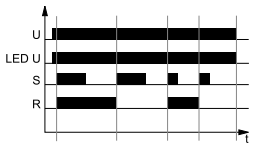
Time relay input is powered by voltage U in a constant way. Closing the control contact S causes immediate turning on operating relay R for the T1 time (display shows vertical strip spinning to the right, LED diode "R" is on). After measuring T1 time the operating relay R turns off display shows "End", and LED diode "R" is off). Opening and closing the control contact S during measuring T1 time does not affect the function being carried out. Turning on the operating relay R again is possible (after measuring T1 time) by another closing of control contact S.

F9 – Wa - ON for the set interval triggered with the control contact S.



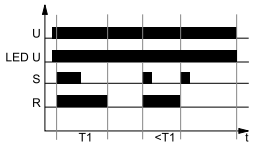
Time relay input is powered by voltage U in a constant way. Opening the control contact S causes immediate turning on operating relay R for the T1 time (display shows vertical strip spinning to the right, LED diode "R" is on). After measuring T1 time the operating relay R turns off display shows "End", and LED diode "R" is off). Opening and closing the control contact S during measuring T1 time does not affect the function being carried out. Turning on the operating relay R again is possible (after measuring T1 time) by another closing of control contact S.

F10 – B - Cyclical operation with the control contact S (the feature of a bistable relay) - setting T1 time to the value of "Zero" is required.



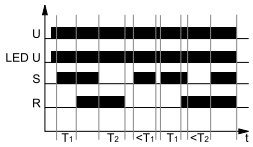
Time relay input is powered by voltage U in a constant way. Each closing of control contact S causes the change of the state of the operating relay R into the opposite one (the feature of a bistable relay).

F10 – Wi - ON for the set interval controlled by closing of the control contact S, with the function of switching off the output relay R prior to the lapse of the interval T1 (the feature of a bistable relay).



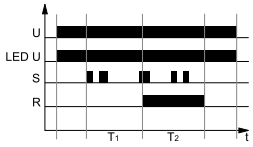
Time relay input is powered by voltage U in a constant way. Closing the control contact S causes immediate turning on the operating relay for T1 time (display shows a vertical strip spinning to the right, and LED diode "R" is on). After measuring T1 time the operating relay R turns off (display shows "End", and LED diode "R" is off). If during the measuring T1 time the control contact is closed, the measured time T1 will be restarted, and the operating relay R turns off. Another closing of the control contact S causes another turning on the operating relay R for the T1 time. Relay with this function adopts the feature of bistable relay.

F11 – ER - ON delay and OFF delay with control contact S. Independent settings of T1 and T2 intervals.



Time relay input is powered by voltage U in a constant way Closing the control contact S starts measuring the T1 time (display shows a vertical strip spinning to the right) and after measuring the T1 time the operating relay R turns on (display shows two horizontal strips, and LED diode "R" is on). Opening the control contact S starts measuring T1 time - the delayed turning off the operating relay R (display shows a vertical strip spinning to the left) and after the time is finished the operating relay R turns off display shows "End", and LED diode "R" is off). If during the measuring T2 time the control contact S is closed, the measured time will be restarted, and the operating relay R stays on. If the control contact S is closed for a shorter time than T1 time, the system will not turn on the operating relay R.

F12 – EWs - ON delay and ON for the set time with closing of the control contact S. Independent settings of T1 and T2 intervals.

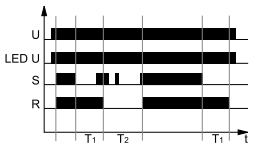


Time relay input is powered by voltage U in a constant way. Closing the control contact (impulsive or constant) starts measuring T1 time (Time relay input is powered by voltage U in a constant way.), and after its completion the operating relay R turns on for T2 time (display shows a vertical strip spinning to the left, LED diode "R" is on). After the T2 time the operating relay R turns off (display shows "End", and LED diode is off). The system is waiting for another closing of the control contact S. During measuring times T1 and T2 the state of the contact S does not matter.

U - supply voltage; **R** - output state of the relay; **S** - control contact state; **T1, T2, T3** - measured times;
Ts - pause in function performance - time measurement stop period (applies to F18 and F19); **t** - time axis

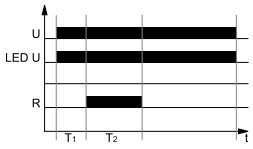
Time functions

F13 – EWa - OFF delay and breaking time delay with opening of the control contact S. Independent settings of T1 and T2 intervals.



Time relay input is powered by voltage U in a constant way. Closing the control contact S causes immediate turning on the operating relay R (display shows two horizontal strips, and LED diode "R" is on). Opening the control contact S starts measuring the time T1 (display shows a vertical strip spinning to the right), and after measuring is finished the operating relay R turns off and measuring of T2 time starts (display shows a vertical strip spinning to the left, and LED diode "R" is off) After measuring T2 time display shows "End", and the operating relay R - depending on the state of the control contact S - stays off when the control contact S is open or turns on when the control contact S is closed, and LED diode "R" goes on.

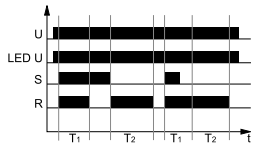
F14 – EWu - ON delay for the set interval. Independent settings of T1 and T2 intervals.



Turning on feeding U starts work from measuring the time T1 (display shows a vertical strip spinning to the right), and after its completion the operating relay R starts at T2 time (display shows a vertical strip spinning to the left, and LED diode "R" is on). After measuring T2 time the operating relay turns off (display shows "End", and LED diode "R" is off).

F15 – WsWa - ON for the set intervals T1 and T2 with the control contact S. Independent settings of T1 and T2 intervals.

Diagram 1

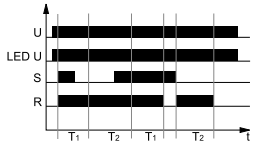


Time relay input is powered by voltage U in a constant way. Closing the control contact S turns on the operating relay R for T1 time (display shows a vertical strip spinning to the right, and the LED diode "R" is on). After measuring T1 time the operating relay R turns off (display shows two horizontal strips, and LED diode "R" is off). Opening the control contact S causes another turning on the operating relay R for T2 time (display shows a vertical strip spinning to the left, and the LED diode "R" is on). After measuring T2 time the operating relay turns off (display shows "End", and LED diode "R" is off).

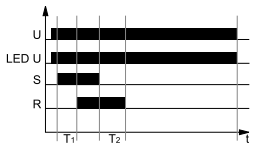
a/ If during measuring T1 time the control contact S is opened, then (after measuring T1 time) the operating relay will stay on until the moment of the end of measuring T2 time. After measuring T2 time the operating relay R will turn off (display shows "End", and LED diode "R" turns off) - see Diagram 1.

b/ If during measuring T1 time the control contact S is opened, and next, during measuring T2 time, it is closed, then (after measuring T1 and T2 times) the operating relay R will turn on for the additional T1 time. After measuring additional T1 time the operating relay R will turn off (display shows two horizontal strips, and LED diode will turn off). Such state will last until the opening of the control contact S. After opening the control contact S the operating relay R will turn on again and the measuring of T2 time will start (display shows a vertical strip spinning to the left, and LED diode "R" is on). After measuring T2 time the operating relay R will turn off (display shows "End", and LED diode "R" will turn off) - see Diagram 2.

Diagram 2

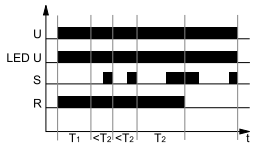


F16 – EWf - ON delay and OFF delay with the control contact S. Independent settings of T1 and T2 intervals.



Time relay input is powered by voltage U in a constant way. Closing the control contact S starts measuring the time T1 (display shows a vertical strip spinning to the gight). After T1 time is finished, the relay R turns on (display shows two horizontal strips, and LED diode "R" is on). Opening the control contact S starts measuring the time T2 - delayed turning off the operating relay R (display shows a vertical strip spinning to the left). After measuring T2 time the operating relay R turns off (display shows "End", and LED diode "R" is off).

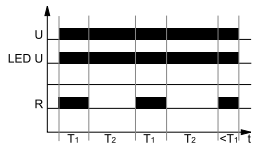
F17 – Wt - Monitoring of the sequence of pulses. Switching on T2 interval is extended with consecutive pulses (closing and opening of the contact S). Independent settings of T1 and T2 intervals.



Turning on the feeding voltage U causes immediate turning on of the operating relay R fot the set T1 time (display shows a vertical strip spinning to the right, and LED diode "R" is on). After measuring T1 time measuring T2 time starts with the operating relay R still being on (display shows a vertical strip spinning to the left, and LED diode "R" is on) In order to keep the operating relay R on, during measuring T2 time closing, and next opening of the control contact S must occur (single impulse), which will cause resetting the time measured so far and start measuring T2 time again. If before T2 time is finished the single impulse of the control contact S does not occur, the operating relay will turn off (display shows "End", and LED diode "R" will turn off). Another turning on of the operating relay will be possible after turning off feeding U and turning it on again.

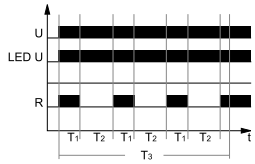
F18 – Pi - Cyclical operation pulse first. Independent settings of T1 and T2 intervals. Possibility of turninig on or omitting T3 time.

Diagram 1



Turning on feeding voltage U starts cyclic work from turning on the operating relay R for the T1 time (display shows a vertical strip spinning to the right, and LED diode "R" is on), after which occurs turning off of the operating relay R for T2 time (display shows a vertical strip spinning to the left, and LED diode "R" is off). Cyclic work lasts until the moment of turning off feeding voltage - see Diagram 1.

Diagram 2



Note: it is possible **to turn on T3 time** (i.e. the time of cyclic work) during programming the relay (when the LED T3 diode is flashing) by confirming it with the OK button, or omitting the T3 time by pressing "F/T" button. When T3 time has been turned on and set, during cyclic work green LED diode T3 is flashing. After T3 time is finished display shows "End", LED diode T3 is off, and operating relay R remains in the state which it was in at the moment of the end of T3 time. If T3 time finishes during measuring T1 time, the operating relay R will remain on (LED "R" is on), and if it finishes during measuring T2 time, the operating relay R will remain off (LED diode "R" is off). Another turning on the function of cyclic work will be possible after turning off feeding U and turning it on again - see Diagram 2.

U - supply voltage; **R** - output state of the relay; **S** - control contact state; **T1, T2, T3** - measured times; **Ts** - pause in function performance - time measurement stop period (applies to F18 and F19); **t** - time axis

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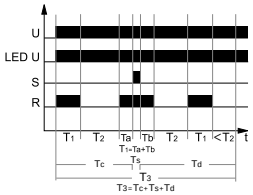
Time functions

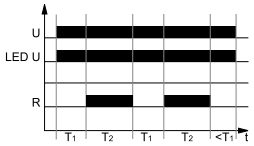
F18 – Pi(S) - Cyclical operation pulse first. Independent settings of T1 and T2 intervals. Possibility of turninig on or omitting T3 time. Possibility of stopping and resuming cyclic work by control contact S.



Turning on the feeding voltage U starts cyclic work from turning on the operating relay R for the T1 time (display shows a vertical strip spinning to the right, and LED diode "R" is on), after which the operating relay turns off for T2 time (display shows a vertical strip spinning to the left, and LED diode "R" is off). Cyclic work lasts until the moment of turning off feeding voltage U.
Note: it is possible **to turn on T3 time** (i.e. the time of cyclic work) during programming the relay (when the LED T3 diode is flashing) by confirming it with the OK button, or omitting the T3 time by pressing "F/T" button. When T3 time has been turned on and set, during cyclic work green LED diode T3 is flashing. After T3 time is finished display shows "End", LED diode T3 is off, and operating relay R remains in the state which it was in at the moment of the end of T3 time. If T3 time finishes during measuring T1 time, the operating relay R will remain on (LED "R" is on), and if it finishes during measuring T2 time, the operating relay R will remain off (LED diode "R" is off). Another turning on the function of cyclic work will be possible after turning off feeding U and turning it on again.
Operation of contact S: closing control contact S immediately stops measuring times. Opening control contact S resumes measuring times. The break in carrying out the function Pi(S) (by the period of closing contact S) is included in T3.

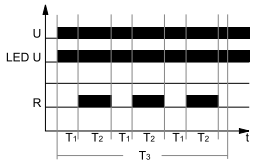
F19 – Pp - Cyclical operation pause first. Independent settings of T1 and T2 intervals. Possibility of turninig on or omitting T3 time.

Diagram 1



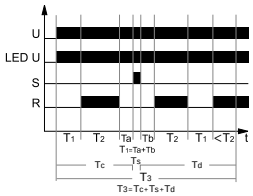
Turning on feeding voltage U starts cyclic work from measuring the time of break T1 - the time of turning off the operating relay R (display shows a vertical strip spinning to the right), after which occurs turning off of the operating relay R for the T2 time (Display shows a vertical strip spinning to the left, and LED diode "R" is on). Cyclic work lasts until the moment of turning off feeding voltage U - see Diagram 1.

Diagram 2



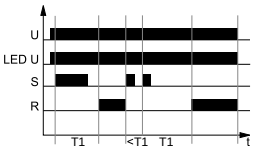
Note: it is possible **to turn on T3 time** (i.e. the time of cyclic work) during programming the relay (when the LED T3 diode is flashing) by confirming it with the OK button, or omitting the T3 time by pressing "F/T" button. When T3 time has been turned on and set, during cyclic work green LED diode T3 is flashing. After T3 time is finished display shows "End", LED diode T3 is off, and operating relay R remains in the state which it was in at the moment of the end of T3 time. If T3 time finishes during measuring T1 time, the operating relay R will remain on (LED "R" is on), and if it finishes during measuring T2 time, the operating relay R will remain off (LED diode "R" is off). Another turning on the function of cyclic work will be possible after turning off feeding U and turning it on again - see Diagram 2.

F19 – Pp(S) - Cyclical operation pause first. Independent settings of T1 and T2 intervals. Possibility of turninig on or omitting T3 time. Possibility of stopping and resuming cyclic work by control contact S.



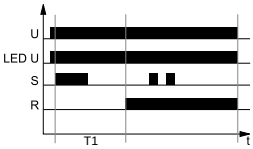
Turning on feeding voltage U starts cyclic work from measuring break time T1 - time of turning off the operating relay R (display shows a vertical strip spinning to the right), after which occurs turning on the operating relay R for the T2 time (display shows a vertical strip spinning to the left, and LED diode "R" is on). Cyclic work lasts until the moment of turning off feeding voltage U.
Note: it is possible **to turn on T3 time** (i.e. the time of cyclic work) during programming the relay (when the LED T3 diode is flashing) by confirming it with the OK button, or omitting the T3 time by pressing "F/T" button. When T3 time has been turned on and set, during cyclic work green LED diode T3 is flashing. After T3 time is finished display shows "End", LED diode T3 is off, and operating relay R remains in the state which it was in at the moment of the end of T3 time. If T3 time finishes during measuring T1 time, the operating relay R will remain on (LED "R" is on), and if it finishes during measuring T2 time, the operating relay R will remain off (LED diode "R" is off). Another turning on the function of cyclic work will be possible after turning off feeding U and turning it on again.
Operation of contact S: closing control contact S immediately stops measuring times. Opening control contact S resumes measuring times. The break in carrying out the function Pi(S) (by the period of closing contact S) is included in T3.

F20 – Est - ON delay with closing of the control contact S, with the interval T1 extended.



The input of the time relay is supplied with voltage U continuously. Closing of the control contact S for a shorter time than T1 time starts the T1 time, and after the T1 time has lapsed, the output relay R switches on and remains in this position until the control contact S is closed again or until the supply voltage U is interrupted. Closing of the control contact S resets the thus far measured time and starts the new T1 time.

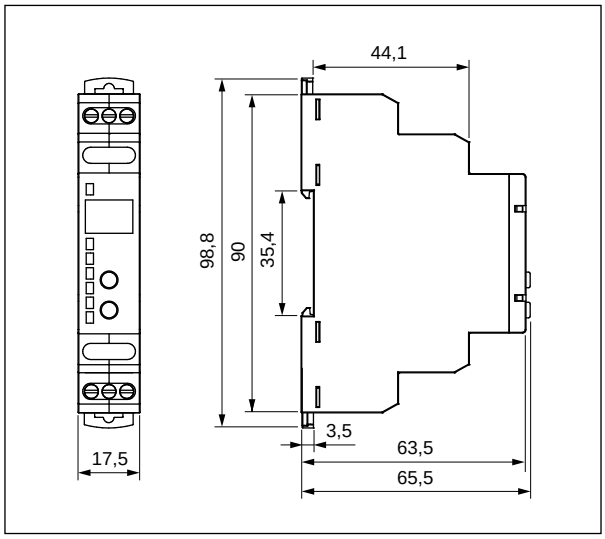
F21 – Esp - ON delay - one cycle, with closing of the control contact S.



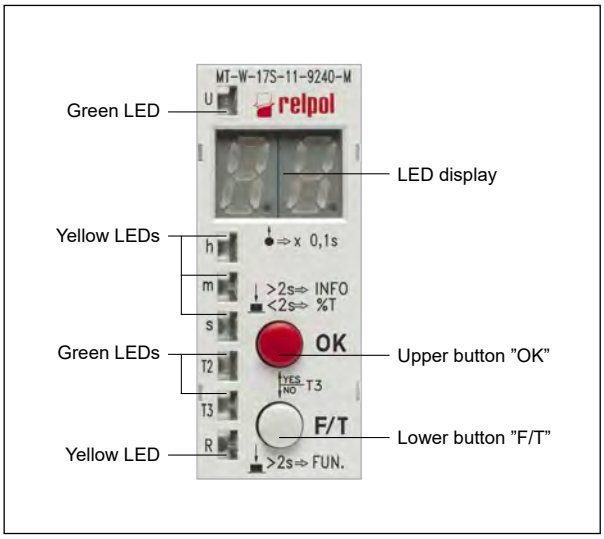
The input of the time relay is supplied with voltage U continuously. Closing of the control contact S starts the T1 time, and after the T1 time has lapsed, the output relay R switches on and remains in this position until the supply voltage U is interrupted. When the output relay R is on, opening or closing of the control contact S does not affect its status.

U - supply voltage; **R** - output state of the relay; **S** - control contact state; **T1, T2, T3** - measured times;
Ts - pause in function performance - time measurement stop period (applies to F18 and F19); **t** - time axis

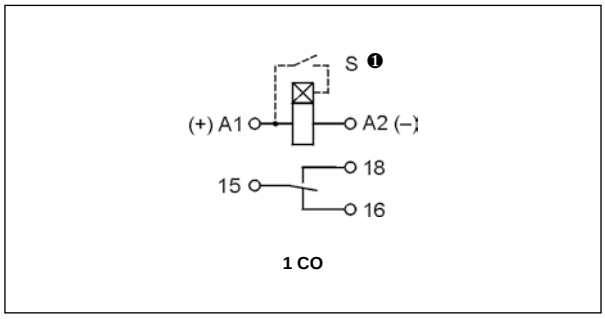
Dimensions



Front panel description



Connection diagram



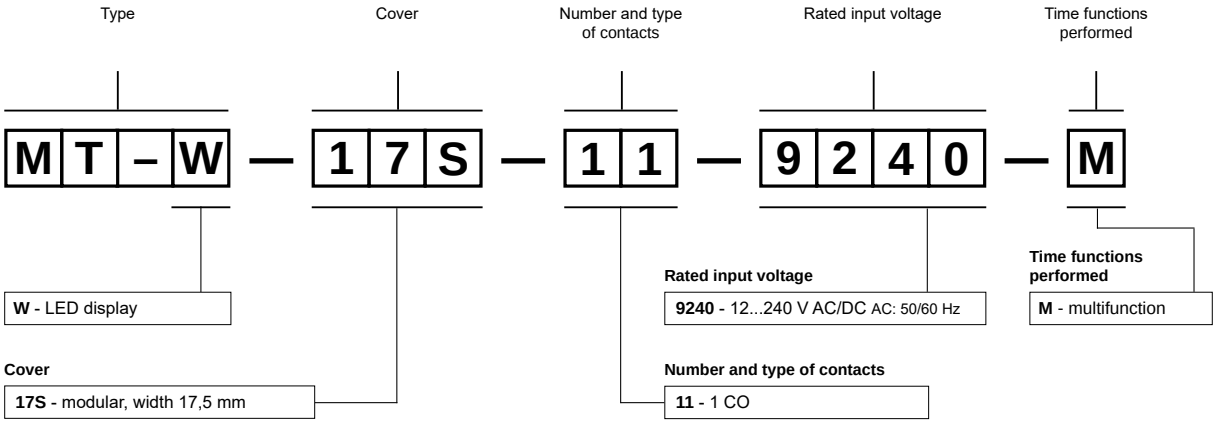
❶ The control terminal S is activated by connection to A1 terminal via the external control contact S.

Mounting

Relays **MT-W...M** are designed for direct mounting on 35 mm rail mount acc. to PN-EN 60715. Operational position - any. **Connections:** max. cross section of the cables: 1 x 2,5 mm² / 2 x 1,5 mm² (1 x 14 / 2 x 16 AWG), length of the cable deinsulation: 6,5 mm, max. tightening moment for the terminal: 0,6 Nm.

Two taps: easy assembly on 35 mm rail, firm tapping (top and bottom).

Ordering codes



Example of ordering codes:

MT-W-17S-11-9240-M universal time relay **MT-W...M** with LED display, multifunction (relay perform 6 functions), cover - modular, width 17,5 mm, one changeover contact, contact material $AgSnO_2$, rated input voltage 12...240 V AC/DC AC: 50/60 Hz

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- **Multifunction time relays (7 time functions; 8 time ranges)**
- Cadmium - free contacts • AC/DC input voltages
- Cover - modular, width 17,5 mm
- Direct mounting on 35 mm rail mount acc. to PN-EN 60715
- Applications: in low-voltage systems
- Compliance with standard PN-EN 61812-1
- Recognitions, certifications, directives: CE EAC

Output circuit - contact data

Number and type of contacts		1 CO
Contact material		$AgSnO_2$
Max. switching voltage		400 V AC / 300 V DC
Rated load	AC1	10 A / 250 V AC
	DC1	10 A / 24 V DC; 0,3 A / 250 V DC
Rated current		10 A / 250 V AC
Max. breaking capacity	AC1	16 A / 250 V AC
Min. breaking capacity		1 W 10 V, 10 mA
Contact resistance		≤ 100 mΩ
Max. operating frequency		
• at rated load	AC1	600 cycles/hour

Input circuit

Rated voltage	AC: 50/60 Hz AC/DC	12...240 V terminals (+)A1 – (-)A2
Operating range of supply voltage		0,9...1,1 U_n
Rated power consumption	AC	≤ 4,5 VA AC: 50 Hz
	DC	≤ 1,5 W
Range of supply frequency	AC	48...63 Hz
Control contact S ❶		
• min. voltage ❷		0,7 U_n
• min. time of pulse duration ❷		AC: ≥ 50 ms DC: ≥ 20 ms

Insulation according to PN-EN 60664-1

Insulation rated voltage		250 V AC
Rated surge voltage		2 500 V 1,2 / 50 µs
Overvoltage category		II
Insulation pollution degree		1
Flammability class		V-0 UL94
Dielectric strength	• input - output	2 500 V AC type of insulation: basic
	• contact clearance	1 000 V AC type of clearance: micro-disconnection

General data

Electrical life	• resistive AC1	> 0,5 x 10^5 10 A, 250 V AC
Mechanical life (cycles)		> 3 x 10^7
Dimensions (L x W x H) / Weight		90 ❸ x 17,5 x 63,5 mm / 64 g
Ambient temperature	• storage	-40...+70 °C
	• operating	-20...+45 °C
Cover protection category		IP 20 PN-EN 60529
Relative humidity		up to 85%
Shock / vibration resistance		15 g / 0,35 mm 10...55 Hz

Time module data

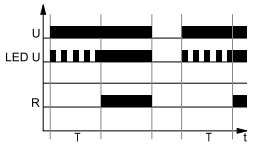
Functions		E, Wu, Bp, T, R, Ws, Wa permanent switching ON and OFF
Time ranges		1 s ❹; 10 s; 1 min.; 10 min.; 1 h; 10 h; 1 d; 10 d
Timing adjustment		smooth - (0,1...1) x time range
Setting accuracy		± 5% ❺ ❹
Repeatability		± 0,5% ❹
Values affecting the timing adjustment	• temperature	± 0,05% / °C
	• humidity	± 0,05% / %HR
Recovery time		≤ 50 ms
LED indicator		green LED U ON - indication of supply voltage U green LED U flashing - measurement of T time yellow LED R ON/OFF - output relay status

❶ The control terminal S is activated by connection to A1 terminal via the external control contact S. ❷ Where the control signal is recognizable. ❸ Length with 35 mm rail taps: 98,8 mm. ❹ For first range setpoint (1 s) setting accuracy and repeatability are smaller than the given ones in technical parameters (significant influence of the operational relay operating time, processor start-time, and the moment of supply switching as referred to the AC supply course). ❺ Calculated from the final range values, for the setting direction from minimum to maximum.

Time functions

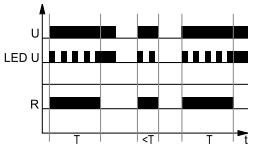
Permanent switching **ON and OFF**.
The functions ON and OFF are selected with TIME potentiometer. In the ON function, the normally open contacts are closed all the time whereas in the OFF function they are open. The position of the FUNC potentiometer is of no significance in these functions as is the preset measurement time. The ON or OFF functions are used for the time relay operation control in electric systems.

E - ON delay.



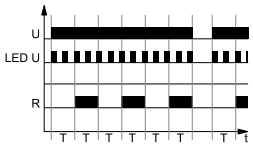
On applying the supply voltage U the set interval T begins - off-delay of the output relay R. After the interval T has lapsed, the output relay R switches on and remains on until supply voltage U is interrupted.

Wu - ON for the set interval.



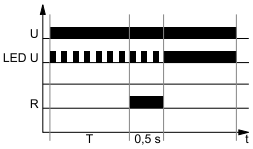
Applying the supply voltage U immediately switches the output relay R on for the set interval T. After the interval T has lapsed, the output relay R switches off.

Bp - Symmetrical cyclical operation pause first.



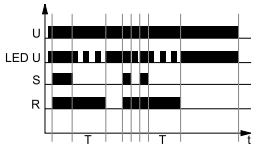
Applying the supply voltage U starts the cyclical operation from the T interval - switching the output relay R off followed by switching on the output relay R for the interval T. The cyclical operation lasts until the supply voltage U is interrupted.

T - Generation of the 0,5 s pulse after the interval T.



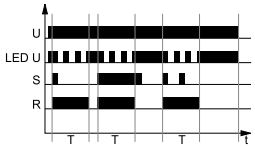
Applying the supply voltage U starts the interval T. After the interval T has lapsed, the output relay switches on for 0,5 s (the time of the NO contact of the output relay).

R - OFF delay with the control contact S.



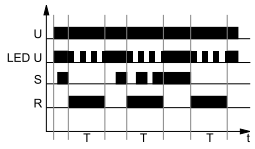
The input of the time relay is supplied with voltage U continuously. Closing of the control contact S immediately switches on the output relay R. Opening of the control contact S starts the set time of the delayed switching off of the output relay R. After the interval T has lapsed, the output relay R switches off. If the control contact S is closed during the interval T, the already measured time is reset, and the output relay R is switched on again. The OFF delay of the output relay R will start when the control contact S is opened again.

Ws - Single shot for the set interval triggered by closing of the control contact S.



The input of the time relay is supplied with voltage U continuously. Closing of the control contact S immediately switches the output relay R on for the set interval T. After the interval T has lapsed, the output relay R is switched off. In the course of the interval T, any opening of the control contact S does not affect the function to be performed. The output relay R may be switched on again for the set interval, after the interval T has lapsed, by closing the control contact S again.

Wa - ON for the set interval triggered with the control contact S.



The input of the time relay is supplied with voltage U continuously. Closing of the control contact S does not start the interval T, and it does not change the position of the output relay R. Opening of the control contact S immediately switches on the output relay R for the set time. After the interval T has lapsed, the output relay R switches off. Opening and closing of the control contact S in the course of the interval T does not affect the function to be performed. The output relay R may be switched on again for the set interval with another closing and opening of the control contact S.

U - supply voltage; **R** - output state of the relay; **S** - control contact state; **T** - measured time; **t** - time axis

Additional functions

Supply diode: it is lit permanently when the time is not being measured. In course of the T time measurement, it flashes at 500 ms period where it is lit for 80% of the time, and off for 20% of the time.

Adjustment of the set values:
- the values of time and range are read in the course of the relay's operation. The set values may be modified at any moment,
- no change of the function is possible in the course of the relay's operation. Any change of the settings of the relay shall be read only after the supply voltage has been switched off and on again.

Release: depending on the function to be performed, the relay is released with the supply voltage or by connection of the S contact to the A1 line. For DC supply, the positive pole must be connected to the A1 line. The level of the S contact activation is adjusted automatically depending on the supply voltage.

Supply: the relay may be supplied with DC voltage or AC voltage 48...63 Hz of 10,8...250 V. A programmed control of the supply voltage has been applied so the processor shall not start operation if the voltage is lower than approximately 10 V. The supply voltage is permanently monitored in course of the operation of the relay. When the voltage drops below 9 V for more than 50 ms, the relay shall be reset. Owing to this, the regeneration time is programmed to 50 ms, and it does not depend on the tolerance of the elements.

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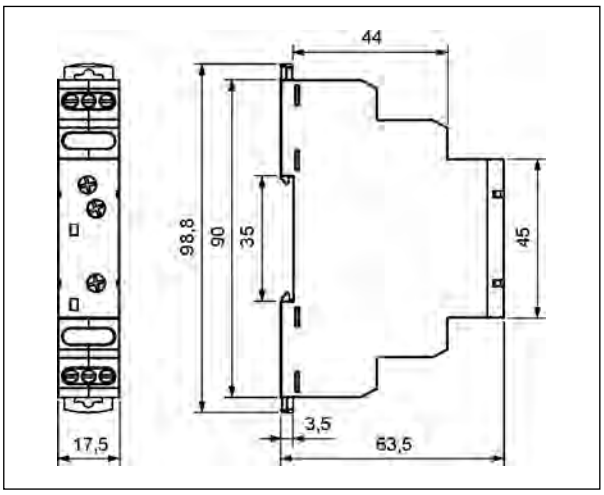
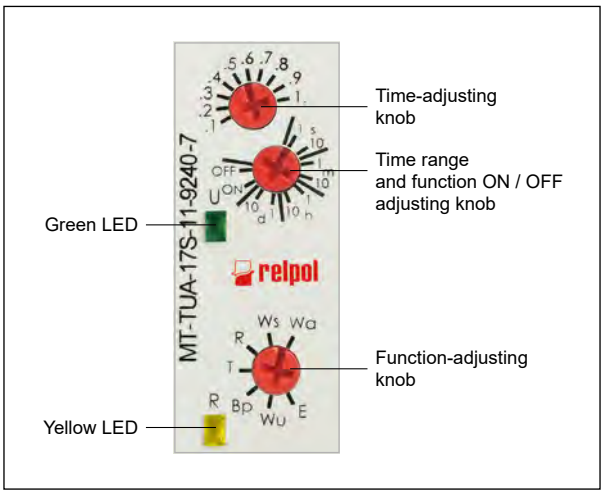
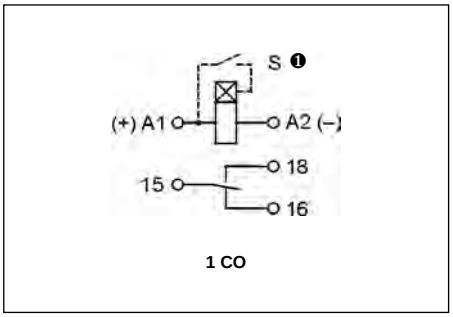
Dimensions



Front panel description



Connection diagram



❶ The control terminal S is activated by connection to A1 terminal via the external control contact S.

Mounting

Relays **MT-TUA-...** are designed for direct mounting on 35 mm rail mount acc. to PN-EN 60715. Operational position - any. **Connections:** max. cross section of the cables: 1 x 2,5 mm² / 2 x 1,5 mm² (1 x 14 / 2 x 16 AWG), length of the cable deinsulation: 6,5 mm, max. tightening moment for the terminal: 0,6 Nm.

Two taps: easy assembly on 35 mm rail, firm tapping (top and bottom).

Ordering codes

Type	Time functions performed	Cover	Number and type of contacts	Rated input voltage	Number of functions
MT-	TUA	— 17S	— 11	— 9240	— 7

Time functions performed
UA - multifunction

Cover
17S - modular, width 17,5 mm

Number and type of contacts
11 - 1 CO

Rated input voltage
9240 - 12...240 V AC/DC AC: 50/60 Hz

Number of functions
7 - relay perform 7 functions

Example of ordering code:

MT-TUA-17S-11-9240-7 time relay **MT-TUA-...**, multifunction (relay perform 7 functions), cover - modular, width 17,5 mm, one changeover contact, contact material $AgSnO_2$, rated input voltage 12...240 V AC/DC AC: 50/60 Hz

- **Multifunction time relays (7 time functions; 8 time ranges)**
- Cadmium - free contacts • AC/DC input voltages
- Cover - modular, width 17,5 mm
- Direct mounting on 35 mm rail mount acc. to PN-EN 60715
- Applications: in low-voltage systems
- Compliance with standard PN-EN 61812-1
- Recognitions, certifications, directives: CE EAC

Output circuit - contact data

Number and type of contacts		1 CO
Contact material		$AgSnO_2$
Max. switching voltage		400 V AC / 300 V DC
Rated load	AC1	10 A / 250 V AC
	DC1	10 A / 24 V DC; 0,3 A / 250 V DC
Rated current		10 A / 250 V AC
Max. breaking capacity	AC1	16 A / 250 V AC
Min. breaking capacity		1 W 10 V, 10 mA
Contact resistance		≤ 100 mΩ
Max. operating frequency		
• at rated load	AC1	600 cycles/hour

Input circuit

Rated voltage	AC: 50/60 Hz AC/DC	12...240 V	terminals (+)A1 – (-)A2
Operating range of supply voltage		0,9...1,1 U_n	
Rated power consumption	AC	≤ 4,5 VA AC: 50 Hz	
	DC	≤ 1,5 W	
Range of supply frequency	AC	48...63 Hz	
Control contact S ❶			
• min. voltage ❷		0,7 U_n	
• min. time of pulse duration ❷		AC: ≥ 50 ms	DC: ≥ 20 ms

Insulation according to PN-EN 60664-1

Insulation rated voltage		250 V AC
Rated surge voltage		2 500 V 1,2 / 50 µs
Overvoltage category		II
Insulation pollution degree		1
Flammability class		V-0 UL94
Dielectric strength	• input - output	2 500 V AC type of insulation: basic
	• contact clearance	1 000 V AC type of clearance: micro-disconnection

General data

Electrical life	• resistive AC1	> 0,5 x 10^5 10 A, 250 V AC
Mechanical life (cycles)		> 3 x 10^7
Dimensions (L x W x H) / Weight		90 ❸ x 17,5 x 63,5 mm / 64 g
Ambient temperature	• storage	-40...+70 °C
	• operating	-20...+45 °C
Cover protection category		IP 20 PN-EN 60529
Relative humidity		up to 85%
Shock / vibration resistance		15 g / 0,35 mm 10...55 Hz

Time module data

Functions		B, Ra, Esf, Wi, Wst, Est, Esp permanent switching ON and OFF
Time ranges		1 s ❹; 10 s; 1 min.; 10 min.; 1 h; 10 h; 1 d; 10 d
Timing adjustment		smooth - (0,1...1) x time range
Setting accuracy		± 5% ❺ ❹
Repeatability		± 0,5% ❹
Values affecting	• temperature	± 0,05% / °C
the timing adjustment	• humidity	± 0,05% / %HR
Recovery time		≤ 50 ms
LED indicator		green LED U ON - indication of supply voltage U green LED U flashing - measurement of T time yellow LED R ON/OFF - output relay status

❶ The control terminal S is activated by connection to A1 terminal via the external control contact S. ❷ Where the control signal is recognizable. ❸ Length with 35 mm rail taps: 98,8 mm. ❹ For first range setpoint (1 s) setting accuracy and repeatability are smaller than the given ones in technical parameters (significant influence of the operational relay operating time, processor start-time, and the moment of supply switching as referred to the AC supply course). ❺ Calculated from the final range values, for the setting direction from minimum to maximum.

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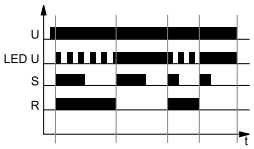
Time functions

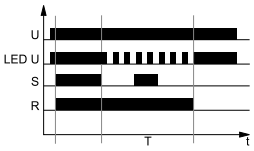
Permanent switching **ON and OFF**.
The functions ON and OFF are selected with TIME potentiometer. In the ON function, the normally open contacts are closed all the time whereas in the OFF function they are open. The position of the FUNC potentiometer is of no significance in these functions as is the preset measurement time. The ON or OFF functions are used for the time relay operation control in electric systems.

B - Cyclical operation controlled with closing of the control contact S.



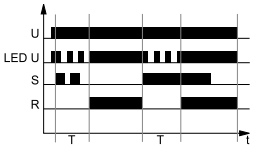
The input of the time relay is supplied with U voltage continuously. Closing of the control contact S immediately switches on the output relay R. Each next closing of the control contact S results in a change of the status of the output relay R to an opposite one (the feature of a bistable relay).

Ra - OFF delay with the control contact S, without extension of the interval T.



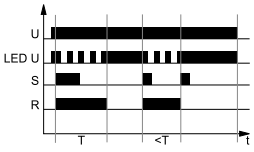
The input of the time relay is supplied with voltage U continuously. Closing of the control contact S immediately switches on the output relay R. Opening of the control contact S starts the set time of the delayed switching off of the output relay R. After the interval T has lapsed, the output relay R switches off. Opening or closing of the control contact S within the interval T does not affect the function to be performed.

Esf - ON delay with the control contact S without the interval T extension.



The input of the time relay is supplied with voltage U continuously. Closing of the control contact S starts the interval T - on-delay of the output relay R. After the interval T has lapsed, the output relay R switches on and remains in this position until the control contact S is closed again, which instantly switches the output relay off for the time T, and after the interval T has lapsed, the output relay R switches on again. In the course of measurement of the interval T, opening or closing of the control contact S does not affect the status of the output relay R. The output relay R may be switched on again after the current cycle has been completed.

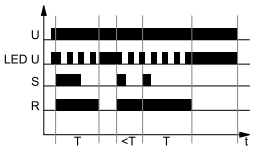
Wi - ON for the set interval controlled by closing of the control contact S, with the function of switching off the output relay R prior to the lapse of the interval T.



The input of the time relay is supplied with voltage U continuously. Closing of the control contact S immediately switches the output relay R on for the set interval T. After the interval T has lapsed, the output relay R is switched off. Any next closing of the control contact S switches on the output relay R again. In case the control contact S is closed again during the interval T, the output relay is immediately switched off, and the measured interval is cancelled. In the course of the interval T, any opening of the control contact S does not affect the function to be performed.

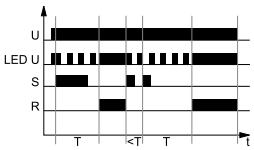
U - supply voltage; **R** - output state of the relay; **S** - control contact state; **T** - measured time; **t** - time axis

Wst - ON for the set interval by closing the control contact S, with extension of the interval T - extension of the time of switching on the output relay R.



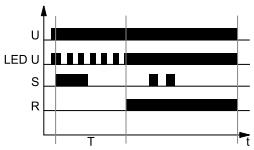
The input of the time relay is supplied with voltage U continuously. Closing of the control contact S immediately switches the output relay R on for the set interval T. After the interval T has lapsed, the output relay R is switched off. The next closing of the control contact S immediately switches on the output relay R for the interval T. In case the control contact S is closed within the interval T, the measured time is cancelled, and the interval T starts again.

Est - ON delay with closing of the control contact S, with the interval T extended.



The input of the time relay is supplied with voltage U continuously. Closing of the control contact S starts the interval T, and after the interval T has lapsed, the output relay R switches on and remains in this position until the control contact S is closed again or until the supply voltage U is interrupted. Closing of the control contact S resets the thus far measured time and starts the new interval T.

Esp - ON delay - one cycle, with closing of the control contact S.



The input of the time relay is supplied with voltage U continuously. Closing of the control contact S starts the interval T, and after the interval T has lapsed, the output relay R switches on and remains in this position until the supply voltage U is interrupted. When the output relay R is on, opening or closing of the control contact S does not affect its status.

Additional functions

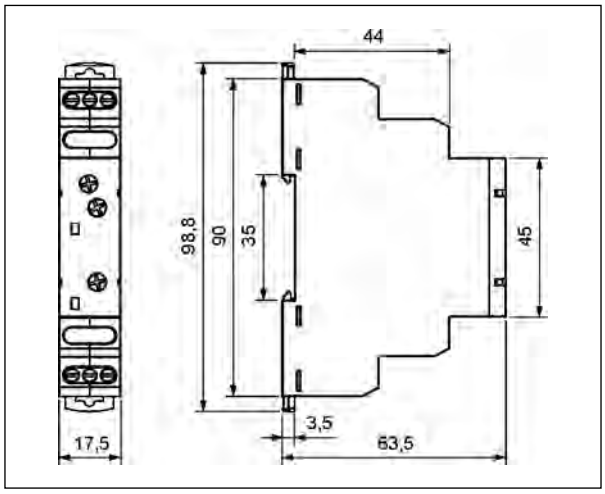
Supply diode: it is lit permanently when the time is not being measured. In course of the T time measurement, it flashes at 500 ms period where it is lit for 80% of the time, and off for 20% of the time.

Adjustment of the set values:
- the values of time and range are read in the course of the relay's operation. The set values may be modified at any moment,
- no change of the function is possible in the course of the relay's operation. Any change of the settings of the relay shall be read only after the supply voltage has been switched off and on again.

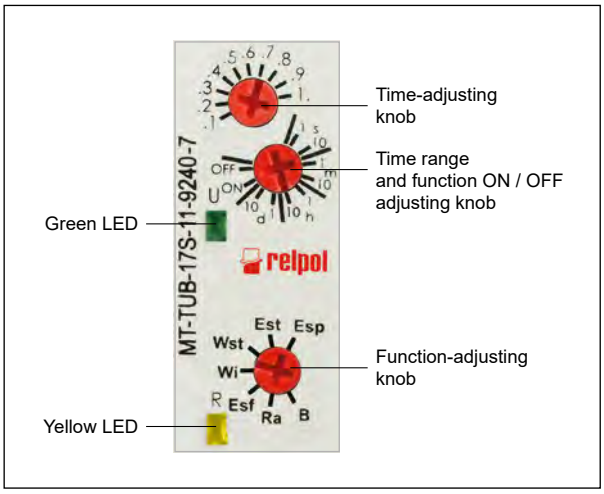
Release: depending on the function to be performed, the relay is released with the supply voltage or by connection of the S contact to the A1 line. For DC supply, the positive pole must be connected to the A1 line. The level of the S contact activation is adjusted automatically depending on the supply voltage.

Supply: the relay may be supplied with DC voltage or AC voltage 48...63 Hz of 10,8...250 V. A programmed control of the supply voltage has been applied so the processor shall not start operation if the voltage is lower than approximately 10 V. The supply voltage is permanently monitored in course of the operation of the relay. When the voltage drops below 9 V for more than 50 ms, the relay shall be reset. Owing to this, the regeneration time is programmed to 50 ms, and it does not depend on the tolerance of the elements.

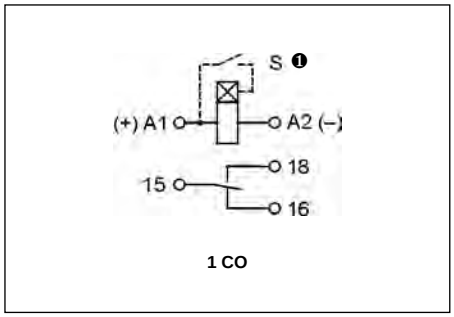
Dimensions



Front panel description



Connection diagram



❶ The control terminal S is activated by connection to A1 terminal via the external control contact S.

Mounting

Relays **MT-TUB-...** are designed for direct mounting on 35 mm rail mount acc. to PN-EN 60715. Operational position - any. **Connections:** max. cross section of the cables: 1 x 2,5 mm² / 2 x 1,5 mm² (1 x 14 / 2 x 16 AWG), length of the cable deinsulation: 6,5 mm, max. tightening moment for the terminal: 0,6 Nm.

Two taps:
easy assembly on 35 mm rail,
firm tapping (top and bottom).

Ordering codes

Type	Time functions performed		Cover		Number and type of contacts		Rated input voltage				Number of functions
M	T	–	T	U	B	—	1	7	S	—	1	1	—	9	2	4	0	—	7

Time functions performed
UB - multifunction

Cover
17S - modular, width 17,5 mm

Number and type of contacts
11 - 1 CO

Rated input voltage
9240 - 12...240 V AC/DC AC: 50/60 Hz

Number of functions
7 - relay perform 7 functions

Example of ordering code:

MT-TUB-17S-11-9240-7 time relay **MT-TUB-...**, multifunction (relay perform 7 functions), cover - modular, width 17,5 mm, one changeover contact, contact material $AgSnO_2$, rated input voltage 12...240 V AC/DC AC: 50/60 Hz

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NEW

- **Single-function time relays**, **time function E** (ON delay), **8 time ranges**
- Cadmium - free contacts • AC/DC input voltages
- Cover - modular, width 17,5 mm
- Direct mounting on 35 mm rail mount acc. to PN-EN 60715
- Applications: in low-voltage systems
- Compliance with standard PN-EN 61812-1
- Recognitions, certifications, directives: CE EAC

Output circuit - contact data

Number and type of contacts		1 CO
Contact material		$AgSnO_2$
Max. switching voltage		400 V AC / 300 V DC
Rated load	AC1	10 A / 250 V AC
	DC1	10 A / 24 V DC; 0,3 A / 250 V DC
Rated current		10 A / 250 V AC
Max. breaking capacity	AC1	16 A / 250 V AC
Min. breaking capacity		1 W 10 V, 10 mA
Contact resistance		≤ 100 mΩ
Max. operating frequency		
• at rated load	AC1	600 cycles/hour

Input circuit

Rated voltage	AC: 50/60 Hz AC/DC	12...240 V terminals (+)A1 – (-)A2
Operating range of supply voltage		0,9...1,1 U_n
Rated power consumption	AC	≤ 4,5 VA AC: 50 Hz
	DC	≤ 1,5 W
Range of supply frequency	AC	48...63 Hz

Insulation according to PN-EN 60664-1

Insulation rated voltage		250 V AC
Rated surge voltage		2 500 V 1,2 / 50 µs
Overvoltage category		II
Insulation pollution degree		1
Flammability class		V-0 UL94
Dielectric strength	• input - output	2 500 V AC type of insulation: basic
	• contact clearance	1 000 V AC type of clearance: micro-disconnection

General data

Electrical life	• resistive AC1	> 0,5 x 10^5 10 A, 250 V AC
Mechanical life (cycles)		> 3 x 10^7
Dimensions (L x W x H)		90 ❶ x 17,5 x 63,5 mm
Weight		64 g
Ambient temperature	• storage	-40...+70 °C
	• operating	-20...+45 °C
Cover protection category		IP 20 PN-EN 60529
Relative humidity		up to 85%
Shock resistance		15 g
Vibration resistance		0,35 mm DA 10...55 Hz

Time module data

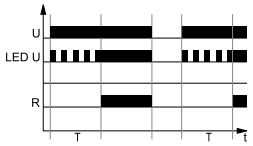
Functions		E permanent switching ON and OFF
Time ranges		1 s ❷; 10 s; 1 min.; 10 min.; 1 h; 10 h; 1 d; 10 d
Timing adjustment		smooth - (0,1...1) x time range
Setting accuracy		± 5% ❸ ❷
Repeatability		± 0,5% ❷
Values affecting	• temperature	± 0,05% / °C
the timing adjustment	• humidity	± 0,05% / %HR
Recovery time		≤ 50 ms
LED indicator		green LED U ON - indication of supply voltage U green LED U flashing - measurement of T time yellow LED R ON/OFF - output relay status

❶ Length with 35 mm rail taps: 98,8 mm. ❷ For first range setpoint (1 s) setting accuracy and repeatability are smaller than the given ones in technical parameters (significant influence of the operational relay operating time, processor start-time, and the moment of supply switching as referred to the AC supply course). ❸ Calculated from the final range values, for the setting direction from minimum to maximum.

Time functions

Permanent switching **ON and OFF**.
The functions ON and OFF are selected with TIME potentiometer. In the ON function, the normally open contacts are closed all the time whereas in the OFF function they are open. The position of the FUNC potentiometer is of no significance in these functions as is the preset measurement time. The ON or OFF functions are used for the time relay operation control in electric systems.

E - ON delay.



On applying the supply voltage U the set interval T begins - off-delay of the output relay R. After the interval T has lapsed, the output relay R switches on and remains on until supply voltage U is interrupted.

U - supply voltage; **R** - output state of the relay; **T** - measured time; **t** - time axis

Additional functions

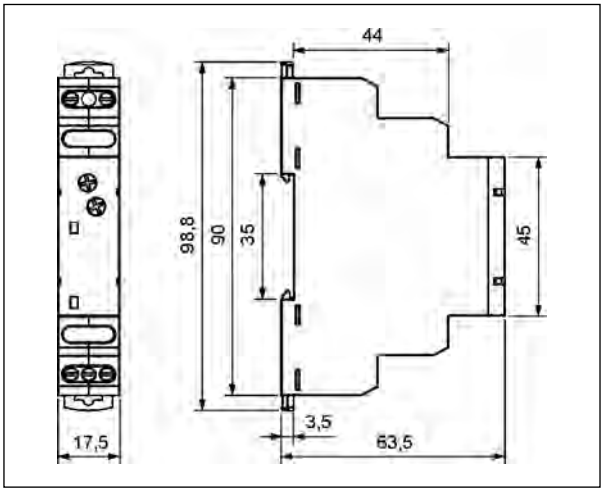
Supply diode: it is lit permanently when the time is not being measured. In course of the T time measurement, it flashes at 500 ms period where it is lit for 80% of the time, and off for 20% of the time.

Adjustment of the set values: the values of time and range are read in the course of the relay's operation. The set values may be modified at any moment.

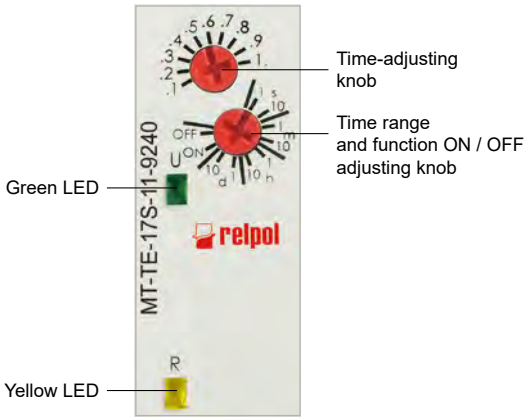
Release: the relay is released with the supply voltage.

Supply: the relay may be supplied with DC voltage or AC voltage 48...63 Hz of 10,8...250 V. A programmed control of the supply voltage has been applied so the processor shall not start operation if the voltage is lower than approximately 10 V. The supply voltage is permanently monitored in course of the operation of the relay. When the voltage drops below 9 V for more than 50 ms, the relay shall be reset. Owing to this, the regeneration time is programmed to 50 ms, and it does not depend on the tolerance of the elements.

Dimensions



Front panel description



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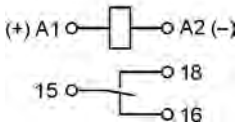
Connection diagram



1 CO

Mounting

Relays **MT-TE-...** are designed for direct mounting on 35 mm rail mount acc. to PN-EN 60715. Operational position - any. **Connections:** max. cross section of the cables: 1 x 2,5 mm^2 / 2 x 1,5 mm^2 (1 x 14 / 2 x 16 AWG), length of the cable deinsulation: 6,5 mm, max. tightening moment for the terminal: 0,6 Nm.

Two taps:
easy assembly on 35 mm rail,
firm tapping (top and bottom).

Ordering codes

Type	Time functions performed		Cover		Number and type of contacts		Rated input voltage			
M	T	–	T	E	1	7	S	1	1	9	2	4	0

Time functions performed

E - relay performing a function E

Cover

17S - modular, width 17,5 mm

Number and type of contacts

11 - 1 CO

Rated input voltage

9240 - 12...240 V AC/DC AC: 50/60 Hz

Example of ordering code:

MT-TE-17S-11-9240 time relay **MT-TE-...**, single-function (relay perform function E), cover - modular, width 17,5 mm, one changeover contact, contact material $AgSnO_2$, rated input voltage 12...240 V AC/DC AC: 50/60 Hz

NEW

- **Single-function time relays**, **time function Wu** (ON for the set interval), **8 time ranges**
- Cadmium - free contacts • AC/DC input voltages
- Cover - modular, width 17,5 mm
- Direct mounting on 35 mm rail mount acc. to PN-EN 60715
- Applications: in low-voltage systems
- Compliance with standard PN-EN 61812-1
- Recognitions, certifications, directives: CE EAC

Output circuit - contact data

Number and type of contacts			1 CO
Contact material			$AgSnO_2$
Max. switching voltage			400 V AC / 300 V DC
Rated load		AC1	10 A / 250 V AC
		DC1	10 A / 24 V DC; 0,3 A / 250 V DC
Rated current			10 A / 250 V AC
Max. breaking capacity		AC1	16 A / 250 V AC
Min. breaking capacity			1 W 10 V, 10 mA
Contact resistance			≤ 100 mΩ
Max. operating frequency			
• at rated load		AC1	600 cycles/hour

Input circuit

Rated voltage	AC: 50/60 Hz AC/DC		12...240 V terminals (+)A1 – (-)A2
Operating range of supply voltage			0,9...1,1 U_n
Rated power consumption		AC	≤ 4,5 VA AC: 50 Hz
		DC	≤ 1,5 W
Range of supply frequency		AC	48...63 Hz

Insulation according to PN-EN 60664-1

Insulation rated voltage			250 V AC
Rated surge voltage			2 500 V 1,2 / 50 µs
Overvoltage category			II
Insulation pollution degree			1
Flammability class			V-0 UL94
Dielectric strength	• input - output		2 500 V AC type of insulation: basic
	• contact clearance		1 000 V AC type of clearance: micro-disconnection

General data

Electrical life	• resistive AC1		> 0,5 x 10^5 10 A, 250 V AC
Mechanical life (cycles)			> 3 x 10^7
Dimensions (L x W x H)			90 ❶ x 17,5 x 63,5 mm
Weight			64 g
Ambient temperature		• storage	-40...+70 °C
		• operating	-20...+45 °C
Cover protection category			IP 20 PN-EN 60529
Relative humidity			up to 85%
Shock resistance			15 g
Vibration resistance			0,35 mm DA 10...55 Hz

Time module data

Functions		Wu permanent switching ON and OFF
Time ranges		1 s ❷; 10 s; 1 min.; 10 min.; 1 h; 10 h; 1 d; 10 d
Timing adjustment		smooth - (0,1...1) x time range
Setting accuracy		± 5% ❸ ❷
Repeatability		± 0,5% ❷
Values affecting the timing adjustment	• temperature	± 0,05% / °C
	• humidity	± 0,05% / %HR
Recovery time		≤ 50 ms
LED indicator		green LED U ON - indication of supply voltage U green LED U flashing - measurement of T time yellow LED R ON/OFF - output relay status

❶ Length with 35 mm rail taps: 98,8 mm. ❷ For first range setpoint (1 s) setting accuracy and repeatability are smaller than the given ones in technical parameters (significant influence of the operational relay operating time, processor start-time, and the moment of supply switching as referred to the AC supply course). ❸ Calculated from the final range values, for the setting direction from minimum to maximum.

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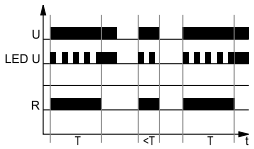
Time functions

Permanent switching **ON and OFF**.
The functions ON and OFF are selected with TIME potentiometer. In the ON function, the normally open contacts are closed all the time whereas in the OFF function they are open. The position of the FUNC potentiometer is of no significance in these functions as is the preset measurement time. The ON or OFF functions are used for the time relay operation control in electric systems.

Wu - ON for the set interval.



Applying the supply voltage U immediately switches the output relay R on for the set interval T. After the interval T has lapsed, the output relay R switches off.

U - supply voltage; **R** - output state of the relay; **T** - measured time; **t** - time axis

Additional functions

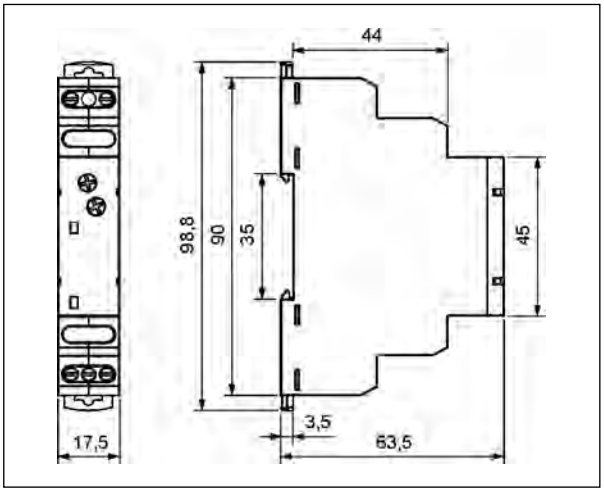
Supply diode: it is lit permanently when the time is not being measured. In course of the T time measurement, it flashes at 500 ms period where it is lit for 80% of the time, and off for 20% of the time.

Adjustment of the set values: the values of time and range are read in the course of the relay's operation. The set values may be modified at any moment.

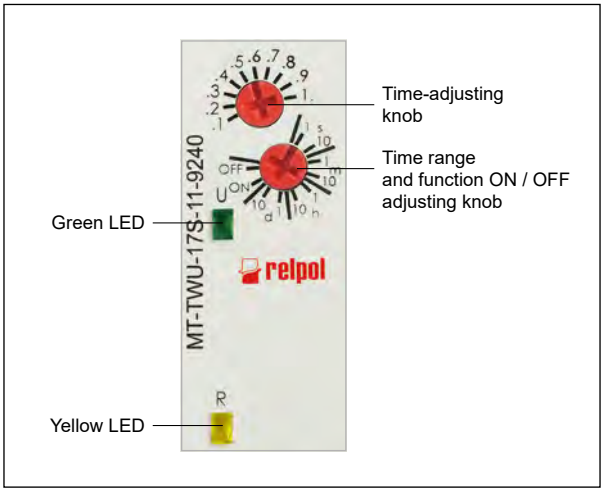
Release: the relay is released with the supply voltage.

Supply: the relay may be supplied with DC voltage or AC voltage 48...63 Hz of 10,8...250 V. A programmed control of the supply voltage has been applied so the processor shall not start operation if the voltage is lower than approximately 10 V. The supply voltage is permanently monitored in course of the operation of the relay. When the voltage drops below 9 V for more than 50 ms, the relay shall be reset. Owing to this, the regeneration time is programmed to 50 ms, and it does not depend on the tolerance of the elements.

Dimensions



Front panel description



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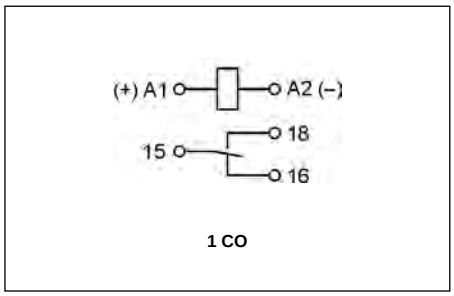
Connection diagram



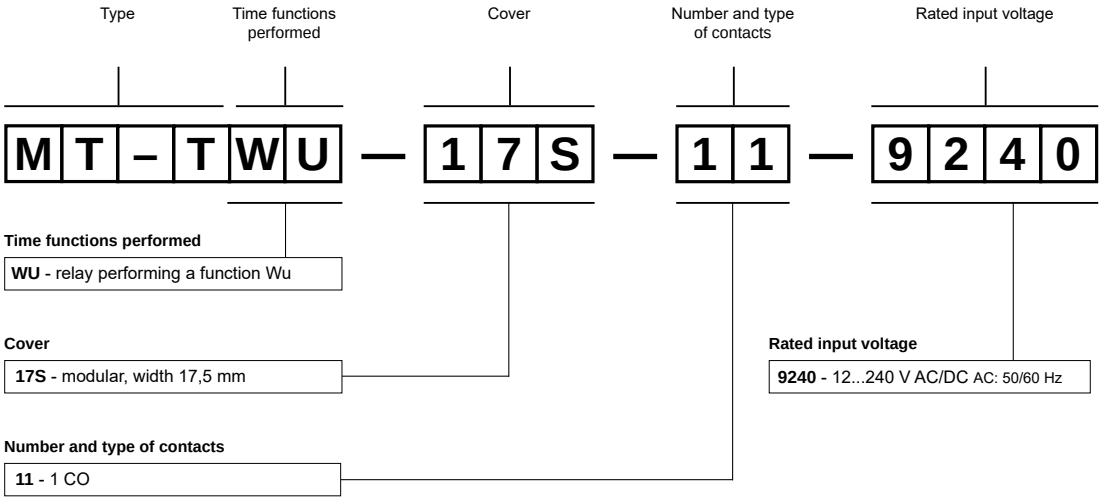
1 CO

Mounting

Relays **MT-TWU-...** are designed for direct mounting on 35 mm rail mount acc. to PN-EN 60715. Operational position - any. **Connections:** max. cross section of the cables: 1 x 2,5 mm^2 / 2 x 1,5 mm^2 (1 x 14 / 2 x 16 AWG), length of the cable deinsulation: 6,5 mm, max. tightening moment for the terminal: 0,6 Nm.

Two taps:
easy assembly on 35 mm rail,
firm tapping (top and bottom).

Ordering codes



Example of ordering code:

MT-TWU-17S-11-9240 time relay **MT-TWU-...**, single-function (relay perform function Wu), cover - modular, width 17,5 mm, one changeover contact, contact material $AgSnO_2$, rated input voltage 12...240 V AC/DC AC: 50/60 Hz

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NEW

- **Single-function time relays**, **time function Bp** (Symmetrical cyclical operation pause first), **8 time ranges**
- Cadmium - free contacts • AC/DC input voltages
- Cover - modular, width 17,5 mm
- Direct mounting on 35 mm rail mount acc. to PN-EN 60715
- Applications: in low-voltage systems
- Compliance with standard PN-EN 61812-1
- Recognitions, certifications, directives: CE EAC

Output circuit - contact data

Number and type of contacts		1 CO
Contact material		$AgSnO_2$
Max. switching voltage		400 V AC / 300 V DC
Rated load	AC1	10 A / 250 V AC
	DC1	10 A / 24 V DC; 0,3 A / 250 V DC
Rated current		10 A / 250 V AC
Max. breaking capacity	AC1	16 A / 250 V AC
Min. breaking capacity		1 W 10 V, 10 mA
Contact resistance		≤ 100 mΩ
Max. operating frequency		
• at rated load	AC1	600 cycles/hour

Input circuit

Rated voltage	AC: 50/60 Hz AC/DC	12...240 V terminals (+)A1 – (-)A2
Operating range of supply voltage		0,9...1,1 U_n
Rated power consumption	AC	≤ 4,5 VA AC: 50 Hz
	DC	≤ 1,5 W
Range of supply frequency	AC	48...63 Hz

Insulation according to PN-EN 60664-1

Insulation rated voltage		250 V AC
Rated surge voltage		2 500 V 1,2 / 50 µs
Overvoltage category		II
Insulation pollution degree		1
Flammability class		V-0 UL94
Dielectric strength	• input - output	2 500 V AC type of insulation: basic
	• contact clearance	1 000 V AC type of clearance: micro-disconnection

General data

Electrical life	• resistive AC1	> 0,5 x 10^5 10 A, 250 V AC
Mechanical life (cycles)		> 3 x 10^7
Dimensions (L x W x H)		90 ❶ x 17,5 x 63,5 mm
Weight		64 g
Ambient temperature	• storage	-40...+70 °C
	• operating	-20...+45 °C
Cover protection category		IP 20 PN-EN 60529
Relative humidity		up to 85%
Shock resistance		15 g
Vibration resistance		0,35 mm DA 10...55 Hz

Time module data

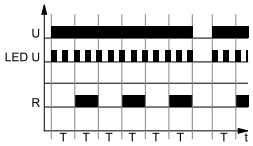
Functions		Bp permanent switching ON and OFF
Time ranges		1 s ❷; 10 s; 1 min.; 10 min.; 1 h; 10 h; 1 d; 10 d
Timing adjustment		smooth - (0,1...1) x time range
Setting accuracy		± 5% ❸ ❷
Repeatability		± 0,5% ❷
Values affecting	• temperature	± 0,05% / °C
the timing adjustment	• humidity	± 0,05% / %HR
Recovery time		≤ 50 ms
LED indicator		green LED U ON - indication of supply voltage U green LED U flashing - measurement of T time yellow LED R ON/OFF - output relay status

❶ Length with 35 mm rail taps: 98,8 mm. ❷ For first range setpoint (1 s) setting accuracy and repeatability are smaller than the given ones in technical parameters (significant influence of the operational relay operating time, processor start-time, and the moment of supply switching as referred to the AC supply course). ❸ Calculated from the final range values, for the setting direction from minimum to maximum.

Time functions

Permanent switching **ON and OFF**.
The functions ON and OFF are selected with TIME potentiometer. In the ON function, the normally open contacts are closed all the time whereas in the OFF function they are open. The position of the FUNC potentiometer is of no significance in these functions as is the preset measurement time. The ON or OFF functions are used for the time relay operation control in electric systems.

Bp - Symmetrical cyclical operation pause first.



Applying the supply voltage U starts the cyclical operation from the T interval - switching the output relay R off followed by switching on the output relay R for the interval T. The cyclical operation lasts until the supply voltage U is interrupted.

Additional functions

Supply diode: it is lit permanently when the time is not being measured. In course of the T time measurement, it flashes at 500 ms period where it is lit for 80% of the time, and off for 20% of the time.

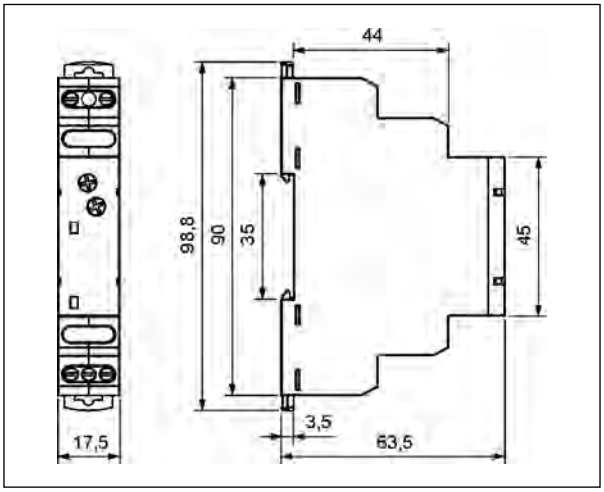
Adjustment of the set values: the values of time and range are read in the course of the relay's operation. The set values may be modified at any moment.

Release: the relay is released with the supply voltage.

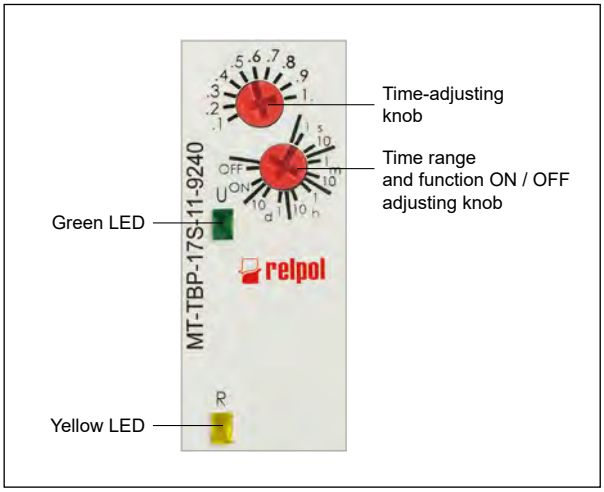
Supply: the relay may be supplied with DC voltage or AC voltage 48...63 Hz of 10,8...250 V. A programmed control of the supply voltage has been applied so the processor shall not start operation if the voltage is lower than approximately 10 V. The supply voltage is permanently monitored in course of the operation of the relay. When the voltage drops below 9 V for more than 50 ms, the relay shall be reset. Owing to this, the regeneration time is programmed to 50 ms, and it does not depend on the tolerance of the elements.

U - supply voltage; **R** - output state of the relay; **T** - measured time; **t** - time axis

Dimensions



Front panel description



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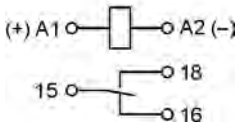
Connection diagram



1 CO

Mounting

Relays **MT-TBP-...** are designed for direct mounting on 35 mm rail mount acc. to PN-EN 60715. Operational position - any. **Connections:** max. cross section of the cables: 1 x 2,5 mm^2 / 2 x 1,5 mm^2 (1 x 14 / 2 x 16 AWG), length of the cable deinsulation: 6,5 mm, max. tightening moment for the terminal: 0,6 Nm.

Two taps:
easy assembly on 35 mm rail,
firm tapping (top and bottom).

Ordering codes

Type	Time functions performed		Cover		Number and type of contacts		Rated input voltage			
M	T	–	T	B	P	—	1	7	S	—	1	1	—	9	2	4	0

Time functions performed

BP - relay performing a function Bp

Cover

17S - modular, width 17,5 mm

Number and type of contacts

11 - 1 CO

Rated input voltage

9240 - 12...240 V AC/DC AC: 50/60 Hz

Example of ordering code:

MT-TBP-17S-11-9240 time relay **MT-TBP-...**, single-function (relay perform function Bp), cover - modular, width 17,5 mm, one changeover contact, contact material $AgSnO_2$, rated input voltage 12...240 V AC/DC AC: 50/60 Hz

- **Time relays with independently controled times T1 and T2, time function ER** (ON delay and OFF delay), **7 time ranges**
- Cadmium - free contacts • AC/DC input voltages
- Cover - modular, width 17,5 mm
- Direct mounting on 35 mm rail mount acc. to PN-EN 60715
- Applications: in low-voltage systems
- Compliance with standard PN-EN 61812-1
- Recognitions, certifications, directives: CE EAC

Output circuit - contact data

Number and type of contacts		1 CO
Contact material		$AgSnO_2$
Max. switching voltage		400 V AC / 300 V DC
Rated load	AC1	10 A / 250 V AC
	DC1	10 A / 24 V DC; 0,3 A / 250 V DC
Rated current		10 A / 250 V AC
Max. breaking capacity	AC1	16 A / 250 V AC
Min. breaking capacity		1 W 10 V, 10 mA
Contact resistance		≤ 100 mΩ
Max. operating frequency		
• at rated load	AC1	600 cycles/hour

Input circuit

Rated voltage	AC: 50/60 Hz AC/DC	12...240 V	terminals (+)A1 – (-)A2
Operating range of supply voltage		0,9...1,1 U_n	
Rated power consumption	AC	≤ 4,5 VA AC: 50 Hz	
	DC	≤ 1,5 W	
Range of supply frequency	AC	48...63 Hz	
Control contact S ❶			
• min. voltage ❷		0,7 U_n	
• min. time of pulse duration ❷		AC: ≥ 50 ms	DC: ≥ 20 ms

Insulation according to PN-EN 60664-1

Insulation rated voltage		250 V AC
Rated surge voltage		2 500 V 1,2 / 50 µs
Overvoltage category		II
Insulation pollution degree		1
Flammability class		V-0 UL94
Dielectric strength	• input - output	2 500 V AC type of insulation: basic
	• contact clearance	1 000 V AC type of clearance: micro-disconnection

General data

Electrical life	• resistive AC1	> 0,5 x 10^5 10 A, 250 V AC
Mechanical life (cycles)		> 3 x 10^7
Dimensions (L x W x H) / Weight		90 ❸ x 17,5 x 63,5 mm / 64 g
Ambient temperature	• storage	-40...+70 °C
	• operating	-20...+45 °C
Cover protection category		IP 20 PN-EN 60529
Relative humidity		up to 85%
Shock / vibration resistance		15 g / 0,35 mm 10...55 Hz

Time module data

Functions		ER
Time ranges		1 s ❹; 10 s; 1 min.; 10 min.; 1 h; 10 h; 100 h
Timing adjustment		smooth - (0,1...1) x time range
Setting accuracy		± 5% ❺ ❹
Repeatability		± 0,5% ❹
Values affecting the timing adjustment	• temperature	± 0,05% / °C
	• humidity	± 0,05% / %HR
Recovery time		≤ 50 ms
LED indicator		green LED U ON - indication of supply voltage U green LED U slow flashing - measurement of T1 time green LED U fast flashing - measurement of T2 time yellow LED R ON/OFF - output relay status

❶ The control terminal S is activated by connection to A1 terminal via the external control contact S. ❷ Where the control signal is recognizable. ❸ Length with 35 mm rail taps: 98,8 mm. ❹ For first range setpoint (1 s) setting accuracy and repeatability are smaller than the given ones in technical parameters (significant influence of the operational relay operating time, processor start-time, and the moment of supply switching as referred to the AC supply course). ❺ Calculated from the final range values, for the setting direction from minimum to maximum.

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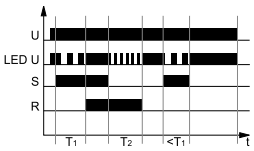
Time functions

ER - ON delay and OFF delay with control contact S. Independent settings of T1 and T2 intervals.



The input of the time relay is supplied with voltage U continuously. Closing of the control contact S starts the interval T1, and after it has lapsed, the output relay R switches on. Opening of the control contact S starts the interval T2, and after it has lapsed, the output relay R switches off. In case the control contact S is closed in the course of the interval T2, the measured time is reset and the output relay R remains switched on. In case the control contact S is closed for time shorter than T1, the unit will not switch the output relay R on.

U - supply voltage; **R** - output state of the relay;
S - control contact state; **T1**, **T2** - measured times; **t** - time axis

Additional functions

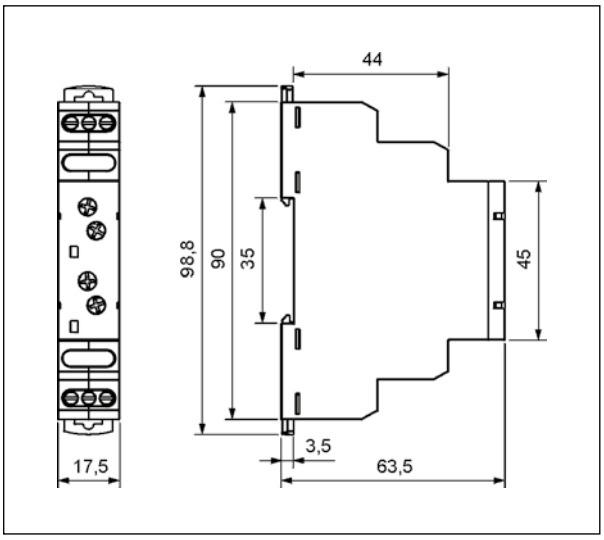
Supply diode: it is lit permanently when the time is not being measured. In course of the T1 time measurement, it flashes at 500 ms period where it is lit for 80% of the time, and off for 20% of the time. For the T2 time, the period is 250 ms.

Adjustment of the set values: the values of time and range are read in the course of the relay's operation. The set values may be modified at any moment.

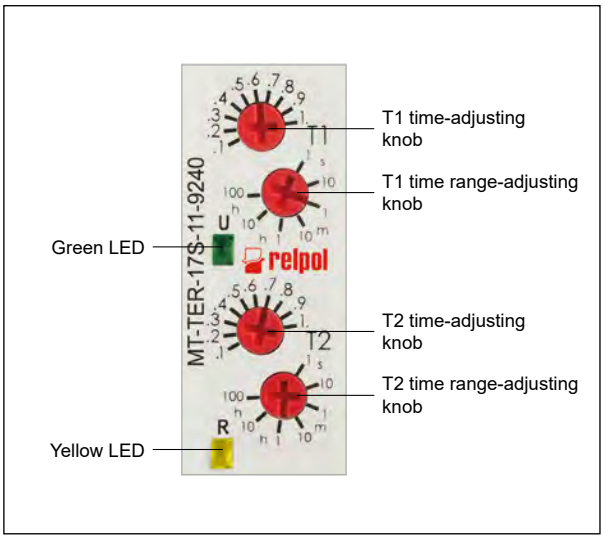
Release: the relay is released by connection of the S contact to the A1 line. For DC supply, the positive pole must be connected to the A1 line. The level of the S contact activation is adjusted automatically depending on the supply voltage.

Supply: the relay may be supplied with DC voltage or AC voltage 48...63 Hz of 10,8...250 V. A programmed control of the supply voltage has been applied so the processor shall not start operation if the voltage is lower than approximately 10 V. The supply voltage is permanently monitored in course of the operation of the relay. When the voltage drops below 9 V for more than 50 ms, the relay shall be reset. Owing to this, the regeneration time is programmed to 50 ms, and it does not depend on the tolerance of the elements.

Dimensions



Front panel description



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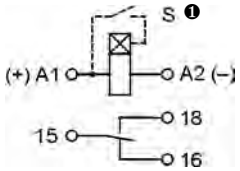
Connection diagram



1 CO

❶ The control terminal S is activated by connection to A1 terminal via the external control contact S.

Mounting

Relays **MT-TER-...** are designed for direct mounting on 35 mm rail mount acc. to PN-EN 60715. Operational position - any. **Connections:** max. cross section of the cables: 1 x 2,5 mm^2 / 2 x 1,5 mm^2 (1 x 14 / 2 x 16 AWG), length of the cable deinsulation: 6,5 mm, max. tightening moment for the terminal: 0,6 Nm.

Two taps:
easy assembly on 35 mm rail,
firm tapping (top and bottom).

Ordering codes

Type	Time function performed	Cover	Number and type of contacts	Rated input voltage
MT-	TER	— 17S	— 11	— 9240

Time function performed

ER - relay performing a function ER

Cover

17S - modular, width 17,5 mm

Number and type of contacts

11 - 1 CO

Rated input voltage

9240 - 12...240 V AC/DC AC: 50/60 Hz

Example of ordering code:

MT-TER-17S-11-9240 time relay **MT-TER-...**, single-function (relay perform function ER), cover - modular, width 17,5 mm, one changeover contact, contact material $AgSnO_2$, rated input voltage 12...240 V AC/DC AC: 50/60 Hz

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- **Time relays with independently controled times T1 and T2, time function EWa** (OFF delay and breaking time delay), **7 time ranges** • Cadmium - free contacts • AC/DC input voltages
- Cover - modular, width 17,5 mm
- Direct mounting on 35 mm rail mount acc. to PN-EN 60715
- Applications: in low-voltage systems
- Compliance with standard PN-EN 61812-1
- Recognitions, certifications, directives: CE EAC

Output circuit - contact data

Number and type of contacts		1 CO
Contact material		$AgSnO_2$
Max. switching voltage		400 V AC / 300 V DC
Rated load	AC1	10 A / 250 V AC
	DC1	10 A / 24 V DC; 0,3 A / 250 V DC
Rated current		10 A / 250 V AC
Max. breaking capacity	AC1	16 A / 250 V AC
Min. breaking capacity		1 W 10 V, 10 mA
Contact resistance		≤ 100 mΩ
Max. operating frequency		
• at rated load	AC1	600 cycles/hour

Input circuit

Rated voltage AC: 50/60 Hz AC/DC	12...240 V	terminals (+)A1 – (-)A2
Operating range of supply voltage	0,9...1,1 U_n	
Rated power consumption AC	≤ 4,5 VA AC: 50 Hz	
DC	≤ 1,5 W	
Range of supply frequency AC	48...63 Hz	
Control contact S ❶		
• min. voltage ❷	0,7 U_n	
• min. time of pulse duration ❷	AC: ≥ 50 ms	DC: ≥ 20 ms

Insulation according to PN-EN 60664-1

Insulation rated voltage	250 V AC	
Rated surge voltage	2 500 V 1,2 / 50 µs	
Overvoltage category	II	
Insulation pollution degree	1	
Flammability class	V-0 UL94	
Dielectric strength • input - output	2 500 V AC	type of insulation: basic
• contact clearance	1 000 V AC	type of clearance: micro-disconnection

General data

Electrical life • resistive AC1	> 0,5 x 10^5	10 A, 250 V AC
Mechanical life (cycles)	> 3 x 10^7	
Dimensions (L x W x H) / Weight	90 ❸ x 17,5 x 63,5 mm / 64 g	
Ambient temperature • storage	-40...+70 °C	
• operating	-20...+45 °C	
Cover protection category	IP 20	PN-EN 60529
Relative humidity	up to 85%	
Shock / vibration resistance	15 g / 0,35 mm 10...55 Hz	

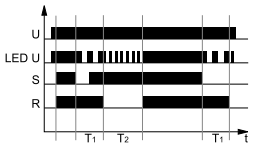
Time module data

Functions	EWa	
Time ranges	1 s ❹; 10 s; 1 min.; 10 min.; 1 h; 10 h; 100 h	
Timing adjustment	smooth - (0,1...1) x time range	
Setting accuracy	± 5% ❺ ❹	
Repeatability	± 0,5% ❹	
Values affecting • temperature	± 0,05% / °C	
the timing adjustment • humidity	± 0,05% / %HR	
Recovery time	≤ 50 ms	
LED indicator	green LED U ON - indication of supply voltage U green LED U slow flashing - measurement of T1 time green LED U fast flashing - measurement of T2 time yellow LED R ON/OFF - output relay status	

❶ The control terminal S is activated by connection to A1 terminal via the external control contact S. ❷ Where the control signal is recognizable. ❸ Length with 35 mm rail taps: 98,8 mm. ❹ For first range setpoint (1 s) setting accuracy and repeatability are smaller than the given ones in technical parameters (significant influence of the operational relay operating time, processor start-time, and the moment of supply switching as referred to the AC supply course). ❺ Calculated from the final range values, for the setting direction from minimum to maximum.

Time functions

EWa - OFF delay and breaking time delay with opening of the control contact S. Independent settings of T1 and T2 intervals.



The input of the time relay is supplied with voltage U continuously. Closing of the control contact S switches on the output relay R. Opening of the control contact S starts the interval T1, and after the interval has lapsed, the output relay R switches off for the interval T2. Following the interval T2, the output relay R will be switched on again when the control contact S is closed on the lapse of the interval. In the course of the intervals T1 and T2 the position of the control contact S is of no importance.

U - supply voltage; **R** - output state of the relay;
S - control contact state; **T1**, **T2** - measured times; **t** - time axis

Additional functions

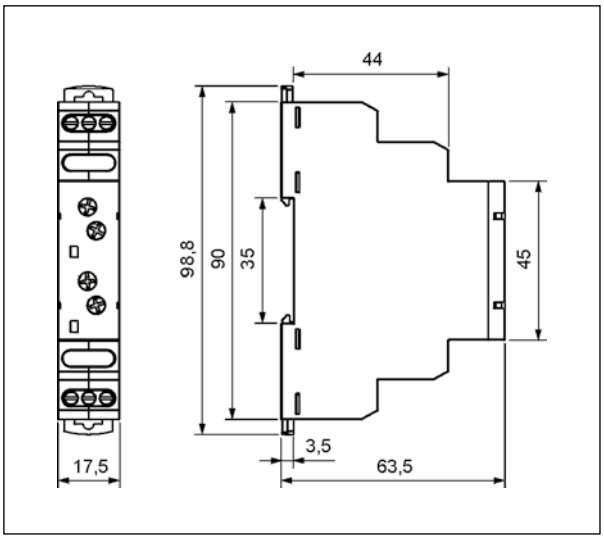
Supply diode: it is lit permanently when the time is not being measured. In course of the T1 time measurement, it flashes at 500 ms period where it is lit for 80% of the time, and off for 20% of the time. For the T2 time, the period is 250 ms.

Adjustment of the set values: the values of time and range are read in the course of the relay's operation. The set values may be modified at any moment.

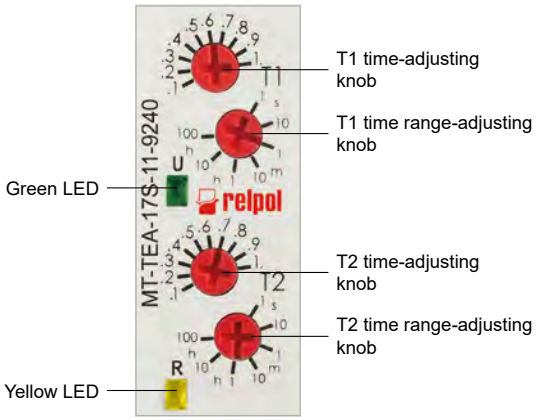
Release: the relay is released by connection of the S contact to the A1 line. For DC supply, the positive pole must be connected to the A1 line. The level of the S contact activation is adjusted automatically depending on the supply voltage.

Supply: the relay may be supplied with DC voltage or AC voltage 48...63 Hz of 10,8...250 V. A programmed control of the supply voltage has been applied so the processor shall not start operation if the voltage is lower than approximately 10 V. The supply voltage is permanently monitored in course of the operation of the relay. When the voltage drops below 9 V for more than 50 ms, the relay shall be reset. Owing to this, the regeneration time is programmed to 50 ms, and it does not depend on the tolerance of the elements.

Dimensions



Front panel description



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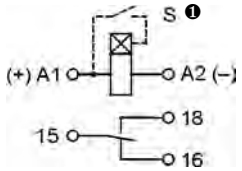
Connection diagram



1 CO

❶ The control terminal S is activated by connection to A1 terminal via the external control contact S.

Mounting

Relays **MT-TEA-...** are designed for direct mounting on 35 mm rail mount acc. to PN-EN 60715. Operational position - any. **Connections:** max. cross section of the cables: 1 x 2,5 mm^2 / 2 x 1,5 mm^2 (1 x 14 / 2 x 16 AWG), length of the cable deinsulation: 6,5 mm, max. tightening moment for the terminal: 0,6 Nm.

Two taps:
easy assembly on 35 mm rail,
firm tapping (top and bottom).

Ordering codes

Type	Time function performed		Cover		Number and type of contacts		Rated input voltage			
M	T	–	T	E	A	—	1	7	S	—	1	1	—	9	2	4	0

Time function performed

EA - relay performing a function EWa

Cover

17S - modular, width 17,5 mm

Number and type of contacts

11 - 1 CO

Rated input voltage

9240 - 12...240 V AC/DC AC: 50/60 Hz

Example of ordering code:

MT-TEA-17S-11-9240 time relay **MT-TEA-...**, single-function (relay perform function EWa), cover - modular, width 17,5 mm, one changeover contact, contact material $AgSnO_2$, rated input voltage 12...240 V AC/DC AC: 50/60 Hz

- **Time relays with independently controled times T1 and T2, time function EWs** (ON delay and ON for the set time), **7 time ranges** • Cadmium - free contacts • AC/DC input voltages
- Cover - modular, width 17,5 mm
- Direct mounting on 35 mm rail mount acc. to PN-EN 60715
- Applications: in low-voltage systems
- Compliance with standard PN-EN 61812-1
- Recognitions, certifications, directives: CE EAC

Output circuit - contact data

Number and type of contacts		1 CO
Contact material		$AgSnO_2$
Max. switching voltage		400 V AC / 300 V DC
Rated load	AC1	10 A / 250 V AC
	DC1	10 A / 24 V DC; 0,3 A / 250 V DC
Rated current		10 A / 250 V AC
Max. breaking capacity	AC1	16 A / 250 V AC
Min. breaking capacity		1 W 10 V, 10 mA
Contact resistance		≤ 100 mΩ
Max. operating frequency		
• at rated load	AC1	600 cycles/hour

Input circuit

Rated voltage	AC: 50/60 Hz AC/DC	12...240 V	terminals (+)A1 – (-)A2
Operating range of supply voltage		0,9...1,1 U_n	
Rated power consumption	AC	≤ 4,5 VA AC: 50 Hz	
	DC	≤ 1,5 W	
Range of supply frequency	AC	48...63 Hz	
Control contact S ❶			
• min. voltage ❷		0,7 U_n	
• min. time of pulse duration ❷		AC: ≥ 50 ms	DC: ≥ 20 ms

Insulation according to PN-EN 60664-1

Insulation rated voltage	250 V AC
Rated surge voltage	2 500 V 1,2 / 50 µs
Overvoltage category	II
Insulation pollution degree	1
Flammability class	V-0 UL94
Dielectric strength • input - output	2 500 V AC type of insulation: basic
• contact clearance	1 000 V AC type of clearance: micro-disconnection

General data

Electrical life • resistive AC1	> 0,5 x 10^5	10 A, 250 V AC
Mechanical life (cycles)	> 3 x 10^7	
Dimensions (L x W x H) / Weight	90 ❸ x 17,5 x 63,5 mm / 64 g	
Ambient temperature • storage	-40...+70 °C	
• operating	-20...+45 °C	
Cover protection category	IP 20	PN-EN 60529
Relative humidity	up to 85%	
Shock / vibration resistance	15 g / 0,35 mm	10...55 Hz

Time module data

Functions	EWs
Time ranges	1 s ❹; 10 s; 1 min.; 10 min.; 1 h; 10 h; 100 h
Timing adjustment	smooth - (0,1...1) x time range
Setting accuracy	± 5% ❺ ❹
Repeatability	± 0,5% ❹
Values affecting • temperature	± 0,05% / °C
the timing adjustment • humidity	± 0,05% / %HR
Recovery time	≤ 50 ms
LED indicator	green LED U ON - indication of supply voltage U green LED U slow flashing - measurement of T1 time green LED U fast flashing - measurement of T2 time yellow LED R ON/OFF - output relay status

❶ The control terminal S is activated by connection to A1 terminal via the external control contact S. ❷ Where the control signal is recognizable. ❸ Length with 35 mm rail taps: 98,8 mm. ❹ For first range setpoint (1 s) setting accuracy and repeatability are smaller than the given ones in technical parameters (significant influence of the operational relay operating time, processor start-time, and the moment of supply switching as referred to the AC supply course). ❺ Calculated from the final range values, for the setting direction from minimum to maximum.

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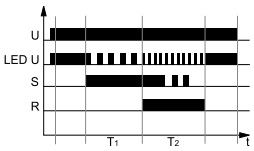
Time functions

EWs - ON delay and ON for the set time with closing of the control contact S. Independent settings of T1 and T2 intervals.



The input of the time relay is supplied with voltage U continuously. Closing of the control contact S starts the interval T1, and after the interval has lapsed, the output relay R switches on for the interval T2. Following the interval T2, the output relay switches off, and the circuits awaits for the control contact S to be closed again. In the course of the intervals T1 and T2 the position of the control contact S is of no importance.

U - supply voltage; **R** - output state of the relay;
S - control contact state; **T1**, **T2** - measured times; **t** - time axis

Additional functions

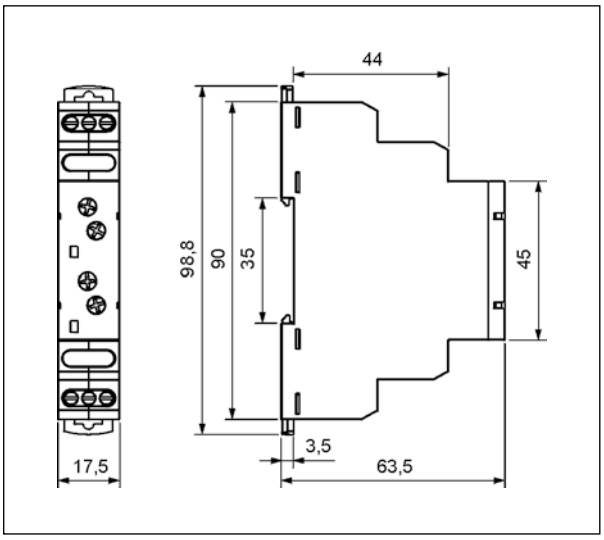
Supply diode: it is lit permanently when the time is not being measured. In course of the T1 time measurement, it flashes at 500 ms period where it is lit for 80% of the time, and off for 20% of the time. For the T2 time, the period is 250 ms.

Adjustment of the set values: the values of time and range are read in the course of the relay's operation. The set values may be modified at any moment.

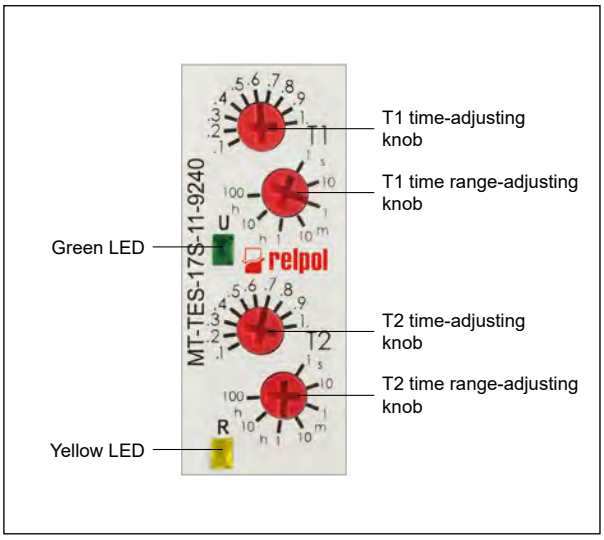
Release: the relay is released by connection of the S contact to the A1 line. For DC supply, the positive pole must be connected to the A1 line. The level of the S contact activation is adjusted automatically depending on the supply voltage.

Supply: the relay may be supplied with DC voltage or AC voltage 48...63 Hz of 10,8...250 V. A programmed control of the supply voltage has been applied so the processor shall not start operation if the voltage is lower than approximately 10 V. The supply voltage is permanently monitored in course of the operation of the relay. When the voltage drops below 9 V for more than 50 ms, the relay shall be reset. Owing to this, the regeneration time is programmed to 50 ms, and it does not depend on the tolerance of the elements.

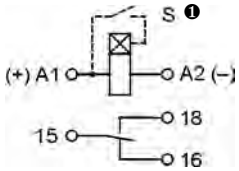
Dimensions



Front panel description



Connection diagram



1 CO

❶ The control terminal S is activated by connection to A1 terminal via the external control contact S.

Mounting

Relays **MT-TES-...** are designed for direct mounting on 35 mm rail mount acc. to PN-EN 60715. Operational position - any. **Connections:** max. cross section of the cables: 1 x 2,5 mm^2 / 2 x 1,5 mm^2 (1 x 14 / 2 x 16 AWG), length of the cable deinsulation: 6,5 mm, max. tightening moment for the terminal: 0,6 Nm.

Two taps:
easy assembly on 35 mm rail,
firm tapping (top and bottom).

Ordering codes

Type	Time function performed		Cover		Number and type of contacts		Rated input voltage			
M	T	–	T	E	S	—	1	7	S	—	1	1	—	9	2	4	0

Time function performed

ES - relay performing a function EWs

Cover

17S - modular, width 17,5 mm

Number and type of contacts

11 - 1 CO

Rated input voltage

9240 - 12...240 V AC/DC AC: 50/60 Hz

Example of ordering code:

MT-TES-17S-11-9240 time relay **MT-TES-...**, single-function (relay perform function EWs), cover - modular, width 17,5 mm, one changeover contact, contact material $AgSnO_2$, rated input voltage 12...240 V AC/DC AC: 50/60 Hz

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- **Time relays with independently controled times T1 and T2**, **time function EWu + NWu** (ON delay for the set interval or switching ON for the set interval - switching OFF for the set interval - continuous ON), **7 time ranges** • Cadmium - free contacts
- AC/DC input voltages • Cover - modular, width 17,5 mm • Direct mounting on 35 mm rail mount acc. to PN-EN 60715 • Applications: in low-voltage systems • Compliance with standard PN-EN 61812-1
- Recognitions, certifications, directives: CE EAC

Output circuit - contact data

Number and type of contacts		1 CO
Contact material		$AgSnO_2$
Max. switching voltage		400 V AC / 300 V DC
Rated load	AC1	10 A / 250 V AC
	DC1	10 A / 24 V DC; 0,3 A / 250 V DC
Rated current		10 A / 250 V AC
Max. breaking capacity	AC1	16 A / 250 V AC
Min. breaking capacity		1 W 10 V, 10 mA
Contact resistance		≤ 100 mΩ
Max. operating frequency		
• at rated load	AC1	600 cycles/hour

Input circuit

Rated voltage	AC: 50/60 Hz AC/DC	12...240 V terminals (+)A1 – (-)A2
Operating range of supply voltage		0,9...1,1 U_n
Rated power consumption	AC	≤ 4,5 VA AC: 50 Hz
	DC	≤ 1,5 W
Range of supply frequency	AC	48...63 Hz
Control contact S ❶		
• min. voltage ❷		0,7 U_n
• min. time of pulse duration ❷		AC: ≥ 50 ms DC: ≥ 20 ms

Insulation according to PN-EN 60664-1

Insulation rated voltage		250 V AC
Rated surge voltage		2 500 V 1,2 / 50 µs
Overvoltage category		II
Insulation pollution degree		1
Flammability class		V-0 UL94
Dielectric strength	• input - output	2 500 V AC type of insulation: basic
	• contact clearance	1 000 V AC type of clearance: micro-disconnection

General data

Electrical life	• resistive AC1	> 0,5 x 10^5 10 A, 250 V AC
Mechanical life (cycles)		> 3 x 10^7
Dimensions (L x W x H) / Weight		90 ❸ x 17,5 x 63,5 mm / 64 g
Ambient temperature	• storage	-40...+70 °C
	• operating	-20...+45 °C
Cover protection category		IP 20 PN-EN 60529
Relative humidity		up to 85%
Shock / vibration resistance		15 g / 0,35 mm 10...55 Hz

Time module data

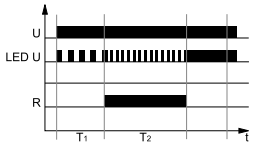
Functions		EWu + NWu
Time ranges		1 s ❹; 10 s; 1 min.; 10 min.; 1 h; 10 h; 100 h
Timing adjustment		smooth - (0,1...1) x time range
Setting accuracy		± 5% ❺ ❹
Repeatability		± 0,5% ❹
Values affecting the timing adjustment	• temperature	± 0,05% / °C
	• humidity	± 0,05% / %HR
Recovery time		≤ 50 ms
LED indicator		green LED U ON - indication of supply voltage U green LED U slow flashing - measurement of T1 time green LED U fast flashing - measurement of T2 time yellow LED R ON/OFF - output relay status

❶ The control terminal S is activated by connection to A1 terminal via the external control contact S. ❷ Where the control signal is recognizable. ❸ Length with 35 mm rail taps: 98,8 mm. ❹ For first range setpoint (1 s) setting accuracy and repeatability are smaller than the given ones in technical parameters (significant influence of the operational relay operating time, processor start-time, and the moment of supply switching as referred to the AC supply course). ❺ Calculated from the final range values, for the setting direction from minimum to maximum.

Time functions

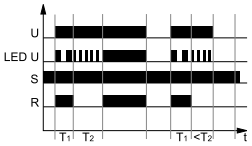
EWu + NWu - ON delay for the set interval (EWu) or switching ON for the set interval-switching OFF for the set interval-continuous ON with the control contact S (NWu). Independent settings of T1 and T2 intervals.

function EWu



When the control contact S is open, application of the supply voltage U starts operation in the EWu function - the interval T1, and after the interval T1 has lapsed, the output relay switches on for the interval T2.

function NWu



When the control contact S is closed, application of the supply voltage U starts operation in the NWu function - from switching on the output relay R for the interval T1, and after the interval T1 has lapsed, the output relay switches off for the interval T2, and following the interval T2, the output relay R switches on for continuous time.

In the course of the relay operation, closing of the control contact S at any time will cause reset and the operation in the NWu function will start whereas opening of the control contact S at any time will cause reset and the operation in the EWu function will start.

Additional functions

Supply diode: it is lit permanently when the time is not being measured. In course of the T1 time measurement, it flashes at 500 ms period where it is lit for 80% of the time, and off for 20% of the time. For the T2 time, the period is 250 ms.

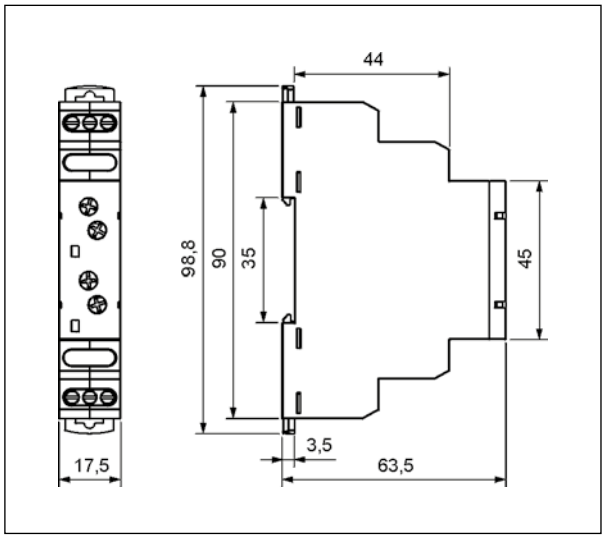
Adjustment of the set values: the values of time and range are read in the course of the relay's operation. The set values may be modified at any moment.

Release: the relay is released with the supply voltage. For DC supply, the positive pole must be connected to the A1 line. The level of the S contact activation is adjusted automatically depending on the supply voltage.

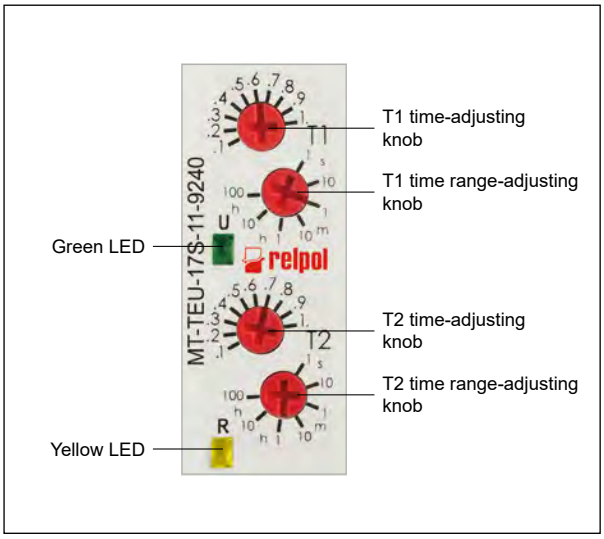
Supply: the relay may be supplied with DC voltage or AC voltage 48...63 Hz of 10,8...250 V. A programmed control of the supply voltage has been applied so the processor shall not start operation if the voltage is lower than approximately 10 V. The supply voltage is permanently monitored in course of the operation of the relay. When the voltage drops below 9 V for more than 50 ms, the relay shall be reset. Owing to this, the regeneration time is programmed to 50 ms, and it does not depend on the tolerance of the elements.

U - supply voltage; **R** - output state of the relay;
S - control contact state; **T1**, **T2** - measured times; **t** - time axis

Dimensions



Front panel description



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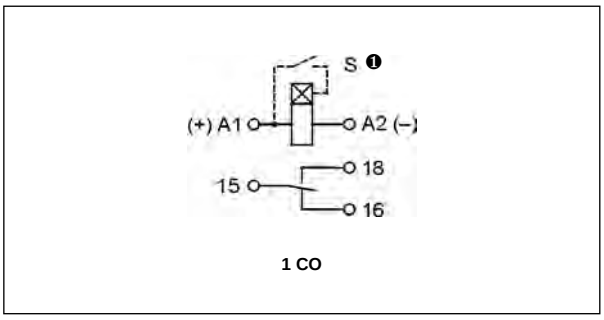
Connection diagram



❶ The control terminal S is activated by connection to A1 terminal via the external control contact S.

Mounting

Relays **MT-TEU-...** are designed for direct mounting on 35 mm rail mount acc. to PN-EN 60715. Operational position - any. **Connections:** max. cross section of the cables: 1 x 2,5 mm^2 / 2 x 1,5 mm^2 (1 x 14 / 2 x 16 AWG), length of the cable deinsulation: 6,5 mm, max. tightening moment for the terminal: 0,6 Nm.

Two taps:
easy assembly on 35 mm rail,
firm tapping (top and bottom).

Ordering codes

Type	Time function performed		Cover		Number and type of contacts		Rated input voltage			
M	T	–	T	E	U	—	1	7	S	—	1	1	—	9	2	4	0

Time function performed

EU - relay performing a function EWu + NWu

Cover

17S - modular, width 17,5 mm

Number and type of contacts

11 - 1 CO

Rated input voltage

9240 - 12...240 V AC/DC AC: 50/60 Hz

Example of ordering code:

MT-TEU-17S-11-9240 time relay **MT-TEU-...**, single-function (relay perform function EWu + NWu), cover - modular, width 17,5 mm, one changeover contact, contact material $AgSnO_2$, rated input voltage 12...240 V AC/DC AC: 50/60 Hz

- **Time relays with independently controled times T1 and T2, time function Ii + Ip** (Cyclical operation in two independent intervals T1 and T2), **7 time ranges** • Cadmium - free contacts
- AC/DC input voltages • Cover - modular, width 17,5 mm
- Direct mounting on 35 mm rail mount acc. to PN-EN 60715
- Applications: in low-voltage systems
- Compliance with standard PN-EN 61812-1
- Recognitions, certifications, directives: CE EAC

Output circuit - contact data

Number and type of contacts		1 CO
Contact material		$AgSnO_2$
Max. switching voltage		400 V AC / 300 V DC
Rated load	AC1	10 A / 250 V AC
	DC1	10 A / 24 V DC; 0,3 A / 250 V DC
Rated current		10 A / 250 V AC
Max. breaking capacity	AC1	16 A / 250 V AC
Min. breaking capacity		1 W 10 V, 10 mA
Contact resistance		≤ 100 mΩ
Max. operating frequency		
• at rated load	AC1	600 cycles/hour

Input circuit

Rated voltage	AC: 50/60 Hz AC/DC	12...240 V	terminals (+)A1 – (-)A2
Operating range of supply voltage		0,9...1,1 U_n	
Rated power consumption	AC	≤ 4,5 VA AC: 50 Hz	
	DC	≤ 1,5 W	
Range of supply frequency	AC	48...63 Hz	
Control contact S ❶			
• min. voltage ❷		0,7 U_n	
• min. time of pulse duration ❷		AC: ≥ 50 ms	DC: ≥ 20 ms

Insulation according to PN-EN 60664-1

Insulation rated voltage		250 V AC
Rated surge voltage		2 500 V 1,2 / 50 µs
Overvoltage category		II
Insulation pollution degree		1
Flammability class		V-0 UL94
Dielectric strength	• input - output	2 500 V AC type of insulation: basic
	• contact clearance	1 000 V AC type of clearance: micro-disconnection

General data

Electrical life	• resistive AC1	> 0,5 x 10^5 10 A, 250 V AC
Mechanical life (cycles)		> 3 x 10^7
Dimensions (L x W x H) / Weight		90 ❸ x 17,5 x 63,5 mm / 64 g
Ambient temperature	• storage	-40...+70 °C
	• operating	-20...+45 °C
Cover protection category		IP 20 PN-EN 60529
Relative humidity		up to 85%
Shock / vibration resistance		15 g / 0,35 mm 10...55 Hz

Time module data

Functions		Ii + Ip
Time ranges		1 s ❹; 10 s; 1 min.; 10 min.; 1 h; 10 h; 100 h
Timing adjustment		smooth - (0,1...1) x time range
Setting accuracy		± 5% ❺ ❹
Repeatability		± 0,5% ❹
Values affecting the timing adjustment	• temperature	± 0,05% / °C
	• humidity	± 0,05% / %HR
Recovery time		≤ 50 ms
LED indicator		green LED U ON - indication of supply voltage U green LED U slow flashing - measurement of T1 time green LED U fast flashing - measurement of T2 time yellow LED R ON/OFF - output relay status

❶ The control terminal S is activated by connection to A1 terminal via the external control contact S. ❷ Where the control signal is recognizable. ❸ Length with 35 mm rail taps: 98,8 mm. ❹ For first range setpoint (1 s) setting accuracy and repeatability are smaller than the given ones in technical parameters (significant influence of the operational relay operating time, processor start-time, and the moment of supply switching as referred to the AC supply course). ❺ Calculated from the final range values, for the setting direction from minimum to maximum.

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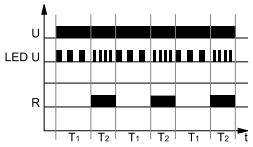
Time functions

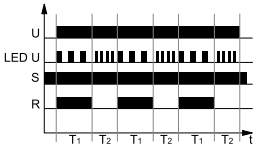
Ii + Ip - Cyclical operation in two independent intervals T1 and T2; operation in the function Ii or Ip depending on the position of the control contact S.

function Ip



Application of the supply voltage U when the control contact S is open start the cyclical operation in the Ip function - from the interval T1 (time of switching off the output relay R), following which the output relay R is switched on for the interval T2. The cyclical operation continues until the supply voltage U is interrupted.

function Ii



When the control contact S is closed, application of the supply voltage U starts operation in the Ii function - from switching on the output relay R for the interval T1, and after the interval T1 has lapsed, the output relay switches off for the interval T2. The cyclical operation continues until the supply voltage U is interrupted.

In the course of the relay operation, closing of the control contact S at any time will cause reset and the operation in the Ii function will start whereas opening of the control contact S at any time will cause reset and the operation in the Ip function will start.

Additional functions

Supply diode: it is lit permanently when the time is not being measured. In course of the T1 time measurement, it flashes at 500 ms period where it is lit for 80% of the time, and off for 20% of the time. For the T2 time, the period is 250 ms.

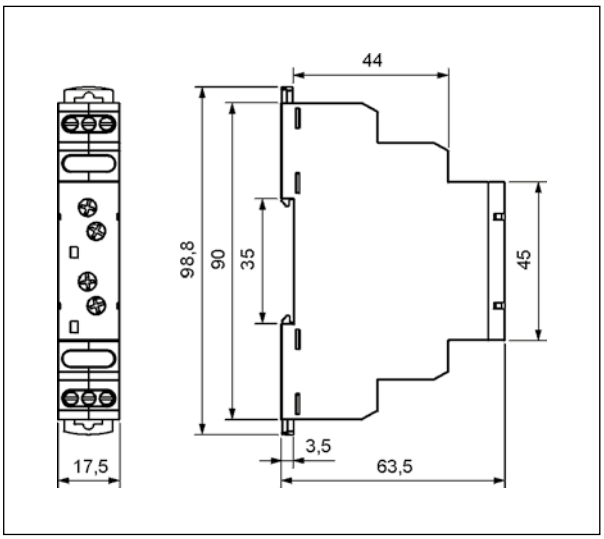
Adjustment of the set values: the values of time and range are read in the course of the relay's operation. The set values may be modified at any moment.

Release: the relay is released with the supply voltage. For DC supply, the positive pole must be connected to the A1 line. The level of the S contact activation is adjusted automatically depending on the supply voltage.

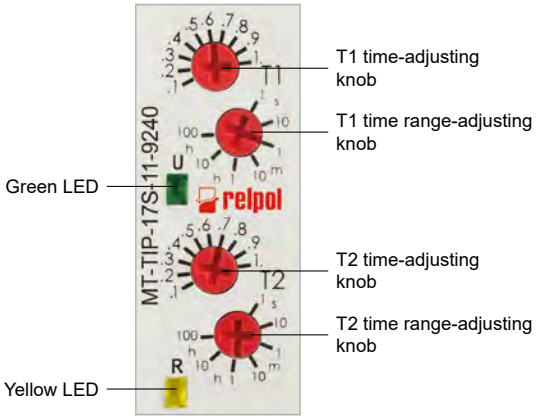
Supply: the relay may be supplied with DC voltage or AC voltage 48...63 Hz of 10,8...250 V. A programmed control of the supply voltage has been applied so the processor shall not start operation if the voltage is lower than approximately 10 V. The supply voltage is permanently monitored in course of the operation of the relay. When the voltage drops below 9 V for more than 50 ms, the relay shall be reset. Owing to this, the regeneration time is programmed to 50 ms, and it does not depend on the tolerance of the elements.

U - supply voltage; **R** - output state of the relay;
S - control contact state; **T1**, **T2** - measured times; **t** - time axis

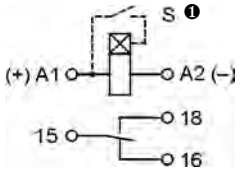
Dimensions



Front panel description



Connection diagram



1 CO

❶ The control terminal S is activated by connection to A1 terminal via the external control contact S.

Mounting

Relays **MT-TIP-...** are designed for direct mounting on 35 mm rail mount acc. to PN-EN 60715. Operational position - any. **Connections:** max. cross section of the cables: 1 x 2,5 mm^2 / 2 x 1,5 mm^2 (1 x 14 / 2 x 16 AWG), length of the cable deinsulation: 6,5 mm, max. tightening moment for the terminal: 0,6 Nm.

Two taps:
easy assembly on 35 mm rail,
firm tapping (top and bottom).

Ordering codes

Type	Time function performed		Cover		Number and type of contacts		Rated input voltage			
M	T	–	T	I	P	—	1	7	S	—	1	1	—	9	2	4	0

Time function performed

IP - relay performing a function Ii + Ip

Cover

17S - modular, width 17,5 mm

Number and type of contacts

11 - 1 CO

Rated input voltage

9240 - 12...240 V AC/DC AC: 50/60 Hz

Example of ordering code:

MT-TIP-17S-11-9240 time relay **MT-TIP-...**, single-function (relay perform function Ii + Ip), cover - modular, width 17,5 mm, one changeover contact, contact material $AgSnO_2$, rated input voltage 12...240 V AC/DC AC: 50/60 Hz

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- **Time relays with independently controled times T1 and T2, time function WsWa** (ON for the set intervals T1 and T2), **7 time ranges** • Cadmium - free contacts • AC/DC input voltages
- Cover - modular, width 17,5 mm
- Direct mounting on 35 mm rail mount acc. to PN-EN 60715
- Applications: in low-voltage systems
- Compliance with standard PN-EN 61812-1
- Recognitions, certifications, directives: CE EAC

Output circuit - contact data

Number and type of contacts		1 CO	
Contact material		$AgSnO_2$	
Max. switching voltage		400 V AC / 300 V DC	
Rated load	AC1	10 A / 250 V AC	
	DC1	10 A / 24 V DC; 0,3 A / 250 V DC	
Rated current		10 A / 250 V AC	
Max. breaking capacity	AC1	16 A / 250 V AC	
Min. breaking capacity		1 W 10 V, 10 mA	
Contact resistance		≤ 100 mΩ	
Max. operating frequency			
• at rated load	AC1	600 cycles/hour	

Input circuit

Rated voltage	AC: 50/60 Hz AC/DC	12...240 V	terminals (+)A1 – (-)A2
Operating range of supply voltage		0,9...1,1 U_n	
Rated power consumption	AC	≤ 4,5 VA AC: 50 Hz	
	DC	≤ 1,5 W	
Range of supply frequency	AC	48...63 Hz	
Control contact S ❶			
• min. voltage ❷		0,7 U_n	
• min. time of pulse duration ❷		AC: ≥ 50 ms	DC: ≥ 20 ms

Insulation according to PN-EN 60664-1

Insulation rated voltage		250 V AC	
Rated surge voltage		2 500 V 1,2 / 50 µs	
Overvoltage category		II	
Insulation pollution degree		1	
Flammability class		V-0 UL94	
Dielectric strength	• input - output	2 500 V AC	type of insulation: basic
	• contact clearance	1 000 V AC	type of clearance: micro-disconnection

General data

Electrical life	• resistive AC1	> 0,5 x 10^5	10 A, 250 V AC
Mechanical life (cycles)		> 3 x 10^7	
Dimensions (L x W x H) / Weight		90 ❸ x 17,5 x 63,5 mm / 64 g	
Ambient temperature	• storage	-40...+70 °C	
	• operating	-20...+45 °C	
Cover protection category		IP 20	PN-EN 60529
Relative humidity		up to 85%	
Shock / vibration resistance		15 g / 0,35 mm 10...55 Hz	

Time module data

Functions		WsWa
Time ranges		1 s ❹; 10 s; 1 min.; 10 min.; 1 h; 10 h; 100 h
Timing adjustment		smooth - (0,1...1) x time range
Setting accuracy		± 5% ❺ ❹
Repeatability		± 0,5% ❹
Values affecting the timing adjustment	• temperature	± 0,05% / °C
	• humidity	± 0,05% / %HR
Recovery time		≤ 50 ms
LED indicator		green LED U ON - indication of supply voltage U green LED U slow flashing - measurement of T1 time green LED U fast flashing - measurement of T2 time yellow LED R ON/OFF - output relay status

❶ The control terminal S is activated by connection to A1 terminal via the external control contact S. ❷ Where the control signal is recognizable. ❸ Length with 35 mm rail taps: 98,8 mm. ❹ For first range setpoint (1 s) setting accuracy and repeatability are smaller than the given ones in technical parameters (significant influence of the operational relay operating time, processor start-time, and the moment of supply switching as referred to the AC supply course). ❺ Calculated from the final range values, for the setting direction from minimum to maximum.

Time functions

WsWa - ON for the set intervals T1 and T2 with the control contact S. Independent settings of T1 and T2 intervals.

The input of the time relay is supplied with voltage U continuously. Closing of the control contact S switches the output relay R for the interval T1, and after the interval has lapsed, the relay R is switched off. Opening of the control contact S switches on the output relay R for the interval T2. If the control contact S is open when the interval T1 lapses, the output relay R will remain on for the interval T2. If the control contact S is closed when the interval T2 lapses, the output relay R will remain on for the interval T1.

U - supply voltage; **R** - output state of the relay;
S - control contact state; **T1**, **T2** - measured times; **t** - time axis

Additional functions

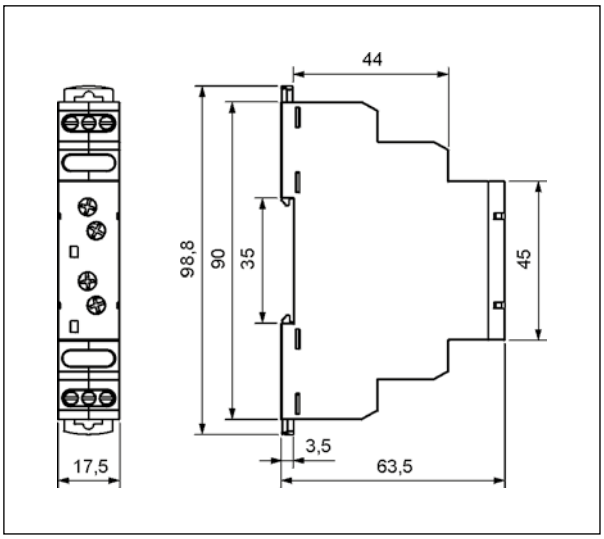
Supply diode: it is lit permanently when the time is not being measured. In course of the T1 time measurement, it flashes at 500 ms period where it is lit for 80% of the time, and off for 20% of the time. For the T2 time, the period is 250 ms.

Adjustment of the set values: the values of time and range are read in the course of the relay's operation. The set values may be modified at any moment.

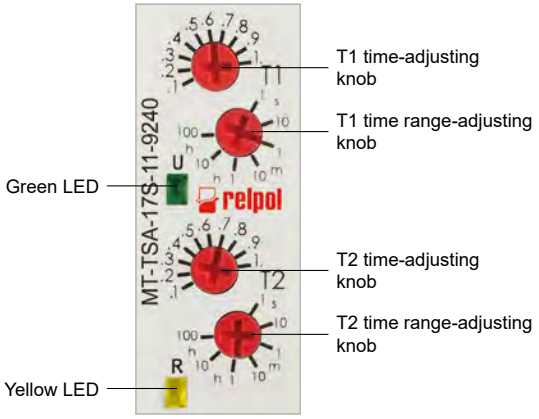
Release: the relay is released by connection of the S contact to the A1 line. For DC supply, the positive pole must be connected to the A1 line. The level of the S contact activation is adjusted automatically depending on the supply voltage.

Supply: the relay may be supplied with DC voltage or AC voltage 48...63 Hz of 10,8...250 V. A programmed control of the supply voltage has been applied so the processor shall not start operation if the voltage is lower than approximately 10 V. The supply voltage is permanently monitored in course of the operation of the relay. When the voltage drops below 9 V for more than 50 ms, the relay shall be reset. Owing to this, the regeneration time is programmed to 50 ms, and it does not depend on the tolerance of the elements.

Dimensions



Front panel description



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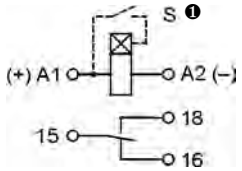
Connection diagram



1 CO

❶ The control terminal S is activated by connection to A1 terminal via the external control contact S.

Mounting

Relays **MT-TSA-...** are designed for direct mounting on 35 mm rail mount acc. to PN-EN 60715. Operational position - any. **Connections:** max. cross section of the cables: 1 x 2,5 mm^2 / 2 x 1,5 mm^2 (1 x 14 / 2 x 16 AWG), length of the cable deinsulation: 6,5 mm, max. tightening moment for the terminal: 0,6 Nm.

Two taps:
easy assembly on 35 mm rail,
firm tapping (top and bottom).

Ordering codes

Type	Time function performed		Cover		Number and type of contacts		Rated input voltage			
M	T	–	T	S	A	—	1	7	S	—	1	1	—	9	2	4	0

Time function performed

SA - relay performing a function WsWa

Cover

17S - modular, width 17,5 mm

Number and type of contacts

11 - 1 CO

Rated input voltage

9240 - 12...240 V AC/DC AC: 50/60 Hz

Example of ordering code:

MT-TSA-17S-11-9240 time relay **MT-TSA-...**, single-function (relay perform function WsWa), cover - modular, width 17,5 mm, one changeover contact, contact material $AgSnO_2$, rated input voltage 12...240 V AC/DC AC: 50/60 Hz

- **Time relays with independently controled times T1 and T2, time function Wt** (Monitoring of the sequence of pulses), **7 time ranges** • Cadmium - free contacts • AC/DC input voltages
- Cover - modular, width 17,5 mm
- Direct mounting on 35 mm rail mount acc. to PN-EN 60715
- Applications: in low-voltage systems
- Compliance with standard PN-EN 61812-1
- Recognitions, certifications, directives: CE EAC

Output circuit - contact data

Number and type of contacts		1 CO
Contact material		$AgSnO_2$
Max. switching voltage		400 V AC / 300 V DC
Rated load	AC1	10 A / 250 V AC
	DC1	10 A / 24 V DC; 0,3 A / 250 V DC
Rated current		10 A / 250 V AC
Max. breaking capacity	AC1	16 A / 250 V AC
Min. breaking capacity		1 W 10 V, 10 mA
Contact resistance		≤ 100 mΩ
Max. operating frequency		
• at rated load	AC1	600 cycles/hour

Input circuit

Rated voltage	AC: 50/60 Hz AC/DC	12...240 V	terminals (+)A1 – (-)A2
Operating range of supply voltage		0,9...1,1 U_n	
Rated power consumption	AC	≤ 4,5 VA AC: 50 Hz	
	DC	≤ 1,5 W	
Range of supply frequency	AC	48...63 Hz	
Control contact S ❶			
• min. voltage ❷		0,7 U_n	
• min. time of pulse duration ❷		AC: ≥ 50 ms	DC: ≥ 20 ms

Insulation according to PN-EN 60664-1

Insulation rated voltage		250 V AC
Rated surge voltage		2 500 V 1,2 / 50 µs
Overvoltage category		II
Insulation pollution degree		1
Flammability class		V-0 UL94
Dielectric strength	• input - output	2 500 V AC type of insulation: basic
	• contact clearance	1 000 V AC type of clearance: micro-disconnection

General data

Electrical life	• resistive AC1	> 0,5 x 10^5	10 A, 250 V AC
Mechanical life (cycles)		> 3 x 10^7	
Dimensions (L x W x H) / Weight		90 ❸ x 17,5 x 63,5 mm / 64 g	
Ambient temperature	• storage	-40...+70 °C	
	• operating	-20...+45 °C	
Cover protection category		IP 20	PN-EN 60529
Relative humidity		up to 85%	
Shock / vibration resistance		15 g / 0,35 mm	10...55 Hz

Time module data

Functions		Wt
Time ranges		1 s ❹; 10 s; 1 min.; 10 min.; 1 h; 10 h; 100 h
Timing adjustment		smooth - (0,1...1) x time range
Setting accuracy		± 5% ❺ ❹
Repeatability		± 0,5% ❹
Values affecting the timing adjustment	• temperature	± 0,05% / °C
	• humidity	± 0,05% / %HR
Recovery time		≤ 50 ms
LED indicator		green LED U ON - indication of supply voltage U green LED U slow flashing - measurement of T1 time green LED U fast flashing - measurement of T2 time yellow LED R ON/OFF - output relay status

❶ The control terminal S is activated by connection to A1 terminal via the external control contact S. ❷ Where the control signal is recognizable. ❸ Length with 35 mm rail taps: 98,8 mm. ❹ For first range setpoint (1 s) setting accuracy and repeatability are smaller than the given ones in technical parameters (significant influence of the operational relay operating time, processor start-time, and the moment of supply switching as referred to the AC supply course). ❺ Calculated from the final range values, for the setting direction from minimum to maximum.

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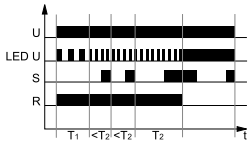
Time functions

Wt - Monitoring of the sequence of pulses. Switching on is extended with consecutive pulses / closings of the contact S. Independent settings of T1 and T2 intervals.



On applying the supply voltage U the output relay R is switched on for the set interval T1. After the interval T1 has lapsed, the interval T2 starts with the output relay R still switched on. For the output relay to switch on, the control contact S must be closed and then opened (single pulse) during the interval T2, which cancels the time already measured an starts the interval T2 again. In case of absence of a single pulse prior to lapse of the interval T2, the output relay R will switch off, and it may be switched on after the supply voltage has been interrupted and applied again.

U - supply voltage; **R** - output state of the relay;
S - control contact state; **T1**, **T2** - measured times; **t** - time axis

Additional functions

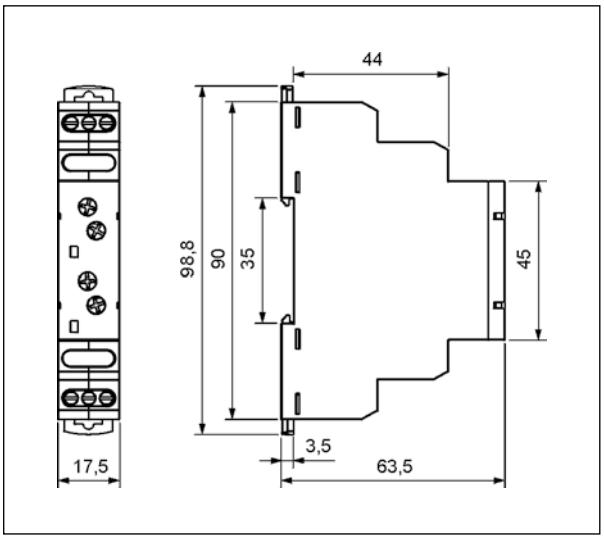
Supply diode: it is lit permanently when the time is not being measured. In course of the T1 time measurement, it flashes at 500 ms period where it is lit for 80% of the time, and off for 20% of the time. For the T2 time, the period is 250 ms.

Adjustment of the set values: the values of time and range are read in the course of the relay's operation. The set values may be modified at any moment.

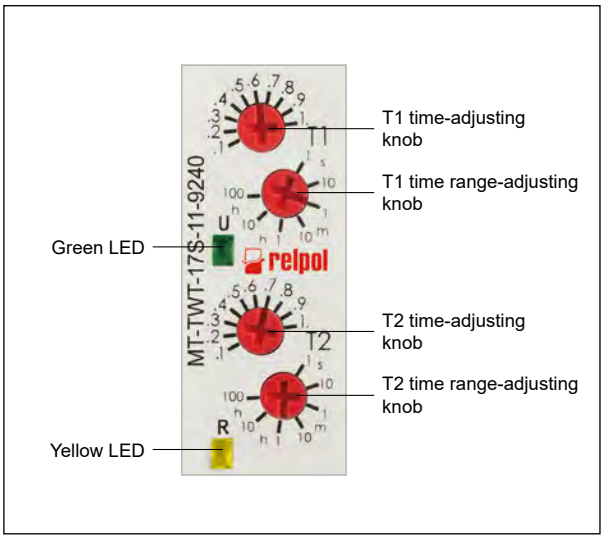
Release: the relay is released by connection of the S contact to the A1 line. For DC supply, the positive pole must be connected to the A1 line. The level of the S contact activation is adjusted automatically depending on the supply voltage.

Supply: the relay may be supplied with DC voltage or AC voltage 48...63 Hz of 10,8...250 V. A programmed control of the supply voltage has been applied so the processor shall not start operation if the voltage is lower than approximately 10 V. The supply voltage is permanently monitored in course of the operation of the relay. When the voltage drops below 9 V for more than 50 ms, the relay shall be reset. Owing to this, the regeneration time is programmed to 50 ms, and it does not depend on the tolerance of the elements.

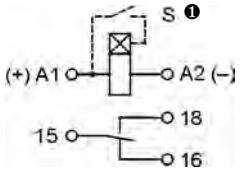
Dimensions



Front panel description



Connection diagram



1 CO

❶ The control terminal S is activated by connection to A1 terminal via the external control contact S.

Mounting

Relays **MT-TWT-...** are designed for direct mounting on 35 mm rail mount acc. to PN-EN 60715. Operational position - any. **Connections:** max. cross section of the cables: 1 x 2,5 mm^2 / 2 x 1,5 mm^2 (1 x 14 / 2 x 16 AWG), length of the cable deinsulation: 6,5 mm, max. tightening moment for the terminal: 0,6 Nm.

Two taps:
easy assembly on 35 mm rail,
firm tapping (top and bottom).

Ordering codes

Type	Time function performed	Cover	Number and type of contacts	Rated input voltage
MT-T	WT	17S	11	9240

Time function performed

WT - relay performing a function Wt

Cover

17S - modular, width 17,5 mm

Number and type of contacts

11 - 1 CO

Rated input voltage

9240 - 12...240 V AC/DC AC: 50/60 Hz

Example of ordering code:

MT-TWT-17S-11-9240 time relay **MT-TWT-...**, single-function (relay perform function Wt), cover - modular, width 17,5 mm, one changeover contact, contact material $AgSnO_2$, rated input voltage 12...240 V AC/DC AC: 50/60 Hz

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- **Time relays with independently controled times T1 and T2, time function SD** (Star-Delta start-up), **7 time ranges**
- Cadmium - free contacts • AC/DC input voltages
- Cover - modular, width 17,5 mm
- Direct mounting on 35 mm rail mount acc. to PN-EN 60715
- Applications: in low-voltage systems
- Compliance with standard PN-EN 61812-1
- Recognitions, certifications, directives: CE EAC

Output circuits - contact data

Number and type of contacts		2 x 1 CO
Contact material		$AgSnO_2$
Max. switching voltage		400 V AC / 300 V DC
Rated load	AC1	10 A / 250 V AC
	DC1	10 A / 24 V DC; 0,3 A / 250 V DC
Rated current		10 A / 250 V AC
Max. breaking capacity	AC1	16 A / 250 V AC
Min. breaking capacity		1 W 10 V, 10 mA
Contact resistance		≤ 100 mΩ
Max. operating frequency		
• at rated load	AC1	600 cycles/hour

Input circuit

Rated voltage	AC: 50/60 Hz AC/DC	12...240 V terminals (+)A1 – (-)A2
Operating range of supply voltage		0,9...1,1 U_n
Rated power consumption	AC	≤ 4,5 VA AC: 50 Hz
	DC	≤ 1,5 W
Range of supply frequency	AC	48...63 Hz

Insulation according to PN-EN 60664-1

Insulation rated voltage		250 V AC
Rated surge voltage		2 500 V 1,2 / 50 µs
Overvoltage category		II
Insulation pollution degree		1
Flammability class		V-0 UL94
Dielectric strength	• input - outputs	2 500 V AC type of insulation: basic
	• contact clearance	1 000 V AC type of clearance: micro-disconnection

General data

Electrical life	• resistive AC1	> 0,5 x 10^5 10 A, 250 V AC
Mechanical life (cycles)		> 3 x 10^7
Dimensions (L x W x H)		90 ❶ x 17,5 x 63,5 mm
Weight		84 g
Ambient temperature	• storage	-40...+70 °C
	• operating	-20...+45 °C
Cover protection category		IP 20 PN-EN 60529
Relative humidity		up to 85%
Shock resistance		15 g
Vibration resistance		0,35 mm 10...55 Hz

Time module data

Functions		SD
Time ranges (start-up for the star) T1		10 s; 30 s; 1 min.; 3 min.; 10 min.; 30 min.; 1 h
Timing adjustment T1		smooth - (0,05...1) x time range
Transit time (adjustable) ❷ T2		smoothly within the range 0,05...1 s (linear adjustment of time)
Setting accuracy		± 5% ❸
Repeatability		± 3%
Values affecting	• temperature	± 0,05% / °C
the timing adjustment	• humidity	± 0,05% / %HR
Recovery time		≤ 50 ms
LED indicator		green LED U ON - indication of supply voltage U green LED U flashing - measurement of T1 and T2 times yellow LEDs ON/OFF - contactors switching signal

❶ Length with 35 mm rail taps: 98,8 mm.
❷ Pause time between switching off the star contactor and switching on the delta contactor.
❸ Calculated from the final range values, for the setting direction from minimum to maximum.

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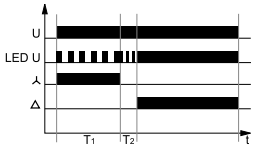
Time functions

SD - Star-Delta start-up.



When the supply voltage U is applied, the operating star-contact (15-18) becomes closed, which is signaled with illumination of the yellow LED. Measurement of the set time T1 starts, and the greed LED flashes at 500 ms. After the T1 time has lapsed, the star contact is disconnected and the relay begins measuring the T2 time, which is signaled with the green LED flashing at 250 ms. After the T2 time has lapsed, the delta contact (25-28) is switched on together with the yellow LED, and the green LED remains illuminated.

U - supply voltage; **T1**, **T2** - measured times; **t** - time axis

Additional functions

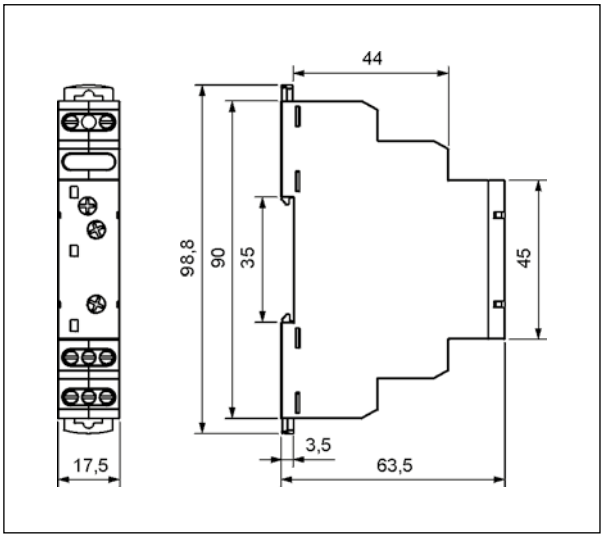
Supply diode: it is lit permanently when the time is not being measured. In course of the T1 time measurement, it flashes at 500 ms period where it is lit for 80% of the time, and off for 20% of the time. For the T2 time, the period is 250 ms.

Adjustment of the set values: the values of time and range are read in the course of the relay's operation. The set values may be modified at any moment.

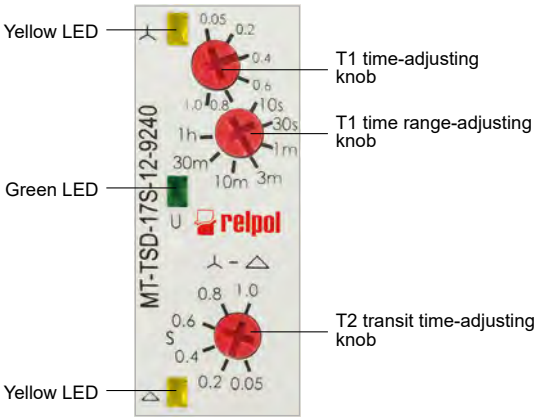
Release: the relay is released with the supply voltage.

Supply: the relay may be supplied with DC voltage or AC voltage 48...63 Hz of 10,8...250 V. A programmed control of the supply voltage has been applied so the processor shall not start operation if the voltage is lower than approximately 10 V. The supply voltage is permanently monitored in course of the operation of the relay. When the voltage drops below 9 V for more than 50 ms, the relay shall be reset. Owing to this, the regeneration time is programmed to 50 ms, and it does not depend on the tolerance of the elements.

Dimensions



Front panel description



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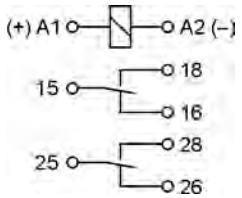
Connection diagram



2 x 1 CO

Mounting

Relays **MT-TSD-...** are designed for direct mounting on 35 mm rail mount acc. to PN-EN 60715. Operational position - any. **Connections:** max. cross section of the cables: 1 x 2,5 mm^2 / 2 x 1,5 mm^2 (1 x 14 / 2 x 16 AWG), length of the cable deinsulation: 6,5 mm, max. tightening moment for the terminal: 0,6 Nm.

Two taps:
easy assembly on 35 mm rail,
firm tapping (top and bottom).

Ordering codes

Type	Time functions performed	Cover	Number and type of contacts	Rated input voltage
MT-	TSD	— 17S	— 12	— 9240

Time functions performed

SD - delta-star start-up systems

Cover

17S - modular, width 17,5 mm

Number and type of contacts

12 - 2 x 1 CO

Rated input voltage

9240 - 12...240 V AC/DC AC: 50/60 Hz

Example of ordering code:

MT-TSD-17S-12-9240 time relay **MT-TSD-...**, single-function (relay perform function SD), cover - modular, width 17,5 mm, two changeover contacts, contact material $AgSnO_2$, rated input voltage 12...240 V AC/DC AC: 50/60 Hz

- **Multifunction time relays (7 time functions; 7 time ranges)**
- AC/DC input voltages
- Cover - modular, width 17,5 mm
- Direct mounting on 35 mm rail mount acc. to PN-EN 60715
- Applications: in low-voltage systems
- Recognitions, certifications, directives: CE EAC

Output circuit - contact data

Number and type of contacts		1 CO
Contact material		AgNi
Rated load	AC1	8 A / 250 V AC
Max. breaking capacity	AC1	2 000 VA (8 A / 250 V AC)
Max. operating frequency • at resistive load 100 VA • at resistive load 1 000 VA		 3 600 cycles/hour 360 cycles/hour

Input circuit

Rated voltage	AC: 50/60 Hz AC/DC	12...240 V terminals (+)A1 – (-)A2
Must release voltage		AC: ≥ 0,3 U_n
Operating range of supply voltage		0,9...1,1 U_n
Rated power consumption	AC DC	4,0 VA 1,5 W
Range of supply frequency	AC	48...63 Hz
Duty cycle		100%
Residual ripple to DC		10%
Control contact S ❶ • min. time of pulse duration ❷ • loadable • max. length of control line • trigger level (sensitivity)		 AC: ≥ 100 ms DC: ≥ 50 ms yes 10 m automatic adaption to supply voltage

Insulation according to PN-EN 60664-1

Insulation rated voltage		250 V AC
Rated surge voltage		4 000 V 1,2 / 50 µs
Overvoltage category		III
Insulation pollution degree		2 if built-in: 3
Dielectric strength	• contact clearance	1 000 V AC type of clearance: micro-disconnection

General data

Electrical life	• resistive AC1	> 2 x 10^5 1 000 VA
Mechanical life (cycles)		> 2 x 10^7
Dimensions (L x W x H)		87 x 17,5 x 65 mm
Weight		63 g
Ambient temperature	• storage • operating	-25...+70 °C -25...+55 °C
Cover protection category		IP 20 PN-EN 60529
Relative humidity		15...85%
Shock resistance		15 g 11 ms
Vibration resistance		0,35 mm DA 10...55 Hz

Time module data

Functions ❸	E, Wu, Bp, R, Ws, Wa, Es
Time ranges	1 s; 10 s; 1 min.; 10 min.; 1 h; 10 h; 100 h
Timing adjustment	smooth - (0,05...1) x time range
Base accuracy	± 1% (calculated from the final range values)
Setting accuracy	± 5% (calculated from the final range values)
Repeatability	± 0,5% or ± 5 ms
Temperature influence	± 0,01% / °C
Recovery time	100 ms
LED indicator	green LED U ON - indication of supply voltage U green LED U flashing - measurement of T time yellow LED R ON/OFF - output relay status

❶ The control terminal S is activated by connection to A1 terminal via the external control contact S.
❷ Where the control signal is recognizable.
❸ The function has to be set before connecting the relay to the supply voltage.

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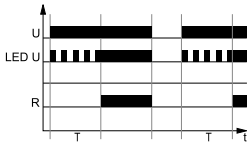
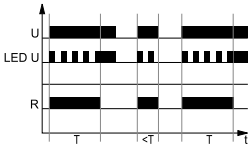
Time functions

E - ON delay.



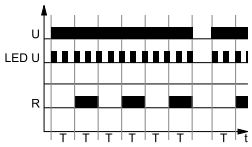
When the supply voltage U is applied, the set interval T begins (green LED flashes). After the interval T has expired (green LED illuminated) the output relay R switches into on-position (yellow LED illuminated). This status remains until the supply voltage is interrupted. If the supply voltage is interrupted before the expiry of the interval T, the interval already expired is erased and is restarted when the supply voltage is next applied.

Wu - ON for the set interval.



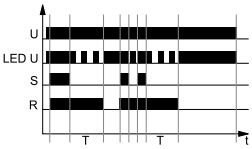
When the supply voltage U is applied, the output relay R switches into on-position (yellow LED illuminated) and the set interval T begins (green LED flashes). After the interval T has expired (green LED illuminated) the output relay switches into off-position (yellow LED not illuminated). This status remains until the supply voltage is interrupted. If the supply voltage is interrupted before the interval T has expired, the output relay switches into off-position. The interval already is erased and is restarted when the supply voltage is next applied.

Bp - Symmetrical cyclical operation pause first.



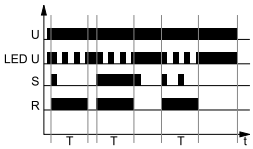
When the supply voltage U is applied, the set interval T begins (green LED flashes). After the interval T has expired, the output relay R switches into on-position (yellow LED illuminated) and the set interval T begins again. After the interval T has expired, the output relay switches into off-position (yellow LED not illuminated). The output relay is triggered at a ratio of 1:1 until the supply voltage is interrupted.

R - OFF delay with the control contact S.



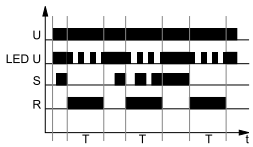
The supply voltage U must be constantly applied to the device (green LED illuminated). When the control contact S is closed, the output relay R switches into on-position (yellow LED illuminated). If the control contact is opened, the set interval T begins (green LED flashes). After the interval T has expired (green LED illuminated) the output relay switches into off-position (yellow LED not illuminated). If the control contact is closed again before the interval T has expired, the interval already expired is erased and is restarted.

Ws - Single shot for the set interval triggered by closing of the control contact S.



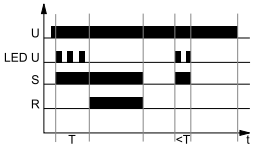
The supply voltage U must be constantly applied to the device (green LED illuminated). When the control contact S is closed, the output relay R switches into on-position (green LED illuminated) and the set interval T begins (green LED flashes). After the interval T has expired (green LED illuminated) the output relay switches into off-position (yellow LED not illuminated). During the interval, the control contact can be operated any number of times. A further cycle can only be started when the cycle run has been completed.

Wa - ON for the set interval triggered with the control contact S.



The supply voltage U must be constantly applied to the device (green LED illuminated). Closing the control contact S has no influence on the condition of the output R. When the control contact is opened, the output relay switches into on-position (yellow LED illuminated) and the set interval T begins (green LED flashes). After the interval T has expired (green LED illuminated), the ouput relay switches into off-position (yellow LED not illuminated). During the interval, the control contact can be operated any number of times. A further cycle can only be started when the cycle run has been completed.

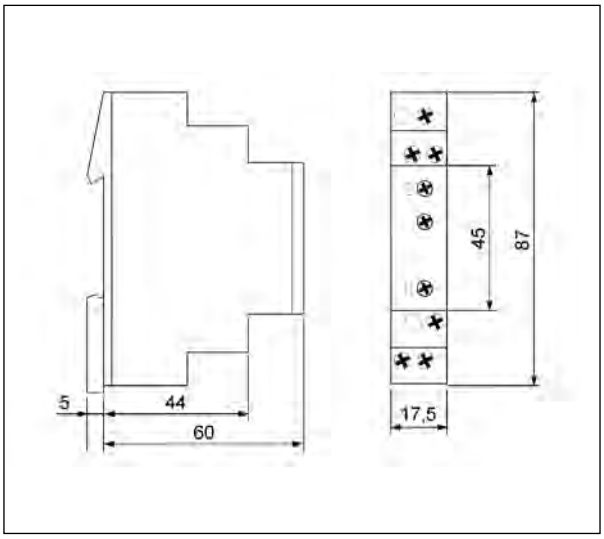
Es - ON delay with the control contact S.



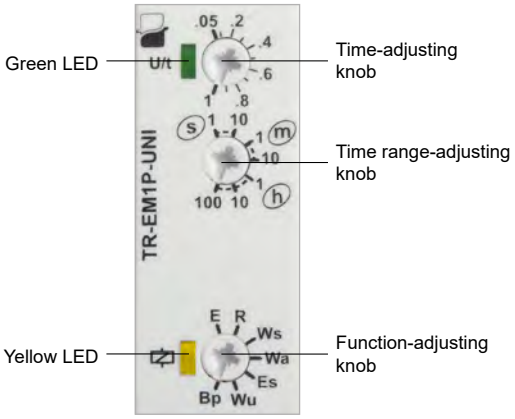
The supply voltage U must be constantly applied to the device (green LED illuminated). When the control contact S is closed, the set interval T begins (green LED flashes). After the interval T has expired (green LED illuminated) the output relay R switches into on-position (yellow LED illuminated). This status remains until the control contact is opened again. If the control contact is opened before the interval T has expired, the interval already expired is erased and is restarted with the next cycle.

U - supply voltage; **R** - output state of the relay; **S** - control contact state; **T** - measured time; **t** - time axis

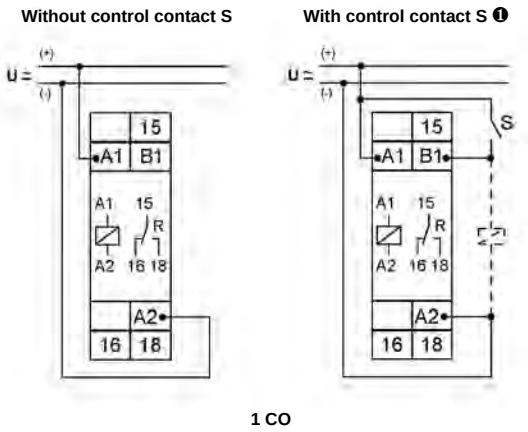
Dimensions



Front panel description



Connection diagrams



Mounting

Relays **TR-EM1P-UNI** are designed for direct mounting on 35 mm rail mount acc. to PN-EN 60715. Operational position - any. **Connections:** max. cross section of the cables: 1 x 2,5 mm² / 2 x 1,5 mm² (1 x 14 / 2 x 16 AWG), length of the cable deinsulation: 6,5 mm, max. tightening moment for the terminal: 1,0 Nm. Shockproof terminal connection according to VBG 4 (PZ1 required).

❶ The control terminal S is activated by connection to A1 terminal via the external control contact S.

Ordering codes

Type

T	R	–	E	M	1	P	–	U	N	I

Number and type of contacts

1P - 1 CO

Example of ordering codes:

TR-EM1P-UNI

time relay **TR-EM1P-UNI**, multifunction (relay perform 7 functions), cover - modular, width 17,5 mm, one changeover contact, rated input voltage 12...240 V AC/DC AC: 50/60 Hz

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- **Multifunction time relays (7 time functions; 7 time ranges)**
- AC/DC input voltages
- Cover - modular, width 35 mm
- Direct mounting on 35 mm rail mount acc. to PN-EN 60715
- Applications: in low-voltage systems
- Recognitions, certifications, directives:

Output circuit - contact data

Number and type of contacts		2 CO
Contact material		AgNi
Rated load	AC1	8 A / 250 V AC
Max. breaking capacity	AC1	2 000 VA (8 A / 250 V AC)
Max. operating frequency • at resistive load 100 VA • at resistive load 1 000 VA		 3 600 cycles/hour 360 cycles/hour

Input circuit

Rated voltage	AC: 50/60 Hz AC/DC	12...240 V terminals (+)A1 – (-)A2
Must release voltage		AC: ≥ 0,3 U_n
Operating range of supply voltage		0,9...1,1 U_n
Rated power consumption	AC DC	6,0 VA 2,0 W
Range of supply frequency	AC	48...63 Hz
Duty cycle		100%
Residual ripple to DC		10%
Control contact S ❶ • min. time of pulse duration ❷ • loadable • max. length of control line • trigger level (sensitivity)		 AC: ≥ 100 ms DC: ≥ 50 ms yes 10 m automatic adaption to supply voltage

Insulation according to PN-EN 60664-1

Insulation rated voltage		250 V AC
Rated surge voltage		4 000 V 1,2 / 50 µs
Overvoltage category		III
Insulation pollution degree		2 if built-in: 3
Dielectric strength	• contact clearance	1 000 V AC type of clearance: micro-disconnection

General data

Electrical life	• resistive AC1	> 2 x 10^5 1 000 VA
Mechanical life (cycles)		> 2 x 10^7
Dimensions (L x W x H)		87 x 35 x 65 mm
Weight		120 g
Ambient temperature	• storage • operating	-25...+70 °C -25...+55 °C
Cover protection category		IP 20 PN-EN 60529
Relative humidity		15...85%
Shock resistance		15 g 11 ms
Vibration resistance		0,35 mm DA 10...55 Hz

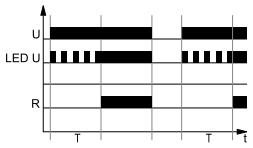
Time module data

Functions ❸	E, Wu, Bp, R, Ws, Wa, Es
Time ranges	1 s; 10 s; 1 min.; 10 min.; 1 h; 10 h; 100 h
Timing adjustment	smooth - (0,05...1) x time range
Base accuracy	± 1% (calculated from the final range values)
Setting accuracy	± 5% (calculated from the final range values)
Repeatability	± 0,5% or ± 5 ms
Temperature influence	± 0,01% / °C
Recovery time	100 ms
LED indicator	green LED U ON - indication of supply voltage U green LED U flashing - measurement of T time yellow LED R ON/OFF - output relay status

❶ The control terminal S is activated by connection to A1 terminal via the external control contact S.
❷ Where the control signal is recognizable.
❸ The function has to be set before connecting the relay to the supply voltage.

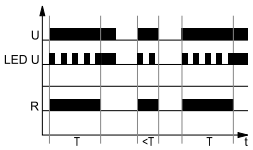
Time functions

E - ON delay.



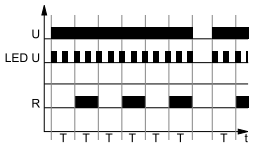
When the supply voltage U is applied, the set interval T begins (green LED flashes). After the interval T has expired (green LED illuminated) the output relay R switches into on-position (yellow LED illuminated). This status remains until the supply voltage is interrupted. If the supply voltage is interrupted before the expiry of the interval T, the interval already expired is erased and is restarted when the supply voltage is next applied.

Wu - ON for the set interval.



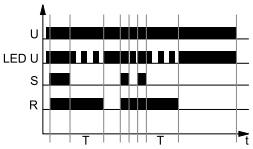
When the supply voltage U is applied, the output relay R switches into on-position (yellow LED illuminated) and the set interval T begins (green LED flashes). After the interval T has expired (green LED illuminated) the output relay switches into off-position (yellow LED not illuminated). This status remains until the supply voltage is interrupted. If the supply voltage is interrupted before the interval T has expired, the output relay switches into off-position. The interval already is erased and is restarted when the supply voltage is next applied.

Bp - Symmetrical cyclical operation pause first.



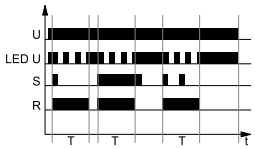
When the supply voltage U is applied, the set interval T begins (green LED flashes). After the interval T has expired, the output relay R switches into on-position (yellow LED illuminated) and the set interval T begins again. After the interval T has expired, the output relay switches into off-position (yellow LED not illuminated). The output relay is triggered at a ratio of 1:1 until the supply voltage is interrupted.

R - OFF delay with the control contact S.



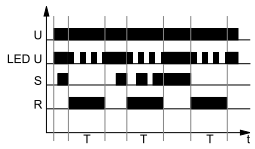
The supply voltage U must be constantly applied to the device (green LED illuminated). When the control contact S is closed, the output relay R switches into on-position (yellow LED illuminated). If the control contact is opened, the set interval T begins (green LED flashes). After the interval T has expired (green LED illuminated) the output relay switches into off-position (yellow LED not illuminated). If the control contact is closed again before the interval T has expired, the interval already expired is erased and is restarted.

Ws - Single shot for the set interval triggered by closing of the control contact S.



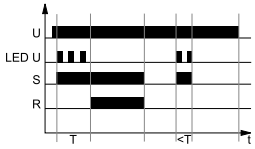
The supply voltage U must be constantly applied to the device (green LED illuminated). When the control contact S is closed, the output relay R switches into on-position (green LED illuminated) and the set interval T begins (green LED flashes). After the interval T has expired (green LED illuminated) the output relay switches into off-position (yellow LED not illuminated). During the interval, the control contact can be operated any number of times. A further cycle can only be started when the cycle run has been completed.

Wa - ON for the set interval triggered with the control contact S.



The supply voltage U must be constantly applied to the device (green LED illuminated). Closing the control contact S has no influence on the condition of the output R. When the control contact is opened, the output relay switches into on-position (yellow LED illuminated) and the set interval T begins (green LED flashes). After the interval T has expired (green LED illuminated), the ouput relay switches into off-position (yellow LED not illuminated). During the interval, the control contact can be operated any number of times. A further cycle can only be started when the cycle run has been completed.

Es - ON delay with the control contact S.



The supply voltage U must be constantly applied to the device (green LED illuminated). When the control contact S is closed, the set interval T begins (green LED flashes). After the interval T has expired (green LED illuminated) the output relay R switches into on-position (yellow LED illuminated). This status remains until the control contact is opened again. If the control contact is opened before the interval T has expired, the interval already expired is erased and is restarted with the next cycle.

U - supply voltage; **R** - output state of the relay; **S** - control contact state; **T** - measured time; **t** - time axis

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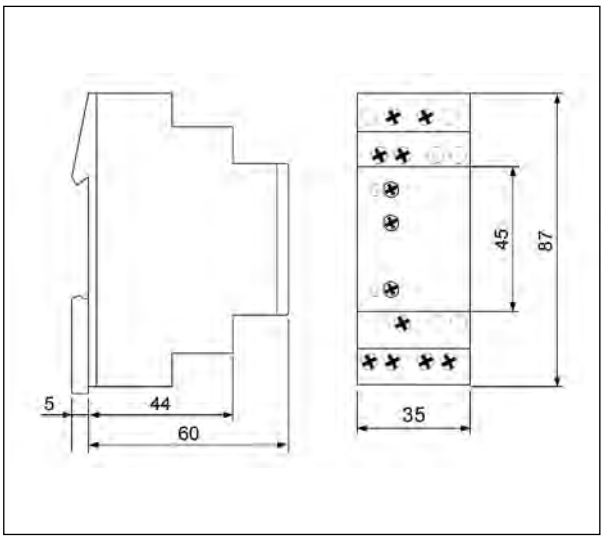
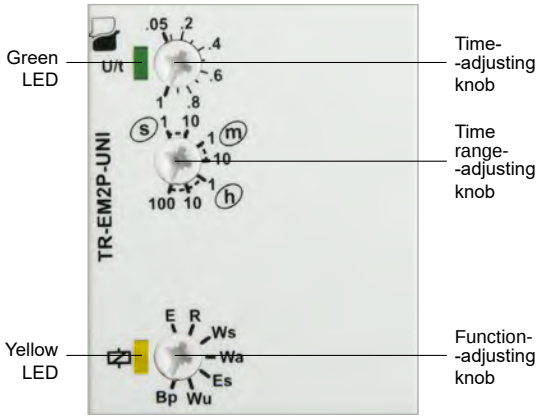
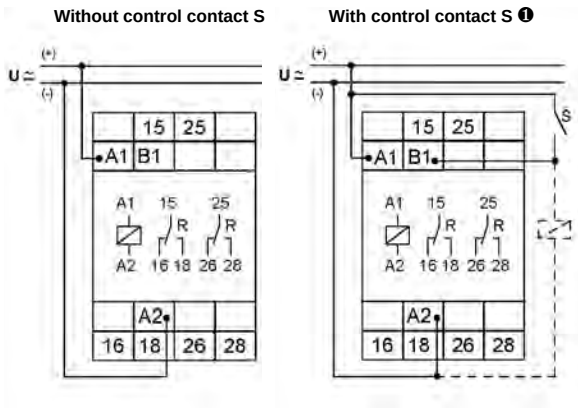
Dimensions



Front panel description



Connection diagrams



Mounting

Relays **TR-EM2P-UNI** are designed for direct mounting on 35 mm rail mount acc. to PN-EN 60715. Operational position - any. **Connections:** max. cross section of the cables: 1 x 2,5 mm² / 2 x 1,5 mm² (1 x 14 / 2 x 16 AWG), length of the cable deinsulation: 6,5 mm, max. tightening moment for the terminal: 1,0 Nm. Shockproof terminal connection according to VBG 4 (PZ1 required).

❶ The control terminal S is activated by connection to A1 terminal via the external control contact S.

Ordering codes

Type

T	R	–	E	M	2	P	–	U	N	I

Number and type of contacts

2P - 2 CO

Example of ordering codes:

TR-EM2P-UNI

time relay **TR-EM2P-UNI**, multifunction (relay perform 7 functions), cover - modular, width 35 mm, two changeover contacts, rated input voltage 12...240 V AC/DC AC: 50/60 Hz

- **Time relays with independently controled times T1 and T2, time function Ii, Ip** (Cyclical operation in two independent intervals T1 and T2) ❶**, 7 time ranges**
- AC/DC input voltages
- Cover - modular, width 17,5 mm
- Direct mounting on 35 mm rail mount acc. to PN-EN 60715
- Applications: in low-voltage systems
- Recognitions, certifications, directives: CE EAC

Output circuit - contact data

Number and type of contacts		1 CO
Contact material		AgNi
Rated load	AC1	8 A / 250 V AC
Max. breaking capacity	AC1	2 000 VA (8 A / 250 V AC)
Max. operating frequency • at resistive load 100 VA • at resistive load 1 000 VA		 3 600 cycles/hour 360 cycles/hour

Input circuit

Rated voltage	AC: 50/60 Hz AC/DC	12...240 V terminals (+)A1 – (-)A2
Must release voltage		AC: ≥ 0,3 U_n
Operating range of supply voltage		0,9...1,1 U_n
Rated power consumption	AC DC	4,0 VA 1,5 W
Range of supply frequency	AC	48...63 Hz
Duty cycle		100%
Residual ripple to DC		10%

Insulation according to PN-EN 60664-1

Insulation rated voltage		250 V AC
Rated surge voltage		4 000 V 1,2 / 50 µs
Overvoltage category		III
Insulation pollution degree		2 if built-in: 3
Dielectric strength	• contact clearance	1 000 V AC type of clearance: micro-disconnection

General data

Electrical life	• resistive AC1	> 2 x 10^5 1 000 VA
Mechanical life (cycles)		> 2 x 10^7
Dimensions (L x W x H)		87 x 17,5 x 65 mm
Weight		63 g
Ambient temperature	• storage • operating	-25...+70 °C -25...+55 °C
Cover protection category		IP 20 PN-EN 60529
Relative humidity		15...85%
Shock resistance		15 g 11 ms
Vibration resistance		0,35 mm DA 10...55 Hz

Time module data

Functions ❶	Ii, Ip
Time ranges	1 s; 10 s; 1 min.; 10 min.; 1 h; 10 h; 100 h
Timing adjustment	smooth - (0,05...1) x time range
Base accuracy	± 1% (calculated from the final range values)
Setting accuracy	± 5% (calculated from the final range values)
Repeatability	± 0,5% or ± 5 ms
Temperature influence	± 0,01% / °C
Recovery time	100 ms
LED indicator	green LED U ON - indication of supply voltage U green LED U slow flashing - measurement of T1 time green LED U fast flashing - measurement of T2 time yellow LED R ON/OFF - output relay status

❶ Start by function Ip - terminals A1-B1 are not connected / bridged; start by function Ii - terminals A1-B1 are connected / bridged
- see „**Time functions**", page 330.

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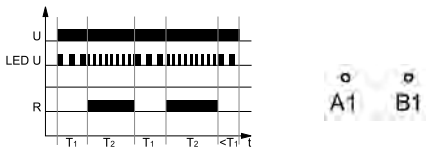
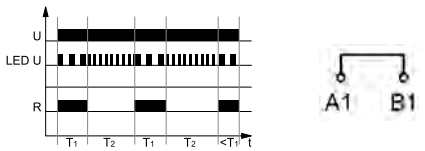
Time functions

Ip - Cyclical operation pause first. Independent settings of T1 and T2 intervals.
❶ Start by function Ip - terminals A1-B1 are not connected / bridged.



When the supply voltage U is applied, the set interval T1 begins (green LED flashes slowly). After the interval T1 has expired, the output relay R switches into on-position (yellow LED illuminated) and the set interval T2 begins (green LED flashes fast). After the interval T2 has expired, the output relay switches into off-position (yellow LED not illumninated). The output relay is triggered at the ratio of T1:T2 until the supply voltage is interrupted.

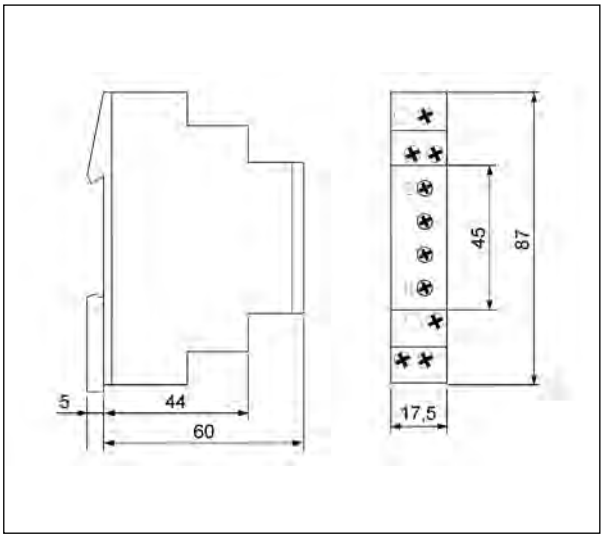
Ii - Cyclical operation pulse first. Independent settings of T1 and T2 intervals.
❶ Start by function Ii - terminals A1-B1 are connected / bridged.



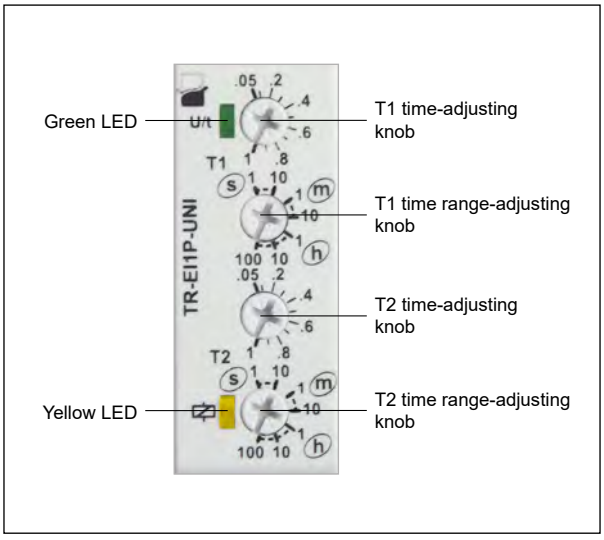
When the supply voltage U is applied, the output relay R switches into on-position (yellow LED illuminated) and the set interval T1 begins (green LED flashes slowly). After the interval T1 has expired, the output relay switches into off-position (yellow LED not illuminated) and the set interval T2 begins (green LED flashes fast). After the interval T2 has expired, the output relay switches into on-position (yellow LED illuminated). The output relay is triggered at the ratio of T1:T2 until the supply voltage is interrupted.

U - supply voltage; **R** - output state of the relay; **T1, T2** - measured times; **t** - time axis

Dimensions



Front panel description



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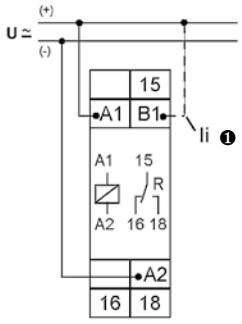
Connection diagram



1 CO

Mounting

Relays **TR-EI1P-UNI** are designed for direct mounting on 35 mm rail mount acc. to PN-EN 60715. Operational position - any. **Connections:** max. cross section of the cables: 1 x 2,5 mm^2 / 2 x 1,5 mm^2 (1 x 14 / 2 x 16 AWG), length of the cable deinsulation: 6,5 mm, max. tightening moment for the terminal: 1,0 Nm. Shockproof terminal connection according to VBG 4 (PZ1 required).

❶ Start by function Ip - terminals A1-B1 are not connected / bridged; start by function Ii - terminals A1-B1 are connected / bridged - see „**Time functions**”, page 330.

Ordering codes

Type

T	R	–	E	I	1	P	–	U	N	I

Number and type of contacts

1P - 1 CO

Example of ordering codes:

TR-EI1P-UNI time relay **TR-EI1P-UNI**, single-function (relay perform function Ii + Ip), cover - modular, width 17,5 mm, one changeover contact, rated input voltage 12...240 V AC/DC AC: 50/60 Hz

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- **Multifunction time relays with independently controled times T1 and T2 (7 time functions; 7 time ranges)**
- AC/DC input voltages
- Cover - modular, width 35 mm
- Direct mounting on 35 mm rail mount acc. to PN-EN 60715
- Applications: in low-voltage systems
- Recognitions, certifications, directives:

Output circuit - contact data

Number and type of contacts		2 CO
Contact material		AgNi
Rated load	AC1	8 A / 250 V AC
Max. breaking capacity	AC1	2 000 VA (8 A / 250 V AC)
Max. operating frequency • at resistive load 100 VA • at resistive load 1 000 VA		 3 600 cycles/hour 360 cycles/hour

Input circuit

Rated voltage	AC: 50/60 Hz AC/DC	12...240 V terminals (+)A1 – (-)A2
Must release voltage		AC: ≥ 0,3 U_n
Operating range of supply voltage		0,9...1,1 U_n
Rated power consumption	AC DC	6,0 VA 2,0 W
Range of supply frequency	AC	48...63 Hz
Duty cycle		100%
Residual ripple to DC		10%
Control contact S ❶ • min. time of pulse duration ❷ • loadable • max. length of control line • trigger level (sensitivity)		 AC: ≥ 100 ms DC: ≥ 50 ms yes 10 m automatic adaption to supply voltage

Insulation according to PN-EN 60664-1

Insulation rated voltage		250 V AC
Rated surge voltage		4 000 V 1,2 / 50 µs
Overvoltage category		III
Insulation pollution degree		2 if built-in: 3
Dielectric strength	• contact clearance	1 000 V AC type of clearance: micro-disconnection

General data

Electrical life	• resistive AC1	> 2 x 10^5 1 000 VA
Mechanical life (cycles)		> 2 x 10^7
Dimensions (L x W x H)		87 x 35 x 65 mm
Weight		120 g
Ambient temperature	• storage • operating	-25...+70 °C -25...+55 °C
Cover protection category		IP 20 PN-EN 60529
Relative humidity		15...85%
Shock resistance		15 g 11 ms
Vibration resistance		0,35 mm DA 10...55 Hz

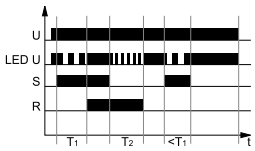
Time module data

Functions ❸	ER, EWs, EWu, Ip, Ii, WsWa, Wt
Time ranges	1 s; 10 s; 1 min.; 10 min.; 1 h; 10 h; 100 h
Timing adjustment	smooth - (0,05...1) x time range
Base accuracy	± 1% (calculated from the final range values)
Setting accuracy	± 5% (calculated from the final range values)
Repeatability	± 0,5% or ± 5 ms
Temperature influence	± 0,01% / °C
Recovery time	100 ms
LED indicator	green LED U ON - indication of supply voltage U green LED U slow flashing - measurement of T1 time green LED U fast flashing - measurement of T2 time yellow LED R ON/OFF - output relay status

❶ The external control contact S connect terminal A1 with terminal B1 (applies to functions with control contact S).
❷ Where the control signal is recognizable.
❸ The function has to be set before connecting the relay to the supply voltage.

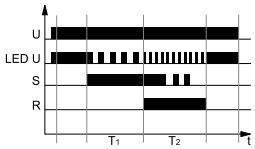
Time functions

ER - ON delay and OFF delay with control contact S. Independent settings of T1 and T2 intervals.



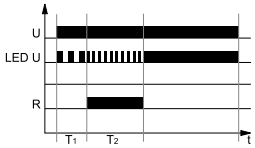
The supply voltage U must be constantly applied to the device (green LED illuminated). When the control contact S is closed, the set interval T1 begins (green LED flashes slowly). After the interval T1 has expired, the output relay R switches into on-position (yellow LED illuminated). If the control contact is opened, the set interval T2 begins (green LED flashes fast). After the interval T2 has expired, the output relay switches into off-position (yellow LED not illuminated). If the control contact is opened before the interval T1 has expired, the interval already expired is erased and is restarted with the next cycle.

EWs - ON delay and ON for the set time with closing of the control contact S. Independent settings of T1 and T2 intervals.



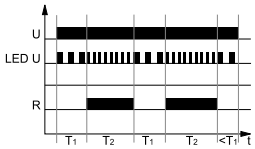
The supply voltage U must be constantly applied to the device (green LED illuminated). When the control contact S is closed, the set interval T1 begins (green LED flashes slowly). After the interval T1 has expired, the output relay R switches into on-position (yellow LED illuminated) and the set interval T2 begins (green LED flashes fast). After the interval T2 has expired, the output relay switches into off-position (yellow LED not illuminated). During the interval, the control contact can be operated any number of times. A further cycle can only be started when the cycle run has been completed.

EWu - ON delay and the set interval. Independent settings of T1 and T2 intervals.



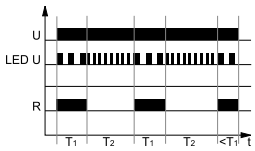
When the supply voltage U is applied, the set interval T1 begins (green LED/t flashes slowly). After the interval T1 has expired, the output relay R switches into on-position (yellow LED illuminated) and the set interval T2 begins (green LED flashes fast). After the interval T2 has expired, the output relay switches into off-position (yellow LED not illuminated). If the supply voltage is interrupted before the interval T1+T2 has expired, the interval already expired is erased and is restarted when the supply voltage is next applied.

Ip - Cyclical operation pause first. Independent settings of T1 and T2 intervals.



When the supply voltage U is applied, the set interval T1 begins (green LED flashes slowly). After the interval T1 has expired, the output relay R switches into on-position (yellow LED illuminated) and the set interval T2 begins (green LED flashes fast). After the interval T2 has expired, the output relay switches into off-position (yellow LED not illumninated). The output relay is triggered at the ratio of T1:T2 until the supply voltage is interrupted.

Ii - Cyclical operation pulse first. Independent settings of T1 and T2 intervals.

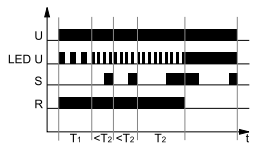


When the supply voltage U is applied, the output relay R switches into on-position (yellow LED illuminated) and the set interval T1 begins (green LED flashes slowly). After the interval T1 has expired, the output relay switches into off-position (yellow LED not illuminated) and the set interval T2 begins (green LED flashes fast). After the interval T2 has expired, the output relay switches into on-position (yellow LED illuminated). The output relay is triggered at the ratio of T1:T2 until the supply voltage is interrupted.

WsWa - ON for the set intervals T1 and T2 with the control contact S. Independent settings of T1 and T2 intervals.

The supply voltage U must be constantly applied to the device (green LED illuminated). When the control contact S is closed, the output relay R switches into on-position (yellow LED illuminated) and the set interval T1 begins (green LED flashes slowly). After the interval T1 has expired, the output relay R switches into off-position (yellow LED not illuminated). If the control contact is opened, the output relay again switches into on-position (yellow LED illuminated) and the set interval T2 begins (green LED flashes fast). After the interval T2 has expired the output relay switches into off-position (yellow LED not illuminated). During the interval, the control contact can be operated any number of times.

Wt - Monitoring of the sequence of pulses. Switching on is extended with consecutive pulses / closings of the contact S. Independent settings of T1 and T2 intervals.



When the supply voltage U is applied, the set interval T1 begins (green LED flashes slowly) and the output relay R switches into on-position (yellow LED illuminated). After the interval T1 has expired, the set interval T2 begins (green LED flashes fast). So that the output relay R remains in on-position, the control contact S must be closed and opened again within the set interval T2. If this does not happen, the output relay R switches into off-position (yellow LED not illuminated) and all further pulses at the control contact are ignored. To restart the function the supply voltage must be interrupted and reapplied.

U - supply voltage; **R** - output state of the relay; **S** - control contact state; **T1, T2** - measured times; **t** - time axis

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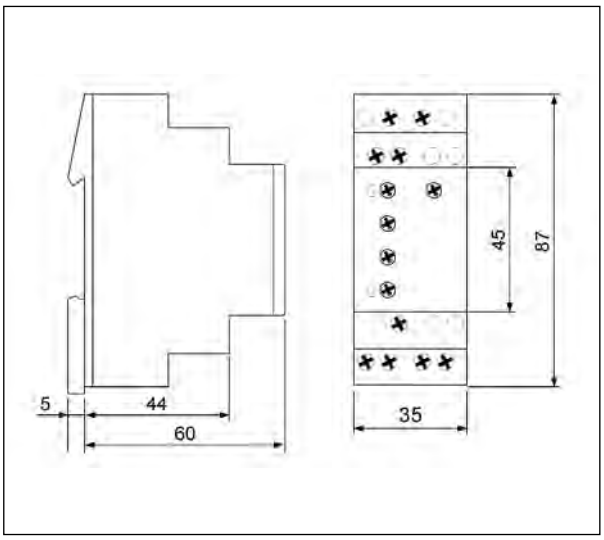
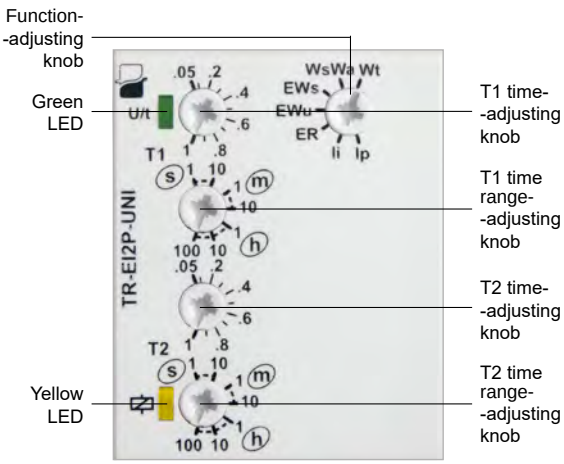
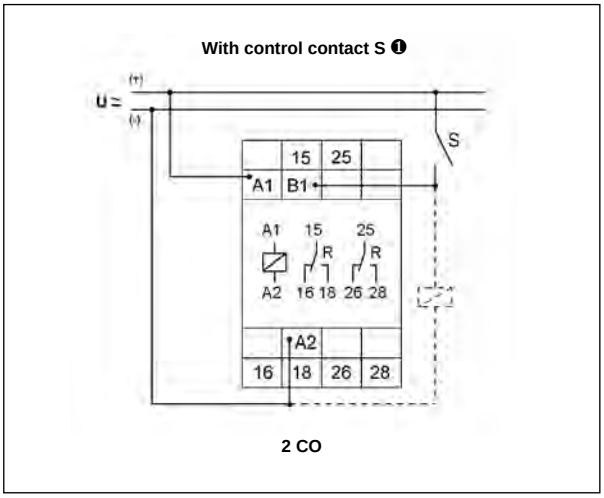
Dimensions



Front panel description



Connection diagram



Mounting

Relays **TR-EI2P-UNI** are designed for direct mounting on 35 mm rail mount acc. to PN-EN 60715. Operational position - any. **Connections:** max. cross section of the cables: 1 x 2,5 mm^2 / 2 x 1,5 mm^2 (1 x 14 / 2 x 16 AWG), length of the cable deinsulation: 6,5 mm, max. tightening moment for the terminal: 1,0 Nm. Shockproof terminal connection according to VBG 4 (PZ1 required).

❶ The external control contact S connect terminal A1 with terminal B1 (applies to functions with control contact S).

Ordering codes

Type

T	R	–	E	I	2	P	–	U	N	I

Number and type of contacts

2P - 2 CO

Example of ordering codes:

TR-EI2P-UNI

time relay **TR-EI2P-UNI**, multifunction (relay perform 7 functions), cover - modular, width 35 mm, two changeover contacts, rated input voltage 12...240 V AC/DC AC: 50/60 Hz

- **Time relays with independently controled times T1 and T2, time function SD** (Star-Delta start-up), **4 time ranges**
- AC/DC input voltages
- Cover - modular, width 35 mm
- Direct mounting on 35 mm rail mount acc. to PN-EN 60715
- Applications: in low-voltage systems
- Recognitions, certifications, directives: CE EAC

Output circuit - contact data

Number and type of contacts		2 x 1 CO
Contact material		AgNi
Rated load	AC1	8 A / 250 V AC
Max. breaking capacity	AC1	2 000 VA 8 A / 250 V AC
Max. operating frequency • at resistive load 100 VA • at resistive load 1 000 VA		 3 600 cycles/hour 360 cycles/hour

Input circuit

Rated voltage	AC: 50/60 Hz AC/DC	12...240 V	terminals (+)A1 – (-)A2
Must release voltage		AC: ≥ 0,3 U_n	
Operating range of supply voltage		0,9...1,1 U_n	
Rated power consumption	AC DC	6,0 VA 2,0 W	
Range of supply frequency	AC	48...63 Hz	
Duty cycle		100%	
Residual ripple to DC		10%	

Insulation according to PN-EN 60664-1

Insulation rated voltage		250 V AC	
Rated surge voltage		4 000 V	1,2 / 50 µs
Overvoltage category		III	
Insulation pollution degree		2	if built-in: 3
Dielectric strength	• contact clearance	1 000 V AC	type of clearance: micro-disconnection

General data

Electrical life	• resistive AC1	> 2 x 10^5	1 000 VA
Mechanical life (cycles)		> 2 x 10^7	
Dimensions (L x W x H)		87 x 35 x 65 mm	
Weight		120 g	
Ambient temperature	• storage • operating	-25...+70 °C -25...+55 °C	
Cover protection category		IP 20	PN-EN 60529
Relative humidity		15...85%	
Shock resistance		15 g	11 ms
Vibration resistance		0,35 mm DA	10...55 Hz

Time module data

Functions	SD
Time ranges (start-up for the star) T1	10 s; 30 s; 1 min.; 3 min.
Timing adjustment T1	smooth - (0,05...1) x time range
Transit time (fixed) ❶ T2	40 ms; 60 ms; 80 ms; 100 ms
Base accuracy	± 1% (calculated from the final range values)
Setting accuracy	± 5% (calculated from the final range values)
Repeatability	± 0,5% or ± 5 ms
Temperature influence	± 0,01% / °C
Recovery time	100 ms
LED indicator	green LED U ON - indication of delta contactor supply voltage U green LED U flashing - measurement of T1 time yellow LED R ON/OFF - indication of star contactor

❶ Pause time between switching off the star contactor and switching on the delta contactor.

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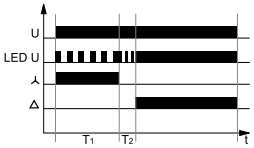
Time functions

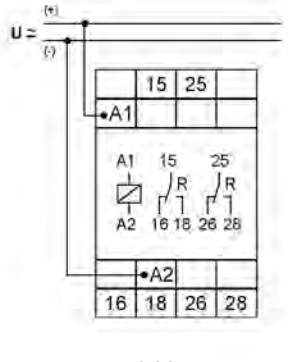
SD - Star-Delta start-up.



When the supply voltage U is applied, the star-contact (15-18) switches into on-position (yellow LED illuminated) and the set star-time T1 begins (green LED flashes). After the interval T1 has expired (green LED illuminated) the star-contact switches into off-position (yellow LED not illuminated) and the set transit-time T2 begins. After the interval T2 has expired the contact for the delta-contactor (25-28) switches into on-position. To restart the function the supply voltage must be interrupted and re-applied.

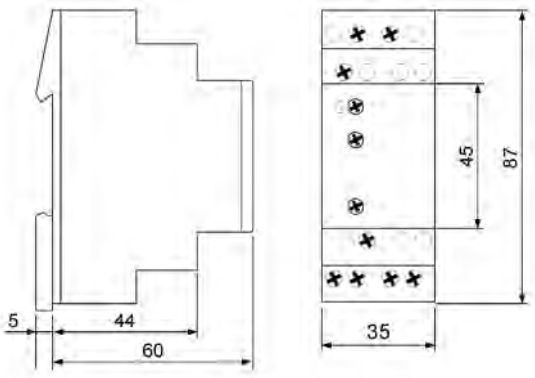
U - supply voltage; **T1, T2** - measured times; **t** - time axis

Connection diagram

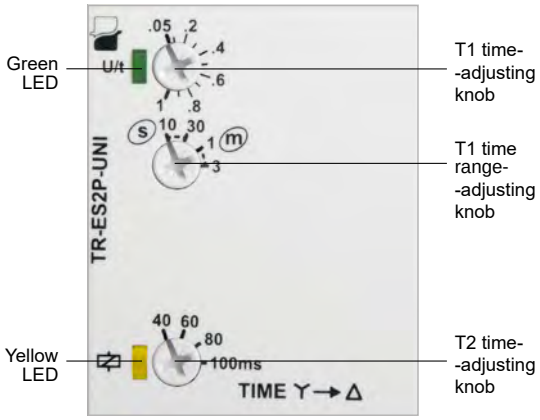


2 CO

Dimensions



Front panel description



Mounting

Relays **TR-ES2P-UNI** are designed for direct mounting on 35 mm rail mount acc. to PN-EN 60715. Operational position - any. **Connections:** max. cross section of the cables: 1 x 2,5 mm^2 / 2 x 1,5 mm^2 (1 x 14 / 2 x 16 AWG), length of the cable deinsulation: 6,5 mm, max. tightening moment for the terminal: 1,0 Nm. Shockproof terminal connection according to VBG 4 (PZ1 required).

Ordering codes

Type

T	R	–	E	S	2	P	–	U	N	I

Number and type of contacts

2P - 2 x 1 CO

Example of ordering codes:

TR-ES2P-UNI

time relay **TR-ES2P-UNI**, single-function (relay perform function SD), cover - modular, width 35 mm, two changeover contacts, rated input voltage 12...240 V AC/DC AC: 50/60 Hz

• 10-function electronic time relays in compact cover • Cadmium - free contacts • AC and AC/DC input voltages • Direct mounting on 35 mm rail mount acc. to PN-EN 60715 • The main advantages of application: simple selection of the performed function, possibility to control one or two circuits (1 or 2 changeover contacts), esthetic design in the control cabinet • The switching capacity of contacts as in RM85 (1 CO) or RM84 (2 CO) electromagnetic relay • Compliance with standard PN-EN 61812-1
• Recognitions, certifications, directives: CE EAC

Output circuits - contact data

Number and type of contacts		1 CO		2 CO	
Contact material		**AgNi**		**AgNi**	
Max. switching voltage		440 V AC / 300 V DC		440 V AC / 300 V DC	
Rated load	AC1	16 A / 250 V AC		8 A / 250 V AC	
	DC1	16 A / 24 V DC; 0,3 A / 250 V DC		8 A / 24 V DC; 0,3 A / 250 V DC	
Rated current		16 A		8 A	
Max. breaking capacity	AC1	4 000 VA		2 000 VA	
Min. breaking capacity		0,3 W 5 V, 5 mA			
Contact resistance		≤ 100 mΩ			
Max. operating frequency					
• at rated load	AC1	600 cycles/hour			
• no load		18 000 cycles/hour			
Input circuit					
Rated voltage	50/60 Hz AC	115 ... 230 V			
	AC: 50/60 Hz AC/DC	12 ... 24 V			
Operating range of supply voltage		0,9...1,2 U_n	12 V AC/DC		
		0,85...1,2 U_n	24 V AC/DC, 115 V AC, 230 V AC		
Rated power consumption	AC	1,3 VA	115 V AC	1,7 VA	230 V AC
	AC/DC	0,5 VA / 0,5 W	12 V AC/DC	0,7 VA / 0,7 W	24 V AC/DC
Range of supply frequency	AC	48...63 Hz			
	AC/DC	48...100 Hz			
Control contact S ❶					
• min. voltage ❷		0,6 U_n			
• min. time of pulse duration ❷		AC: ≥ 25 ms	DC: ≥ 15 ms		
Insulation according to PN-EN 60664-1					
Insulation rated voltage		250 V AC			
Insulation category		B250			
Overvoltage category		III			
Insulation pollution degree		2			
Flammability class		V-1 UL94			
Dielectric strength	• input - outputs	2 000 V AC	type of insulation: basic		
	• contact clearance	1 000 V AC	type of clearance: micro-disconnection		
Input - outputs distance					
• clearance		≥ 10 mm			
• creepage		≥ 10 mm			
General data					
Electrical life					
• resistive AC1		> 0,7 x 10^5 16 A, 250 V AC		> 10^5 8 A, 250 V AC	
Mechanical life (cycles)		> 3 x 10^7			
Dimensions (L x W x H)		90 x 17,6 x 55 mm			
Weight		67 g			
Ambient temperature	• storage	-40...+70 °C			
	• operating	-20...+55 °C			
Cover protection category		IP 20 PN-EN 60529			
Environmental protection		RTI PN-EN 116000-3			
Shock resistance		15 g			
Vibration resistance		0,35 mm DA 10...55 Hz			

The data in bold type relate to the standard versions of the relays.
❶ The control terminal S is activated by connection to A1 terminal via the external control contact S.
❷ Where the control signal is recognizable.

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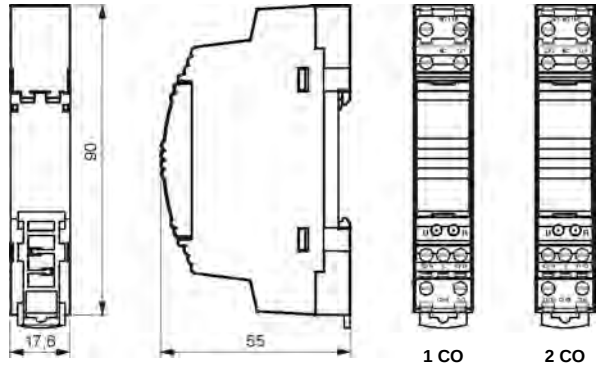
Time module data

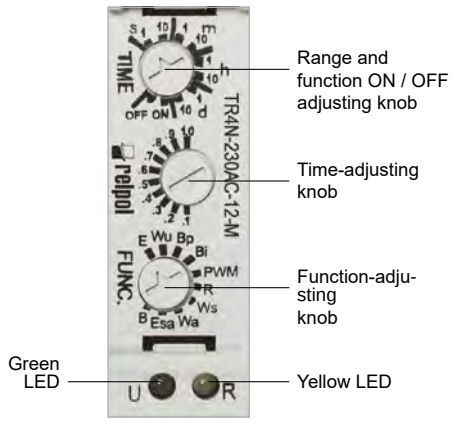
Functions	E, Wu, Bp, Bi, PWM, R, Ws, Wa, Esa, B permanent switching ON and OFF
Time ranges	1 s ❸; 10 s; 1 min.; 10 min.; 1 h; 10 h; 1 d; 10 d
Timing adjustment	smooth - (0,1...1) x time range
Setting accuracy	± 5% (calculated from the final range values) ❸
Repeatability	± 0,5% ❸
Temperature influence	± 0,01% / °C
Recovery time	80 ms
LED indicator	green LED - indication of supply voltage U yellow LED - indication of time period T and the status of outputs after the time T has been measured ❹

❸ For first range setpoint (1 s) setting accuracy and repeatability are smaller than the given ones in technical parameters (significant influence of the operational relay operating time). Recommend to set measuring time by experimental method. ❹ The yellow LED - T time measurement (pulsating); excited operational relay; time not measured (steady light); de-excited operational relay, time not measured (no light).

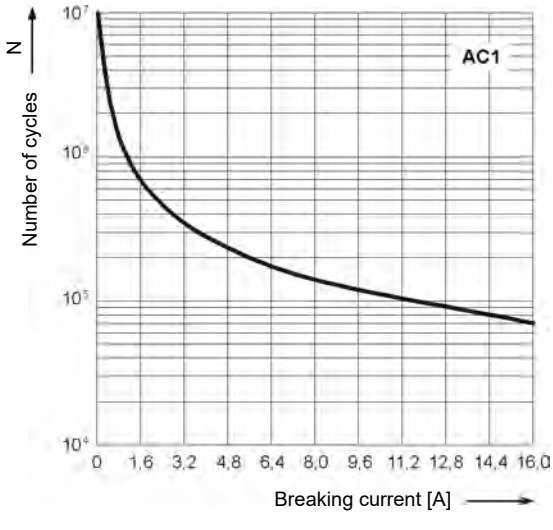
Dimensions



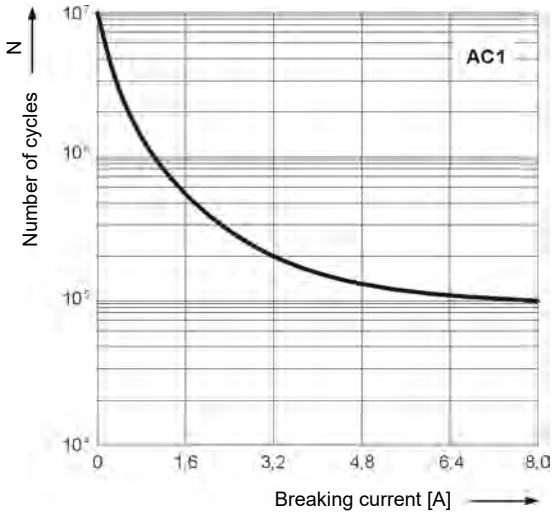
Front panel description



Electrical life at AC resistive current. Switching frequency: 600 cycles/hour - TR4N 1 CO — Fig. 1

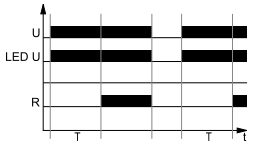


Electrical life at AC resistive current. Switching frequency: 600 cycles/hour - TR4N 2 CO — Fig. 2



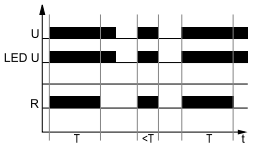
Time functions

E - ON delay.



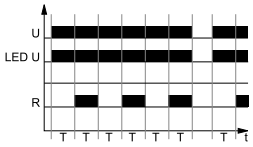
On applying the supply voltage U the set interval T begins - off-delay of the output relay R. After the interval T has lapsed, the output relay R switches on and remains on until supply voltage U is interrupted.

Wu - ON for the set interval.



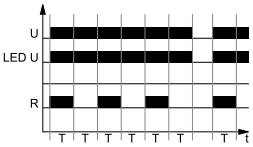
Applying the supply voltage U immediately switches the output relay R on for the set interval T. After the interval T has lapsed, the output relay R switches off.

Bp - Symmetrical cyclical operation pause first.



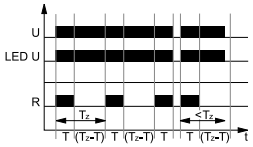
Applying the supply voltage U starts the cyclical operation from the T interval - switching the output relay R off followed by switching on the output relay R for the interval T. The cyclical operation lasts until the supply voltage U is interrupted.

Bi - Symmetrical cyclical operation pulse first.



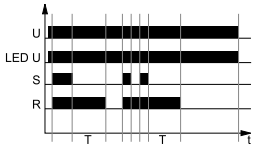
Applying the supply voltage U starts the cyclical operation from switching on the output relay R for the set interval T. After the interval T has lapsed, the output relay R switches off for the interval T. The cyclical operation lasts until the supply voltage U is interrupted.

PWM - Pulse width modulation.



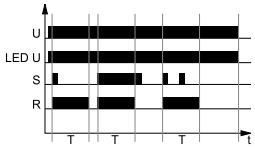
Set the relay to a single Tz cycle which is one of the time ranges available for a time relay. The cycle shall be set with the time selection knob. Then, set the interval T, i.e. the ON time of the output relay R with the time fine setting knob. The interval T may be set from 0.1 to 1.0 of the time range (Tz cycle). Applying the supply voltage U immediately switches on the output relay R for the set interval, and after the interval has lapsed, the output relay R switches off for the time left until the set time Tz. After the Tz time, consecutive cycles start and are continued until the supply voltage U is interrupted. In the course of the PWM function, the ON time of the output relay R may be changed, and such change does not affect the interval of the Tz cycle. The changed ON time of the output relay R shall be realized starting from the new Tz cycle following the change.

R - OFF delay with the control contact S.



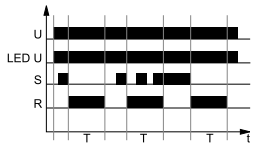
The input of the time relay is supplied with voltage U continuously. Closing of the control contact S immediately switches on the output relay R. Opening of the control contact S starts the set time of the delayed switching off of the output relay R. After the interval T has lapsed, the output relay R switches off. If the control contact S is closed during the interval T, the already measured time is reset, and the output relay R is switched on again. The OFF delay of the output relay R will start when the control contact S is opened again.

Ws - Single shot for the set interval triggered by closing of the control contact S.



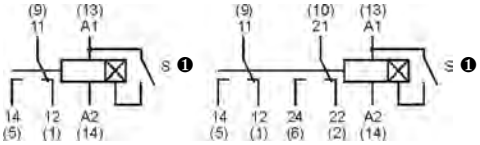
The input of the time relay is supplied with voltage U continuously. Closing of the control contact S immediately switches the output relay R on for the set interval T. After the interval T has lapsed, the output relay R is switched off. In the course of the interval T, any opening of the control contact S does not affect the function to be performed. The output relay R may be switched on again for the set interval, after the interval T has lapsed, by closing the control contact S again.

Wa - ON for the set interval triggered with the control contact S.



The input of the time relay is supplied with voltage U continuously. Closing of the control contact S does not start the interval T, and it does not change the position of the output relay R. Opening of the control contact S immediately switches on the output relay R for the set time. After the interval T has lapsed, the output relay R switches off. Opening and closing of the control contact S in the course of the interval T does not affect the function to be performed. The output relay R may be switched on again for the set interval with another closing and opening of the control contact S.

Connections diagrams



1 CO **2 CO**

❶ The control terminal S is activated by connection to A1 terminal via the external control contact S.

U - supply voltage; **R** - output state of the relay; **S** - control contact state; **Tz** - value of the set interval; **T** - measured time; **t** - time axis

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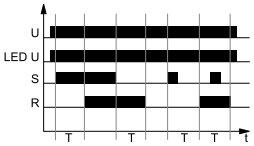
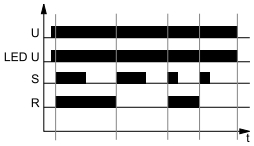
Time functions

Esa - ON and OFF delay with the control contact S.



The input of the time relay is supplied with voltage U continuously. Closing of the control contact S starts the interval T - on-delay of the output relay R. After the interval T has lapsed, the output relay R switches on. Opening of the control contact S begins further measurement of the interval T - off-delay of the output relay R, and after the interval has lapsed, the output relay switches off. In case the time for which the control contact S is closed in the course of measurement of the on-delay of the output relay R is shorter than the set interval T, the output relay R will switch on after the set interval T, and the output relay R will remain in on position for the interval T. When the output relay R is in on position, closing of the control contact S does not affect the function to be performed.

B - Cyclical operation controlled with closing of the control contact S.



The input of the time relay is supplied with U voltage continuously. Closing of the control contact S immediately switches on the output relay R. Each next closing of the control contact S results in a change of the status of the output relay R to an opposite one (the feature of a bistable relay).

Permanent switching ON and OFF.
The functions ON and OFF are selected with TIME potentiometer. In the ON function, the normally open contacts are closed all the time whereas in the OFF function they are open. The position of the FUNC potentiometer is of no significance in these functions as is the preset measurement time. The ON or OFF functions are used for the time relay operation control in electric systems.

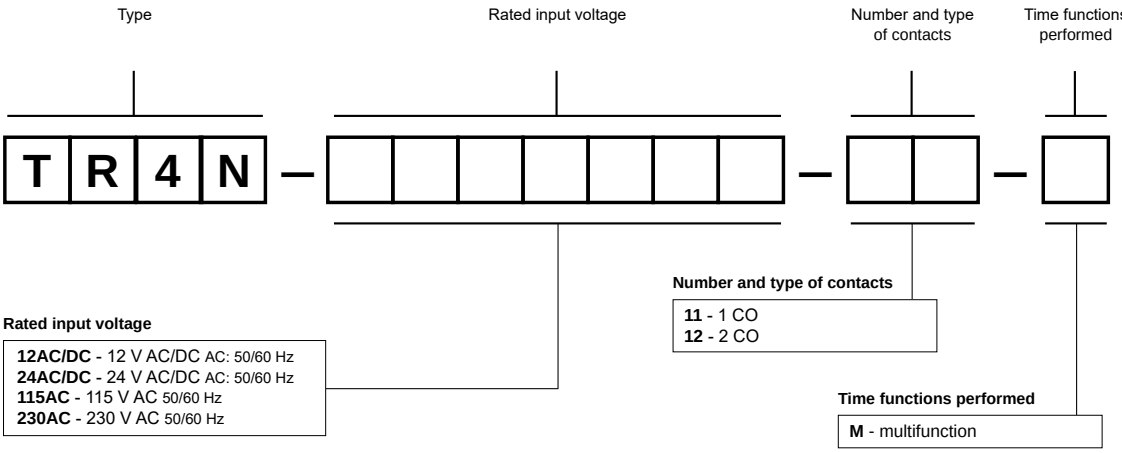
U - supply voltage; **R** - output state of the relay; **S** - control contact state; **Tz** - value of the set interval; **T** - measured time; **t** - time axis

Mounting

Relays **TR4N 1 CO, 2 CO** are designed for direct mounting on 35 mm rail mount acc. to PN-EN 60715. Operational position - any. **Connections:** max. cross section of the cables: 1 x 2,5 mm^2 / 2 x 1,5 mm^2 (1 x 14 / 2 x 16 AWG), length of the cable deinsulation: 6,5 mm, max. tightening moment for the terminal: 0,6 Nm.

One tap:
easy assembly
on 35 mm rail,
firm tapping (bottom).

Ordering codes



Examples of ordering codes:

TR4N-230AC-11-M time relay **TR4N 1 CO**, multifunction (relay perform 10 functions), one changeover contact, contact material AgNi, rated input voltage 230 V AC 50/60 Hz

TR4N-24AC/DC-12-M time relay **TR4N 2 CO**, multifunction (relay perform 10 functions), two changeover contacts, contact material AgNi, rated input voltage 24 V AC/DC AC: 50/60 Hz

• 10-function electronic time relays in compact cover • Cadmium - free contacts • AC and AC/DC input voltages • Direct mounting on 35 mm rail mount acc. to PN-EN 60715 • The main advantages of application: simple selection of the performed function, possibility to control a few circuits (4 changeover contacts), esthetic design in the control cabinet • The switching capacity of contacts as in R4 electromagnetic relay • Compliance with standard PN-EN 61812-1
• Recognitions, certifications, directives: CE EAC

Output circuits - contact data

Number and type of contacts		4 CO
Contact material		**AgNi**
Max. switching voltage		250 V AC / 250 V DC
Rated load	AC1	6 A / 250 V AC
	DC1	6 A / 24 V DC; 0,15 A / 250 V DC
Rated current		6 A
Max. breaking capacity	AC1	1 500 VA
Min. breaking capacity		0,3 W 5 V, 5 mA
Contact resistance		≤ 100 mΩ
Max. operating frequency		
• at rated load	AC1	1 200 cycles/hour
• no load		18 000 cycles/hour

Input circuit

Rated voltage	50/60 Hz AC	115 ... 230 V
	AC: 50/60 Hz AC/DC	12 ... 24 V
Operating range of supply voltage		0,9...1,1 U_n 12 V AC/DC
		0,85...1,1 U_n 24 V AC/DC, 115 V AC, 230 V AC
Rated power consumption	AC	2,2 VA 115 V AC, 230 V AC
	AC/DC	1,0 VA / 1,0 W 12 V AC/DC, 24 V AC/DC
Range of supply frequency	AC	48...63 Hz
	AC/DC	48...100 Hz
Control contact S ❶		
• min. voltage ❷		0,6 U_n
• min. time of pulse duration ❷		AC: ≥ 25 ms DC: ≥ 15 ms

Insulation according to PN-EN 60664-1

Insulation rated voltage		250 V AC
Insulation category		B250
Overvoltage category		II
Insulation pollution degree		2
Flammability class		V-1 UL94
Dielectric strength	• input - outputs	2 500 V AC type of insulation: basic
	• contact clearance	1 500 V AC type of clearance: micro-disconnection
Input - outputs distance		
• clearance		≥ 1,6 mm
• creepage		≥ 3,2 mm

General data

Electrical life		
• resistive AC1		> 10^5 6 A, 250 V AC
Mechanical life (cycles)		> 2 x 10^7
Dimensions (L x W x H)		90 x 36 x 55 mm
Weight		115 g
Ambient temperature	• storage	-40...+70 °C
	• operating	-20...+55 °C
Cover protection category		IP 20 PN-EN 60529
Environmental protection		RTI PN-EN 116000-3
Shock resistance	(NO/NC)	10 g / 5 g
Vibration resistance		0,35 mm DA 10...55 Hz

The data in bold type relate to the standard versions of the relays.
❶ The control terminal S is activated by connection to A1 terminal via the external control contact S.
❷ Where the control signal is recognizable.

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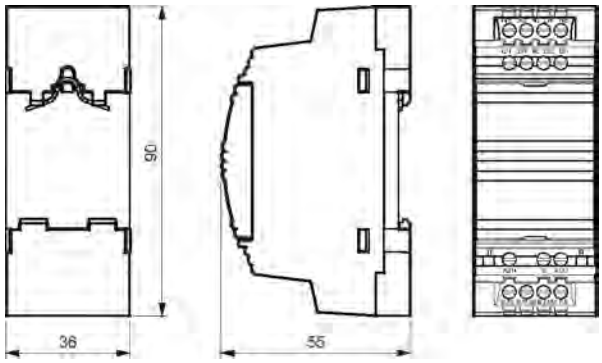
Time module data

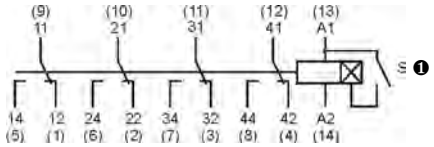
Functions	E, Wu, Bp, Bi, PWM, R, Ws, Wa, Esa, B permanent switching ON and OFF
Time ranges	1 s ❸; 10 s; 1 min.; 10 min.; 1 h; 10 h; 1 d; 10 d
Timing adjustment	smooth - (0,1...1) x time range
Setting accuracy	± 5% (calculated from the final range values) ❸
Repeatability	± 0,5% ❸
Temperature influence	± 0,01% / °C
Recovery time	90 ms
LED indicator	green LED - indication of supply voltage U yellow LED - indication of time period T and the status of outputs after the time T has been measured ❹

❸ For first range setpoint (1 s) setting accuracy and repeatability are smaller than the given ones in technical parameters (significant influence of the operational relay operating time). Recommend to set measuring time by experimental method. ❹ The yellow LED - T time measurement (pulsating); excited operational relay; time not measured (steady light); de-excited operational relay, time not measured (no light).

Dimensions



Connections diagram

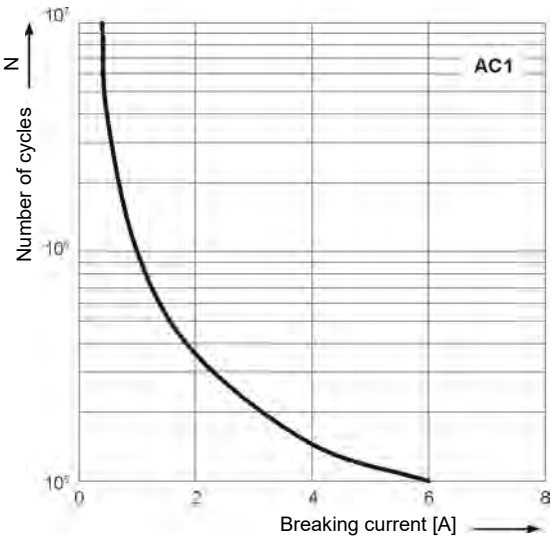


4 CO

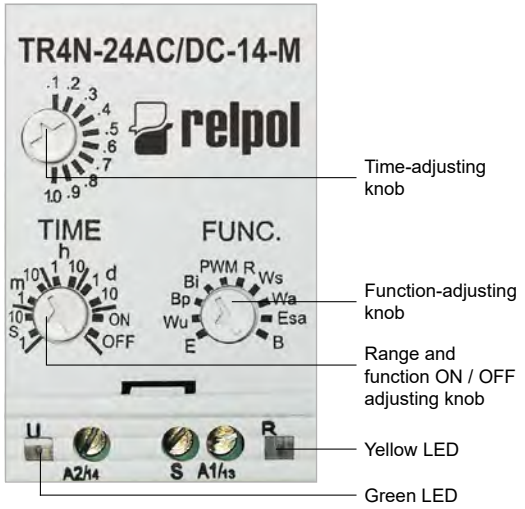
❶ The control terminal S is activated by connection to A1 terminal via the external control contact S.

Electrical life at AC resistive current. Switching frequency: 1 200 cycles/hour

Fig. 1

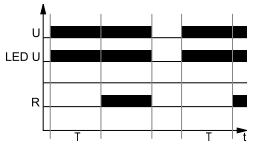


Front panel description



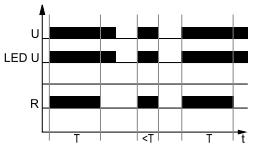
Time functions

E - ON delay.



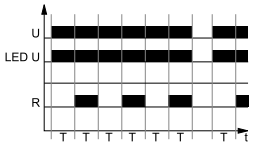
On applying the supply voltage U the set interval T begins - off-delay of the output relay R. After the interval T has lapsed, the output relay R switches on and remains on until supply voltage U is interrupted.

Wu - ON for the set interval.



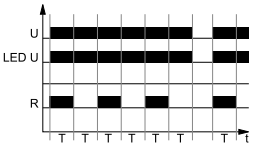
Applying the supply voltage U immediately switches the output relay R on for the set interval T. After the interval T has lapsed, the output relay R switches off.

Bp - Symmetrical cyclical operation pause first.



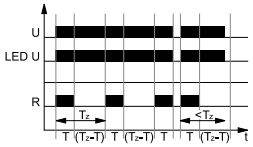
Applying the supply voltage U starts the cyclical operation from the T interval - switching the output relay R off followed by switching on the output relay R for the interval T. The cyclical operation lasts until the supply voltage U is interrupted.

Bi - Symmetrical cyclical operation pulse first.



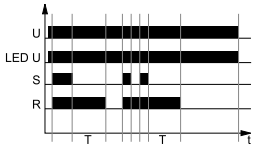
Applying the supply voltage U starts the cyclical operation from switching on the output relay R for the set interval T. After the interval T has lapsed, the output relay R switches off for the interval T. The cyclical operation lasts until the supply voltage U is interrupted.

PWM - Pulse width modulation.



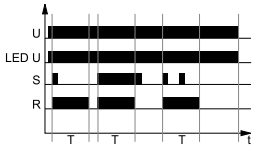
Set the relay to a single Tz cycle which is one of the time ranges available for a time relay. The cycle shall be set with the time selection knob. Then, set the interval T, i.e. the ON time of the output relay R with the time fine setting knob. The interval T may be set from 0.1 to 1.0 of the time range (Tz cycle). Applying the supply voltage U immediately switches on the output relay R for the set interval, and after the interval has lapsed, the output relay R switches off for the time left until the set time Tz. After the Tz time, consecutive cycles start and are continued until the supply voltage U is interrupted. In the course of the PWM function, the ON time of the output relay R may be changed, and such change does not affect the interval of the Tz cycle. The changed ON time of the output relay R shall be realized starting from the new Tz cycle following the change.

R - OFF delay with the control contact S.



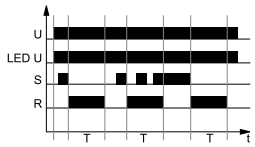
The input of the time relay is supplied with voltage U continuously. Closing of the control contact S immediately switches on the output relay R. Opening of the control contact S starts the set time of the delayed switching off of the output relay R. After the interval T has lapsed, the output relay R switches off. If the control contact S is closed during the interval T, the already measured time is reset, and the output relay R is switched on again. The OFF delay of the output relay R will start when the control contact S is opened again.

Ws - Single shot for the set interval triggered by closing of the control contact S.



The input of the time relay is supplied with voltage U continuously. Closing of the control contact S immediately switches the output relay R on for the set interval T. After the interval T has lapsed, the output relay R is switched off. In the course of the interval T, any opening of the control contact S does not affect the function to be performed. The output relay R may be switched on again for the set interval, after the interval T has lapsed, by closing the control contact S again.

Wa - ON for the set interval triggered with the control contact S.



The input of the time relay is supplied with voltage U continuously. Closing of the control contact S does not start the interval T, and it does not change the position of the output relay R. Opening of the control contact S immediately switches on the output relay R for the set time. After the interval T has lapsed, the output relay R switches off. Opening and closing of the control contact S in the course of the interval T does not affect the function to be performed. The output relay R may be switched on again for the set interval with another closing and opening of the control contact S.

U - supply voltage; **R** - output state of the relay; **S** - control contact state; **Tz** - value of the set interval; **T** - measured time; **t** - time axis

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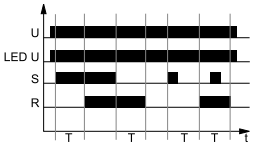
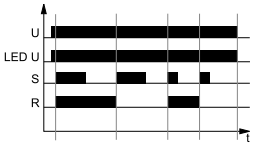
Time functions

Esa - ON and OFF delay with the control contact S.



The input of the time relay is supplied with voltage U continuously. Closing of the control contact S starts the interval T - on-delay of the output relay R. After the interval T has lapsed, the output relay R switches on. Opening of the control contact S begins further measurement of the interval T - off-delay of the output relay R, and after the interval has lapsed, the output relay switches off. In case the time for which the control contact S is closed in the course of measurement of the on-delay of the output relay R is shorter than the set interval T, the output relay R will switch on after the set interval T, and the output relay R will remain in on position for the interval T. When the output relay R is in on position, closing of the control contact S does not affect the function to be performed.

B - Cyclical operation controlled with closing of the control contact S.



The input of the time relay is supplied with U voltage continuously. Closing of the control contact S immediately switches on the output relay R. Each next closing of the control contact S results in a change of the status of the output relay R to an opposite one (the feature of a bistable relay).

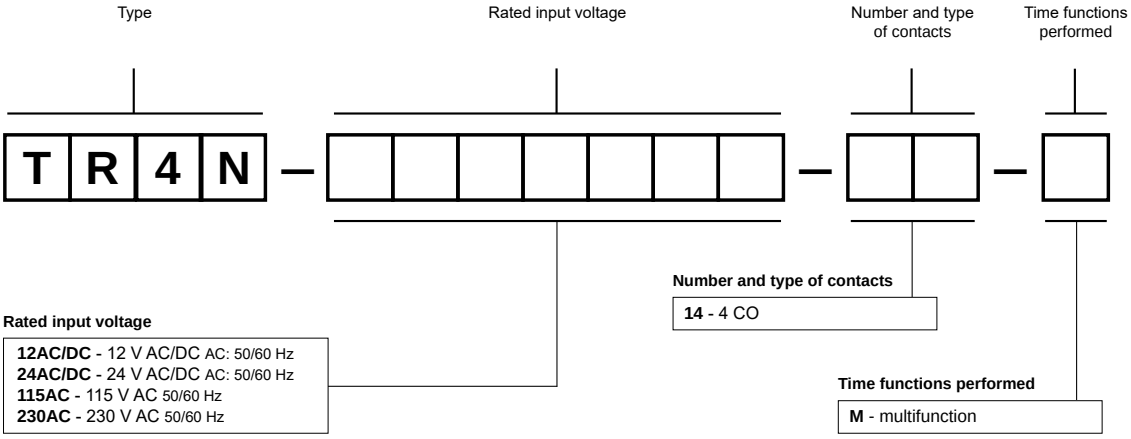
Permanent switching ON and OFF.
The functions ON and OFF are selected with TIME potentiometer. In the ON function, the normally open contacts are closed all the time whereas in the OFF function they are open. The position of the FUNC potentiometer is of no significance in these functions as is the preset measurement time. The ON or OFF functions are used for the time relay operation control in electric systems.

U - supply voltage; **R** - output state of the relay; **S** - control contact state; **Tz** - value of the set interval; **T** - measured time; **t** - time axis

Mounting

Relays **TR4N 4 CO** are designed for direct mounting on 35 mm rail mount acc. to PN-EN 60715. Operational position - any. **Connections:** max. cross section of the cables: 1 x 2,5 mm^2 / 2 x 1,5 mm^2 (1 x 14 / 2 x 16 AWG), length of the cable deinsulation: 6,5 mm, max. tightening moment for the terminal: 0,6 Nm.

Ordering codes



Examples of ordering codes:

TR4N-230AC-14-M time relay **TR4N 4 CO**, multifunction (relay perform 10 functions), four changeover contacts, contact material AgNi, rated input voltage 230 V AC 50/60 Hz

TR4N-24AC/DC-14-M time relay **TR4N 4 CO**, multifunction (relay perform 10 functions), four changeover contacts, contact material AgNi, rated input voltage 24 V AC/DC AC: 50/60 Hz

• Single-function, single-voltage time relays offered in the following versions: **T-R4E** - relay with time function E, **T-R4Wu** - relay with time function Wu, **T-R4Bp** - relay with time function Bp, **T-R4Bi** - relay with time function Bi • Cadmium - free contacts • AC and DC input voltages • For plug-in sockets, 35 mm rail mount acc. to PN-EN 60715 or on panel mounting • Applications: as time systems in electric circuits of machines, technological lines, in automation systems, etc.
• Recognitions, certifications, directives: recognitions R4N, CE

Output circuits - contact data

Number and type of contacts		4 CO
Contact material		**AgNi**
Max. switching voltage		250 V AC / 250 V DC
Rated load	AC1	6 A / 230 V AC
Max. inrush current		12 A
Rated current		6 A
Max. breaking capacity	AC1	1 500 VA
Min. breaking capacity		0,3 W 5 V, 5 mA
Contact resistance		≤ 100 mΩ
Max. operating frequency		
• at rated load	AC1	1 200 cycles/hour
• no load		18 000 cycles/hour

Input circuit

Rated voltage	50/60 Hz AC	24 ... 230 V
	DC	12 ... 24 V
Must release voltage		AC: ≥ 0,2 U_n DC: ≥ 0,1 U_n
Operating range of supply voltage		0,8...1,1 U_n see Tables 1, 2
Rated power consumption	AC	2,2 VA
	DC	1,2 W
Range of supply frequency		48...63 Hz

Insulation according to PN-EN 60664-1

Insulation rated voltage	250 V AC
Overvoltage category	III
Dielectric strength	
• input - outputs	2 500 V AC type of insulation: basic
• contact clearance	1 500 V AC type of clearance: micro-disconnection
• pole - pole	2 000 V AC type of insulation: basic
Input - outputs distance	
• clearance	≥ 1,6 mm
• creepage	≥ 3,2 mm

General data

Operating / release time (typical values)		10 ms / 8 ms
Electrical life		
• resistive AC1		> 10^5 6 A, 250 V AC
• cosφ		see Fig. 2
Mechanical life (cycles)		> 2 x 10^7
Dimensions (L x W x H)		T-R4 + GZM4: 75 x 27 x 91,5 mm T-R4 + GZT4: 76,3 x 27 x 90 mm T-R4 + GZMB4: 95 ❶ x 31 x 90 mm T-R4: 27,5 x 21,2 x 62,5 mm
Weight		T-R4 + GZM4: 123 g T-R4 + GZT4: 113 g T-R4 + GZMB4: 124 g T-R4: 49 g
Ambient temperature	• storage	-20...+85 °C
	• operating	-20...+55 °C
Cover protection category		IP 20 (with socket) PN-EN 60529
Environmental protection		T-R4: RTI GZM4: RT0 PN-EN 116000-3
Shock resistance	(NO/NC)	10 g / 5 g
Vibration resistance		5 g 10...150 Hz

The data in bold type relate to the standard versions of the relays.
❶ Length with 35 mm rail taps: 100 mm.

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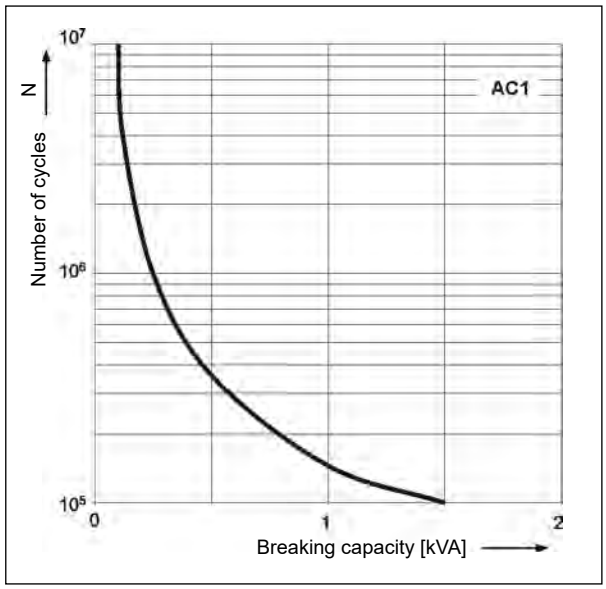
Time module data

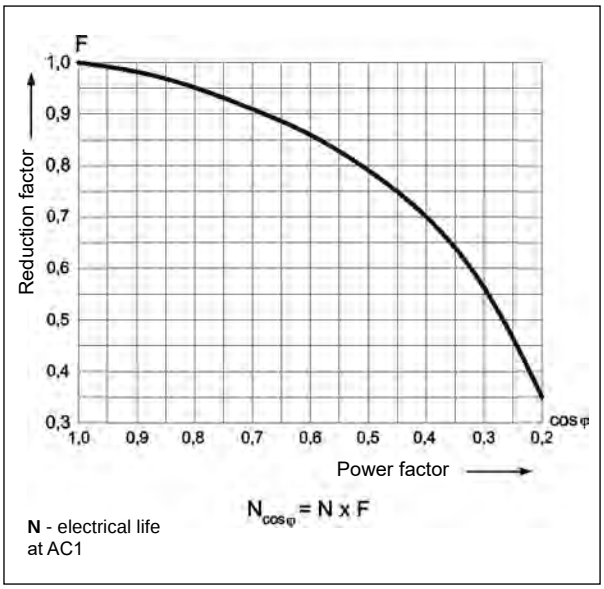
Functions	E, Wu, Bp, Bi
Time ranges	1 s ❶; 10 s; 1 min.; 10 min.; 1 h; 10 h; 100 h
Timing adjustment	range - with the range-adjusting knob / switch; within the range - with the time-adjusting knob / potentiometer
Setting accuracy	± 5% (calculated from the final range values) ❶
Repeatability	± 1% ❶
Temperature influence	± 0,01% / °C
Recovery time	100 ms
LED indicator	green LED - indication of supply voltage U yellow LED - indication of time period T and the status of outputs after the time T has been measured ❷

❶ For first range setpoint (1 s) setting accuracy and repeatability are smaller than the given ones in technical parameters (significant influence of the operational relay operating time). Recommend to set measuring time by experimental method. ❷ The yellow LED - T time measurement (pulsating); excited operational relay; time not measured (steady light); de-excited operational relay, time not measured (no light).

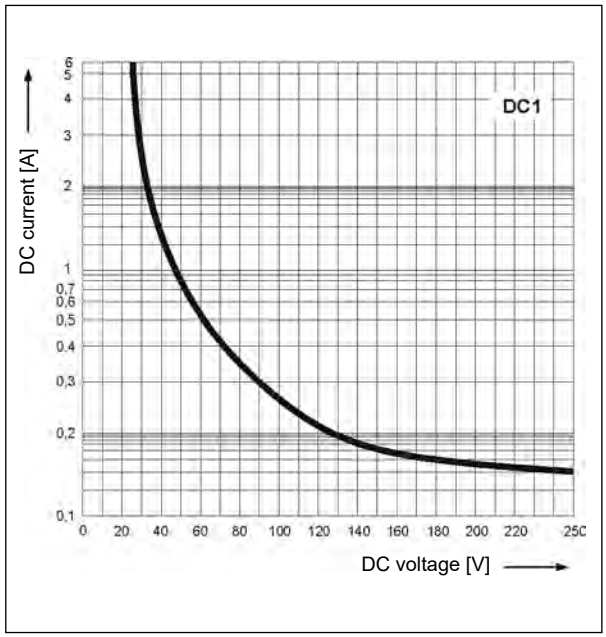
Electrical life at AC resistive load. Switching frequency: 1 200 cycles/hour Fig. 1



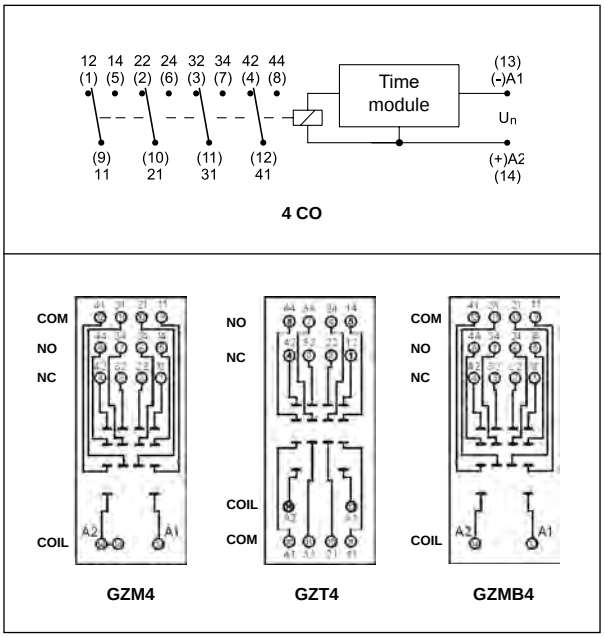
Electrical life reduction factor at AC inductive load Fig. 2



Max. DC resistive load breaking capacity Fig. 3

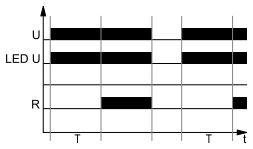


Connection diagrams



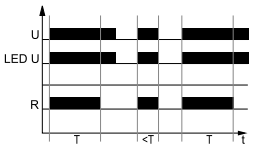
Time functions

E - ON delay.



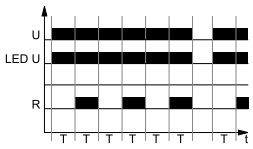
On applying the supply voltage U the set interval T begins - off-delay of the output relay R. After the interval T has lapsed, the output relay R switches on and remains on until supply voltage U is interrupted.

Wu - ON for the set interval.



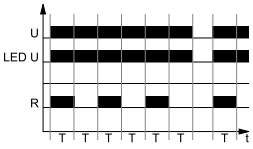
Applying the supply voltage U immediately switches the output relay R on for the set interval T. After the interval T has lapsed, the output relay R switches off.

Bp - Symmetrical cyclical operation pause first.



Applying the supply voltage U starts the cyclical operation from the T interval - switching the output relay R off followed by switching on the output relay R for the interval T. The cyclical operation lasts until the supply voltage U is interrupted.

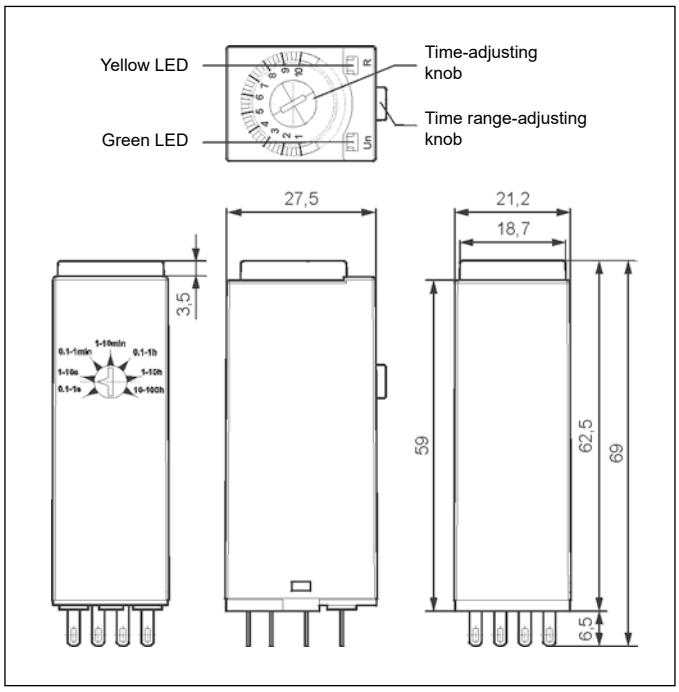
Bi - Symmetrical cyclical operation pulse first.



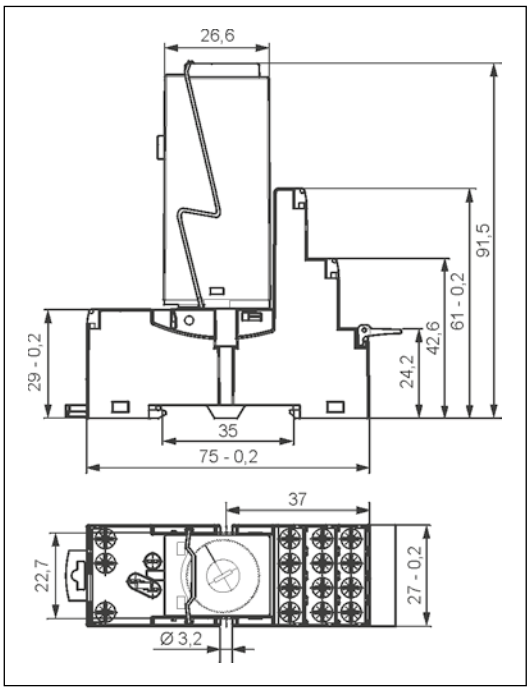
Applying the supply voltage U starts the cyclical operation from switching on the output relay R for the set interval T. After the interval T has lapsed, the output relay R switches off for the interval T. The cyclical operation lasts until the supply voltage U is interrupted.

U - supply voltage; **R** - output state of the relay; **T** - measured time; **t** - time axis

Dimensions - T-R4



Dimensions - T-R4 with socket GZM4



Time relay
T-R4

with plug-in socket
GZM4

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Mounting

Relays **T-R4E**, **T-R4Wu**, **T-R4Bp**, **T-R4Bi** are designed for screw terminals plug-in sockets **GZM4** ❶ ❷ and **GZT4** ❶ ❷, 35 mm rail mount acc. to PN-EN 60715 or on panel mounting with two M3 screws. **Connections:** max. cross section of the cables (stranded): 2 x 2,5 mm^2 (2 x 14 AWG), length of the cable deinsulation: 6,5 mm, max. tightening moment for the terminal: 0,7 Nm • spring terminals plug-in sockets **GZMB4** ❸ ❹, 35 mm rail mount acc. to PN-EN 60715. **Connections:** max. cross section of the cables: 1 x 0,2...1,5 mm^2 (1 x 24...16 AWG), length of the cable deinsulation: 9...11 mm.

❶ Plug-in sockets **GZT4**, **GZM4** may be linked with interconnection strip type **ZGGZ4** (see page 419). ❷ For sockets **GZT4**, **GZM4** are offered clips TR4-2000 and description plates GZT4-0035. ❸ For sockets **GZMB4** are offered clips TR4-2000 and description plates TR. ❹ For sockets **GZMB4** - see page 403 (wire connection).

Separate T-R4 control circuits from load circuits (T-R4 contacts)	GZM4: yes GZT4: no GZMB4: yes
Increased dielectric strength spacing between coil and contacs clamps	GZM4: min. 5 kV GZT4: min. 4 kV GZMB4: min. 4 kV
Double A2(14) terminal is introduced for easy wiring in electrical devices	GZM4: yes GZT4: no GZMB4: yes

Input data - DC voltage version

Table 1

Input voltage code	Rated input voltage U_n V DC	Input resistance at 20 °C Ω	Acceptable resistance	Input - voltage range V DC	
				min. (at 20 °C)	max. (at 55 °C)
1012	**12**	**160**	**± 10%**	**9,6**	**13,2**
1024	**24**	**640**	**± 10%**	**19,2**	**26,4**

The data in bold type relate to the standard versions of the relays.

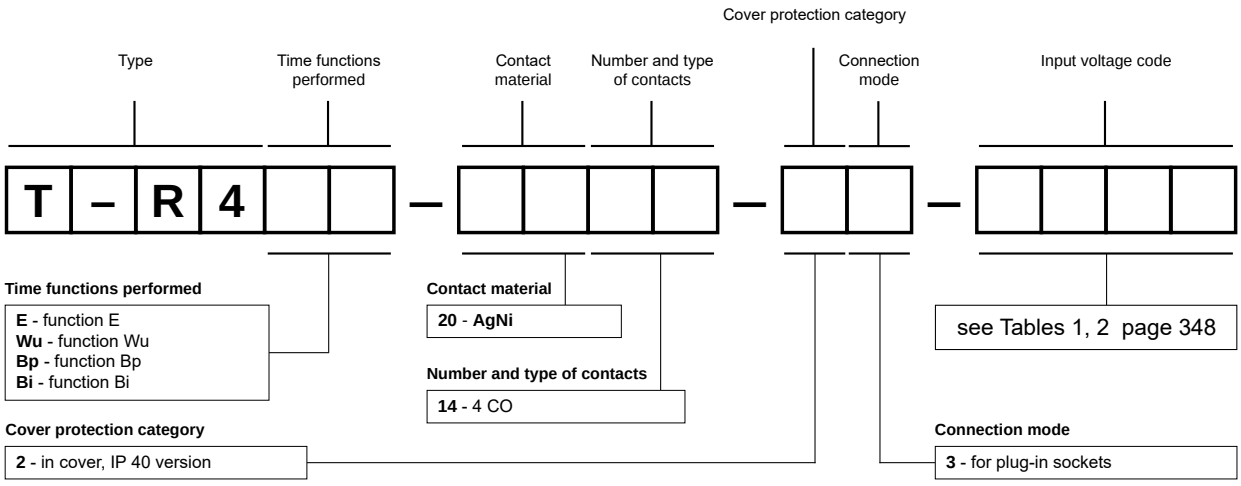
Input data - AC 50/60 Hz voltage version

Table 2

Input voltage code	Rated input voltage U_n V AC	Input resistance at 20 °C Ω	Acceptable resistance	Input - voltage range V AC	
				min. (at 20 °C)	max. (at 55 °C)
5024	**24**	**158**	**± 10%**	**19,2**	**26,4**
5115	115	3 610	± 10%	92,0	127,0
5230	**230**	**16 100**	**± 10%**	**184,0**	**253,0**

The data in bold type relate to the standard versions of the relays.

Ordering codes



Example of ordering code:

T-R4E-2014-23-1012 time relay **T-R4**, single-function (relay perform function **E** - ON delay), for plug-in sockets, four changeover contacts, contact material AgNi, rated input voltage 12 V DC, in cover IP 40

- Time relay **PIR15 - 3 CO (standard)** consists of: electromagnetic relay **R15 - 3 CO**, black plug-in socket **GZP11**, time module **COM3**, spring wire clip **GZP-0054**, white description plate **GZP-0035**
- Time relay **PIR15 - 2 CO** consists of: electromagnetic relay **R15 - 2 CO**, black plug-in socket **GZP8**, time module **COM3**, spring wire clip **GZP-0054**, white description plate **GZP-0035**
- 35 mm rail mount acc. to PN-EN 60715 or on panel mounting with two M3 screws • Recognitions, certifications, directives: recognitions R15, RoHS, CE

Output circuits - contact data

Number and type of contacts		2 CO, **3 CO**
Contact material		**AgNi**
Max. switching voltage		440 V AC / 250 V DC
Rated load (capacity)	AC1	10 A / 250 V AC
	AC15	3 A / 120 V 1,5 A / 240 V (B300)
	AC3	370 W (single-phase motor; 0,5 HP / 240 V AC UL 508)
	DC1	10 A / 24 V DC (see Fig. 3)
	DC13	0,22 A / 120 V 0,1 A / 250 V (R300)
Max. inrush current		20 A
Rated current		10 A
Max. breaking capacity	AC1	2 500 VA
Min. breaking capacity		0,3 W 5 V, 5 mA
Contact resistance		≤ 100 mΩ
Max. operating frequency		
• at rated load	AC1	1 200 cycles/hour
• no load		12 000 cycles/hour

Input circuit

Rated voltage of output relay R15	50/60 Hz AC	24 ... 240 V
	DC	24 ... 220 V
Supply voltage of time module COM3		24...240 V AC/DC (universal module)
Operating range of supply voltage		0,85...1,1 U_n see Tables 1, 2
Rated power consumption	AC	3,0 VA
	DC	2,0 W
Range of supply frequency		48...63 Hz
Control contact S ❶		
• connections		not potential free, terminals A1-B1
• line length		max. 10 m (twisted pair)
• min. time of pulse duration ❷		100 ms

Insulation according to PN-EN 60664-1

Insulation rated voltage	250 V AC
Overvoltage category	III
Dielectric strength	
• input - outputs	2 500 V AC type of insulation: basic
• contact clearance	1 500 V AC type of clearance: micro-disconnection
• pole - pole	2 000 V AC type of insulation: basic
Input - outputs distance	
• clearance	≥ 3 mm
• creepage	≥ 4,2 mm

General data

Operating / release time (typical values)		AC: 12 ms / 10 ms DC: 18 ms / 7 ms
Electrical life		
• resistive AC1		> 2 x 10^5 10 A, 250 V AC
• cosφ		patrz Wykres 2
Mechanical life (cycles)		> 2 x 10^7
Dimensions (L x W x H)		73 x 38,2 x 85,4 mm
Weight		3 CO: 175 g 2 CO: 168 g
Ambient temperature	• storage	-40...+70 °C
	• operating	-40...+55 °C
Cover protection category		IP 20 PN-EN 60529
Environmental protection		R15: RTI GZP11, GZP8: RT0 PN-EN 116000-3
Shock resistance		10 g
Vibration resistance		5 g 10...500 Hz

The data in bold type relate to the standard versions of the relays.
❶ The control terminal B1 is activated by connection to A1 terminal via the external control contact S.
❷ Where the control signal is recognizable.

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Time module data

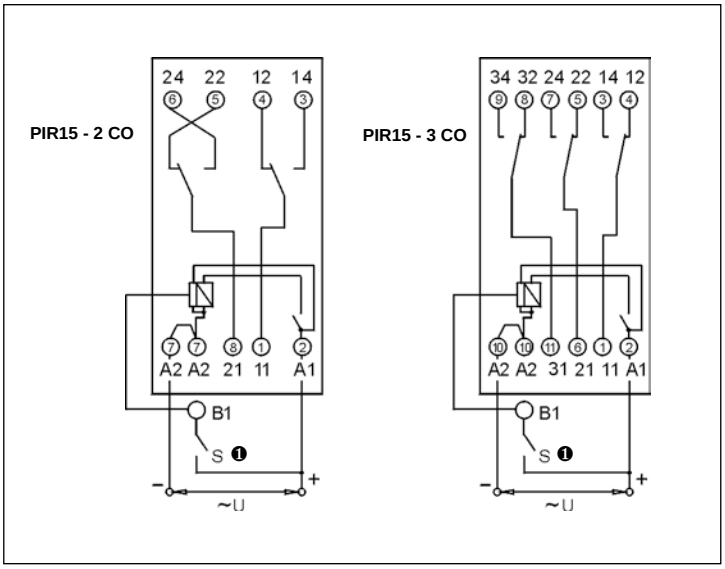
Functions	E, Wu, Bp, Bi, R, Ws, Wa, Es
Function adjustment ❸	selection with microswitches
Time ranges	1 s; 10 s; 1 min.; 10 min.; 1 h; 10 h; 1 d; 10 d
Timing adjustment ❸	time range - with microswitches smooth - (0,05...1) x time range - with potentiometer
Base accuracy	± 1% (calculated from the final range values)
Setting accuracy	± 5% (calculated from the final range values)
Repeatability	± 0,5% or ± 5 ms
Temperature influence	± 0,01% / °C
Recovery time	150 ms
LED indicator	green LED U ON - indication of supply voltage U green LED U flashing - measurement of T time

❸ Settings of switches - see below.

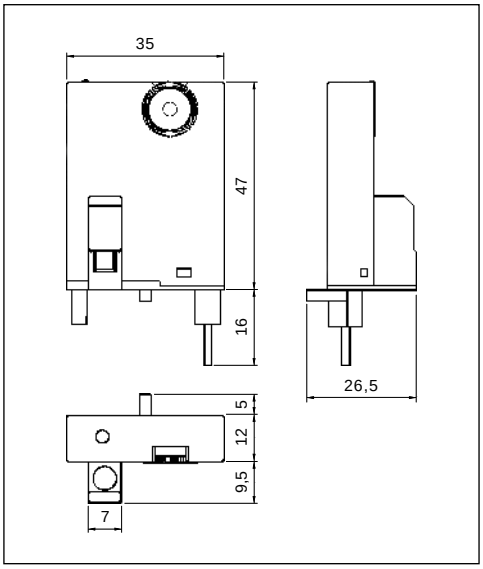
Settings of switches

Function adjustment microswitches 1, 2, 3	E	Wu	Bi	Bp	R	Ws	Wa	Es
								
Timing adjustment (max.) microswitches 4, 5, 6	1 s	10 s	1 min.	10 min.	1 h	10 h	1 d	10 d
								

Connection diagrams (screw terminals side view)



Dimensions - time module COM3



❶ The control terminal B1 is activated by connection to A1 terminal via the external control contact S.

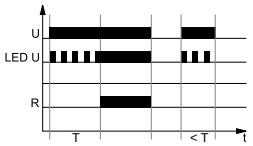
COM3

Universal
time module
- see page 354

Time functions

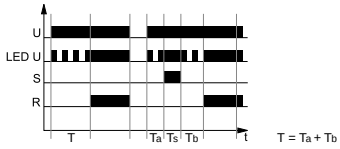
E - ON delay.

Diagram 1



When the supply voltage U is applied, the set interval T begins (green LED flashing). After the interval T has expired (green LED illuminated) the output relay R switches into on-position. This status remains until the supply voltage is interrupted - see Diagram 1.

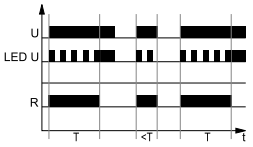
Diagram 2



Additional option (ON delay adding): if the control contact S is closed the running interval T is stopped (green LED illuminated) and the interval already expired is saved. When the control contact S is opened once again the interval T is continued (green LED flashing). After the interval T has expired, the control contact S can be operated as you like - see Diagram 2.

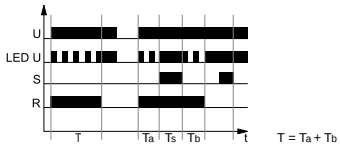
Wu - Single shot leading edge voltage controlled.

Diagram 1



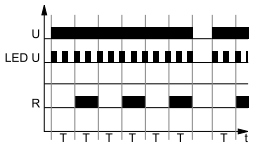
When the supply voltage U is applied, the output relay R switches into on-position and the set interval T begins (green LED flashing). After the interval T has expired (green LED illuminated) the output relay switches into off-position. This status remains until the supply voltage is interrupted. If the supply voltage is interrupted before the interval T has expired, the output relay switches into off-position. The interval already expired is erased and is restarted when the supply voltage is next applied - see Diagram 1.

Diagram 2



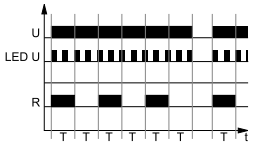
Additional option (Single shot leading edge adding): if the control contact S is closed the running interval T is stopped (green LED illuminated) and the interval already expired is saved. When the control contact S is opened once again the interval T is continued (green LED flashing). After the interval T has expired, the control contact S can be operated as you like - see Diagram 2.

Bp - Symmetrical cyclical operation pause first.



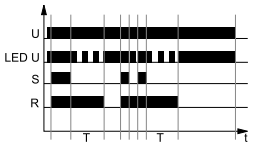
Applying the supply voltage U starts the cyclical operation from the T interval - switching the output relay R off followed by switching on the output relay R for the interval T. The cyclical operation lasts until the supply voltage U is interrupted.

Bi - Symmetrical cyclical operation pulse first.



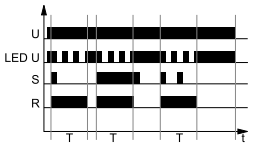
Applying the supply voltage U starts the cyclical operation from switching on the output relay R for the set interval T. After the interval T has lapsed, the output relay R switches off for the interval T. The cyclical operation lasts until the supply voltage U is interrupted.

R - OFF delay with the control contact S.



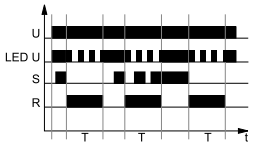
The input of the time relay is supplied with voltage U continuously. Closing of the control contact S immediately switches on the output relay R. Opening of the control contact S starts the set time of the delayed switching off of the output relay R. After the interval T has lapsed, the output relay R switches off. If the control contact S is closed during the interval T, the already measured time is reset, and the output relay R is switched on again. The OFF delay of the output relay R will start when the control contact S is opened again.

Ws - Single shot for the set interval triggered by closing of the control contact S.



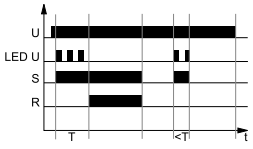
The input of the time relay is supplied with voltage U continuously. Closing of the control contact S immediately switches the output relay R on for the set interval T. After the interval T has lapsed, the output relay R is switched off. In the course of the interval T, any opening of the control contact S does not affect the function to be performed. The output relay R may be switched on again for the set interval, after the interval T has lapsed, by closing the control contact S again.

Wa - ON for the set interval triggered with the control contact S.



The input of the time relay is supplied with voltage U continuously. Closing of the control contact S does not start the interval T, and it does not change the position of the output relay R. Opening of the control contact S immediately switches on the output relay R for the set time. After the interval T has lapsed, the output relay R switches off. Opening and closing of the control contact S in the course of the interval T does not affect the function to be performed. The output relay R may be switched on again for the set interval with another closing and opening of the control contact S.

Es - ON delay with the control contact S.



The input of the time relay is supplied with voltage U continuously. Closing of the control contact S starts the interval T - on-delay of the output relay R. After the interval T has lapsed, the output relay R switches on and remains in this position until the control contact S is opened. In case the control contact S is closed for time shorter than the set interval T, the output relay R will not activate.

U - supply voltage; **R** - output state of the relay; **S** - control contact state; **T** - measured time; **Ta**, **Tb** - component intervals of T time; **Ts** - period of T time interrupt; **t** - time axis

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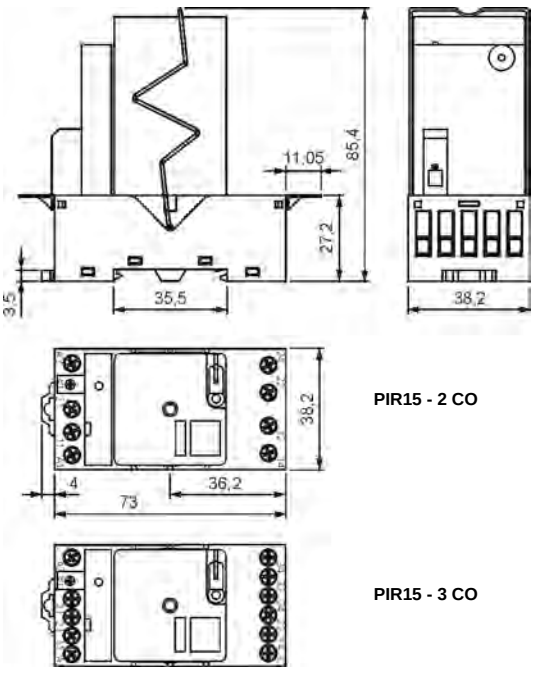
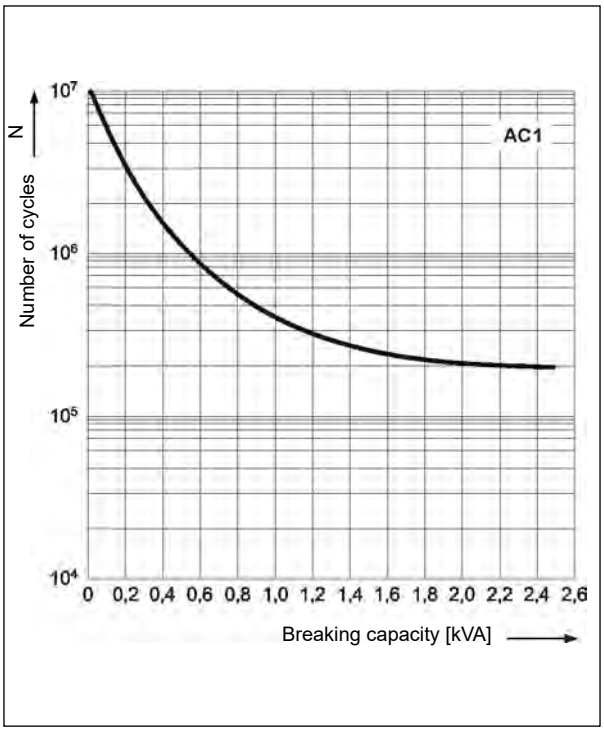
Dimensions



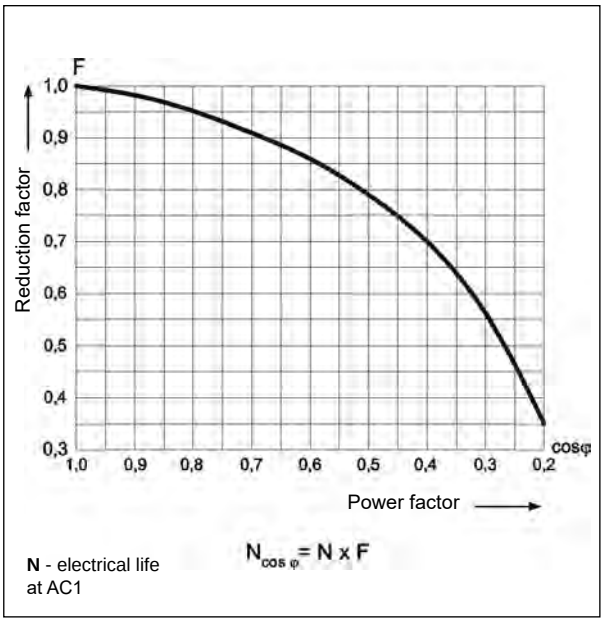
Electrical life at AC resistive load. Switching frequency: 1 200 cycles/hour

Fig. 1



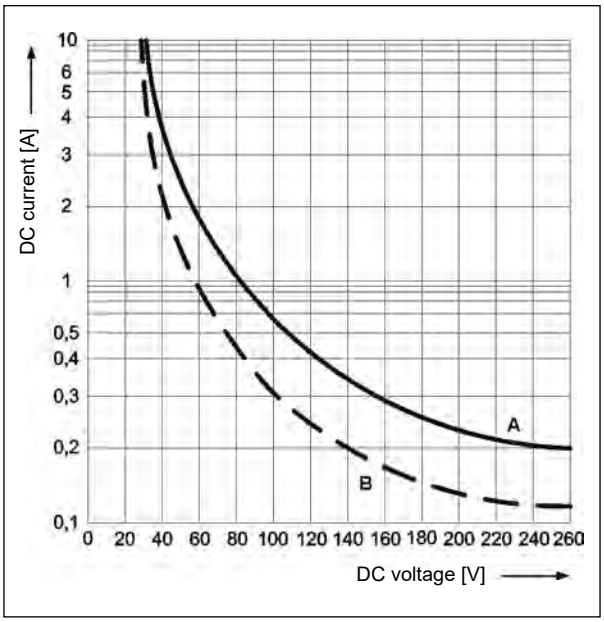
Electrical life reduction factor at AC inductive load

Fig. 2



Max. DC breaking capacity
A - resistive load DC1
B - inductive load L/R = 40 ms

Fig. 3



Mounting

Relays **PIR15...T** are designed for direct mounting on 35 mm rail mount acc. to PN-EN 60715 or on panel mounting with two M3 screws. **Connections:** max. cross section of the cables (stranded): 2 x 2,5 mm^2 (2 x 14 AWG), length of the cable deinsulation: 6,5 mm, max. tightening moment for the terminal: 0,5 Nm.

Input data - DC voltage version Table 1

Input voltage code	Rated input voltage U_n V DC	Input resistance at 20 °C Ω	Acceptable resistance	Input - voltage range V DC	
				min. (at 20 °C)	max. (at 55 °C)
024DC	**24**	**430**	**± 10%**	**19,2**	**26,4**
048DC	48	1 750	± 10%	38,4	52,8
060DC	60	2 700	± 10%	48,0	66,0
110DC	110	9 200	± 10%	88,0	121,0
120DC	120	11 000	± 10%	96,0	132,0
220DC	**220**	**37 000**	**± 10%**	**176,0**	**242,0**

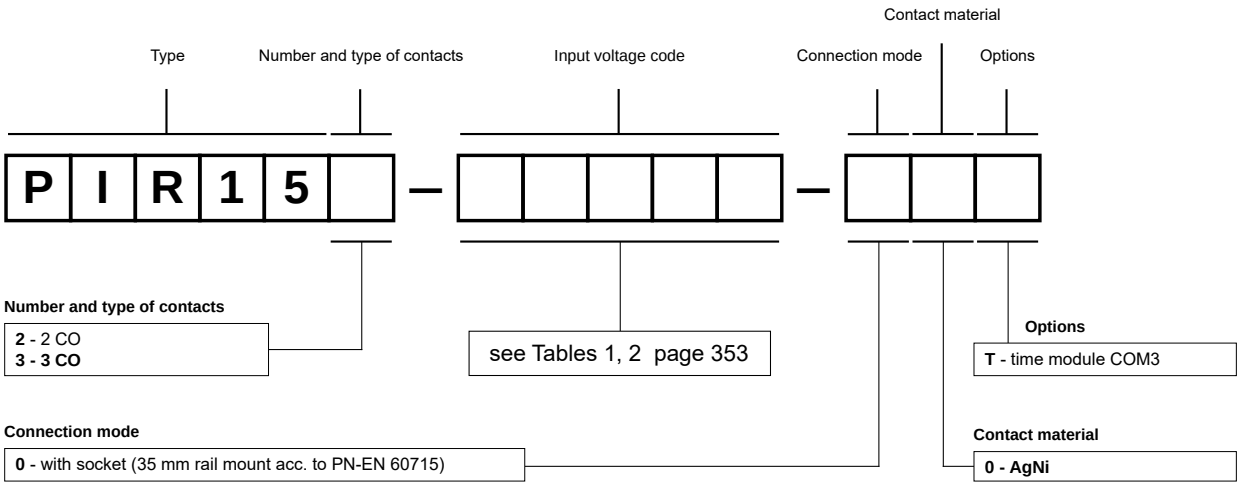
The data in bold type relate to the standard versions of the relays.

Input data - AC 50/60 Hz voltage version Table 2

Input voltage code	Rated input voltage U_n V AC	Input resistance at 20 °C Ω	Acceptable resistance	Input - voltage range V AC	
				min. (at 20 °C)	max. (at 55 °C)
024AC	**24**	**75**	**± 15%**	**19,2**	**26,4**
048AC	48	305	± 15%	38,4	52,8
060AC	60	475	± 15%	48,0	66,0
110AC	110	1 700	± 15%	88,0	121,0
120AC	120	1 910	± 15%	96,0	132,0
230AC	**230**	**7 080**	**± 15%**	**184,0**	**253,0**
240AC	240	7 760	± 15%	192,0	264,0

The data in bold type relate to the standard versions of the relays.

Ordering codes



Examples of ordering codes:

PIR153-230AC-00T time relay **PIR15 - 3 CO** consists of: relay **R15 - 3 CO** (three changeover contacts, contact material AgNi, input voltage 230 V AC 50/60 Hz), socket **GZP11** (black, screw terminals), time module **COM3**, spring wire clip **GZP-0054**, description plate **GZP-0035** (white)

PIR152-024DC-00T time relay **PIR15 - 2 CO** consists of: relay **R15 - 2 CO** (two changeover contacts, contact material AgNi, input voltage 24 V DC), socket **GZP8** (black, screw terminals), time module **COM3**, spring wire clip **GZP-0054**, description plate **GZP-0035** (white)

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- **Multifunction time modules (8 time functions; 8 time ranges)**
- AC/DC input voltages
- Mounting: combinable to relay R15 - 3 CO (2 CO) with plug-in socket GZP11 (GZP8)
- Recognitions, certifications, directives: CE

Output circuits - contact data

Number and type of contacts		according to relays R15 - 3 CO (2 CO)	
Input circuit			
Rated voltage	AC: 50/60 Hz AC/DC	12...240 V	terminals (+)A1 – (-)A2
Must release voltage		> 10 V AC or 10 V DC	
Operating range of supply voltage		0,85...1,1 U_n	
Rated power consumption	AC	80 mVA (54 mW)	24 V AC
		940 mVA (520 mW)	230 V AC
	DC	60 mW	24 V DC
		765 mW	240 V AC
Range of supply frequency	AC	45...65 Hz	
Duty cycle		100%	
Residual ripple to DC		10%	
Control contact S ❶			
• connections		not potential free, terminals A1-B1	
• line length		max. 10 m (twisted pair)	
• min. time of pulse duration ❷		100 ms	
Insulation according to PN-EN 60664-1			
Insulation pollution degree		2	if built-in: 3
General data			
Dimensions (L x W x H)		26,5 x 35 x 47 mm	
Ambient temperature	• storage	-25...+70 °C	
	• operating	-25...+55 °C	
Cover protection category		IP 40	PN-EN 60529
Relative humidity		15...85%	
Time module data			
Functions		E, Wu, Bp, Bi, R, Ws, Wa, Es	
Function adjustment ❸		selection with microswitches	
Time ranges		1 s; 10 s; 1 min.; 10 min.; 1 h; 10 h; 1 d; 10 d	
Timing adjustment ❸		time range - with microswitches smooth - (0,05...1) x time range - with potentiometer	
Base accuracy		± 1% (calculated from the final range values)	
Setting accuracy		± 5% (calculated from the final range values)	
Repeatability		± 0,5% or ± 5 ms	
Temperature influence		± 0,01% / °C	
Recovery time		150 ms	
LED indicator		green LED U ON - indication of supply voltage U green LED U flashing - measurement of T time	

❶ The control terminal B1 is activated by connection to A1 terminal via the external control contact S.
❷ Where the control signal is recognizable.
❸ Settings of switches - see page 356.

Time relay PIR15...T

set: relay R15 - 3 CO (2 CO)
+ socket GZP11 (GZP8)
+ time module COM3
- see page 349

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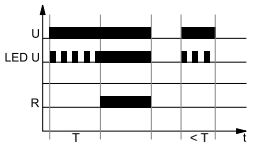
Time functions

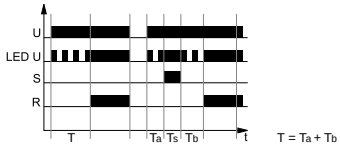
E - ON delay.

Diagram 1



When the supply voltage U is applied, the set interval T begins (green LED flashing). After the interval T has expired (green LED illuminated) the output relay R switches into on-position. This status remains until the supply voltage is interrupted - see Diagram 1.

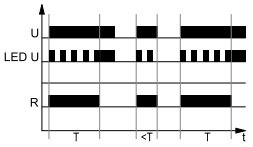
Diagram 2



Additional option (ON delay adding): if the control contact S is closed the running interval T is stopped (green LED illuminated) and the interval already expired is saved. When the control contact S is opened once again the interval T is continued (green LED flashing). After the interval T has expired, the control contact S can be operated as you like - see Diagram 2.

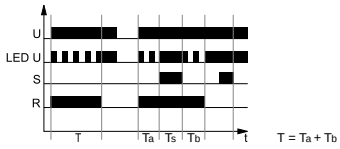
Wu - Single shot leading edge voltage controlled.

Diagram 1



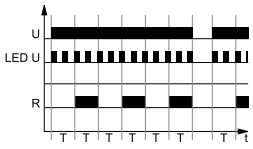
When the supply voltage U is applied, the output relay R switches into on-position and the set interval T begins (green LED flashing). After the interval T has expired (green LED illuminated) the output relay switches into off-position. This status remains until the supply voltage is interrupted. If the supply voltage is interrupted before the interval T has expired, the output relay switches into off-position. The interval already expired is erased and is restarted when the supply voltage is next applied - see Diagram 1.

Diagram 2



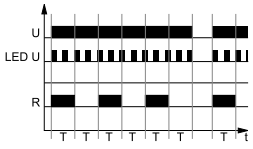
Additional option (Single shot leading edge adding): if the control contact S is closed the running interval T is stopped (green LED illuminated) and the interval already expired is saved. When the control contact S is opened once again the interval T is continued (green LED flashing). After the interval T has expired, the control contact S can be operated as you like - see Diagram 2.

Bp - Symmetrical cyclical operation pause first.



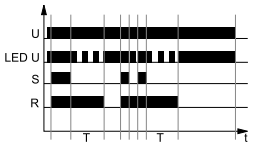
Applying the supply voltage U starts the cyclical operation from the T interval - switching the output relay R off followed by switching on the output relay R for the interval T. The cyclical operation lasts until the supply voltage U is interrupted.

Bi - Symmetrical cyclical operation pulse first.



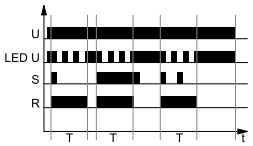
Applying the supply voltage U starts the cyclical operation from switching on the output relay R for the set interval T. After the interval T has lapsed, the output relay R switches off for the interval T. The cyclical operation lasts until the supply voltage U is interrupted.

R - OFF delay with the control contact S.



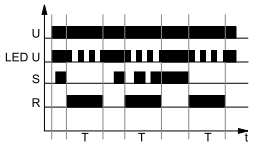
The input of the time relay is supplied with voltage U continuously. Closing of the control contact S immediately switches on the output relay R. Opening of the control contact S starts the set time of the delayed switching off of the output relay R. After the interval T has lapsed, the output relay R switches off. If the control contact S is closed during the interval T, the already measured time is reset, and the output relay R is switched on again. The OFF delay of the output relay R will start when the control contact S is opened again.

Ws - Single shot for the set interval triggered by closing of the control contact S.



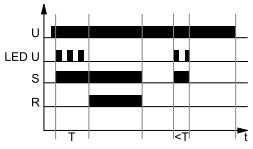
The input of the time relay is supplied with voltage U continuously. Closing of the control contact S immediately switches the output relay R on for the set interval T. After the interval T has lapsed, the output relay R is switched off. In the course of the interval T, any opening of the control contact S does not affect the function to be performed. The output relay R may be switched on again for the set interval, after the interval T has lapsed, by closing the control contact S again.

Wa - ON for the set interval triggered with the control contact S.



The input of the time relay is supplied with voltage U continuously. Closing of the control contact S does not start the interval T, and it does not change the position of the output relay R. Opening of the control contact S immediately switches on the output relay R for the set time. After the interval T has lapsed, the output relay R switches off. Opening and closing of the control contact S in the course of the interval T does not affect the function to be performed. The output relay R may be switched on again for the set interval with another closing and opening of the control contact S.

Es - ON delay with the control contact S.



The input of the time relay is supplied with voltage U continuously. Closing of the control contact S starts the interval T - on-delay of the output relay R. After the interval T has lapsed, the output relay R switches on and remains in this position until the control contact S is opened. In case the control contact S is closed for time shorter than the set interval T, the output relay R will not activate.

U - supply voltage; **R** - output state of the relay; **S** - control contact state; **T** - measured time; **Ta**, **Tb** - component intervals of T time; **Ts** - period of T time interrupt; **t** - time axis

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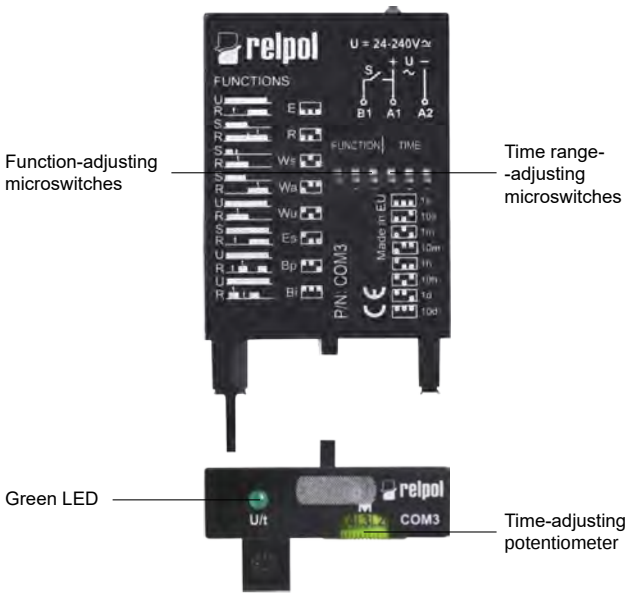
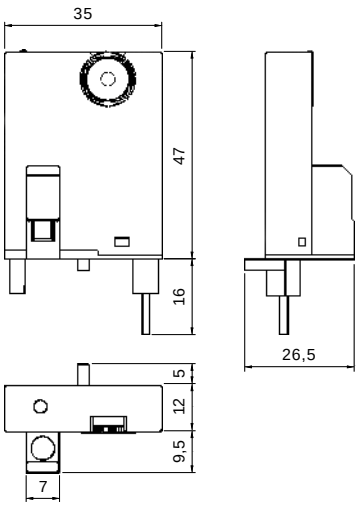
Settings of switches

Function adjustment microswitches 1, 2, 3	E	Wu	Bi	Bp	R	Ws	Wa	Es
								
Timing adjustment (max.) microswitches 4, 5, 6	1 s	10 s	1 min.	10 min.	1 h	10 h	1 d	10 d
								

Panels description



Dimensions - time module COM3



Mounting

Modules **COM3** are designed for mounting on plug-in sockets GZP11 or GZP8 (combinable to relays R15 - 3 CO or R15 - 2 CO). Operational position - any.

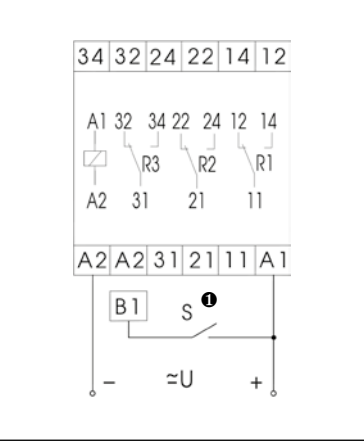
Ordering codes

Type

C	O	M	3

❶ The control terminal B1 is activated by connection to A1 terminal via the external control contact S.

Connection diagram
(COM3 + GZP11 + R15 - 3 CO)



Relays monitoring

relpol® S.A.

Multifunctions monitoring relays for power-engineering and industrial automation systems.

Monitoring relays MR-E... series in modular covers and MR-G... series in industrial covers are designed for direct mounting on 35 mm rail mount acc. to PN-EN 60715.

They meet the requirements of RoHS Directive. The relays are recognized and certified by:

CE

modular covers

industrial covers

- **Multifunctions monitoring relays (DC and AC voltage monitoring in 1-phase network, with adjustable thresholds)**
- Minimum value monitoring with the histeresis mode
- Supply voltage = monitoring voltage
- Output: 1 CO (1 changeover contact)
- Cover - modular, width 17,5 mm
- Direct mounting on 35 mm rail mount acc. to PN-EN 60715
- Recognitions, certifications, directives: CE

Output circuit - contact data

Number and type of contacts		1 CO
Rated voltage		250 V AC
Max. breaking capacity	AC1	1 250 VA (5 A / 250 V AC)
Max. operating frequency • at resistive load 100 VA • at resistive load 1 000 VA		 3 600 cycles/hour 360 cycles/hour

Input circuit

Supply voltage		= monitoring voltage
Rated voltage	AC DC	230 V, 24 V 24 V
Must release voltage		determined by undervoltage detection (see measured circuit)
Operating range of supply voltage		0,75...1,2 U_n
Rated power consumption	AC DC	230 V AC: 10,0 VA / 0,6 W 24 V AC: 1,3 VA / 0,8 W 24 V DC: 0,6 W
Range of supply frequency	AC	48...63 Hz
Duty cycle		100%
Measuring circuit • measuring variable • measuring inputs • overload capacity • swiching threshold • hysteresis H		DC or AC sinus, 48...63 Hz = supply voltage AC: 230 V terminals E-F3 AC: 24 V terminals E-F2 DC: 24 V terminals E-F1 ≥ 1,2 U_n MIN: 0,75...1,15 U_n MAX: 0,8...1,2 U_n see printing on the unit

Insulation according to PN-EN 60664-1

Rated surge voltage		4 000 V 1,2 / 50 µs
Overvoltage category		III
Insulation pollution degree		2 if built-in: 3

General data

Electrical life	• resistive AC1	> 2 x 10^5 1 000 VA
Mechanical life (cycles)		> 2 x 10^7
Dimensions (L x W x H)		87 x 17,5 x 65 mm
Weight		72 g
Ambient temperature	• storage • operating	-25...+70 °C -25...+55 °C
Cover protection category		IP 20 PN-EN 60529
Relative humidity		15...85%
Shock resistance		15 g 11 ms
Vibration resistance		0,35 mm DA 10...55 Hz

Meassuring circuit data

Functions	UNDER, WIN minimum value monitoring with the histeresis mode
Base accuracy	± 5% (calculated from the final range values)
Setting accuracy	± 5% (calculated from the final range values)
Repeatability	± 2%
Temperature influence	± 1% / °C
Recovery time	500 ms
LED indicator	green LED U ON - indication of supply voltage U red LEDs MIN and MAX ON/OFF - indication of failure ❶ yellow LED R ON/OFF - output relay status

❶ Indication of relay status - according to the set threshold.

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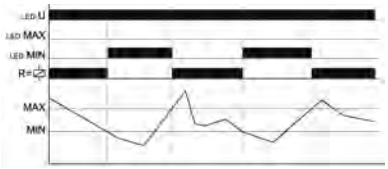
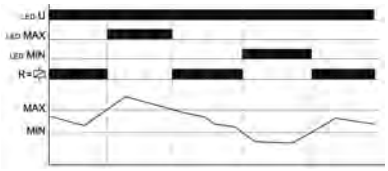
Functions

UNDER - Undervoltage monitoring.



When the supply voltage U is applied, the output relay R switches into on-position, if the measured voltage is beyond the MIN-value. When the measured voltage falls below the MIN-value, the output relay R switches into off-position. The output relay R switches into on-position again, if the voltage exceeds the MAX-value.

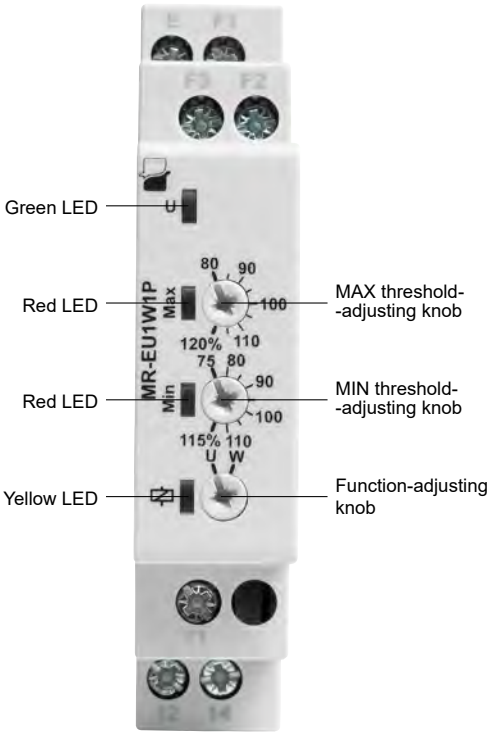
WIN - Voltage monitoring in windowfunction between MIN and MAX values.



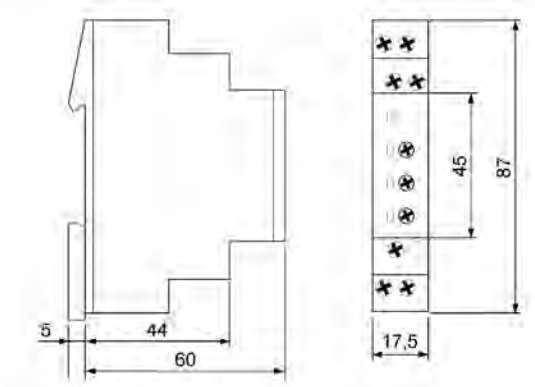
When the supply voltage U is applied, the output relay R switches into on-position, if the measured voltage is within the adjusted window. When the measured voltage left the window between MIN and MAX, the output relay R switches into off-position. The output relay R switches into on-position again, if the voltage re-enter the adjusted window.

U - supply voltage; **R** - output state of the relay; **MIN, MAX** - relay status

Front panel description



Dimensions



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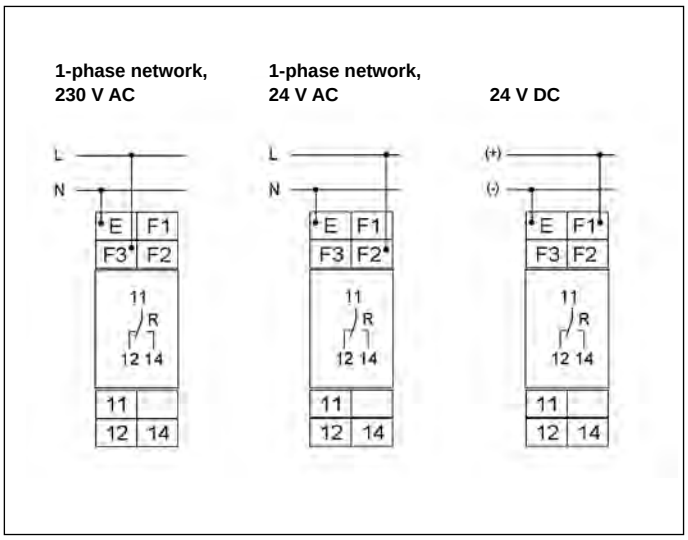
Connection diagrams



Mounting

Relays **MR-EU1W1P** are designed for direct mounting on 35 mm rail mount acc. to PN-EN 60715. Operational position - any. **Terminals - cross section of the connection cables:** 1 x 0,5 ... 2,5 mm^2 with/without multicore cable end, 1 x 4 mm^2 without multicore cable end, 2 x 0,5 ... 1,5 mm^2 with/without multicore cable end, 2 x 2,5 mm^2 flexible without multicore cable end.

Ordering codes

Type

M	R	–	E	U	1	W	1	P

Monitoring

U1 - DC and AC voltage in 1-phase network

Number and type of contacts

1P - 1 CO

Example of ordering code:

MR-EU1W1P monitoring relay **MR-EU1W1P**, multifunction (relay perform 2 functions), cover - modular, width 17,5 mm, one changeover contact, rated monitoring voltages: AC - 230 V, 24 V; DC - 24 V

- **Multifunctions monitoring relays (AC voltage monitoring in 1-phase network and 3-phase - 3(N)~ 400/230 V, with adjustable thresholds)**
- Monitoring of phase sequence ❶ and phase failure • Connection of neutral wire (optional) • Timing adjustment of tripping delay
- Supply voltage = monitoring voltage • Output: 1 CO (1 changeover contact)
- Cover - modular, width 17,5 mm
- Direct mounting on 35 mm rail mount acc. to PN-EN 60715
- Recognitions, certifications, directives: CE

Output circuit - contact data

Number and type of contacts		1 CO
Rated voltage		250 V AC
Max. breaking capacity	AC1	1 250 VA (5 A / 250 V AC)
Max. operating frequency • at resistive load 100 VA • at resistive load 1 000 VA		 3 600 cycles/hour 360 cycles/hour

Input circuit

Supply voltage		= monitoring voltage
Rated voltage	AC	230 V, 3(N)~ 400/230 V
Operating range of supply voltage		0,7...1,3 U_n
Rated power consumption	AC	8,0 VA / 1,0 W
Range of supply frequency	AC	48...63 Hz
Duty cycle		100%
Measuring circuit • measuring variable • measuring inputs • overload capacity • swiching threshold		3(N)~, sinus, 48...63 Hz = supply voltage AC: 230 V, 3(N)~ 400/230 V terminals (N)-L1-L2-L3 determined by tolerance specified for supply voltage MIN: 0,7...1,2 U_n MAX: 0,8...1,3 U_n

Insulation according to PN-EN 60664-1

Rated surge voltage	4 000 V 1,2 / 50 µs
Overvoltage category	III
Insulation pollution degree	2 if built-in: 3

General data

Electrical life	• resistive AC1	> 2 x 10^5 1 000 VA
Mechanical life (cycles)		> 2 x 10^7
Dimensions (L x W x H)		87 x 17,5 x 65 mm
Weight		72 g
Ambient temperature	• storage • operating	-25...+70 °C -25...+55 °C
Cover protection category		IP 20 PN-EN 60529
Relative humidity		15...85%
Shock resistance		15 g 11 ms
Vibration resistance		0,35 mm DA 10...55 Hz

Meassuring circuit data

Functions	UNDER, UNDER+SEQ, WIN, WIN+SEQ SEQ - monitoring of phase sequence ❶ and phase failure connection of neutral wire (optional)
Range of delay timing adjustment	tripping delay: 0...10 s
Base accuracy	± 5% (calculated from the final range values)
Setting accuracy	± 5% (calculated from the final range values)
Repeatability	± 2%
Temperature influence	± 0,05% / °C
Recovery time	500 ms
LED indicator	red LEDs MIN and MAX ON/OFF - indication of failure ❷ red LEDs MIN and MAX flashing - indication of tripping delay ❷ red LED SEQ ON - indication of the change of phase sequence yellow LED R ON/OFF - output relay status

❶ Phase sequence monitoring - selectable.
❷ Indication of relay status - according to the set threshold.

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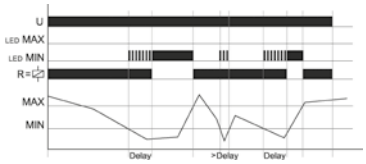
Functions

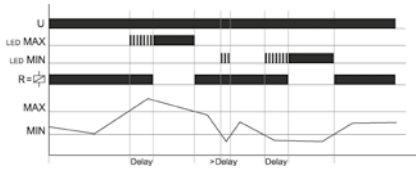
For all functions the LED's MIN and MAX are flashing alternating (the relay is fallen off), when the minimum value for the measured voltage was chosen to be greater than the maximum value. If a failure already exists, when the device is activated, the output relay R remains in off-position and the LED for the corresponding threshold is illuminated. The device includes seperately every phase voltage (L-N) and monitors it according to the selected function (UNDER or WINDOW).

UNDER, UNDER+SEQ - Undervoltage monitoring, undervoltage monitoring with monitoring of phase sequence.



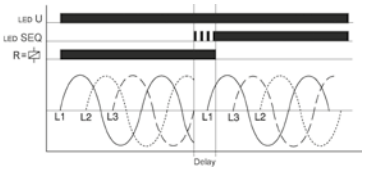
When the measured voltage (one of the phase voltages) falls below the value adjusted at the MIN-regulator, the set interval of the tripping delay (Delay) begins (red LED MIN flashes). After the interval has expired (red LED MIN illuminated), the output relay R switches into off-position (yellow LED not illuminated). The output relay R switches into on-position again (yellow LED illuminated), when the measured voltage (all phase voltages) exceeds the value adjusted at the MAX-regulator.

WIN, WIN+SEQ - Voltage monitoring in windowfunction between MIN and MAX values, voltage monitoring in windowfunction between MIN and MAX values with monitoring of phase sequence.



The output relay R switches into on-position (yellow LED illuminated), when the measured voltage (all phase voltages) exceeds the value adjusted at the MIN-regulator. When the measured voltage (one of the phase voltages) exceeds the value adjusted at the MAX-regulator, the set interval of tripping delay (Delay) begins (red LED MAX flashes). After the interval has expired (red LED MAX illuminated) the output relay R switches into off-position (yellow LED not illuminated). The output relay R switches into on-position again (yellow LED illuminated) when the measured voltage falls below the value adjusted at the MAX-regulator (red LED MAX not illuminated). When the measured voltage (one of the phase voltage) falls below the value adjusted at the Min-regulator, the set interval of tripping delay (Delay) begins again (red LED MIN flashes). After the interval has expired (red LED MIN illuminated), the output relay R switches into off-positon (yellow LED not illuminated).

SEQ - Phase sequence monitoring.

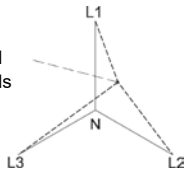


Phase sequence monitoring is selectable for all functions. In single phase circuit, the monitoring of phase sequence must be disconnected. If a change in phase sequence is detected (red LED SEQ illuminated), the output relay R switches into off-position after the set interval of tripping delay (Delay) has expired (yellow LED not illuminated).

U - supply voltage; **R** - output state of the relay; **MIN, MAX** - relay status; **SEQ** - phase sequence

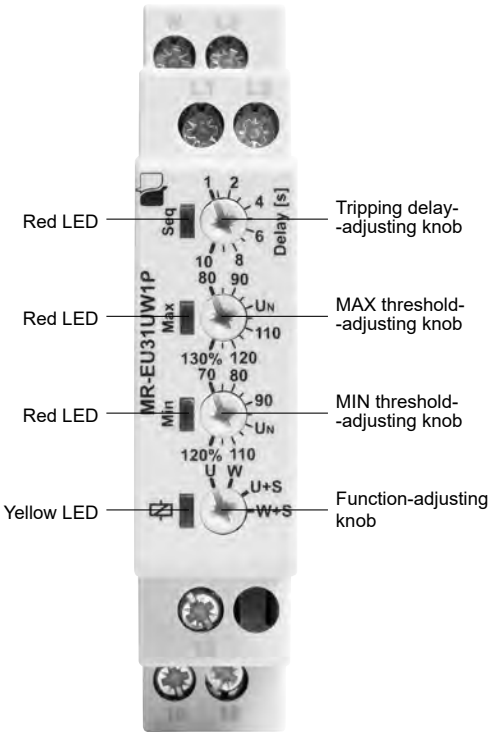
Loss of neutral wire by means of evaluation of asymmetry.

Shift of neutral point caused by asymmetrical phase loads and missing neutral wire

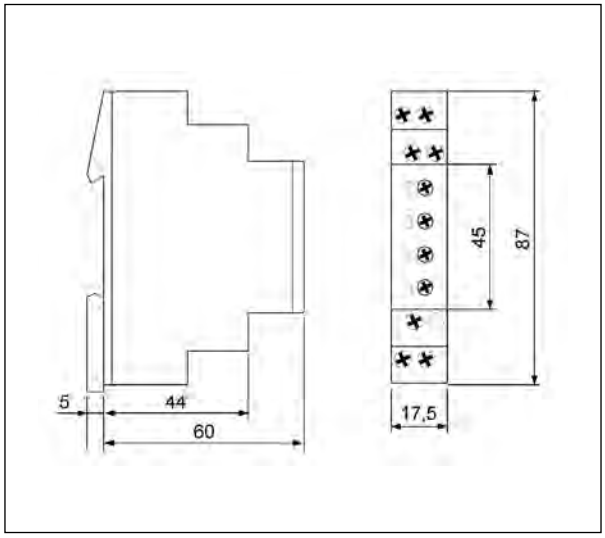


The device monitors every phase (L1, L2 and L3) against the neutral wire N. A shift of neutral point occurs by an asymmetrical phase load if the neutral wire breaks in the power line. If one of the phase voltages exceeds the value adjusted at the trip point, the set interval of tripping delay (Delay) begins (red LED MIN or MAX flashes). After the interval has expired (red LED MIN or MAX illuminated), the output relay R switches into off-position (yellow LED not illuminated).

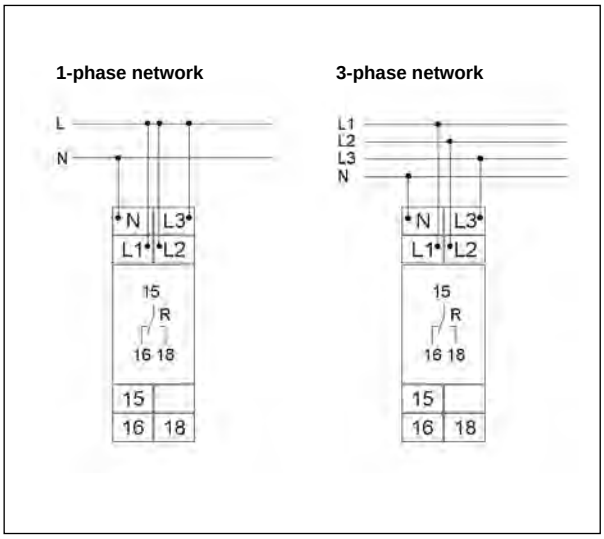
Front panel description



Dimensions



Connection diagrams



Mounting

Relays **MR-EU31UW1P** are designed for direct mounting on 35 mm rail mount acc. to PN-EN 60715. Operational position - any. **Terminals - cross section of the connection cables:** 1 x 0,5 ... 2,5 mm^2 with/without multicore cable end, 1 x 4 mm^2 without multicore cable end, 2 x 0,5 ... 1,5 mm^2 with/without multicore cable end, 2 x 2,5 mm^2 flexible without multicore cable end.

Ordering codes

Type

M	R	–	E	U	3	1	U	W	1	P

Monitoring

U31 - 3(N)~ 400/230 V voltage in 1-phase network and 3-phase

Number and type of contacts

1P - 1 CO

Example of ordering code:

MR-EU31UW1P monitoring relay **MR-EU31UW1P**, multifunction (relay perform 5 functions), cover - modular, width 17,5 mm, one changeover contact, rated monitoring voltages: AC - 230 V, 3(N)~ 400/230 V

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- **Multifunctions monitoring relays (AC voltage monitoring in 3-phase network - 3(N)~ 400/230 V)**
- Monitoring of phase sequence and phase failure • Asymmetry monitoring (adjustable) • Connection of neutral wire (optional)
- Supply voltage = monitoring voltage • Output: 1 CO (1 changeover contact)
- Cover - modular, width 17,5 mm
- Direct mounting on 35 mm rail mount acc. to PN-EN 60715
- Recognitions, certifications, directives: CE

Output circuit - contact data

Number and type of contacts		1 CO
Rated voltage		250 V AC
Max. breaking capacity	AC1	1 250 VA (5 A / 250 V AC)
Max. operating frequency • at resistive load 100 VA • at resistive load 1 000 VA		 3 600 cycles/hour 360 cycles/hour

Input circuit

Supply voltage		= monitoring voltage
Rated voltage	AC	3(N)~ 400/230 V
Must release voltage		AC: ≥ 0,2 U_n
Operating range of supply voltage		0,7...1,3 U_n
Rated power consumption	AC	8,0 VA / 0,8 W
Range of supply frequency	AC	48...63 Hz
Duty cycle		100%
Measuring circuit • measuring variable • measuring inputs • overload capacity • asymmetry		3(N)~, sinus, 48...63 Hz = supply voltage AC: 3(N)~ 400/230 V terminals (N)-L1-L2-L3 determined by tolerance specified for supply voltage adjustable: 5...25%

Insulation according to PN-EN 60664-1

Rated surge voltage		4 000 V 1,2 / 50 µs
Overvoltage category		III
Insulation pollution degree		2 if built-in: 3

General data

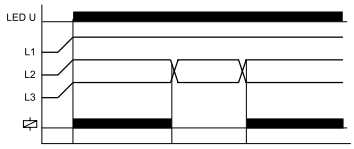
Electrical life	• resistive AC1	> 2 x 10^5 1 000 VA
Mechanical life (cycles)		> 2 x 10^7
Dimensions (L x W x H)		87 x 17,5 x 65 mm
Weight		63 g
Ambient temperature	• storage • operating	-25...+70 °C -25...+55 °C
Cover protection category		IP 20 PN-EN 60529
Relative humidity		15...85%
Shock resistance		15 g 11 ms
Vibration resistance		0,35 mm DA 10...55 Hz

Meassuring circuit data

Functions	SEQ - monitoring of phase sequence and phase failure ASYM - monitoring of asymmetry (adjustable) connection of neutral wire (optional)
Base accuracy	± 5% (calculated from the final range values)
Setting accuracy	± 5% (calculated from the final range values)
Repeatability	± 2%
Temperature influence	± 0,05% / °C
Recovery time	500 ms
LED indicator	green LED U ON - indication of supply voltage U yellow LED R ON/OFF - output relay status

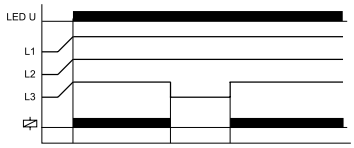
Functions

SEQ - Phase sequence monitoring.



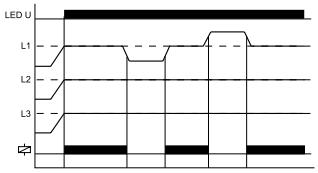
When all the phases are connected in the correct sequence and the measured asymmetry is less than the fixed value, the output relay R switches into on-position (yellow LED illuminated). When the phase sequence changes, the output relay R switches into off-position (yellow LED not illuminated).

SEQ - Phase failure monitoring.



The output relay R switches into off-position (yellow LED not illuminated), when one of the three phases fails.

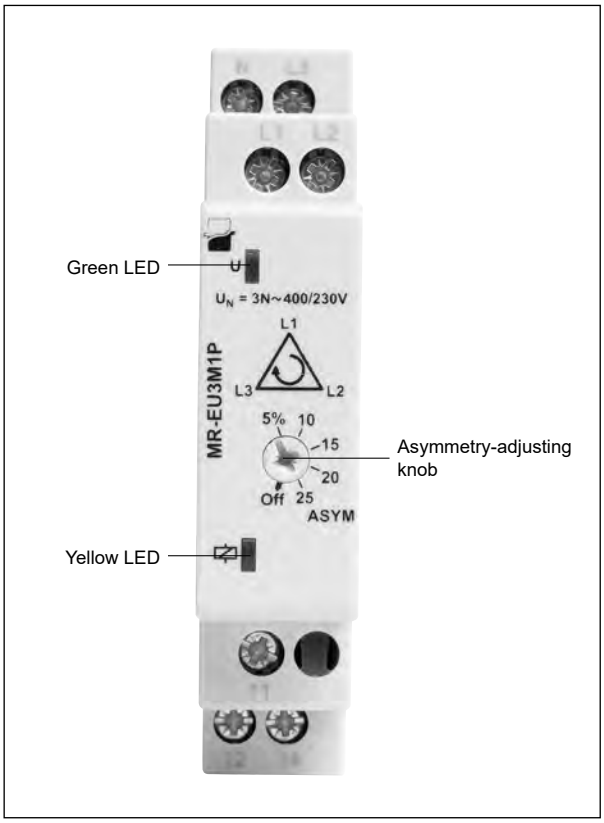
ASYM - Asymmetry monitoring.



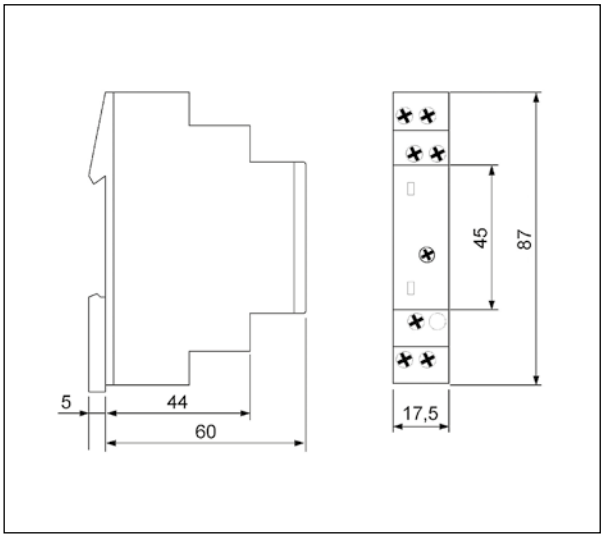
The output relay R switches into off-position (yellow LED not illuminated) when the asymmetrie exceeds the value set at the ASYM-regulator. An asymmetry caused by the reverse voltage of a consumer (e.g. a motor which continues to run on two phases only) does not effect the disconnection.

U - supply voltage; **R** - output state of the relay

Front panel description



Dimensions



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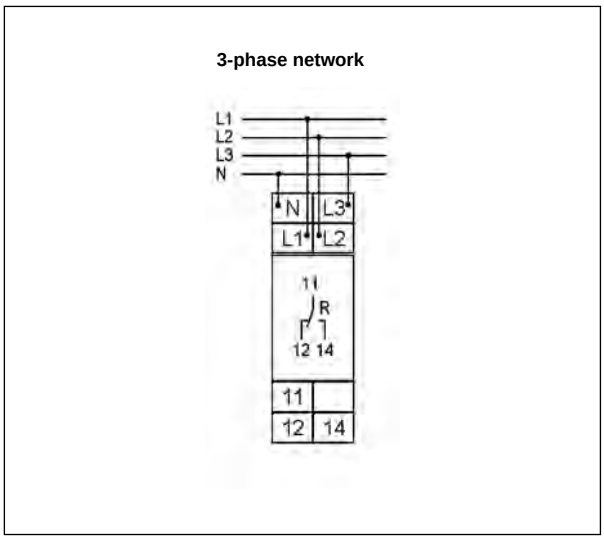
Connection diagram



Mounting

Relays **MR-EU3M1P** are designed for direct mounting on 35 mm rail mount acc. to PN-EN 60715. Operational position - any. **Terminals - cross section of the connection cables:** 1 x 0,5 ... 2,5 mm^2 with/without multicore cable end, 1 x 4 mm^2 without multicore cable end, 2 x 0,5 ... 1,5 mm^2 with/without multicore cable end, 2 x 2,5 mm^2 flexible without multicore cable end.

Ordering codes

Type

M	R	–	E	U	3	M	1	P

Monitoring

U3 - 3(N)~ 400/230 V voltage in 3-phase network

Number and type of contacts

1P - 1 CO

Example of ordering code:

MR-EU3M1P monitoring relay **MR-EU3M1P**, multifunction (relay perform 2 functions), cover - modular, width 17,5 mm, one changeover contact, rated monitoring voltages: AC - 3(N)~ 400/230 V

- **Multifunctions monitoring relays (AC current monitoring in 1-phase network, with adjustable thresholds and adjustable hysteresis)**
- Monitoring windowfunction and histeresis • Timing adjustment of tripping delay • Supply voltage = monitored phase voltage
- Output: 1 CO (1 changeover contact)
- Cover - modular, width 17,5 mm
- Direct mounting on 35 mm rail mount acc. to PN-EN 60715
- Recognitions, certifications, directives: CE

Output circuit - contact data

Number and type of contacts		1 CO
Rated voltage		250 V AC
Max. breaking capacity	AC1	1 250 VA (5 A / 250 V AC)
Max. operating frequency • at resistive load 100 VA • at resistive load 1 000 VA		 3 600 cycles/hour 360 cycles/hour

Input circuit

Supply voltage	AC	230 V terminals (N)-Li
Rated voltage	AC	230 V
Must release voltage		AC: ≥ 0,2 U_n
Operating range of supply voltage		0,85...1,15 U_n
Rated power consumption	AC	5,0 VA / 0,8 W
Range of supply frequency	AC	48...63 Hz
Duty cycle		100%
Measuring circuit • measuring variable		AC sinus, 48...63 Hz
• measuring inputs		AC: 10 A / 230 V AC terminals (N)-Li-Lk
• overload capacity		13 A
• starting current		1 s: 100 A 3 s: 50 A
• input resistance		3 mΩ
• swiching threshold		MIN: 0,05...0,95 I_n MAX: 0,1...1,0 I_n
• hysteresis H		adjustable setting

Insulation according to PN-EN 60664-1

Rated surge voltage	4 000 V 1,2 / 50 µs
Overvoltage category	III
Insulation pollution degree	2 if built-in: 3

General data

Electrical life	• resistive AC1	> 2 x 10^5 1 000 VA
Mechanical life (cycles)		> 2 x 10^7
Dimensions (L x W x H)		87 x 17,5 x 65 mm
Weight		72 g
Ambient temperature	• storage	-25...+70 °C
	• operating	-25...+55 °C
Cover protection category		IP 20 PN-EN 60529
Relative humidity		15...85%
Shock resistance		15 g 11 ms
Vibration resistance		0,35 mm DA 10...55 Hz

Meassuring circuit data

Functions	OVER, OVER+LATCH, UNDER, UNDER+LATCH, WIN, WIN+LATCH monitoring windowfunction and histeresis
Range of delay timing adjustment	tripping delay: 0,1...10 s
Base accuracy	± 5% (calculated from the final range values)
Setting accuracy	± 5% (calculated from the final range values)
Repeatability	± 2%
Temperature influence	± 1% / °C
Recovery time	500 ms
LED indicator	green LED U ON - indication of supply voltage U red LEDs MIN and MAX ON/OFF - indication of failure ❶ red LEDs MIN and MAX flashing - indication of tripping delay ❶ yellow LED R ON/OFF - output relay status

❶ Indication of relay status - according to the set threshold.

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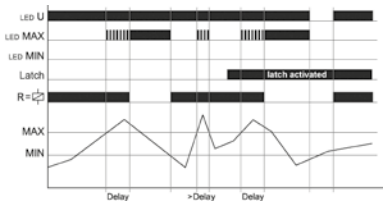
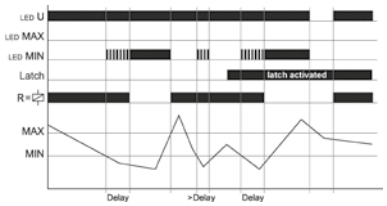
Functions

OVER, OVER+LATCH - Overcurrent monitoring, overcurrent monitoring with fault latch.



When the supply voltage U is applied, the output relay R switches into on-position, if the measured current is below the MAX-value. When the measured current exceeds the MAX-value, the output relay R switches into off-position after the interval of the tripping delay (Delay) has expired.
OVER: the output relay R switches into on-position again, if the current falls below the MIN-value.
OVER+LATCH: the output relay R switches only into on-position again by interrupting and re-applying of the supply voltage, provided that the measured current is below the MAX-value.

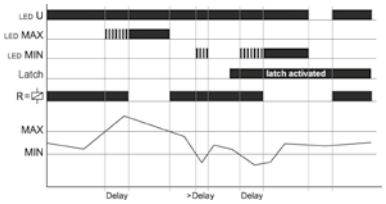
UNDER, UNDER+LATCH - Undercurrent monitoring, undercurrent monitoring with fault latch.



When the supply voltage U is applied, the output relay R switches into on-position, if the measured current is beyond the MIN-value. When the measured current falls below the MIN-value, the output relay R switches into off-position after the interval of the tripping delay (Delay) has expired.
UNDER: the output relay R switches into on-position again, if the current exceeds the MIN-value.
UNDER+LATCH: the output relay R switches only into on-position again by interrupting and re-applying of the supply voltage, provided that the measured current is beyond the MIN-value.

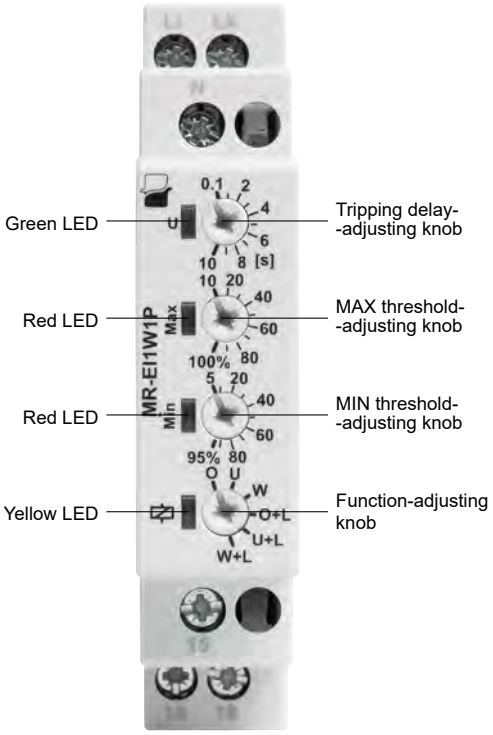
U - supply voltage; **R** - output state of the relay; **MIN, MAX** - relay status; **SEQ** - phase sequence

WIN, WIN+LATCH - Current monitoring in windowfunction between MIN and MAX values, current monitoring in windowfunction between MIN and MAX values with fault latch.

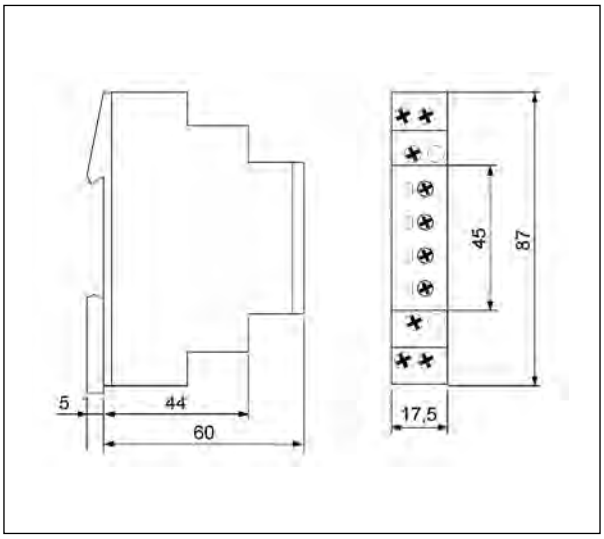


When the supply voltage U is applied, the output relay R switches into on-position, if the measured current is within the adjusted window. When the measured current leaves the window between MIN and MAX, the output relay R switches into off-position after the interval of the tripping delay (Delay) has expired.
WIN: the output relay R switches into on-position again, if the current re-enter the adjusted window.
WIN+LATCH: the output relay R switches only into on-position again by interrupting and re-applying of the supply voltage, provided that the measured current is within the threshold values.

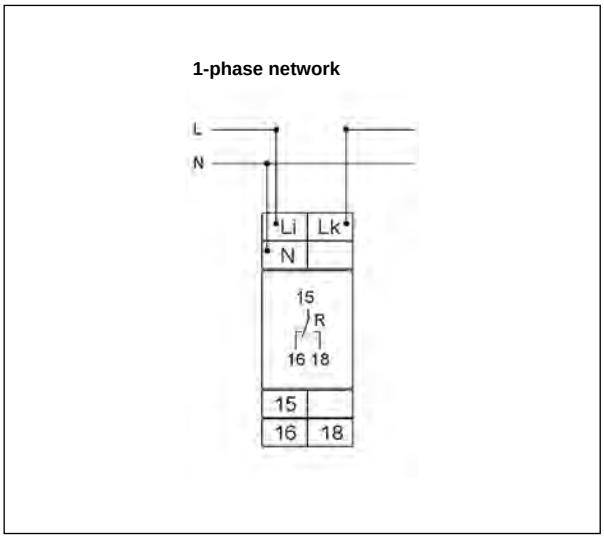
Front panel description



Dimensions



Connection diagram



Mounting

Relays **MR-EI1W1P** are designed for direct mounting on 35 mm rail mount acc. to PN-EN 60715. Operational position - any. **Terminals - cross section of the connection cables:** 1 x 0,5 ... 2,5 mm^2 with/without multicore cable end, 1 x 4 mm^2 without multicore cable end, 2 x 0,5 ... 1,5 mm^2 with/without multicore cable end, 2 x 2,5 mm^2 flexible without multicore cable end.

Ordering codes

Type

M	R	–	E	I	1	W	1	P

Monitoring

I1 - AC current in 1-phase network

Number and type of contacts

1P - 1 CO

Example of ordering code:

MR-EI1W1P monitoring relay **MR-EI1W1P**, multifunction (relay perform 6 functions), cover - modular, width 17,5 mm, one changeover contact, rated input voltage (supply): AC - 230 V; monitoring current: max. 10 A / 230 V AC

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- **Single-functions monitoring relays (motor temperature monitoring)** • Short circuit monitoring of the thermistor line or thermal contact monitoring ❶ • Test functions: integrated Test/Reset key, connection of the external Reset key (optional)
- Insulation rated voltage on the sensor circuit: 690 V • Output: 1 CO (1 changeover contact) • Cover - modular, width 35 mm
- Direct mounting on 35 mm rail mount acc. to PN-EN 60715
- Recognitions, certifications, directives: CE

Output circuit - contact data

Number and type of contacts		1 CO
Rated voltage		250 V AC
Max. breaking capacity	AC1	1 250 VA (thermal constant current 5 A)
Max. operating frequency • at resistive load 100 VA • at resistive load 1 000 VA		 3 600 cycles/hour 360 cycles/hour

Input circuit

Supply voltage	AC	230 V terminals A1-A2
Rated voltage	AC	230 V
Must release voltage		AC: ≥ 0,3 U_n
Operating range of supply voltage		0,85...1,1 U_n
Rated power consumption	AC	1,3 VA / 1,0 W
Range of supply frequency	AC	48...63 Hz
Duty cycle		100%
Measuring circuit • terminals		T1-T2 or T1-T3
• initial resistance		< 1,5 kΩ
• response value		relay in OFF-position: ≥ 3,6 kΩ
• release value		relay in ON-position: ≤ 1,65 kΩ
• disconnection ❷		T1-T2: yes T1-T3: no
• measuring voltage T1-T2		≤ 7,5 V at R ≤ 4 kΩ PN-EN 60947-8
Control contact • function		connection of an external Reset key
• loadable		no
• max. line length		R1-R2: 10 m (twisted pair)
• control pulse length		min. 50 ms
• Reset		contact 1 NO; terminals R1-R2 ❸

Insulation according to PN-EN 60664-1

Rated surge voltage		6 000 V 1,2 / 50 µs
Overvoltage category		III
Insulation pollution degree		2 if built-in: 3

General data

Electrical life	• resistive AC1	> 2 x 10^5 1 000 VA
Mechanical life (cycles)		> 2 x 10^7
Dimensions (L x W x H)		87 x 35 x 65 mm
Weight		100 g
Ambient temperature	• storage	-25...+70 °C
	• operating	-25...+55 °C
Cover protection category		IP 20 PN-EN 60529
Relative humidity		15...85%

Meassuring circuit data

Functions	temperature monitoring of the motor winding, with fault latch (max. 6 PTC - temperature sensors DIN 44081) short circuit monitoring of the thermistor line or thermal contact ❶ test functions: integrated Test/Reset key, connection of the external Reset key (optional)
Base accuracy	± 5% (calculated from the final range values)
Repeatability	± 1%
Temperature influence	± 0,15% / °C
Recovery time	250 ms
LED indicator	green LED U ON - indication of supply voltage U red LED ON/OFF - indication of failure

❶ Only one of this circuit versions (either short circuit monitoring of the thermistor line or thermal contact monitoring) can be executed.
❷ At short circuit.
❸ Terminals R2-T2 are internal affiliated with each other.

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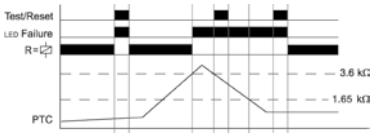
Functions

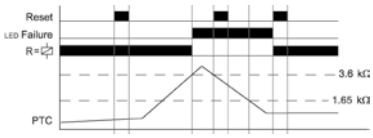
Motor temperature monitoring with fault latch.

If the supply voltage U is applied (green LED illuminated) and the cumulative resistance of the PTC-circuit is less than 3,6 kΩ (standard temperature of the motor), the output relay R switches into on-position. Pressing the Test/Reset key under this conditions forces the output relay R to switch into off-position. It remains in state as long as the Test/Reset key is pressed and thus the switching function can be checked in case of fault. The test function is not effective by using an external Reset key. When the comulative resistance of the PTC-circuit exceeds 3,6 kΩ (at least one of the PTCs has reached the cut-off temperature), the output relay R switches into off-position (red LED illuminated). The output relay R switches into on-position again (red LED not illuminated), if the cumulative resistance drops below 1,65 kΩ by cooling down of the PTC and either a Reset key (internal or external) was pressed or the supply voltage was disconnected and re-applied.

Application of internal **Test/Reset** key.

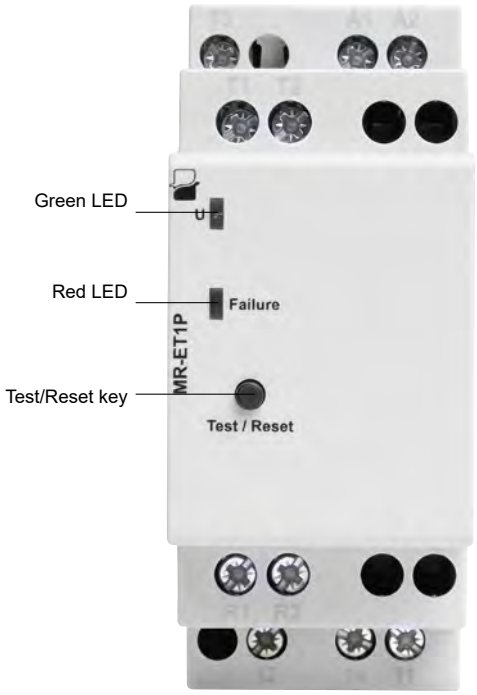


Application of an external **Reset** key.

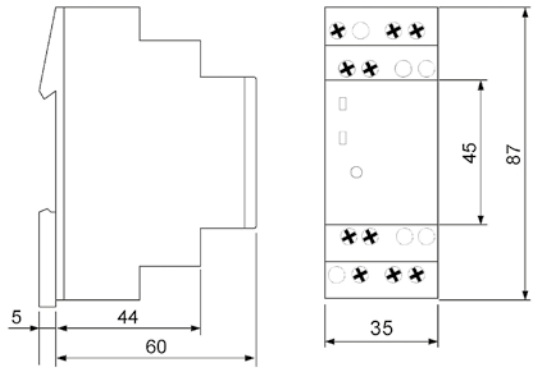


U - supply voltage; **R** - output state of the relay

Front panel description



Dimensions



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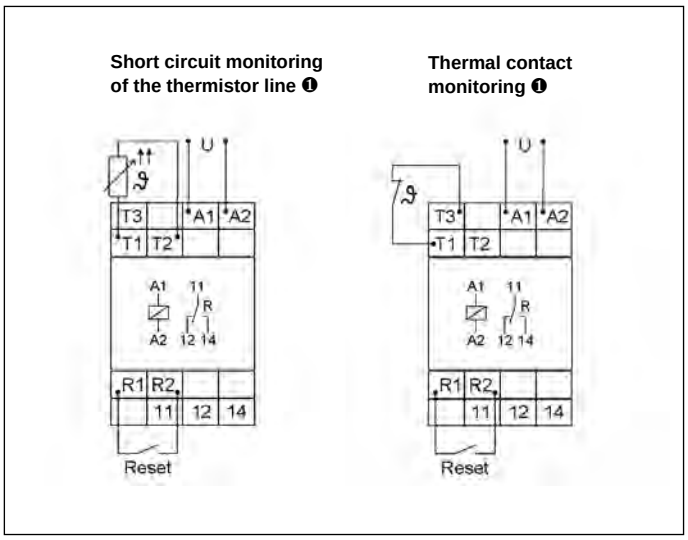
Connection diagrams



Mounting

Relays **MR-ET1P** are designed for direct mounting on 35 mm rail mount acc. to PN-EN 60715. Operational position - any. **Terminals - cross section of the connection cables:** 1 x 0,5 ... 2,5 mm^2 with/without multicore cable end, 1 x 4 mm^2 without multicore cable end, 2 x 0,5 ... 1,5 mm^2 with/without multicore cable end, 2 x 2,5 mm^2 flexible without multicore cable end.

❶ Only one of this circuit versions (either short circuit monitoring of the thermistor line or thermal contact monitoring) can be executed.

Ordering codes

Type

M	R	–	E	T	1	P

Monitoring

T - motor temperature

Number and type of contacts

1P - 1 CO

Example of ordering code:

MR-ET1P monitoring relay **MR-ET1P**, single-function (relay monitors the motor temperature), cover - modular, width 35 mm, one changeover contact, rated input voltage (supply): AC - 230 V

- **Multifunctions monitoring relays (DC and AC voltage monitoring in 1-phase network, with adjustable thresholds)**
- Fault latch mode • Timing adjustment of start-up suppression and tripping delay ❶ • Supply via TR2 supply transformer ❷ • Frequency of supply voltage: 16,6...400 Hz • Output: 2 CO (2 changeover contacts)
- Industrial cover, width 22,5 mm
- Direct mounting on 35 mm rail mount acc. to PN-EN 60715
- Recognitions, certifications, directives: CE

Output circuit - contact data

Number and type of contacts		2 CO
Rated voltage		250 V AC
Max. breaking capacity	AC1	750 VA (3 A / 250 V AC) ❸ 1 250 VA (5 A / 250 V AC) ❹
Max. operating frequency • at resistive load 100 VA • at resistive load 1 000 VA		 3 600 cycles/hour 360 cycles/hour

Input circuit

Supply voltage	AC	12 ... 400 V ❷ terminals A1-A2
Must release voltage		AC: ≥ 0,3 U_n
Operating range of supply voltage		as per the specification of TR2 supply transformer ❷
Rated power consumption	AC	2,0 VA / 1,5 W
Range of supply frequency	AC	as per the specification of TR2 supply transformer ❷
Duty cycle		100%
Measuring circuit • measuring variable		DC or AC sinus, 16,6...400 Hz (frequency response: -10…+5%)
• measuring inputs		AC/DC: 30 V terminals E-F1(+) AC/DC: 60 V terminals E-F2(+) AC/DC: 300 V terminals E-F3(+)
• overload capacity		30 V AC/DC: 100 V_{eff} 60 V AC/DC: 150 V_{eff} 300 V AC/DC: 440 V_{eff}
• input resistance		30 V AC/DC: 47 kΩ 60 V AC/DC: 100 kΩ 300 V AC/DC: 470 kΩ
• swiching threshold		MIN: 0,05...0,95 U_n MAX: 0,1...1,0 U_n

Insulation according to PN-EN 60664-1

Rated surge voltage	4 000 V 1,2 / 50 µs
Overvoltage category	III
Insulation pollution degree	3

General data

Electrical life	• resistive AC1	> 2 x 10^5 1 000 VA
Mechanical life (cycles)		> 2 x 10^7
Dimensions (L x W x H)		90 x 22,5 x 108 mm
Weight		100 g
Ambient temperature	• storage • operating	-25...+70 °C -25...+55 °C
Cover protection category		IP 20 PN-EN 60529
Relative humidity		15...85%
Shock resistance		15 g 11 ms
Vibration resistance		0,35 mm DA 10...55 Hz

Meassuring circuit data

Functions	OVER, OVER+LATCH, UNDER, UNDER+LATCH, WIN, WIN+LATCH fault latch mode
Range of delay timing adjustment	start-up suppression: 0...10 s tripping delay: 0,1...10 s ❶
Base accuracy	± 5% (calculated from the final range values)
Setting accuracy	± 5% (calculated from the final range values)
Repeatability	± 2%
Voltage influence	± 0,5%
Temperature influence	± 0,1% / °C
Recovery time	500 ms
LED indicator	green LED U ON - indication of supply voltage U green LED U flashing - indication of start-up suppression time ❺ red LEDs MIN and MAX ON/OFF - indication of failure ❺ red LEDs MIN and MAX flashing - indication of tripping delay ❺ yellow LED R ON/OFF - output relay status

❶ Separately adjustable (two adjusting knobs). ❷ Supply voltage depending on the TR2 transformer which shall be ordered as a separate product - see page 394. ❸ If the distance between the mounting relays is less than 5 mm. ❹ If the distance between the mounting relays is greater than 5 mm. ❺ Indication of relay status - according to the set threshold.

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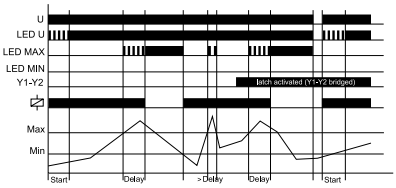
Functions

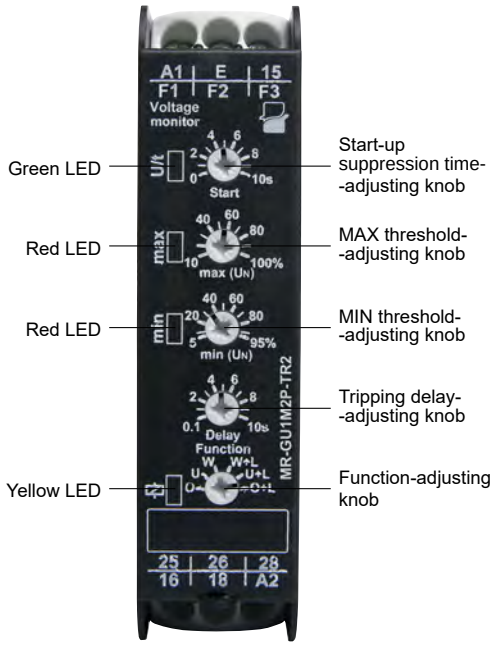
When the supply voltage U is applied, the output relay R switches into on-position (yellow LED illuminated) and the set interval of the start-up suppression (Start) begins (green LED flashes). Changes of the measured voltage during this period do not affect the state of the output relay R. After the interval has expired the green LED is illuminated steadily. For all the functions the LEDs MIN and MAX are flashing alternating, when the minimum value for the measured voltage was chosen to be greater than the maximum value.

OVER, OVER+LATCH - Overvoltage monitoring, overvoltage monitoring with fault latch.

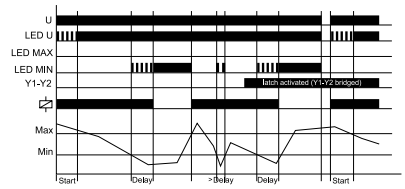


When the measured voltage exceeds the value adjusted at the MAX-regulator, the set interval of the tripping delay (Delay) begins (red LED MAX flashes). After the interval has expired (red LED MAX illuminated), the output relay R switches into off-position (yellow LED not illuminated). The output relay R again switches into on-position (yellow LED illuminated), when the measured voltage falls below the value adjusted at the MIN-regulator (red LED MAX not illuminated).
If the **fault latch** is activated (OVER+LATCH) and the measured voltage remains above the MAX-value longer than the set interval of the tripping delay, the output relay R remains in the off-position even if the measured voltage falls below the value adjusted at the MIN-regulator. After resetting the failure (interrupting and re-applying the supply voltage), the output relay R again switches into on-position and a new measuring cycle begins with the set interval of the start-up suppression (Start).

Front panel description

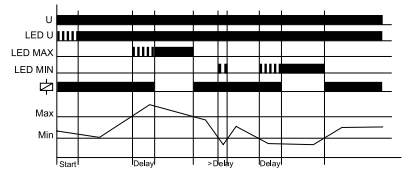


UNDER, UNDER+LATCH - Undervoltage monitoring, undervoltage monitoring with fault latch.

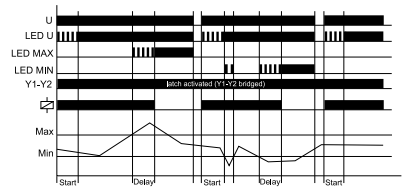


When the measured voltage falls below the value adjusted at the MIN-regulator, the set interval of the tripping delay (Delay) begins (red LED MIN flashes). After the interval has expired (red LED MIN illuminated), the output relay R switches into off-position (yellow LED not illuminated). The output relay R again switches into on-position (yellow LED illuminated), when the measured voltage exceeds the value adjusted at the MAX-regulator. If the **fault latch** is activated (UNDER+LATCH) and the measured voltage remains below the MIN-value longer than the set interval of the tripping delay, the output relay R remains in the off-position even if the measured voltage exceeds the value adjusted at the MAX-regulator. After resetting the failure (interrupting and re-applying the supply voltage), the output relay R switches into on-position and a new measuring cycle begins with the set interval of the start-up suppression (Start).

WIN, WIN+LATCH - Voltage monitoring in windowfunction between MIN and MAX values, voltage monitoring in windowfunction between MIN and MAX values with fault latch.



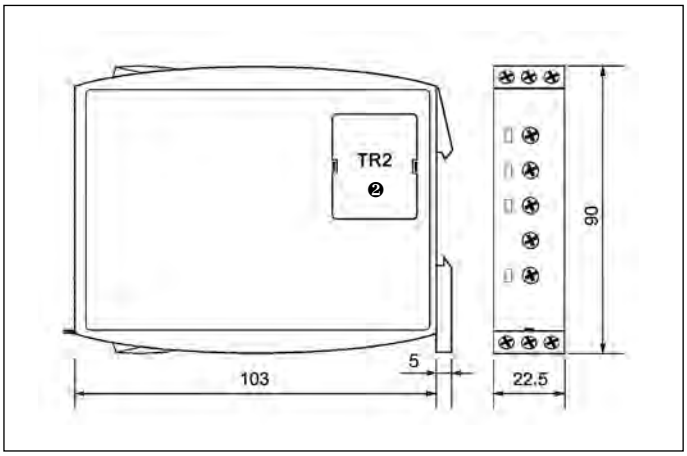
The output relay R switches into on-position (yellow LED illuminated) when the measured voltage exceeds the value adjusted at the MIN-regulator. When the measured voltage exceeds the value adjusted at the MAX-regulator, the set interval of the tripping delay (Delay) begins (red LED MAX flashes). After the interval has expired (red LED MAX illuminated), the output relay R switches into off-position (yellow LED not illuminated). The output relay R again switches into on-position (yellow LED illuminated) when the measured voltage falls below the value adjusted at the MAX--regulator (red LED MAX not illuminated). When the measured voltage falls below the value adjusted at the MIN-regulator, the set interval of the tripping delay (Delay) begins again (red LED MIN flashes). After the interval has expired (red LED MIN illuminated), the output relay R switches into off-position (yellow LED not illuminated).



If the **fault latch** is activated (WIN+LATCH) and the measured voltage remains below the MIN-value longer than the set interval of the tripping delay, the output relay R remains in the off-position even if the measured voltage exceeds the value adjusted at the MIN-regulator. If the measured voltage remains above the MAX-value longer than the set interval of the tripping delay, the output relay R remains in the off-position even if the measured voltage falls below the value adjusted at the MAX-regulator. After resetting the failure (interrupting and re-applying the supply voltage), the output relay R switches into on-position and a new measuring cycle begins with the set interval of the start-up suppression (Start).

U - supply voltage; **R** - output state of the relay; **MIN, MAX** - relay status; **SEQ** - phase sequence

Dimensions



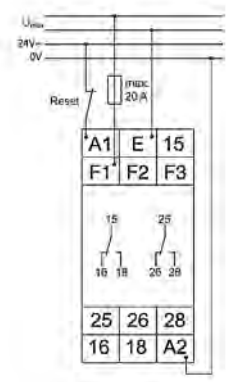
Mounting

Relays **MR-GU1M2P-TR2** are designed for direct mounting on 35 mm rail mount acc. to PN-EN 60715. Operational position - any. **Terminals - cross section of the connection cables:** 1 x 0,5 ... 2,5 mm^2 with/without multicore cable end, 1 x 4 mm^2 without multicore cable end, 2 x 0,5 ... 1,5 mm^2 with/without multicore cable end, 2 x 2,5 mm^2 flexible without multicore cable end.

❷ Supply voltage depending on the TR2 transformer which shall be ordered as a separate product - see page 394.

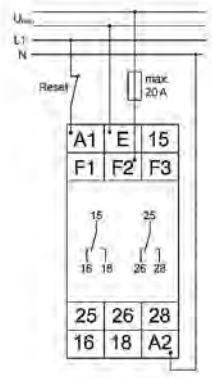
Connection diagrams

Measuring circuit 30 V AC/DC, with fault latch mode



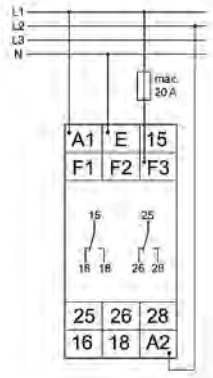
Supply: A1-A2 with TR2 24 V AC ❷

Measuring circuit 60 V AC/DC, with fault latch mode



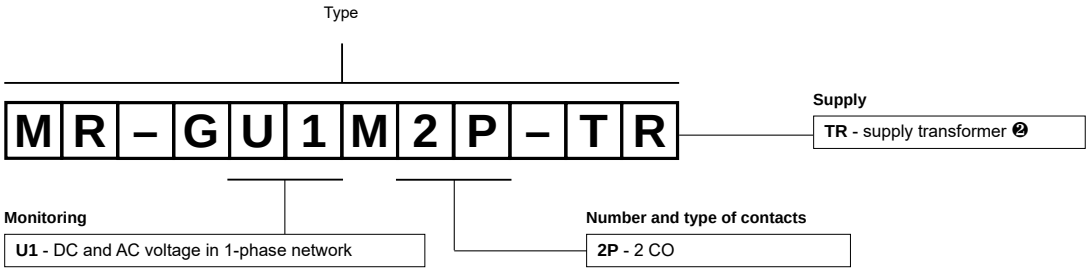
Supply: A1-A2 with TR2 230 V AC ❷

Measuring circuit 300 V AC/DC, without fault latch mode



Supply: A1-A2 with TR2 400 V AC ❷

Ordering codes



Example of ordering code:

MR-GU1M2P-TR2 monitoring relay **MR-GU1M2P-TR2**, multifunction (relay perform 6 functions), industrial cover, width 22,5 mm, two changeover contacts, rated input voltage (supply): AC - 12 ... 400 V AC ❷

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- **Multifunctions monitoring relays (AC voltages monitoring in phases - 230 V, 3-phase network 3(N)~ 400/230 V, with adjustable thresholds)** • Fault latch mode • Connection of neutral wire (required)
- Timing adjustment of tripping delay • Supply via TR2 supply transformer ❶ • Measurement inputs: 230 V AC • Output: 2 CO (2 changeover contacts) • Industrial cover, width 22,5 mm
- Direct mounting on 35 mm rail mount acc. to PN-EN 60715
- Recognitions, certifications, directives: CE

Output circuit - contact data

Number and type of contacts		2 CO
Rated voltage		250 V AC
Max. breaking capacity	AC1	750 VA (3 A / 250 V AC) ❷ 1 250 VA (5 A / 250 V AC) ❸
Max. operating frequency • at resistive load 100 VA • at resistive load 1 000 VA		 3 600 cycles/hour 360 cycles/hour

Input circuit

Supply voltage	AC	12 ... 400 V ❶ terminals A1-A2
Must release voltage		AC: ≥ 0,3 U_n
Operating range of supply voltage		as per the specification of TR2 supply transformer ❶
Rated power consumption	AC	2,0 VA / 1,5 W
Range of supply frequency	AC	as per the specification of TR2 supply transformer ❶
Duty cycle		100%
Measuring circuit • measuring variable		AC sinus, 48...63 Hz
• measuring inputs		AC: 230 V terminals N-L1, N-L2, N-L3
• overload capacity		440 V AC
• input resistance		3(N)~ 400/230 V: 470 kΩ
• swiching threshold		MIN: 0,7...1,2 U_n MAX: 0,8...1,3 U_n

Insulation according to PN-EN 60664-1

Rated surge voltage	4 000 V 1,2 / 50 µs
Overvoltage category	III
Insulation pollution degree	3

General data

Electrical life	• resistive AC1	> 2 x 10^5 1 000 VA
Mechanical life (cycles)		> 2 x 10^7
Dimensions (L x W x H)		90 x 22,5 x 108 mm
Weight		100 g
Ambient temperature	• storage	-25...+70 °C
	• operating	-25...+55 °C
Cover protection category		IP 20 PN-EN 60529
Relative humidity		15...85%
Shock resistance		15 g 11 ms
Vibration resistance		0,35 mm DA 10...55 Hz

Meassuring circuit data

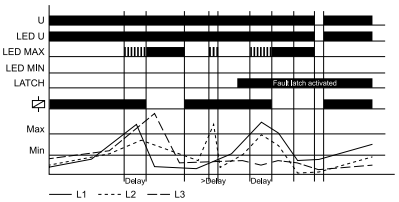
Functions	OVER, OVER+LATCH, UNDER, UNDER+LATCH, WIN, WIN+LATCH fault latch mode, connection of neutral wire (required)
Range of delay timing adjustment	tripping delay: 0,1...10 s
Base accuracy	± 5% (calculated from the final range values)
Setting accuracy	± 5% (calculated from the final range values)
Repeatability	± 2%
Voltage influence	± 0,5%
Temperature influence	± 0,1% / °C
Recovery time	500 ms
LED indicator	green LED U ON - indication of supply voltage U red LEDs MIN and MAX ON/OFF - indication of failure ❹ red LEDs MIN and MAX flashing - indication of tripping delay ❹ yellow LED R ON/OFF - output relay status

❶ Supply voltage depending on the TR2 transformer which shall be ordered as a separate product - see page 394. ❷ If the distance between the mounting relays is less than 5 mm. ❸ If the distance between the mounting relays is greater than 5 mm. ❹ Indication of relay status - according to the set threshold.

Functions

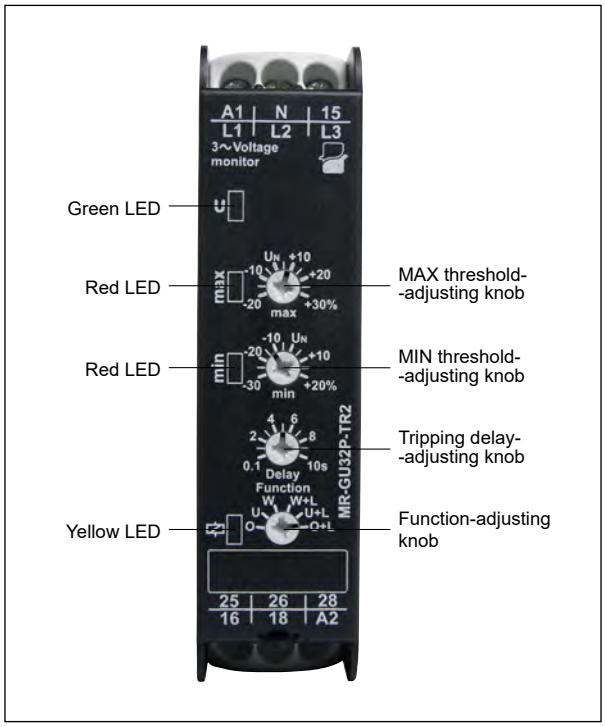
For all functions the LED's MIN and MAX are flashing alternating, when the minimum value for the measured voltage was chosen to be greater than the maximum value. If a failure already exists, when the device is activated, the output relay R remains in off-position and the LED for the corresponding threshold is illuminated.

OVER, OVER+LATCH - Overvoltage monitoring, overvoltage monitoring with fault latch.



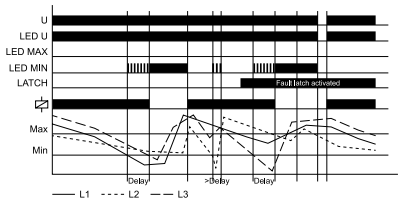
When the measured voltage of one of the phases exceeds the value adjusted at the MAX-regulator, the set interval of the tripping delay (Delay) begins (red LED MAX flashes). After the interval has expired (red LED MAX illuminated), the output relay R switches into off-position (yellow LED not illuminated). The output relay R again switches into on-position (yellow LED illuminated), when the measured voltage of all the phases falls below the value adjusted at the MIN-regulator (red LED MAX not illuminated). If the **fault latch** is activated (OVER+LATCH) and the measured voltage of one of the phases remains above the MAX-value longer than the set interval of the tripping delay, the output relay R remains in the off-position even if the measured voltage of all the phases falls below the value adjusted at the MIN-regulator. After resetting the failure (interrupting and re-applying the supply voltage), the output relay R switches into on-position.

Front panel description



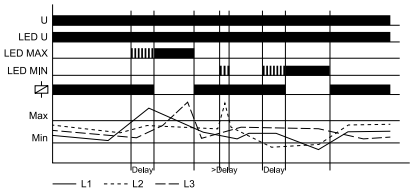
U - supply voltage; **R** - output state of the relay;
MIN, MAX - relay status; **SEQ** - phase sequence

UNDER, UNDER+LATCH - Undervoltage monitoring, undervoltage monitoring with fault latch.

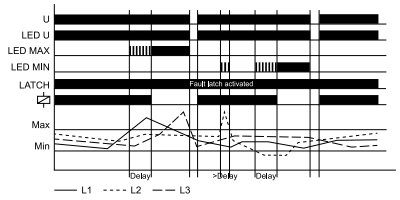


When the measured voltage of one of the phases falls below the value adjusted at the MIN-regulator, the set interval of the tripping delay (Delay) begins (red LED MIN flashes). After the interval has expired (red LED MIN illuminated), the output relay R switches into off-position (yellow LED not illuminated). The output relay R again switches into on-position (yellow LED illuminated), when the measured voltage of all the phases exceeds the value adjusted at the MAX-regulator.
If the **fault latch** is activated (UNDER+LATCH) and the measured voltage of one of the phases remains below the MIN-value longer than the set interval of the tripping delay, the output relay R remains in the off-position even if the measured voltage of all the phases exceeds the value adjusted at the MAX-regulator. After resetting the failure (interrupting and re-applying the supply voltage), the output relay R switches into on-position.

WIN, WIN+LATCH - Voltage monitoring in windowfunction between MIN and MAX values, voltage monitoring in windowfunction between MIN and MAX values with fault latch.



The output relay R switches into on-position (yellow LED illuminated) when the measured voltage of all the phases exceeds the value adjusted at the MIN-regulator. When the measured voltage of one of the phases exceeds the value adjusted at the MAX-regulator, the set interval of the tripping delay (Delay) begins (red LED MAX flashes). After the interval has expired (red LED MAX illuminated), the output relay R switches into off-position (yellow LED not illuminated). The output relay R again switches into on-position (yellow LED illuminated) when the measured voltage of all the phases falls below the value adjusted at the MAX-regulator (red LED MAX not illuminated). When the measured voltage of one of the phases falls below the value adjusted at the MIN-regulator, the set interval of the tripping delay (Delay) begins again (red LED MIN flashes). After the interval has expired (red LED MIN illuminated), the output relay R switches into off-position (yellow LED not illuminated).



If the **fault latch** is activated (WIN+LATCH) and the measured voltage of one of the phases remains below the MIN-value longer than the set interval of the tripping delay, the output relay R remains in the off-position even if the measured voltage of all the phases exceeds the value adjusted at the MIN-regulator. If the measured voltage of one of the phases remains above the MAX-value longer than the set interval of the tripping delay, the output relay R remains in the off-position even if the measured voltage of all the phases falls below the value adjusted at the MAX-regulator. After resetting the failure (interrupting and re-applying the supply voltage), the output relay R switches into on-position.

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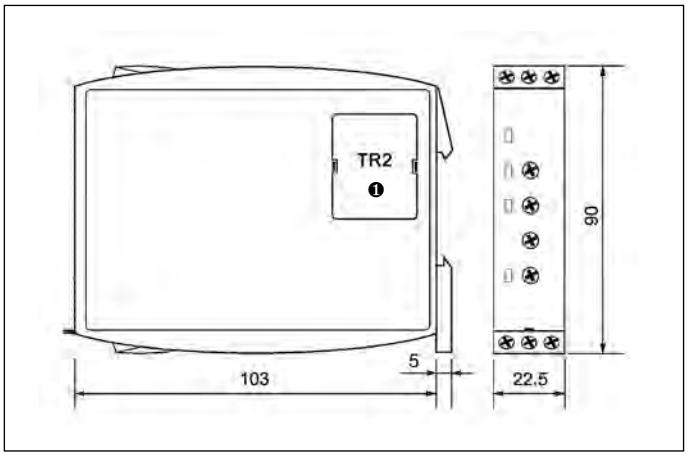
Dimensions



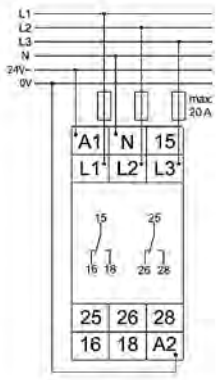
Mounting

Relays **MR-GU32P-TR2** are designed for direct mounting on 35 mm rail mount acc. to PN-EN 60715. Operational position - any. **Terminals - cross section of the connection cables:** 1 x 0,5 ... 2,5 mm^2 with/without multicore cable end, 1 x 4 mm^2 without multicore cable end, 2 x 0,5 ... 1,5 mm^2 with/without multicore cable end, 2 x 2,5 mm^2 flexible without multicore cable end.

❶ Supply voltage depending on the TR2 transformer which shall be ordered as a separate product - see page 394.

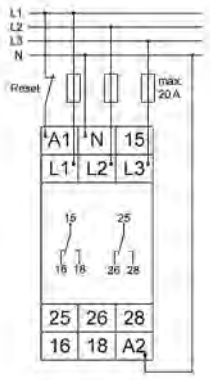
Connection diagrams

Measuring circuit 230 V AC, without fault latch mode



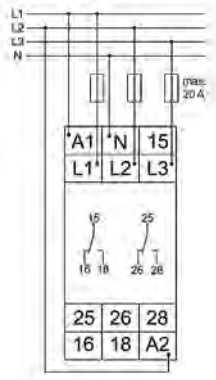
Supply: A1-A2 with TR2 24 V AC ❶

Measuring circuit 230 V AC, with fault latch mode



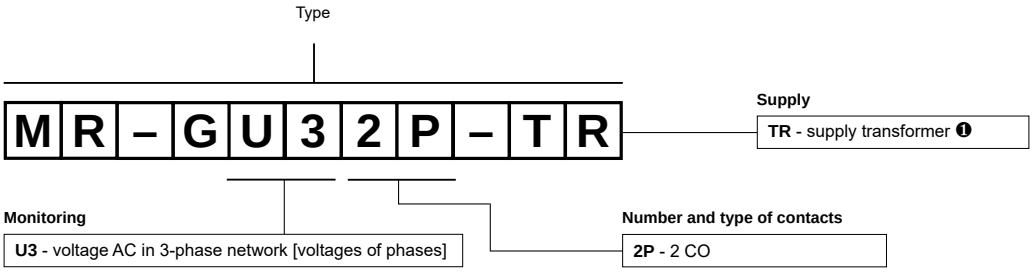
Supply: A1-A2 with TR2 230 V AC ❶

Measuring circuit 230 V AC, without fault latch mode



Supply: A1-A2 with TR2 400 V AC ❶

Ordering codes



Example of ordering code:

MR-GU32P-TR2 monitoring relay **MR-GU32P-TR2**, multifunction (relay perform 6 functions), industrial cover, width 22,5 mm, two changeover contacts, rated input voltage (supply): AC - 12 ... 400 V AC ❶

- **Multifunctions monitoring relays (AC voltage monitoring in 3-phase network, with adjustable thresholds)** • Monitoring of phase sequence and phase failure • Asymmetry monitoring (adjustable)
- Connection of neutral wire (optional) ❶ • Timing adjustment of tripping delay • Supply via TR2 supply transformer ❷ • Output: 2 CO (2 change-over contacts) • Industrial cover, width 22,5 mm
- Direct mounting on 35 mm rail mount acc. to PN-EN 60715
- Recognitions, certifications, directives: CE

Output circuit - contact data

Number and type of contacts		2 CO
Rated voltage		250 V AC
Max. breaking capacity	AC1	750 VA (3 A / 250 V AC) ❸ 1 250 VA (5 A / 250 V AC) ❹
Max. operating frequency • at resistive load 100 VA • at resistive load 1 000 VA		 3 600 cycles/hour 360 cycles/hour

Input circuit

Supply voltage	AC	12 ... 400 V ❷ terminals A1-A2
Must release voltage		AC: ≥ 0,3 U_n
Operating range of supply voltage		as per the specification of TR2 supply transformer ❷
Rated power consumption	AC	2,0 VA / 1,5 W
Range of supply frequency	AC	as per the specification of TR2 supply transformer ❷
Duty cycle		100%
Measuring circuit • measuring variable • measuring inputs • overload capacity • input resistance • swiching threshold • asymmetry		AC sinus, 48...63 Hz AC: 3(N)~ 400/230 V terminals (N)-L1-L2-L3 3(N)~ 600/346 V 3(N)~ 400/230 V: 1 MΩ MIN: 0,7...1,2 U_n MAX: 0,8...1,3 U_n adjustable: 5...25%

Insulation according to PN-EN 60664-1

Rated surge voltage	4 000 V 1,2 / 50 µs
Overvoltage category	III
Insulation pollution degree	3

General data

Electrical life	• resistive AC1	> 2 x 10^5 1 000 VA
Mechanical life (cycles)		> 2 x 10^7
Dimensions (L x W x H)		90 x 22,5 x 108 mm
Weight		100 g
Ambient temperature	• storage • operating	-25...+70 °C -25...+55 °C
Cover protection category		IP 20 PN-EN 60529
Relative humidity		15...85%
Shock resistance		15 g 11 ms
Vibration resistance		0,35 mm DA 10...55 Hz

Meassuring circuit data

Functions	UNDER, UNDER+SEQ, WIN, WIN+SEQ SEQ - monitoring of phase sequence and phase failure ASYM - monitoring of asymmetry (adjustable) connection of neutral wire (optional) ❶
Range of delay timing adjustment	tripping delay: 0,1...10 s
Base accuracy	± 5% (calculated from the final range values)
Setting accuracy	± 5% (calculated from the final range values)
Repeatability	± 2%
Voltage influence	± 0,5%
Temperature influence	± 0,1% / °C
Recovery time	500 ms
LED indicator	red LED ASYM ON/OFF - indication of asymmetry ❺ red LEDs MIN and MAX ON/OFF - indication of failure ❺ red LEDs MIN and MAX flashing - indication of tripping delay ❺ red LED SEQ ON/OFF - indication of phase sequence ❺ yellow LED R ON/OFF - output relay status

❶ Detection of neutral wire loss. ❷ Supply voltage depending on the TR2 transformer which shall be ordered as a separate product - see page 394. ❸ If the distance between the mounting relays is less than 5 mm. ❹ If the distance between the mounting relays is greater than 5 mm. ❺ Indication of relay status - according to the set threshold.

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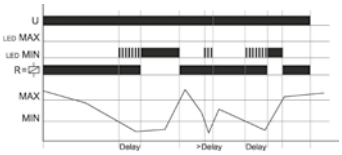
Functions

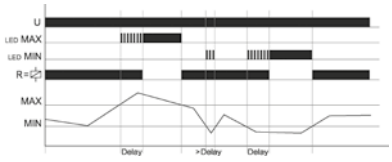
For all functions the LED's MIN and MAX are flashing alternating, when the minimum value for the measured voltage was chosen to be greater than the maximum value. If a failure already exists, when the device is activated, the output relay R remains in off-position and the LED for the corresponding threshold is illuminated.

UNDER, UNDER+SEQ - Undervoltage monitoring, undervoltage monitoring with monitoring of phase sequence.



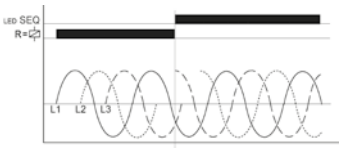
When the measured voltage (mean value of phase-to-phase voltages) falls below the value adjusted at the MIN-regulator, the set interval of the tripping delay (Delay) begins (red LED MIN flashes). After the interval has expired (red LED MIN illuminated), the output relay R switches into off-position (yellow LED not illuminated). The output relay R again switches into on-position (yellow LED illuminated), when the measured voltage exceeds the value adjusted at the MAX-regulator.

WIN, WIN+SEQ - Voltage monitoring in windowfunction between MIN and MAX values, voltage monitoring in windowfunction between MIN and MAX values with monitoring of phase sequence.



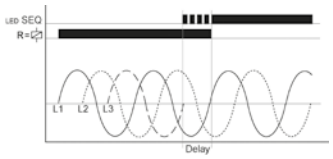
The output relay R switches into on-position (yellow LED illuminated) when the measured voltage (mean value of phase-to-phase voltages) exceeds the value adjusted at the MIN-regulator. When the measured voltage exceeds the value adjusted at the MAX-regulator, the set interval of the tripping delay (Delay) begins (red LED MAX flashes). After the interval has expired (red LED MAX illuminated), the output relay R switches into off-position (yellow LED not illuminated). The output relay R again switches into on-position (yellow LED illuminated) when the measured voltage falls below the value adjusted at the MAX-regulator (red LED MAX not illuminated). When the measured voltage falls below the value adjusted at the MIN-regulator, the set interval of the tripping delay (Delay) begins again (red LED MIN flashes). After the interval has expired (red LED MIN illuminated), the output relay R switches into off-position (yellow LED not illuminated).

SEQ - Phase sequence monitoring.



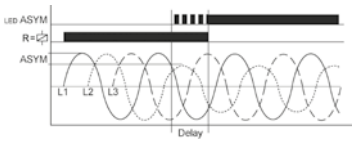
Phase sequence monitoring is selectable for all functions.If a change in phase sequence is detected (red LED SEQ illuminated), the output relay R switches into off-position immediately (yellow LED not illuminated).

SEQ - Phase failure monitoring.



If one of the phase voltages fails, the set interval of the tripping delay (Delay) begins (red LED SEQ flashes). After the interval has expired (red LED SEQ illuminated), the output relay R switches into off-position (yellow LED not illuminated). Reverse voltages of a consumer (e.g. a motor which continues to run on two phases only) do not effect the disconnection but can be monitored by using a proper value for the asymmetry.

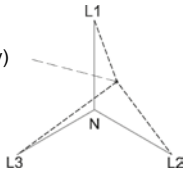
ASYM - Asymmetry monitoring.



If the asymmetry of the phase-to-phase voltages exceeds the value set at the ASYM-regulator, the set interval of the tripping delay (DELAY) begins (red LED ASYM flashes). After the interval has expired (red LED ASYM illuminated), the output relay R switches into off-position (yellow LED not illuminated). If the neutral wire is connected to the device, the asymmetry of the phase voltages referred to the neutral wire (Y-voltage) is monitored also. In that case both values of the asymmetry are evaluated and if one of the values exceeds the value set at the ASYM-regulator, the set interval of the tripping delay (DELAY) begins (red LED ASYM flashes). After the interval has expired (red LED ASYM illuminated), the output relay R switches into off-position (yellow LED not illuminated).

Loss of neutral wire by means of evaluation of asymmetry.

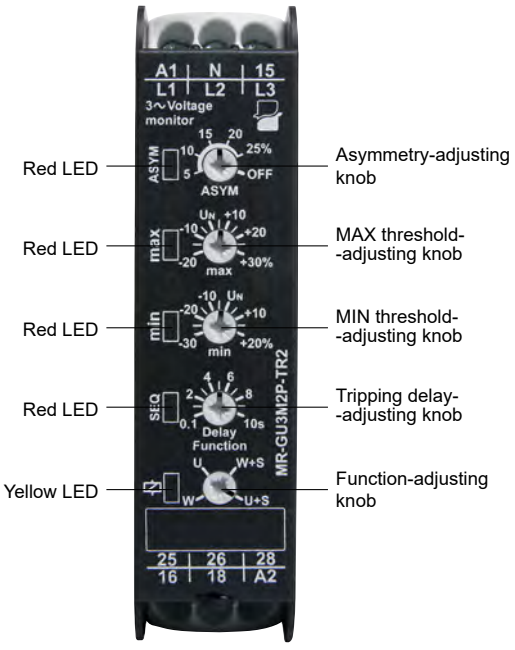
Shift of neutral point (asymmetry) caused by asymmetrical phase loads and missing neutral wire



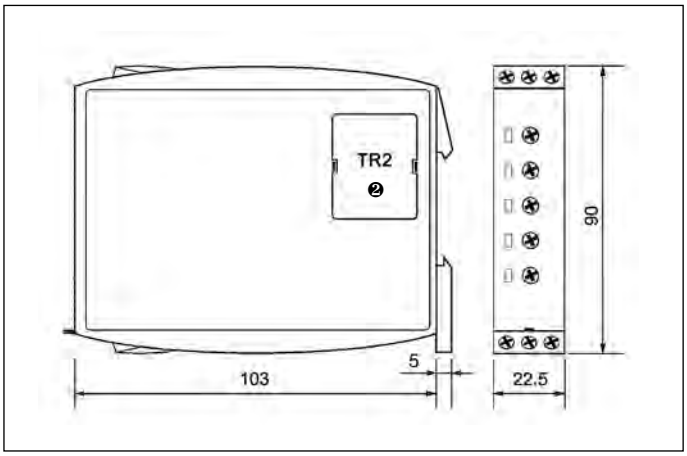
A break of the neutral wire between power line and machinery is detected as soon as asymmetry between phase-to-phase voltage and neutral wire occurs. If the asymmetry exceeds the value set at the ASYM-regulator, the set interval of the tripping delay (Delay) begins (red LED ASYM flashes). After the interval has expired (red LED ASYM illuminated), the output relay R switches into off-position (yellow LED not illuminated). A break of the neutral wire between our device and the machinery can not be detected.

U - supply voltage; **R** - output state of the relay; **MIN, MAX** - relay status; **SEQ** - phase sequence

Front panel description



Dimensions



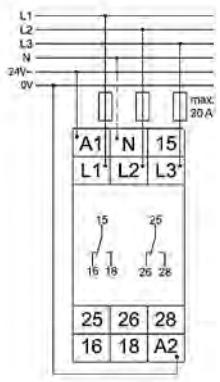
Mounting

Relays **MR-GU3M2P-TR2** are designed for direct mounting on 35 mm rail mount acc. to PN-EN 60715. Operational position - any. **Terminals - cross section of the connection cables:** 1 x 0,5 ... 2,5 mm^2 with/without multicore cable end, 1 x 4 mm^2 without multicore cable end, 2 x 0,5 ... 1,5 mm^2 with/without multicore cable end, 2 x 2,5 mm^2 flexible without multicore cable end.

❷ Supply voltage depending on the TR2 transformer which shall be ordered as a separate product - see page 394.

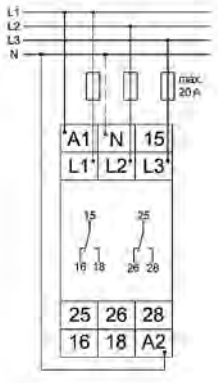
Connection diagrams

Measuring circuit
3(N)~ 400/230 V



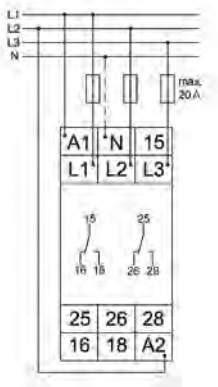
Supply: A1-A2
with TR2 24 V AC ❷

Measuring circuit
3(N)~ 400/230 V



Supply: A1-A2
with TR2 230 V AC ❷

Measuring circuit
3(N)~ 400/230 V



Supply: A1-A2
with TR2 400 V AC ❷

Ordering codes

Type

M	R	–	G	U	3	M	2	P	–	T	R

Supply
TR - supply transformer ❷

Monitoring
U3 - voltage AC in 3-phase network

Number and type of contacts
2P - 2 CO

Example of ordering code:

MR-GU3M2P-TR2 monitoring relay **MR-GU3M2P-TR2**, multifunction (relay perform 6 functions), industrial cover, width 22,5 mm, two changeover contacts, rated input voltage (supply): AC - 12 ... 400 V AC ❷

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- **Multifunctions monitoring relays (AC voltage monitoring in 3-phase network)** • Monitoring of phase sequence and phase failure
- Detection of reverse voltage by means of asymmetry • Connection of neutral wire (optional)
- Supply voltage = monitoring voltage • Output: 2 CO (2 changeover contacts) • Industrial cover, width 22,5 mm
- Direct mounting on 35 mm rail mount acc. to PN-EN 60715
- Recognitions, certifications, directives: CE

Output circuit - contact data

Number and type of contacts		2 CO
Rated voltage		250 V AC
Max. breaking capacity	AC1	750 VA (3 A / 250 V AC) ❶ 1 250 VA (5 A / 250 V AC) ❷
Max. operating frequency • at resistive load 100 VA • at resistive load 1 000 VA		 3 600 cycles/hour 360 cycles/hour

Input circuit

Supply voltage		= monitoring voltage terminals (N)-L1-L2-L3
Must release voltage		AC: ≥ 0,2 U_n
Operating range of supply voltage		3(N)~ 342...457 V
Rated power consumption	AC	9,0 VA
Range of supply frequency	AC	48...63 Hz
Duty cycle		100%
Measuring circuit • measuring variable • measuring inputs • overload capacity • input resistance • asymmetry		AC sinus, 48...63 Hz AC: 3(N)~ 400/230 V terminals (N)-L1-L2-L3 3(N)~ 457/264 V 3(N)~ 400/230 V: 15 kΩ fixed: typical value 30%

Insulation according to PN-EN 60664-1

Rated surge voltage		4 000 V 1,2 / 50 µs
Overvoltage category		III
Insulation pollution degree		3

General data

Electrical life	• resistive AC1	> 2 x 10^5 1 000 VA
Mechanical life (cycles)		> 2 x 10^7
Dimensions (L x W x H)		90 x 22,5 x 108 mm
Weight		100 g
Ambient temperature	• storage • operating	-25...+70 °C -25...+55 °C
Cover protection category		IP 20 PN-EN 60529
Relative humidity		15...85%
Shock resistance		15 g 11 ms
Vibration resistance		0,35 mm DA 10...55 Hz

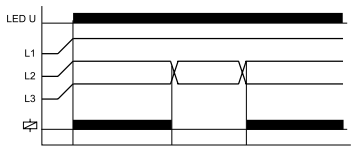
Meassuring circuit data

Functions	SEQ - monitoring of phase sequence and phase failure ASYM - detection of reverse voltage by means of asymmetry connection of neutral wire (optional)
Range of delay timing adjustment	start-up suppression: fixed, max. 0,5 s tripping delay: fixed, max. 0,35 s
Recovery time	100 ms
LED indicator	green LED U ON - indication of supply voltage U yellow LED R ON/OFF - output relay status

❶ If the distance between the mounting relays is less than 5 mm. ❷ If the distance between the mounting relays is greater than 5 mm.

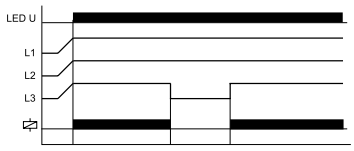
Functions

SEQ - Phase sequence monitoring.



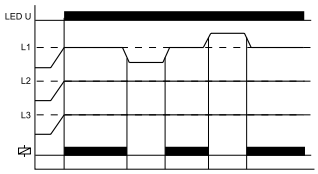
When all the phases are connected in the correct sequence and the measured asymmetry is less than the fixed value, the output relay R switches into on-position (yellow LED illuminated). When the phase sequence changes, the output relay R switches into off-position (yellow LED not illuminated).

SEQ - Phase failure monitoring.



The output relay R switches into off-position (yellow LED not illuminated), when one of the three phases fails.

ASYM - Detection of reverse voltage by means of asymmetry.

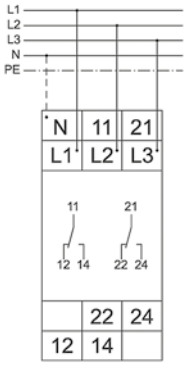


The output relay R switches into off-position (yellow LED not illuminated) when the asymmetry between the phase voltages exceeds the fixed value of the asymmetry. An asymmetry caused by the reverse voltage of a consumer (e.g. a motor which continues to run on two phases only) does not effect the disconnection.

U - supply voltage; **R** - output state of the relay

Front panel description

Connection diagram



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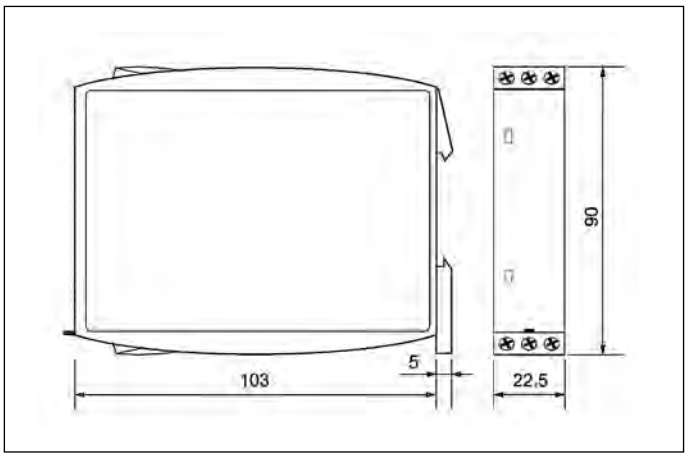
Dimensions



Mounting

Relays **MR-GU3M2P** are designed for direct mounting on 35 mm rail mount acc. to PN-EN 60715. Operational position - any. **Terminals - cross section of the connection cables:** 1 x 0,5 ... 2,5 mm^2 with/without multicore cable end, 1 x 4 mm^2 without multicore cable end, 2 x 0,5 ... 1,5 mm^2 with/without multicore cable end, 2 x 2,5 mm^2 flexible without multicore cable end.

Ordering codes

Type

M	R	–	G	U	3	M	2	P

Monitoring

U3 - voltage AC in 3-phase network

Number and type of contacts

2P - 2 CO

Example of ordering code:

MR-GU3M2P monitoring relay **MR-GU3M2P**, multifunction (relay perform 2 functions), industrial cover, width 22,5 mm, two changeover contacts, rated input voltage (supply): AC - 3(N)~ 400/230 V

- **Multifunctions monitoring relays (DC and AC current monitoring in 1-phase network, with adjustable thresholds)**
- Fault latch mode • Timing adjustment of start-up suppression and tripping delay ❶ • Supply via TR2 supply transformer ❷
- Frequency of supply voltage: 16,6...400 Hz • Output: 2 CO (2 changeover contacts) • Industrial cover, width 22,5 mm
- Direct mounting on 35 mm rail mount acc. to PN-EN 60715
- Recognitions, certifications, directives: CE

Output circuit - contact data

Number and type of contacts		2 CO
Rated voltage		250 V AC
Max. breaking capacity	AC1	750 VA (3 A / 250 V AC) ❸ 1 250 VA (5 A / 250 V AC) ❹
Max. operating frequency • at resistive load 100 VA • at resistive load 1 000 VA		 3 600 cycles/hour 360 cycles/hour

Input circuit

Supply voltage	AC	12 ... 400 V ❷ terminals A1-A2
Must release voltage		AC: ≥ 0,3 U_n
Operating range of supply voltage		as per the specification of TR2 supply transformer ❷
Rated power consumption	AC	2,0 VA / 1,5 W
Range of supply frequency	AC	as per the specification of TR2 supply transformer ❷
Duty cycle		100%
Measuring circuit • measuring variable		DC or AC sinus, 16,6...400 Hz (frequency response: -10…+5%)
• measuring inputs		AC/DC: 0,1 A terminals K-I1 AC/DC: 1 A terminals K-I2 AC/DC: 10 A terminals K-I3
• overload capacity		0,1 A AC/DC: 0,8 A 1 A AC/DC: 3 A 10 A AC/DC: 12 A
• input resistance		0,1 A AC/DC: 470 mΩ 1 A AC/DC: 47 mΩ 10 A AC/DC: 5 mΩ
• swiching threshold		MIN: 0,05...0,95 I_n MAX: 0,1...1,0 I_n

Insulation according to PN-EN 60664-1

Rated surge voltage	4 000 V 1,2 / 50 µs
Overvoltage category	III
Insulation pollution degree	3

General data

Electrical life	• resistive AC1	> 2 x 10^5 1 000 VA
Mechanical life (cycles)		> 2 x 10^7
Dimensions (L x W x H)		90 x 22,5 x 108 mm
Weight		100 g
Ambient temperature	• storage • operating	-25...+70 °C -25...+55 °C
Cover protection category		IP 20 PN-EN 60529
Relative humidity		15...85%
Shock resistance		15 g 11 ms
Vibration resistance		0,35 mm DA 10...55 Hz

Meassuring circuit data

Functions	OVER, OVER+LATCH, UNDER, UNDER+LATCH, WIN, WIN+LATCH fault latch mode
Range of delay timing adjustment	start-up suppression: 0...10 s tripping delay: 0,1...10 s ❶
Base accuracy	± 5% (calculated from the final range values)
Setting accuracy	± 5% (calculated from the final range values)
Repeatability	± 2%
Voltage influence	± 0,5%
Temperature influence	± 0,1% / °C
Recovery time	500 ms
LED indicator	green LED U ON - indication of supply voltage U green LED U flashing - indication of start-up suppression time ❺ red LEDs MIN and MAX ON/OFF - indication of failure ❺ red LEDs MIN and MAX flashing - indication of tripping delay ❺ yellow LED R ON/OFF - output relay status

❶ Separately adjustable (two adjusting knobs). ❷ Supply voltage depending on the TR2 transformer which shall be ordered as a separate product - see page 394. ❸ If the distance between the mounting relays is less than 5 mm. ❹ If the distance between the mounting relays is greater than 5 mm. ❺ Indication of relay status - according to the set threshold.

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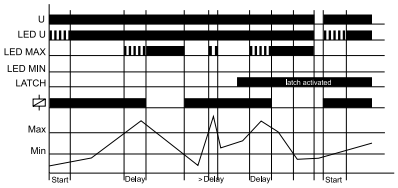
Functions

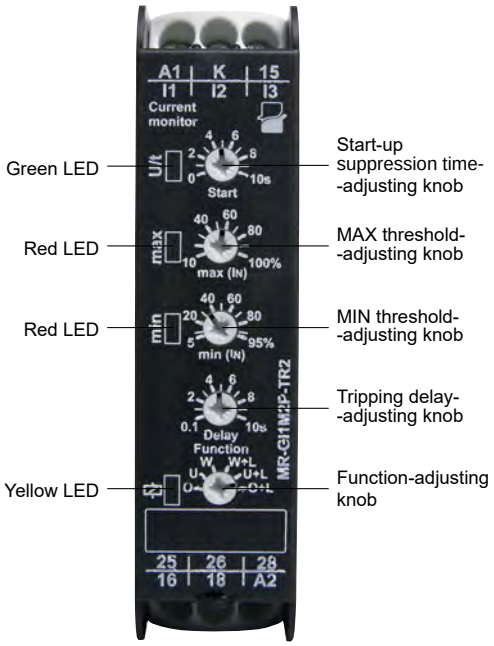
When the supply voltage U is applied, the output relay R switches into on-position (yellow LED illuminated) and the set interval of the start-up suppression (Start) begins (green LED flashes). Changes of the measured current during this period do not affect the state of the output relay R. After the interval has expired the green LED is illuminated steadily. For all the functions the LEDs MIN and MAX are flashing alternating, when the minimum value for the measured current was chosen to be greater than the maximum value.

OVER, OVER+LATCH - Overcurrent monitoring, overcurrent monitoring with fault latch.

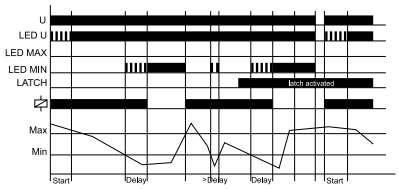


When the measured current exceeds the value adjusted at the MAX-regulator, the set interval of the tripping delay (Delay) begins (red LED MAX flashes). After the interval has expired (red LED MAX illuminated), the output relay R switches into off-position (yellow LED not illuminated). The output relay R again switches into on-position (yellow LED illuminated), when the measured current falls below the value adjusted at the MIN-regulator (red LED MAX not illuminated).
If the **fault latch** is activated (OVER+LATCH) and the measured current remains above the MAX-value longer than the set interval of the tripping delay, the output relay R remains in the off-position even if the measured current falls below the value adjusted at the MIN-regulator. After resetting the failure (interrupting and re-applying the supply voltage), the output relay R again switches into on-position and a new measuring cycle begins with the set interval of the start-up suppression (Start).

Front panel description

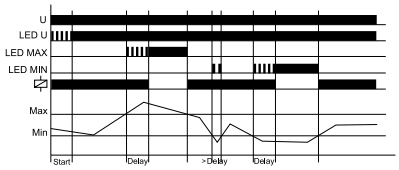


UNDER, UNDER+LATCH - Undercurrent monitoring, undercurrent monitoring with fault latch.

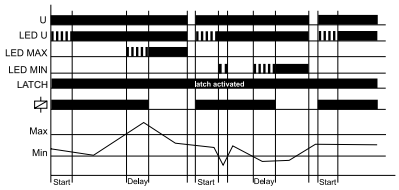


When the measured current falls below the value adjusted at the MIN-regulator, the set interval of the tripping delay (Delay) begins (red LED MIN flashes). After the interval has expired (red LED MIN illuminated), the output relay R switches into off-position (yellow LED not illuminated). The output relay R again switches into on-position (yellow LED illuminated), when the measured current exceeds the value adjusted at the MAX-regulator. If the **fault latch** is activated (UNDER+LATCH) and the measured current remains below the MIN-value longer than the set interval of the tripping delay, the output relay R remains in the off-position even if the measured current exceeds the value adjusted at the MAX-regulator. After resetting the failure (interrupting and re-applying the supply voltage), the output relay R switches into on-position and a new measuring cycle begins with the set interval of the start-up suppression (Start).

WIN, WIN+LATCH - Current monitoring in windowfunction between MIN and MAX values, current monitoring in windowfunction between MIN and MAX values with fault latch.



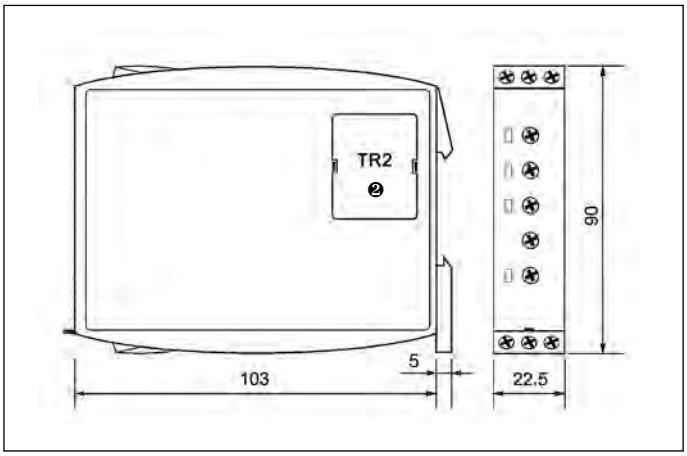
The output relay R switches into on-position (yellow LED illuminated) when the measured **current** exceeds the value adjusted at the MIN-regulator. When the measured current exceeds the value adjusted at the MAX-regulator, the set interval of the tripping delay (Delay) begins (red LED MAX flashes). After the interval has expired (red LED MAX illuminated), the output relay R switches into off-position (yellow LED not illuminated). The output relay R again switches into on-position (yellow LED illuminated) when the measured current falls below the value adjusted at the MAX--regulator (red LED MAX not illuminated). When the measured current falls below the value adjusted at the MIN-regulator, the set interval of the tripping delay (Delay) begins again (red LED MIN flashes). After the interval has expired (red LED MIN illuminated), the output relay R switches into off-position (yellow LED not illuminated).



If the **fault latch** is activated (WIN+LATCH) and the measured current remains below the MIN-value longer than the set interval of the tripping delay, the output relay R remains in the off-position even if the measured current exceeds the value adjusted at the MIN-regulator. If the measured current remains above the MAX-value longer than the set interval of the tripping delay, the output relay R remains in the off-position even if the measured current falls below the value adjusted at the MAX-regulator. After resetting the failure (interrupting and re-applying the supply voltage), the output relay R switches into on-position and a new measuring cycle begins with the set interval of the start-up suppression (Start).

U - supply voltage; **R** - output state of the relay; **MIN, MAX** - relay status; **SEQ** - phase sequence

Dimensions



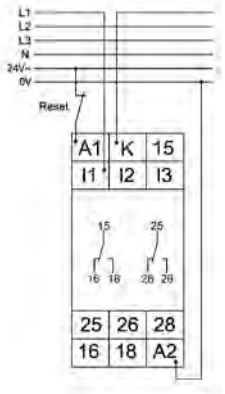
Mounting

Relays **MR-GI1M2P-TR2** are designed for direct mounting on 35 mm rail mount acc. to PN-EN 60715. Operational position - any. **Terminals - cross section of the connection cables:** 1 x 0,5 ... 2,5 mm^2 with/without multicore cable end, 1 x 4 mm^2 without multicore cable end, 2 x 0,5 ... 1,5 mm^2 with/without multicore cable end, 2 x 2,5 mm^2 flexible without multicore cable end.

❷ Supply voltage depending on the TR2 transformer which shall be ordered as a separate product - see page 394.

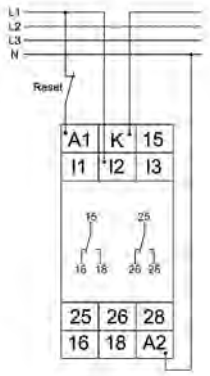
Connection diagrams

Measuring circuit 0,1 A AC/DC, with fault latch mode



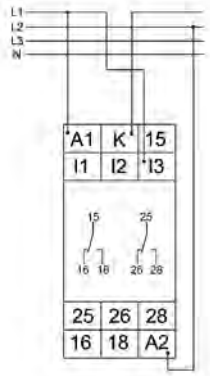
Supply: A1-A2 with TR2 24 V AC ❷

Measuring circuit 1 A AC/DC, with fault latch mode



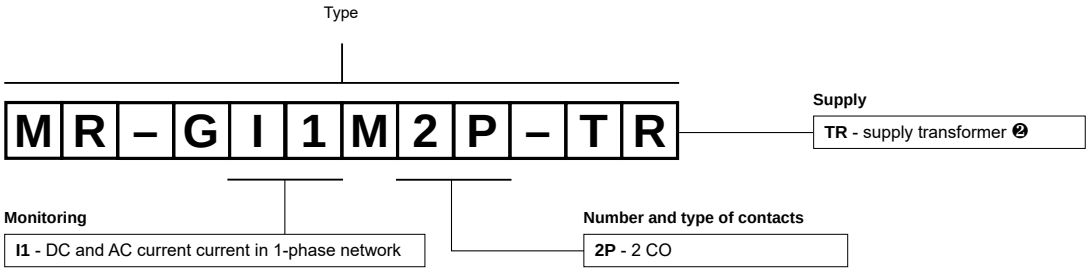
Supply: A1-A2 with TR2 230 V AC ❷

Measuring circuit 10 A AC/DC, without fault latch mode



Supply: A1-A2 with TR2 400 V AC ❷

Ordering codes



Example of ordering code:

MR-GI1M2P-TR2 monitoring relay **MR-GI1M2P-TR2**, multifunction (relay perform 6 functions), industrial cover, width 22,5 mm, two changeover contacts, rated input voltage (supply): AC - 12 ... 400 V AC ❷

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- **Multifunctions monitoring relays (AC current monitoring in 3-phase network, with adjustable thresholds)**
- Fault latch mode • Timing adjustment of start-up suppression and tripping delay ❶ • Supply via TR2 supply transformer ❷
- Output: 2 CO (2 changeover contacts)
- Industrial cover, width 22,5 mm
- Direct mounting on 35 mm rail mount acc. to PN-EN 60715
- Recognitions, certifications, directives: CE

Output circuit - contact data

Number and type of contacts		2 CO
Rated voltage		250 V AC
Max. breaking capacity	AC1	750 VA (3 A / 250 V AC) ❸ 1 250 VA (5 A / 250 V AC) ❹
Max. operating frequency • at resistive load 100 VA • at resistive load 1 000 VA		 3 600 cycles/hour 360 cycles/hour

Input circuit

Supply voltage	AC	12 ... 400 V ❷ terminals A1-A2
Must release voltage		AC: ≥ 0,3 U_n
Operating range of supply voltage		as per the specification of TR2 supply transformer ❷
Rated power consumption	AC	2,0 VA / 1,5 W
Range of supply frequency	AC	as per the specification of TR2 supply transformer ❷
Duty cycle		100%
Measuring circuit • measuring variable		AC sinus, 48...63 Hz (frequency response: -10…+5%)
• measuring inputs		AC: 5 A terminals K-I1
		AC: 5 A terminals K-I2
		AC: 5 A terminals K-I3
• overload capacity		6 A AC
• input resistance		10 mΩ
• swiching threshold		MIN: 0,05...0,95 I_n MAX: 0,1...1,0 I_n

Insulation according to PN-EN 60664-1

Rated surge voltage	4 000 V 1,2 / 50 µs
Overvoltage category	III
Insulation pollution degree	3

General data

Electrical life	• resistive AC1	> 2 x 10^5 1 000 VA
Mechanical life (cycles)		> 2 x 10^7
Dimensions (L x W x H)		90 x 22,5 x 108 mm
Weight		100 g
Ambient temperature	• storage	-25...+70 °C
	• operating	-25...+55 °C
Cover protection category		IP 20 PN-EN 60529
Relative humidity		15...85%
Shock resistance		15 g 11 ms
Vibration resistance		0,35 mm DA 10...55 Hz

Meassuring circuit data

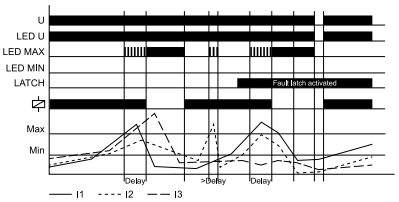
Functions	OVER, OVER+LATCH, UNDER, UNDER+LATCH, WIN, WIN+LATCH fault latch mode
Range of delay timing adjustment	start-up suppression: 0...10 s tripping delay: 0,1...10 s ❶
Base accuracy	± 5% (calculated from the final range values)
Setting accuracy	± 5% (calculated from the final range values)
Repeatability	± 2%
Voltage influence	± 0,5%
Temperature influence	± 0,1% / °C
Recovery time	500 ms
LED indicator	green LED U ON - indication of supply voltage U green LED U flashing - indication of start-up suppression time ❺ red LEDs MIN and MAX ON/OFF - indication of failure ❺ red LEDs MIN and MAX flashing - indication of tripping delay ❺ yellow LED R ON/OFF - output relay status

❶ Separately adjustable (two adjusting knobs). ❷ Supply voltage depending on the TR2 transformer which shall be ordered as a separate product - see page 394. ❸ If the distance between the mounting relays is less than 5 mm. ❹ If the distance between the mounting relays is greater than 5 mm. ❺ Indication of relay status - according to the set threshold.

Functions

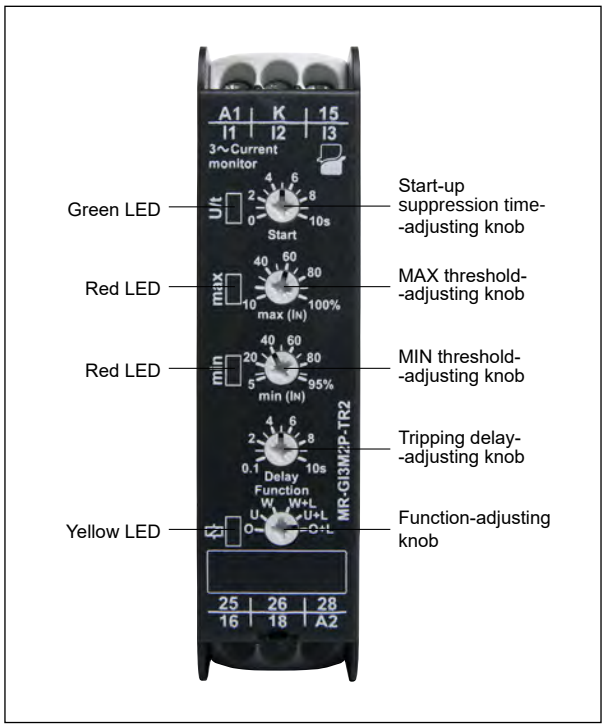
For all functions the LED's MIN and MAX are flashing alternating, when the minimum value for the measured current was chosen to be greater than the maximum value. If a failure already exists, when the device is activated, the output relay R remains in off-position and the LED for the corresponding threshold is illuminated.

OVER, OVER+LATCH - Overcurrent monitoring, overcurrent monitoring with fault latch.



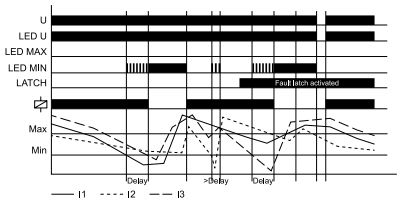
When the measured current of one of the phases exceeds the value adjusted at the MAX-regulator, the set interval of the tripping delay (Delay) begins (red LED MAX flashes). After the interval has expired (red LED MAX illuminated), the output relay R switches into off-position (yellow LED not illuminated). The output relay R again switches into on-position (yellow LED illuminated), when the measured current of all the phases falls below the value adjusted at the MIN-regulator (red LED MAX not illuminated). If the **fault latch** is activated (OVER+LATCH) and the measured current of one of the phases remains above the MAX-value longer than the set interval of the tripping delay, the output relay R remains in the off-position even if the measured current of all the phases falls below the value adjusted at the MIN-regulator. After resetting the failure (interrupting and re-applying the supply voltage), the output relay R switches into on-position and a new measuring cycle begins with the set interval of the start-up suppression (Start).

Front panel description



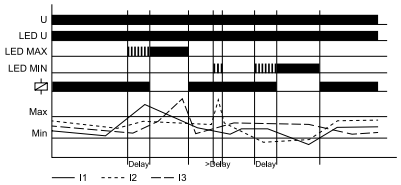
U - supply voltage; **R** - output state of the relay; **MIN, MAX** - relay status; **SEQ** - phase sequence

UNDER, UNDER+LATCH - Undercurrent monitoring, undercurrent monitoring with fault latch.

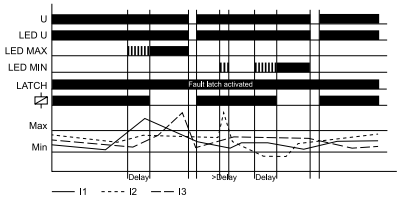


When the measured current of one of the phases falls below the value adjusted at the MIN-regulator, the set interval of the tripping delay (Delay) begins (red LED MIN flashes). After the interval has expired (red LED MIN illuminated), the output relay R switches into off-position (yellow LED not illuminated). The output relay R again switches into on-position (yellow LED illuminated), when the measured current of all the phases exceeds the value adjusted at the MAX-regulator.
If the **fault latch** is activated (UNDER+LATCH) and the measured current of one of the phases remains below the MIN-value longer than the set interval of the tripping delay, the output relay R remains in the off-position even if the measured current of all the phases exceeds the value adjusted at the MAX-regulator. After resetting the failure (interrupting and re-applying the supply voltage), the output relay R switches into on-position and a new measuring cycle begins with the set interval of the start-up suppression (Start).

WIN, WIN+LATCH - Current monitoring in windowfunction between MIN and MAX values, current monitoring in windowfunction between MIN and MAX values with fault latch.



The output relay R switches into on-position (yellow LED illuminated) when the measured current of all the phases exceeds the value adjusted at the MIN-regulator. When the measured current of one of the phases exceeds the value adjusted at the MAX-regulator, the set interval of the tripping delay (Delay) begins (red LED MAX flashes). After the interval has expired (red LED MAX illuminated), the output relay R switches into off-position (yellow LED not illuminated). The output relay R again switches into on-position (yellow LED illuminated) when the measured current of all the phases falls below the value adjusted at the MAX-regulator (red LED MAX not illuminated). When the measured current of one of the phases falls below the value adjusted at the MIN-regulator, the set interval of the tripping delay (Delay) begins again (red LED MIN flashes). After the interval has expired (red LED MIN illuminated), the output relay R switches into off-position (yellow LED not illuminated).



If the **fault latch** is activated (WIN+LATCH) and the measured current of one of the phases remains below the MIN-value longer than the set interval of the tripping delay, the output relay R remains in the off-position even if the measured current of all the phases exceeds the value adjusted at the MIN-regulator. If the measured current of one of the phases remains above the MAX-value longer than the set interval of the tripping delay, the output relay R remains in the off-position even if the measured current of all the phases falls below the value adjusted at the MAX-regulator. After resetting the failure (interrupting and re-applying the supply voltage), the output relay R switches into on-position and a new measuring cycle begins with the set interval of the start-up suppression (Start).

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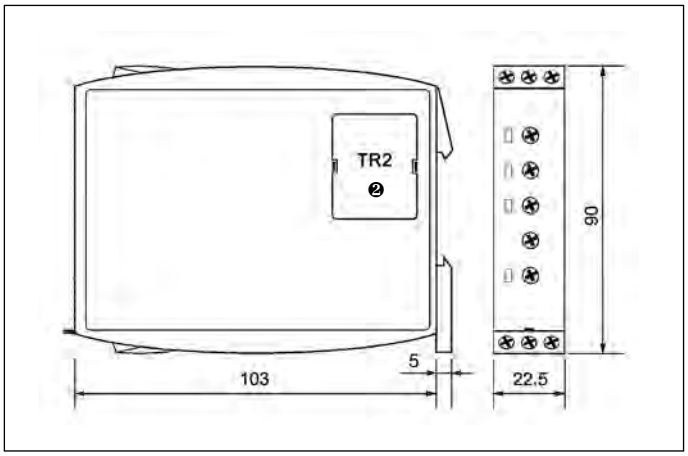
Dimensions



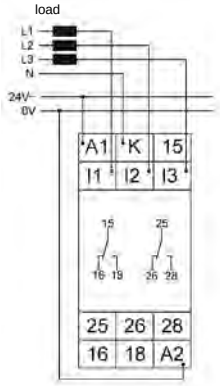
Mounting

Relays **MR-GI3M2P-TR2** are designed for direct mounting on 35 mm rail mount acc. to PN-EN 60715. Operational position - any. **Terminals - cross section of the connection cables:** 1 x 0,5 ... 2,5 mm^2 with/without multicore cable end, 1 x 4 mm^2 without multicore cable end, 2 x 0,5 ... 1,5 mm^2 with/without multicore cable end, 2 x 2,5 mm^2 flexible without multicore cable end.

❷ Supply voltage depending on the TR2 transformer which shall be ordered as a separate product - see page 394.

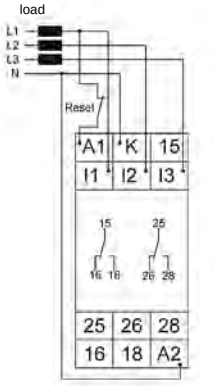
Connection diagrams

Measuring circuit 5 A AC/DC, with fault latch mode



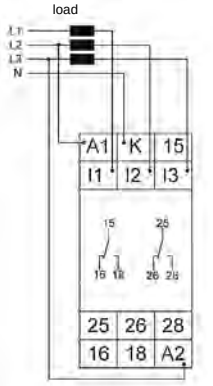
Supply: A1-A2 with TR2 24 V AC ❷

Measuring circuit 5 A AC/DC, with fault latch mode



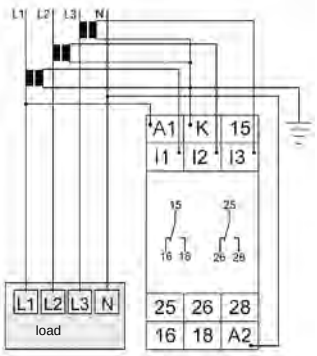
Supply: A1-A2 with TR2 230 V AC ❷

Measuring circuit 5 A AC/DC, without fault latch mode



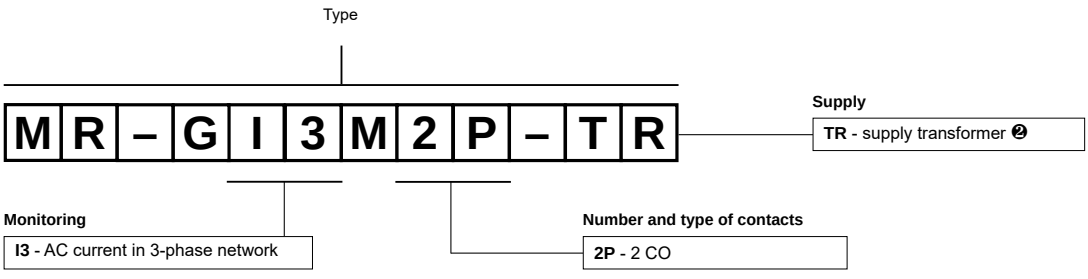
Supply: A1-A2 with TR2 400 V AC ❷

Measuring circuit 5 A AC/DC, with current transformer



Supply: A1-A2 with TR2 230 V AC ❷

Ordering codes



Example of ordering code:

MR-GI3M2P-TR2 monitoring relay **MR-GI3M2P-TR2**, multifunction (relay perform 6 functions), industrial cover, width 22,5 mm, two changeover contacts, rated input voltage (supply): AC - 12 ... 400 V AC ❷

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- **Single-functions monitoring relays (motor temperature monitoring)** • Test functions: integrated Test/Reset key, connection of the external Reset key (optional)
- Supply via TR2 supply transformer ❶
- Output: 2 CO (2 changeover contacts)
- Industrial cover, width 22,5 mm
- Direct mounting on 35 mm rail mount acc. to PN-EN 60715
- Recognitions, certifications, directives: CE

Output circuit - contact data

Number and type of contacts			2 CO
Rated voltage			250 V AC
Max. breaking capacity		AC1	750 VA (3 A / 250 V AC) ❷ 1 250 VA (5 A / 250 V AC) ❸
Max. operating frequency • at resistive load 100 VA • at resistive load 1 000 VA			 3 600 cycles/hour 360 cycles/hour

Input circuit

Supply voltage		AC	12 ... 400 V ❶ terminals A1-A2
Must release voltage			AC: ≥ 0,3 U_n
Operating range of supply voltage			as per the specification of TR2 supply transformer ❶
Rated power consumption		AC	2,0 VA / 1,5 W
Range of supply frequency		AC	as per the specification of TR2 supply transformer ❶
Duty cycle			100%
Measuring circuit	• terminals		T1-T2
	• initial resistance		< 1,5 kΩ
	• response value		relay in OFF-position: ≥ 3,6 kΩ
	• release value		relay in ON-position: ≤ 1,8 kΩ
	• disconnection ❹		no
	• measuring voltage T1-T2		≤ 2,5 V at R ≤ 4 kΩ PN-EN 60947-8
Control contact	• function		connection of an external Reset key
	• loadable		no
	• max. line length		R-T2: 10 m (twisted pair)
	• control pulse length		min. 50 ms
	• Reset		contact 1 NO; terminals R-T2

Insulation according to PN-EN 60664-1

Rated surge voltage			4 000 V 1,2 / 50 µs
Overvoltage category			III
Insulation pollution degree			3

General data

Electrical life		• resistive AC1	> 2 x 10^5 1 000 VA
Mechanical life (cycles)			> 2 x 10^7
Dimensions (L x W x H)			90 x 22,5 x 108 mm
Weight			100 g
Ambient temperature	• storage		-25...+70 °C
	• operating		-25...+55 °C
Cover protection category			IP 20 PN-EN 60529
Relative humidity			15...85%
Shock resistance			15 g 11 ms
Vibration resistance			0,35 mm DA 10...55 Hz

Meassuring circuit data

Functions			temperature monitoring of the motor winding, with fault latch (max. 6 PTC - temperature sensors DIN 44081) test functions: integrated Test/Reset key, connection of the external Reset key (optional)
Base accuracy			± 10% (calculated from the final range values)
Repeatability			± 1%
Voltage influence			± 2,2%
Temperature influence			± 0,1% / °C
Recovery time			500 ms
LED indicator			green LED U ON - indication of supply voltage U red LED ON/OFF - indication of failure

❶ Supply voltage depending on the TR2 transformer which shall be ordered as a separate product - see page 394. ❷ If the distance between the mounting relays is less than 5 mm. ❸ If the distance between the mounting relays is greater than 5 mm. ❹ At short circuit.

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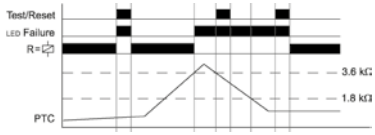
Functions

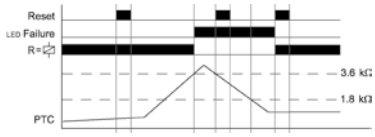
Motor temperature monitoring with fault latch.

If the supply voltage U is applied (green LED illuminated) and the cumulative resistance of the PTC-circuit is less than 3,6 kΩ (standard temperature of the motor), the output relay R switches into on-position. Pressing the Test/Reset key under this conditions forces the output relay R to switch into off-position. It remains in state as long as the Test/Reset key is pressed and thus the switching function can be checked in case of fault. The test function is not effective by using an external Reset key. When the comulative resistance of the PTC-circuit exceeds 3,6 kΩ (at least one of the PTCs has reached the cut-off temperature), the output relay R switches into off-position (red LED illuminated). The output relay R switches into on-position again (red LED not illuminated), if the cumulative resistance drops below 1,8 kΩ by cooling down of the PTC and either a Reset key (internal or external) was pressed or the supply voltage was disconnected and re-applied.

Application of internal **Test/Reset** key.

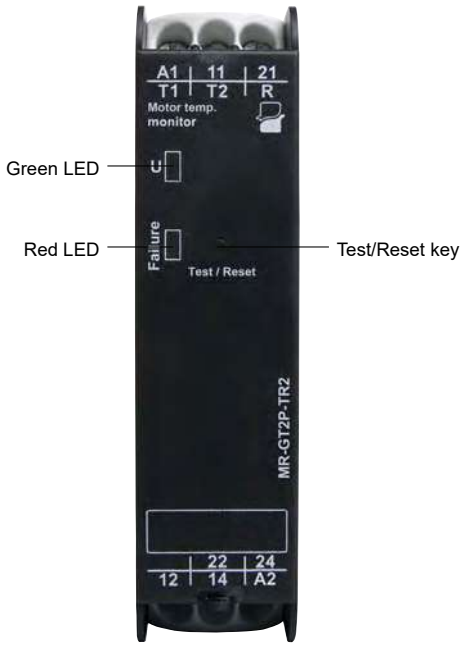


Application of an external **Reset** key.

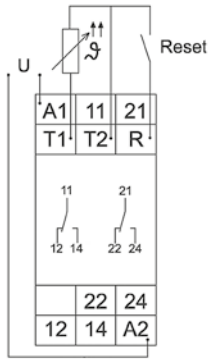


U - supply voltage; **R** - output state of the relay

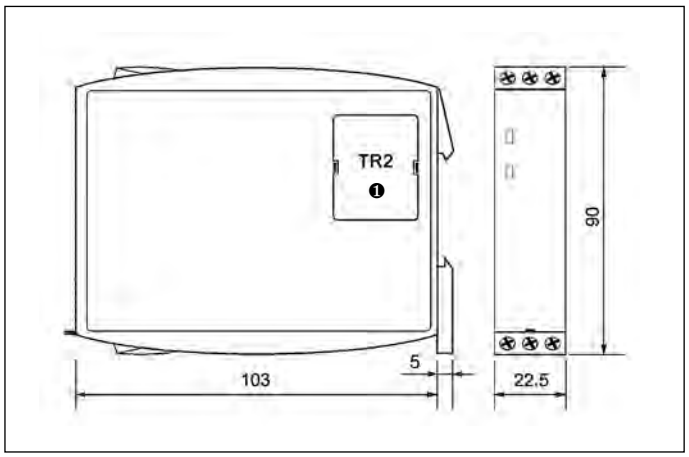
Front panel description



Connection diagram



Dimensions

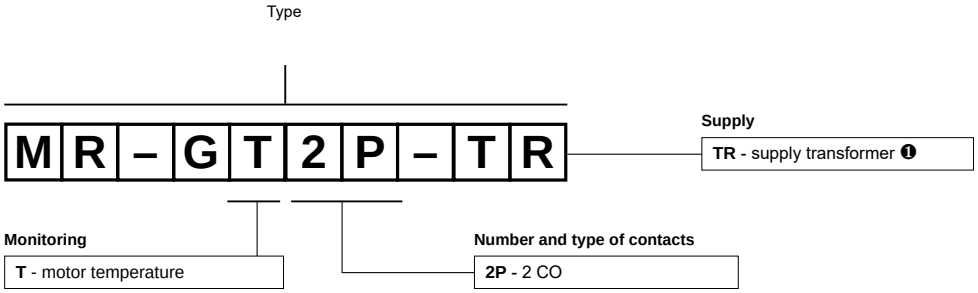


Mounting

Relays **MR-GT2P-TR2** are designed for direct mounting on 35 mm rail mount acc. to PN-EN 60715. Operational position - any. **Terminals - cross section of the connection cables:** 1 x 0,5 ... 2,5 mm^2 with/without multicore cable end, 1 x 4 mm^2 without multicore cable end, 2 x 0,5 ... 1,5 mm^2 with/without multicore cable end, 2 x 2,5 mm^2 flexible without multicore cable end.

❶ Supply voltage depending on the TR2 transformer which shall be ordered as a separate product - see page 394.

Ordering codes



Example of ordering code:

MR-GT2P-TR2 monitoring relay **MR-GT2P-TR2**, single-function (relay monitors the motor temperature), industrial cover, width 22,5 mm, two changeover contacts, rated input voltage (supply): AC - 12 ... 400 V AC ❶

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- Separating TR2... supply transformers for the monitoring relays of MR-G... series to reduce the input voltage applied to the terminals A1 and A2 of monitoring relays to the level required by the internal system
- TR2 transformers shall be ordered as a separate product.

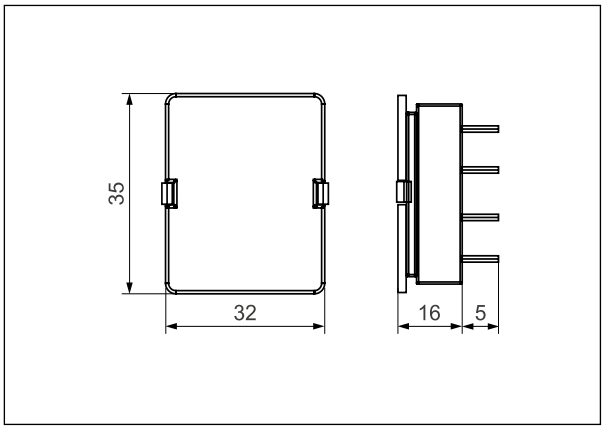
Input circuit

Supply voltage	50/60 Hz AC	12 ... 400 V
Operating range of supply voltage		0,85...1,1 U_n
Rated power consumption	AC	0,5...2,0 VA
Rated frequency	AC	50/60 Hz
Duty cycle		100%

General data

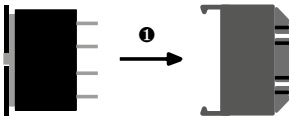
Dimensions (L x W x H)		32 x 35 x 16 mm
Weight		40 g
Ambient temperature	• storage	-25...+70 °C
	• operating	-25...+55 °C
Cover protection category		IP 20
Relative humidity		15...85%

Dimensions

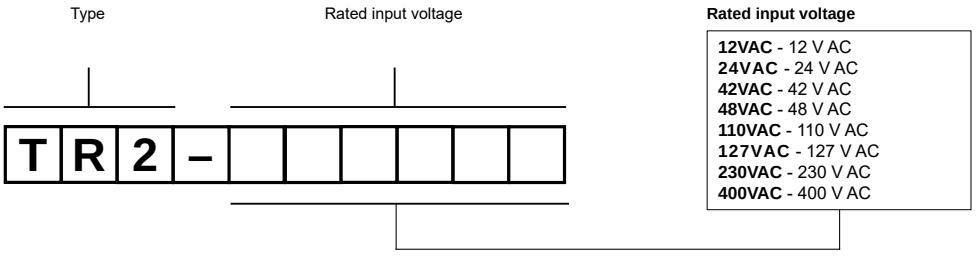


Mounting, mechanical design

TR2 supply transformers are designed for mounting in MR-G... monitoring relays and they are inseparable for their operation. MR-G... relays will not operate without the TR2... transformers. In order to mount the TR2... transformer in the monitoring relay, it is necessary to remove the protective cap ❶ from the relay, which protects the terminals of TR2... Then, TR2... shall be placed in the assembly opening of the MR-G... relay. The cover of TR2... is made of self-extinguishing plastic. When mounted, the tightness of TR2... is IP 20.



Ordering codes



Rated input voltage

12VAC - 12 V AC
24VAC - 24 V AC
42VAC - 42 V AC
48VAC - 48 V AC
110VAC - 110 V AC
127VAC - 127 V AC
230VAC - 230 V AC
400VAC - 400 V AC

Example of ordering code:

TR2-230VAC supply transformer **TR2**, rated input voltage 230 V AC 50/60 Hz

Plug-in sockets and accessories

relpol® S.A.

Plug-in sockets are designed for miniature and industrial relays. They provide for mounting of the relays in printed circuits, on 35 mm rail mount acc. to PN-EN 60715, and on panel mounting.

GZT..., GZM..., GZS..., GZF..., GZ..., GZU... series are the sockets with screw terminals for mounting on 35 mm rail mount acc. to PN-EN 60715, and on panel mounting. GZMB... serie are the sockets with spring terminals for mounting on 35 mm rail mount acc. to PN-EN 60715.

The sockets have the following features: current circuits load: up to 12 A, available plug-in sockets with separation of input (coil) from output (contacts), i.e. coil terminals on one side of the socket, and contact terminals on another side, adapted for mounting signalling / protecting modules type M... - sockets of GZT..., GZM..., GZS..., GZMB..., ES 32 series.

The screw terminals plug-in sockets are recognized and certified by:

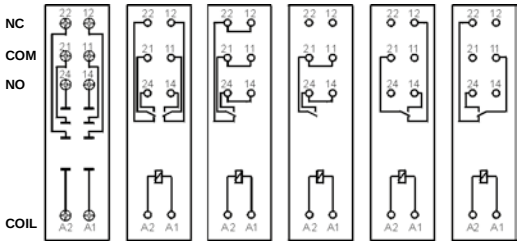
CE EAC

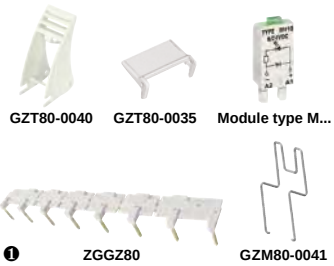
GZT80

For RM84, RM85,
RM85 inrush,
RM85 105 °C sensitive,
RM87L, RM87L sensitive,
RM87P, RM87P sensitive

Screw terminals
Max. tightening moment
for the terminal: 0,7 Nm
35 mm rail mount
acc. to PN-EN 60715
or on panel mounting
80 x 15,6 x 61(67) mm ❷
Two poles, 5 mm pinout
12 A, 300 V AC

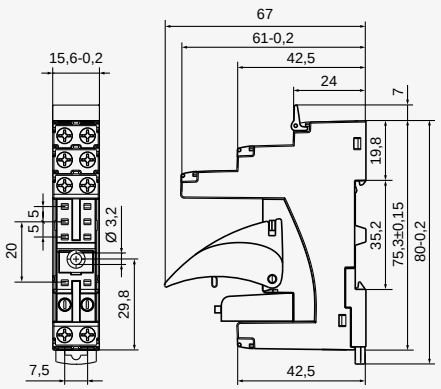
Connection diagrams ❸





Accessories ❶

Dimensions

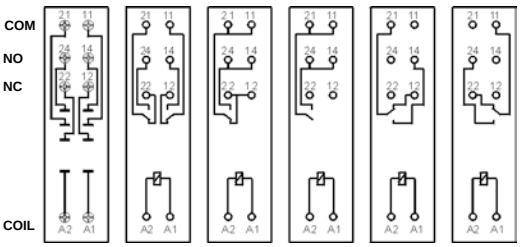


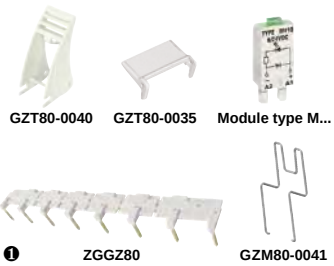
GZM80

For RM84, RM85,
RM85 inrush,
RM85 105 °C sensitive,
RM87L, RM87L sensitive,
RM87P, RM87P sensitive

Screw terminals
Max. tightening moment
for the terminal: 0,7 Nm
35 mm rail mount
acc. to PN-EN 60715
or on panel mounting
81,6 x 15,9 x 61(67) mm ❷
Two poles, 5 mm pinout
12 A, 300 V AC

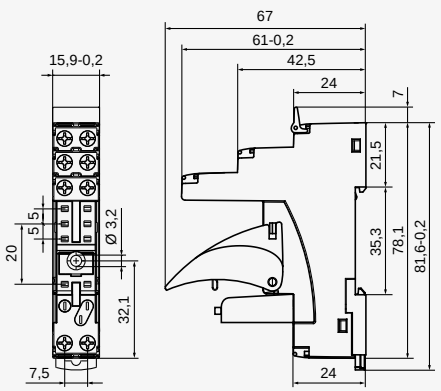
Connection diagrams ❸





Accessories ❶

Dimensions

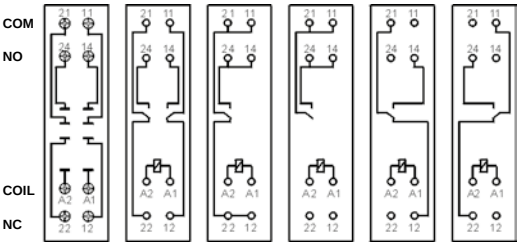


GZS80

For RM84, RM85,
RM85 inrush,
RM85 105 °C sensitive,
RM87L, RM87L sensitive,
RM87P, RM87P sensitive

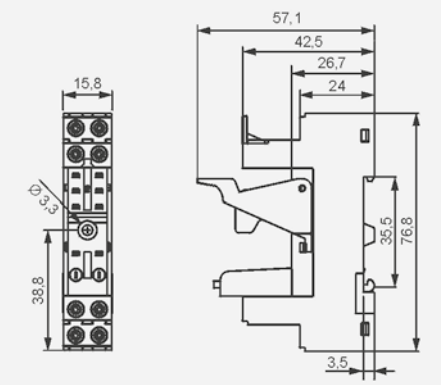
Screw terminals
Max. tightening moment
for the terminal: 0,5 Nm
35 mm rail mount
acc. to PN-EN 60715
or on panel mounting
76,8 x 15,8 x 42,5(57,1) mm ❷
Two poles, 5 mm pinout
10 A, 300 V AC

Connection diagrams ❸



Accessories ❶

Dimensions



❶ Mounting and sub-assemblies of accessories in the socket - see page 411. Signalling / protecting modules type M... - see page 422. ❷ In the bracket the height of socket with retainer / retractor clip is shown. ❸ For RM85..., RMP85: loads above 12 A (GZT80, GZM80) or 10 A (GZS80, GZF80, GZMB80) require bridging pairs of terminals: 11 with 21, 12 with 22, 14 with 24 - see pages 92, 100, 104, 137.

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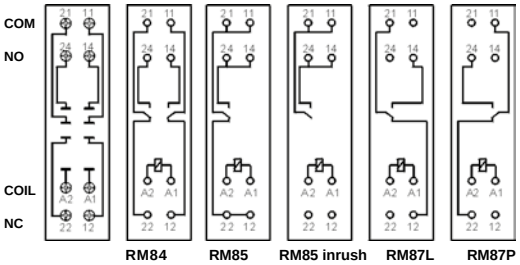
GZF80

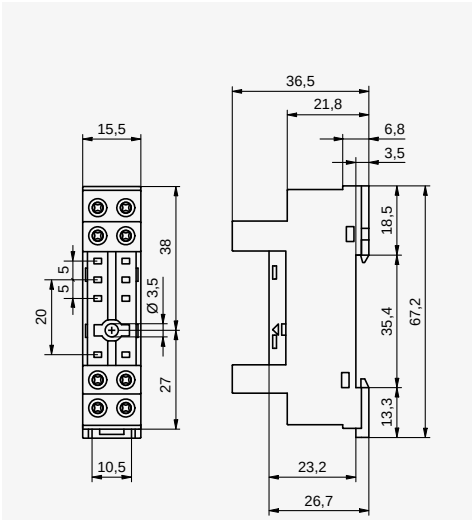
For RM84, RM85,
RM85 inrush,
RM85 105 °C sensitive,
RM87L, RM87L sensitive,
RM87P, RM87P sensitive,
RMP84, RMP85

Screw terminals
Max. tightening moment
for the terminal: 0,5 Nm
35 mm rail mount
acc. to PN-EN 60715
or on panel mounting
67,2 x 15,5 x 36,5 mm
Two poles, 5 mm pinout
10 A, 250 V AC

Connection diagrams ❸



Dimensions



Accessories ❶

GZM80-0041 GZM80-0025

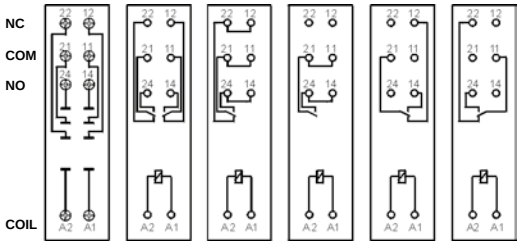
GZMB80

For RM84, RM85,
RM85 inrush,
RM85 105 °C sensitive,
RM87L, RM87L sensitive,
RM87P, RM87P sensitive,
RMP84, RMP85

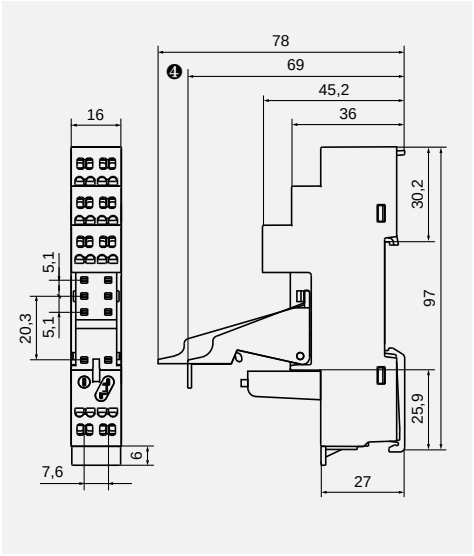
Spring terminals
Max. cross section
of the cables:
1 x 0,2...1,5 mm²
(1 x 24...16 AWG)
Length of the cable
deinsulation: 9...11 mm

35 mm rail mount
acc. to PN-EN 60715
97 x 16 x 45,2(69/78 ❹) mm ❷
Two poles, 5 mm pinout
10 A, 300 V AC

Connection diagrams ❸

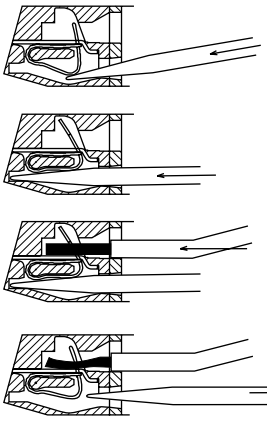


Dimensions



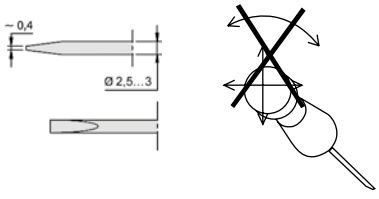
TR

Module type M...



The drawings present the sequence of operations in course of inserting wires to the spring terminal, and the recommended screwdriver to be used for opening of case springs, comply with the DIN 5264 FORM „A".

GZMB80-0040 GZMB80-0025 GZM80-0041 GZM80-0025



Accessories ❶ ❹

Wire connection

❶ Mounting and sub-assemblies of accessories in the socket - see page 411. Signalling / protecting modules type M... - see page 422. ❷ In the bracket the height of socket with retainer / retractor clip is shown. ❸ For RM85..., RMP85: loads above 12 A (GZT80, GZM80) or 10 A (GZS80, GZF80, GZMB80) require bridging pairs of terminals: 11 with 21, 12 with 22, 14 with 24 - see pages 92, 100, 104, 137. ❹ Height of set: 69 mm (GZMB80-0040) or 78 mm (GZMB80-0025).

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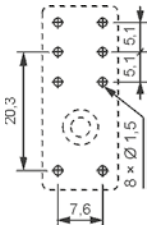
EC 50

For RM84, RM85, RM85 inrush,
RM85 105 °C sensitive,
RM87L, RM87L sensitive,
RM87P, RM87P sensitive,
RM83, RMP84, RMP85

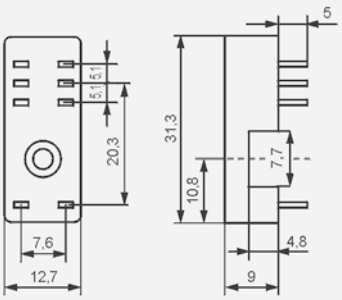
For PCB
31,3 x 12,7 x 9 mm
Two poles, 5 mm pinout
8 A, 300 V AC

Pinout



Accessories

Dimensions

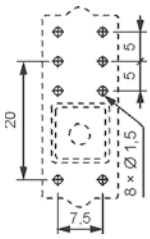


PW80

For RM84, RM85, RM85 inrush,
RM85 105 °C sensitive,
RM87L, RM87L sensitive,
RM87P, RM87P sensitive,
RM83

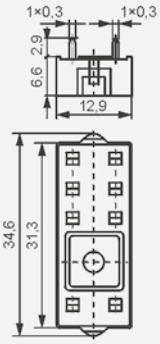
For PCB
34,6 x 12,9 x 6,6 mm
Two poles, 5 mm pinout
8 A, 250 V AC

Pinout



Accessories

Dimensions

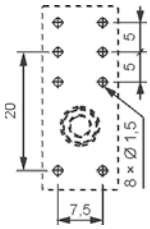


GD50

For RM84, RM85, RM85 inrush,
RM85 105 °C sensitive,
RM87L, RM87L sensitive,
RM87P, RM87P sensitive,
RM83, RMP84, RMP85

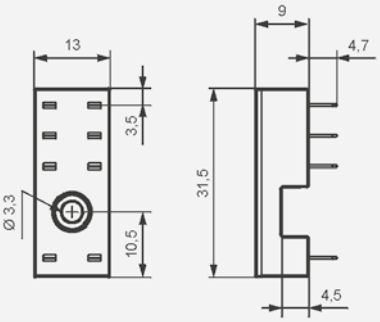
For PCB
31,5 x 13 x 9 mm
Two poles, 5 mm pinout
8 A, 300 V AC

Pinout



Accessories

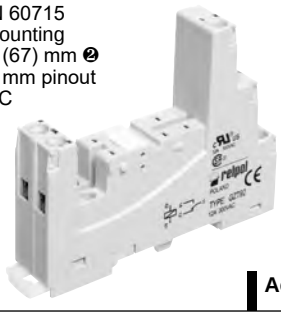
Dimensions



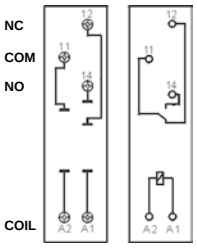
GZT92

For RM87N, RM87N sensitive

Screw terminals
Max. tightening moment
for the terminal: 0,7 Nm
35 mm rail mount
acc. to PN-EN 60715
or on panel mounting
80 x 15,6 x 61(67) mm ❷
One pole, 3,5 mm pinout
12 A, 300 V AC



Connection diagrams



RM87N

Accessories ❶

GZT80-0040

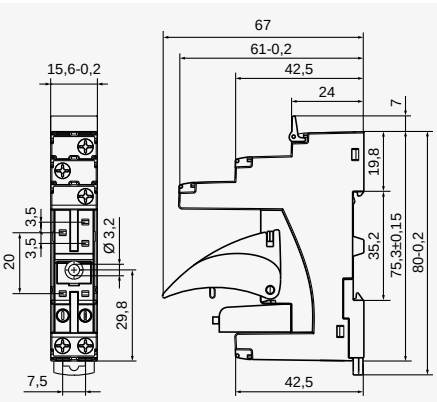
GZT80-0035

Module type M...

ZGGZ80

GZM80-0041

Dimensions



❶ Mounting and sub-assemblies of accessories in the socket - see page 411. Signalling / protecting modules type M... - see page 422.
❷ In the bracket the height of socket with retainer / retractor clip is shown.

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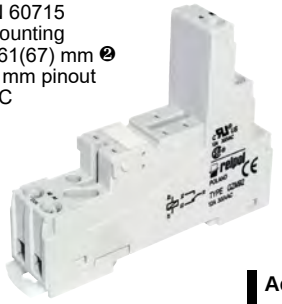
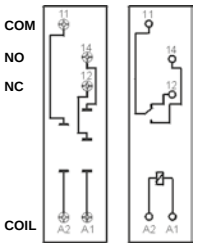
GZM92

For RM87N, RM87N sensitive

Screw terminals
Max. tightening moment
for the terminal: 0,7 Nm
35 mm rail mount
acc. to PN-EN 60715
or on panel mounting
81,6 x 15,9 x 61(67) mm ❷
One pole, 3,5 mm pinout
12 A, 300 V AC



Connection diagrams




GZT80-0040


GZT80-0035

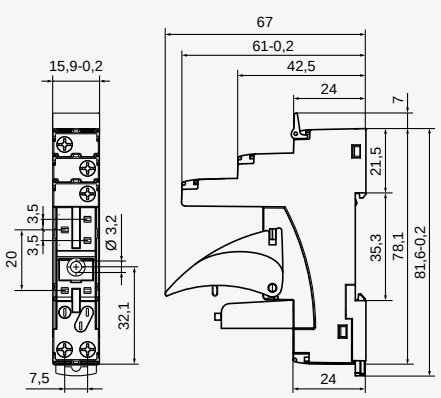

Module type M...


ZGGZ80


GZM80-0041

Accessories ❶

Dimensions

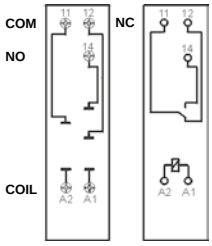


GZS92

For RM87N, RM87N sensitive

Screw terminals
Max. tightening moment
for the terminal: 0,5 Nm
35 mm rail mount
acc. to PN-EN 60715
or on panel mounting
76,8 x 15,8 x 42,5(57,1) mm ❷
One pole, 3,5 mm pinout
12 A, 300 V AC

Connection diagrams




GZS-0040


TR

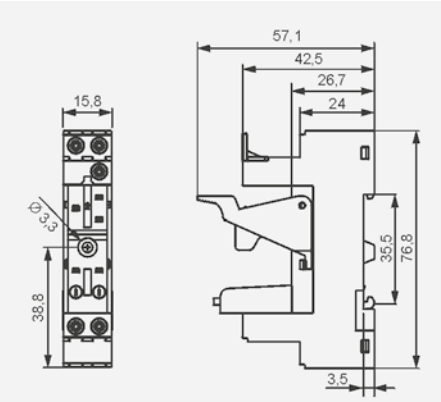

Module type M...


ZGGZ80


GZM80-0041

Accessories ❶

Dimensions

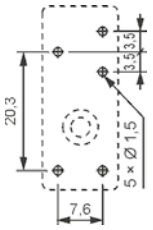


EC 35

For RM87N, RM87N sensitive

For PCB
31,3 x 12,7 x 9 mm
One pole, 3,5 mm pinout
12 A, 300 V AC

Pinout

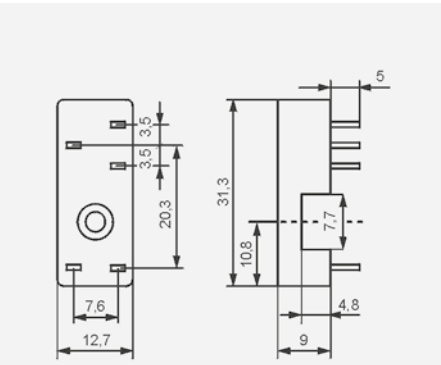


Accessories


MP16-2


MH16-2

Dimensions

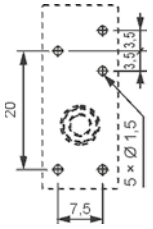


GD35

For RM87N, RM87N sensitive

For PCB
31,5 x 13 x 9 mm
One pole, 3,5 mm pinout
12 A, 300 V AC

Pinout



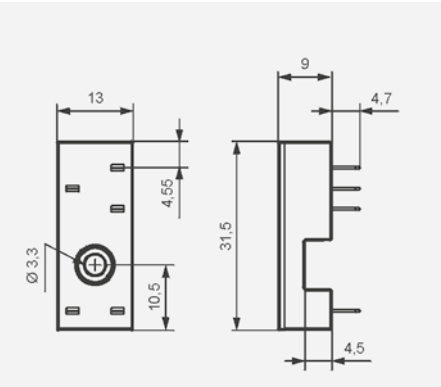
Accessories


MP16-2


MH16-2


GD-0016

Dimensions



❶ Mounting and sub-assemblies of accessories in the socket - see page 411. Signalling / protecting modules type M... - see page 422.
❷ In the bracket the height of socket with retainer / retractor clip is shown.

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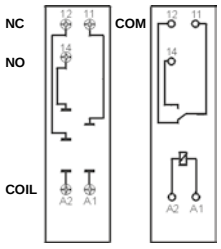
ES 32

For RM96 1 CO

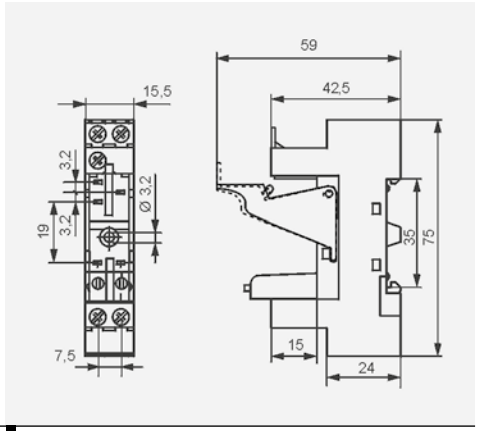
Screw terminals
Max. tightening moment
for the terminal: 0,7 Nm
35 mm rail mount
acc. to PN-EN 60715
or on panel mounting
75 x 15,5 x 42,5(59) mm ❷
One pole, 3,2 mm pinout
12 A, 300 V AC

Connection diagrams



Accessories ❶

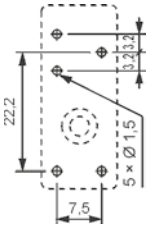
Dimensions



EC 32

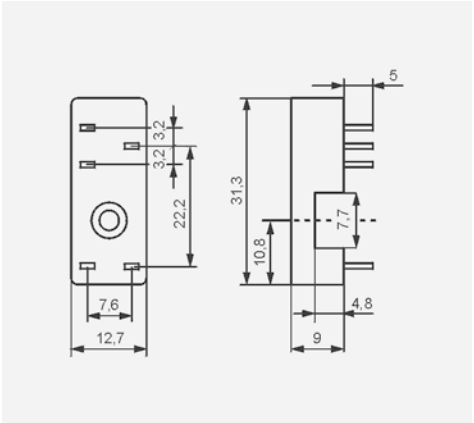
For PCB
31 x 12,7 x 9 mm
One pole, 3,2 mm pinout
12 A, 300 V AC

Pinout



Accessories

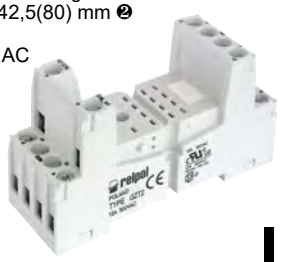
Dimensions



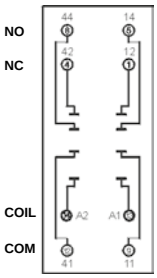
GZT2

For R2N

Screw terminals
Max. tightening moment
for the terminal: 0,7 Nm
35 mm rail mount
acc. to PN-EN 60715
or on panel mounting
76,3 x 27 x 42,5(80) mm ❷
Two poles
12 A, 300 V AC

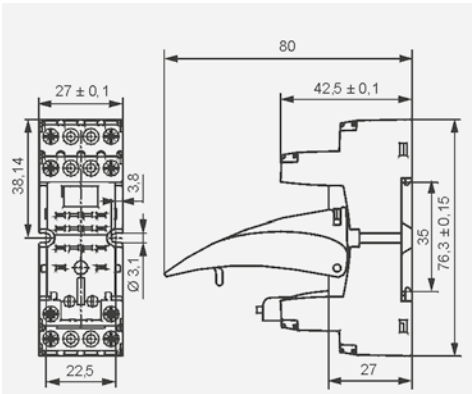


Connection diagram



Accessories ❶

Dimensions

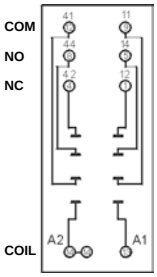


GZM2

For R2N

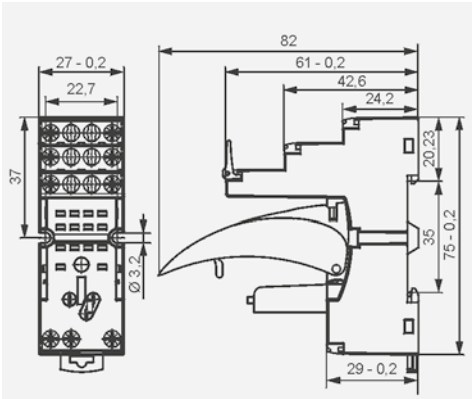
Screw terminals
Max. tightening moment
for the terminal: 0,7 Nm
35 mm rail mount
acc. to PN-EN 60715
or on panel mounting
75 x 27 x 61(82) mm ❷
Two poles
12 A, 300 V AC

Connection diagram



Accessories ❶

Dimensions



❶ Mounting and sub-assemblies of accessories in the socket - see page 411. Signalling / protecting modules type M... - see page 422.
❷ In the bracket the height of socket with retainer / retractor clip is shown.

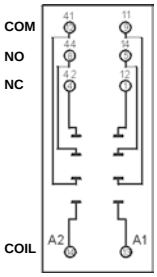
GZMB2

For R2N

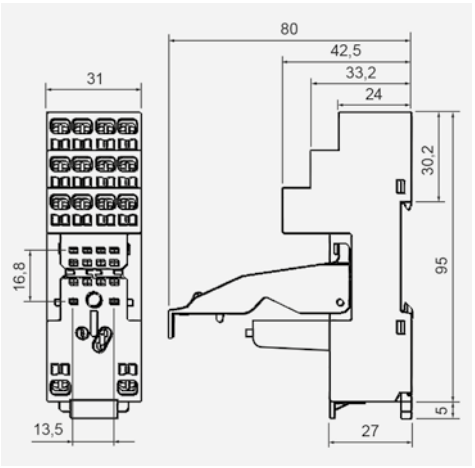
Spring terminals
Max. cross section
of the cables:
1 x 0,2...1,5 mm²
(1 x 24...16 AWG)
Length of the cable
deinsulation: 9...11 mm

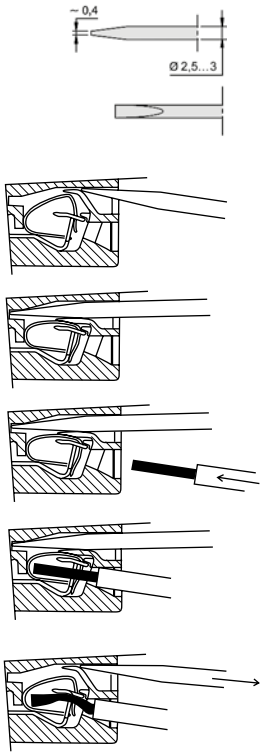
35 mm rail mount
acc. to PN-EN 60715
95 x 31 x 42,5(80) mm ❷
Two poles
10 A, 300 V AC

Connection diagram

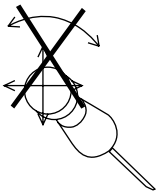


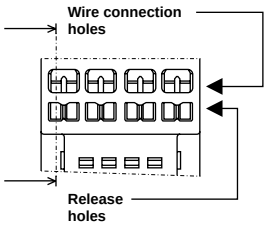
Dimensions





The drawings present the sequence of operations in course of inserting wires to the spring terminal, and the recommended screwdriver to be used for opening of case springs, comply with the DIN 5264 FORM „A".






GZMB4-0040


TR


Module type M...


G4 1052

Accessories ❶

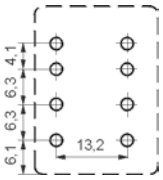
Wire connection

SU4/2D

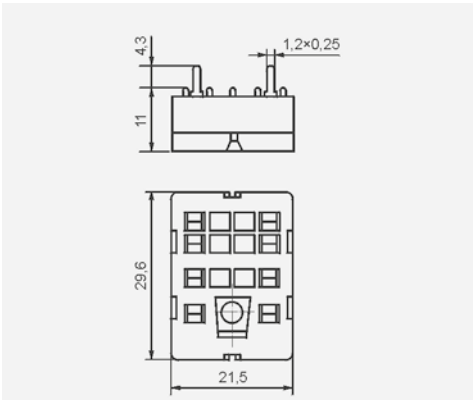
For R2N

For PCB
29,6 x 21,5 x 11 mm
Two poles
12 A, 250 V AC

Pinout



Dimensions




G4 1053

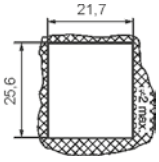
Accessories

SU4/2L

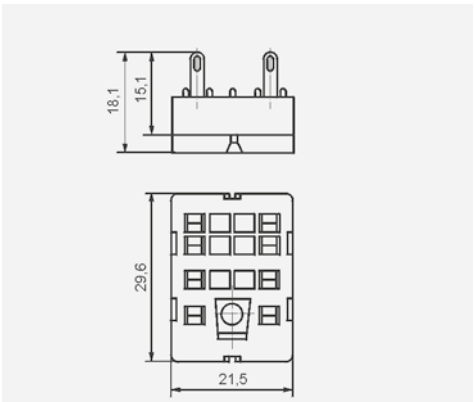
For R2N

Solder terminals
29,6 x 21,5 x 18,1 mm
Two poles
12 A, 250 V AC

Dimensions of opening on panel mounting



Dimensions




G4 1053


G4 1040

Accessories

❶ Mounting and sub-assemblies of accessories in the socket - see page 411. Signalling / protecting modules type M... - see page 422.
❷ In the bracket the height of socket with retainer / retractor clip is shown.

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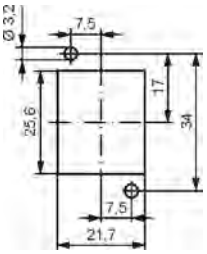
G4/2

For R2N

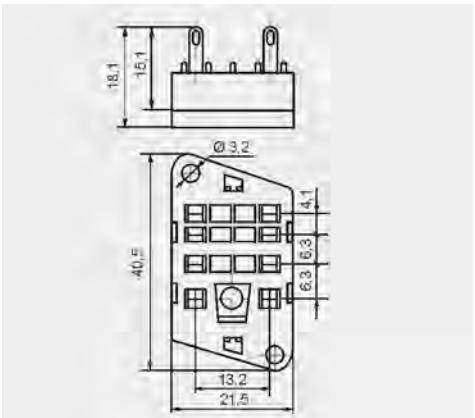
Solder terminals
40,5 x 21,5 x 18,1 mm
Two poles
12 A, 250 V AC

Pinout of openings on panel mounting



Accessories G4 1053

Dimensions

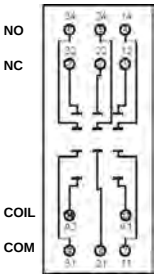


GZT3

For R3N

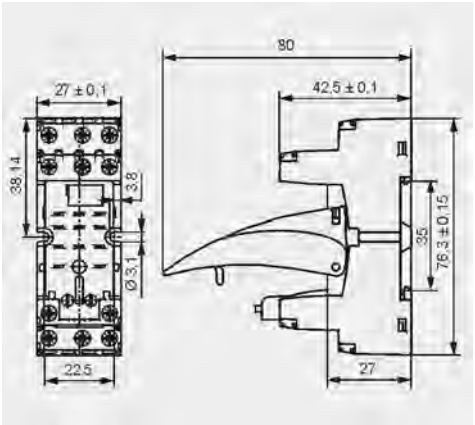
Screw terminals
Max. tightening moment
for the terminal: 0,7 Nm
35 mm rail mount
acc. to PN-EN 60715
or on panel mounting
76,3 x 27 x 42,5(80) mm ❷
Three poles
10 A, 300 V AC

Connection diagram



Accessories ❶

Dimensions

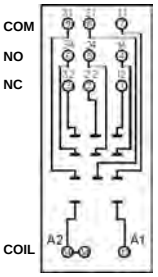


GZM3

For R3N

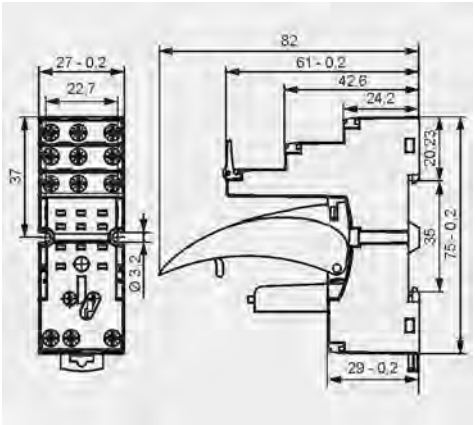
Screw terminals
Max. tightening moment
for the terminal: 0,7 Nm
35 mm rail mount
acc. to PN-EN 60715
or on panel mounting
75 x 27 x 61(82) mm ❷
Three poles
10 A, 300 V AC

Connection diagram



Accessories ❶

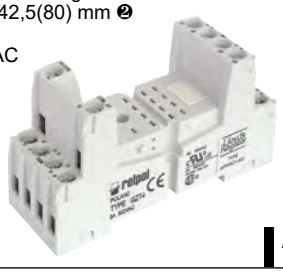
Dimensions



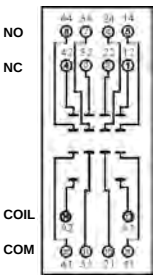
GZT4 ❺

For R4N, T-R4

Screw terminals
Max. tightening moment
for the terminal: 0,7 Nm
35 mm rail mount
acc. to PN-EN 60715
or on panel mounting
76,3 x 27 x 42,5(80) mm ❷
Four poles
6 A, 300 V AC

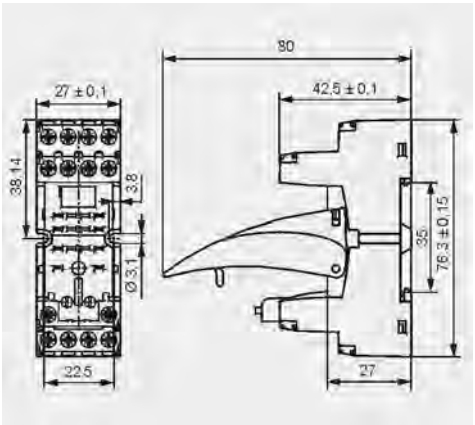


Connection diagram



Accessories ❶ ❻

Dimensions



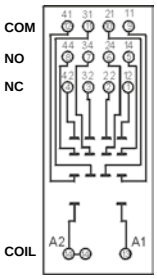
❶ Mounting and sub-assemblies of accessories in the socket - see page 411. Signalling / protecting modules type M... - see page 422. ❷ In the bracket the height of socket with retainer / retractor clip is shown. ❺ Have obtained LR Type Approval Certificate (Lloyd's Register). ❻ For R4N relays: G4 1052, GZT4-0040, GZMB-0040, GZT4-0035, TR, module type M...; for T-R4 relays: TR4-2000, GZT4-0035, TR.

GZM4

For R4N, T-R4

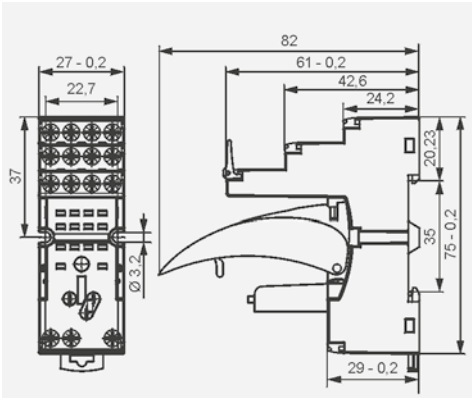
Screw terminals
Max. tightening moment
for the terminal: 0,7 Nm
35 mm rail mount
acc. to PN-EN 60715
or on panel mounting
75 x 27 x 61(82) mm ❷
Four poles
6 A, 300 V AC

Connection diagram



Accessories ❶ ❻

Dimensions



GZMB4

For R4N, T-R4

Spring terminals
Max. cross section
of the cables:
1 x 0,2...1,5 mm²
(1 x 24...16 AWG)
Length of the cable
deinsulation: 9...11 mm

35 mm rail mount
acc. to PN-EN 60715
95 x 31 x 42,5(80) mm ❷
Four poles
10 A, 300 V AC

GZMB4-0040

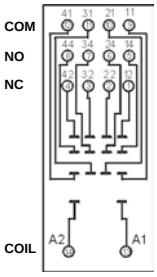
TR

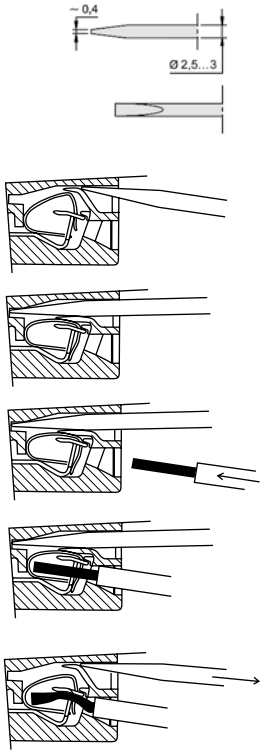
Module type M...

G4 1052

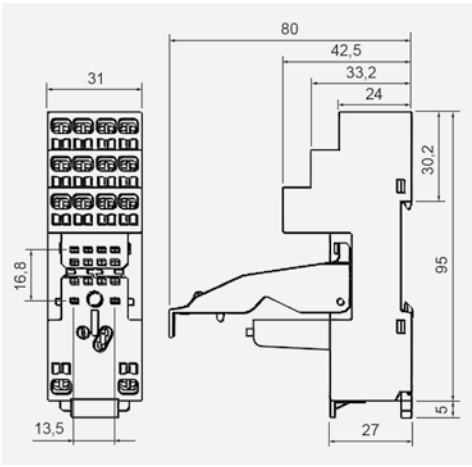
TR4-2000

Connection diagram

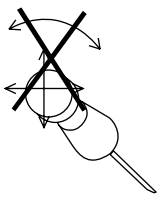


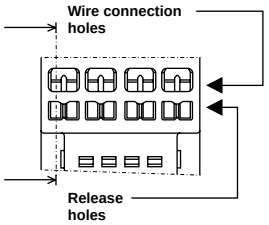


Dimensions



The drawings present the sequence of operations in course of inserting wires to the spring terminal, and the recommended screwdriver to be used for opening of case springs, comply with the DIN 5264 FORM „A".





Accessories ❶ ❻

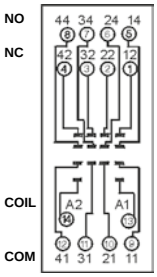
Wire connection

GZ4

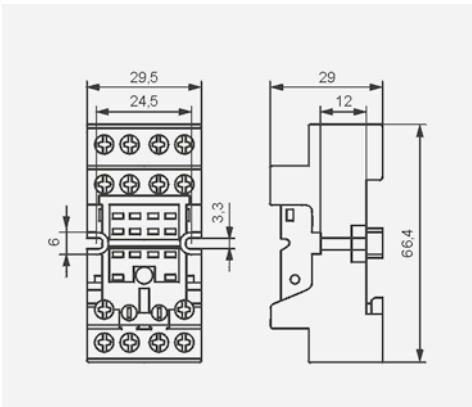
For R4N

Screw terminals
Max. tightening moment
for the terminal: 0,7 Nm
35 mm rail mount
acc. to PN-EN 60715
or on panel mounting
66,4 x 29,5 x 29 mm
Four poles
10 A, 300 V AC

Connection diagram



Dimensions



Accessories

G4 1052

❶ Mounting and sub-assemblies of accessories in the socket - see page 411. Signalling / protecting modules type M... - see page 422. ❷ In the bracket the height of socket with retainer / retractor clip is shown. ❻ For R4N relays: G4 1052, GZT4-0040, GZMB-0040, GZT4-0035, TR, module type M...; for T-R4 relays: TR4-2000, GZT4-0035, TR.

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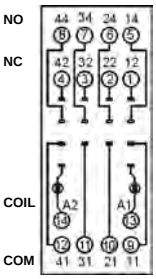
GS4

For R4N

Screw terminals
Max. tightening moment
for the terminal: 0,7 Nm
35 mm rail mount
acc. to PN-EN 60715
or on panel mounting
67 x 30,8 x 30(~63,7) mm ❼
Four poles
6 A, 300 V AC

Connection diagram

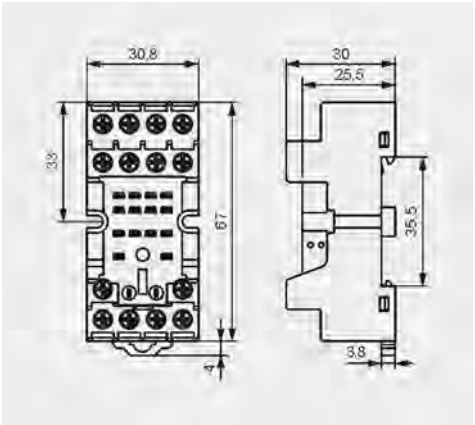


Accessories

GS4-0036

GS4-0035

Dimensions

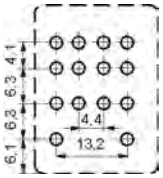


SU4D

For R4N

For PCB
29,6 x 21,5 x 11 mm
Four poles
6 A, 250 V AC

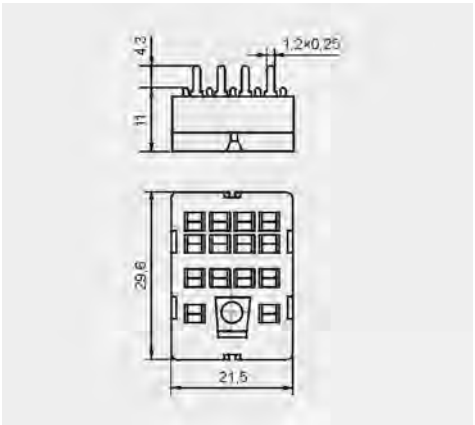
Pinout



Accessories

G4 1053

Dimensions

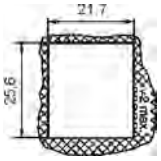


SU4L

For R4N

Solder terminals
29,6 x 21,5 x 18,1 mm
Four poles
6 A, 250 V AC

Dimensions of opening on panel mounting

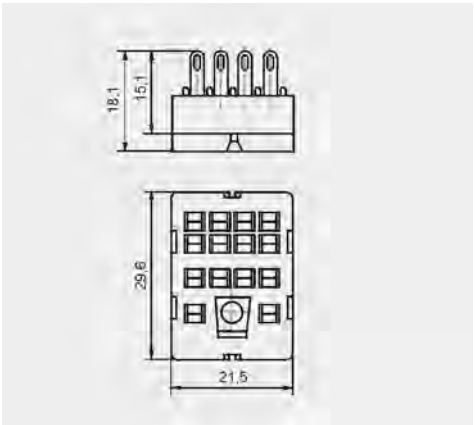


Accessories

G4 1053

G4 1040

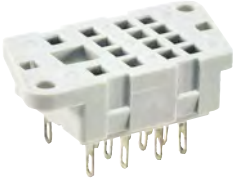
Dimensions



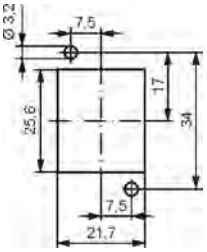
G4

For R4N

Solder terminals
40,5 x 21,5 x 18,1 mm
Four poles
6 A, 250 V AC



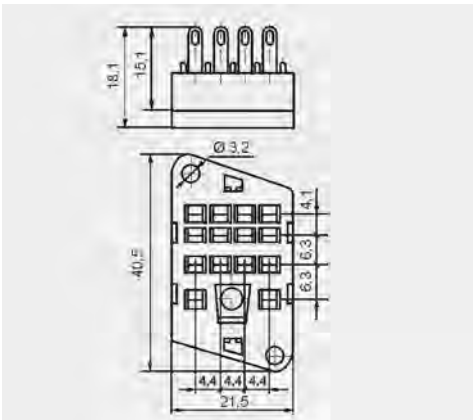
Pinout of openings on panel mounting



Accessories

G4 1053

Dimensions



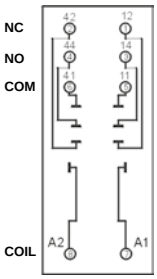
❼ In the bracket the height of socket with spring wire clip is shown.

GZY2G

For RY2

Screw terminals
Max. tightening moment
for the terminal: 0,7 Nm
35 mm rail mount
acc. to PN-EN 60715
or on panel mounting
78,7 x 28 x 32,4 mm
Two poles
12 A, 250 V AC

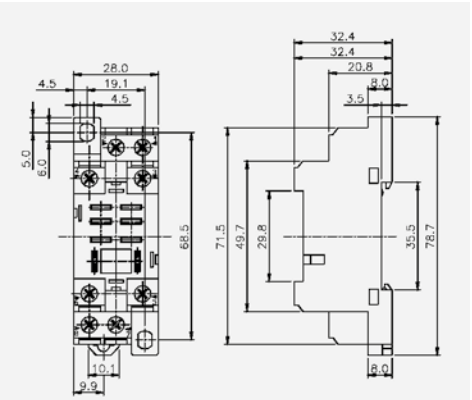
Connection diagram



Accessories

GZY2G-0041

Dimensions

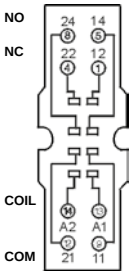


GZ2

For R2M

Screw terminals
Max. tightening moment
for the terminal: 0,7 Nm
35 mm rail mount
acc. to PN-EN 60715
or on panel mounting
65,2 x 20 x 25 mm
Two poles
7 A, 250 V AC

Connection diagram

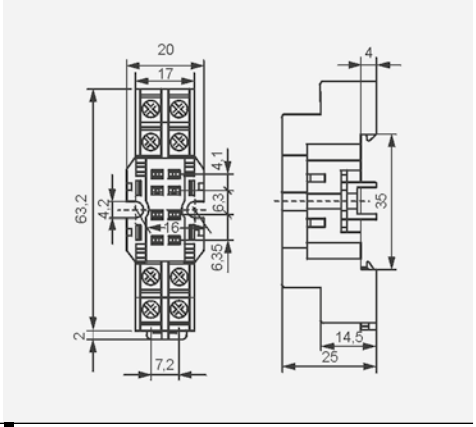


Accessories

GZ2 1060

GZ2 1111

Dimensions

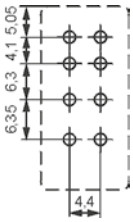


S2M

For R2M

For PCB
29,6 x 14 x 10,5 mm
Two poles
5 A, 250 V AC

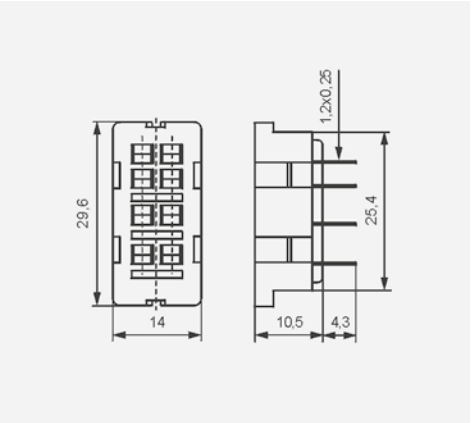
Pinout



Accessories

G4 1050

Dimensions



G2M

For R2M

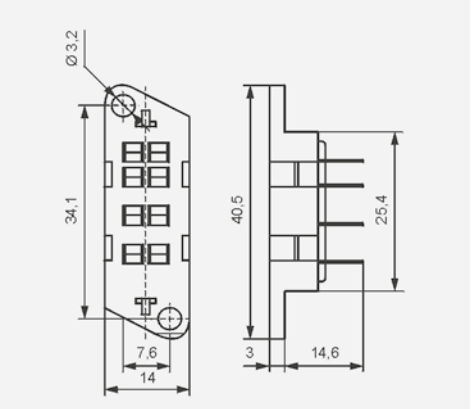
Solder terminals
40,5 x 14 x 10,5 mm
Two poles
5 A, 250 V AC

Accessories

G4 1050

G2M 1020

Dimensions



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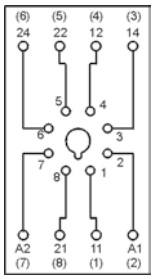
PZ8 ❺

For R15 - 2 CO

Screw terminals
Max. tightening moment
for the terminal: 0,7 Nm
35 mm rail mount
acc. to PN-EN 60715
or on panel mounting
68,2 x 38 x 24,2 mm
Two poles
10 A, 250 V AC

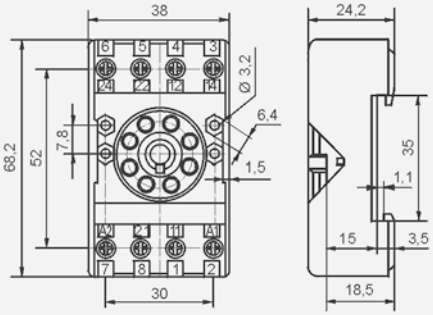
Connection diagram



Accessories

PZ11 0031

Dimensions

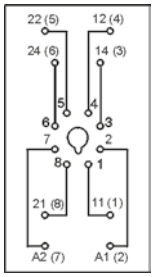


GZU8

For R15 - 2 CO

Screw terminals
Max. tightening moment
for the terminal: 0,7 Nm
35 mm rail mount
acc. to PN-EN 60715
82 x 35,5 x 25,7 mm
Two poles
10 A, 300 V AC

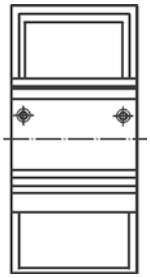
Connection diagram



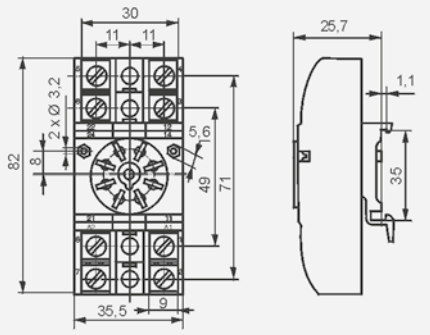
Accessories

GZU 1052

Adaptor



Dimensions

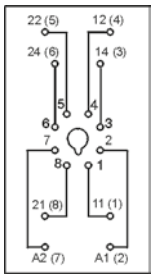


GZ8

For R15 - 2 CO

Screw terminals
Max. tightening moment
for the terminal: 0,7 Nm
On panel mounting
82,8 x 35,5 x 22,5 mm
Two poles
10 A, 300 V AC

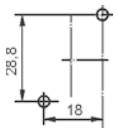
Connection diagram



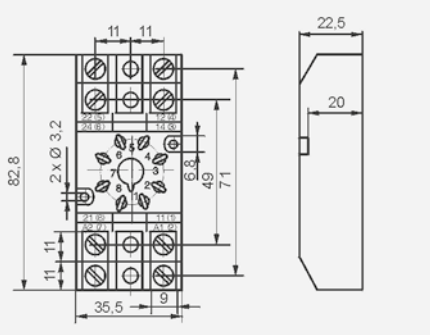
Accessories

GZ 1050

Mounting dimensions



Dimensions

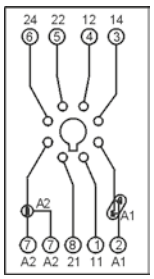


GZP8

For R15 - 2 CO

Screw terminals
Max. tightening moment
for the terminal: 0,5 Nm
35 mm rail mount
acc. to PN-EN 60715
or on panel mounting
73 x 38,2 x 27,2 mm
Two poles
12 A, 300 V AC

Connection diagram



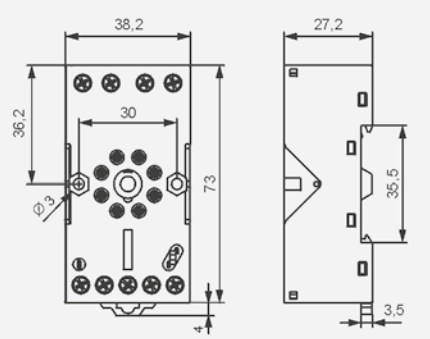
Accessories

GZP-0054

Time module COM3

GZP-0035

Dimensions



❺ Have obtained LR Type Approval Certificate (Lloyd's Register).

GOP8

For R15 - 2 CO

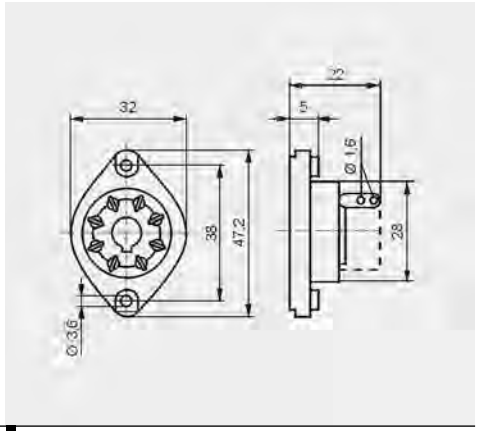
Solder terminals
47,2 x 32 x 22 mm
Two poles
10 A, 250 V AC

Accessories


R159 1051


R15 5922

Dimensions

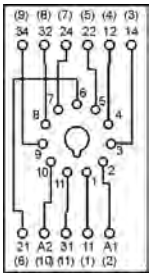


PS11 ❺

For R15 - 3 CO

Screw terminals
Max. tightening moment
for the terminal: 0,7 Nm
35 mm rail mount
acc. to PN-EN 60715
or on panel mounting
68,2 x 38 x 24,2 mm
Three poles
10 A, 250 V AC

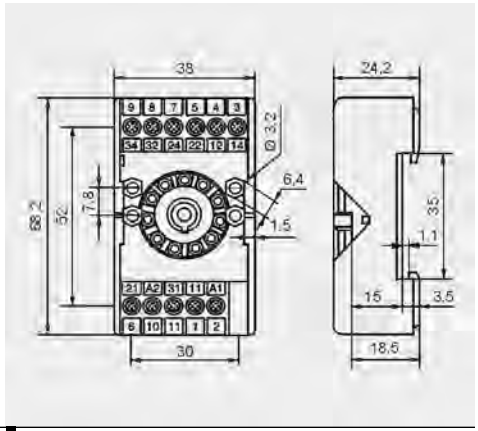
Connection diagram



Accessories


PZ11 0031

Dimensions

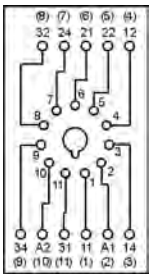


PZ11 ❺

For R15 - 3 CO

Screw terminals
Max. tightening moment
for the terminal: 0,7 Nm
35 mm rail mount
acc. to PN-EN 60715
or on panel mounting
68,2 x 38 x 24,2 mm
Three poles
10 A, 250 V AC

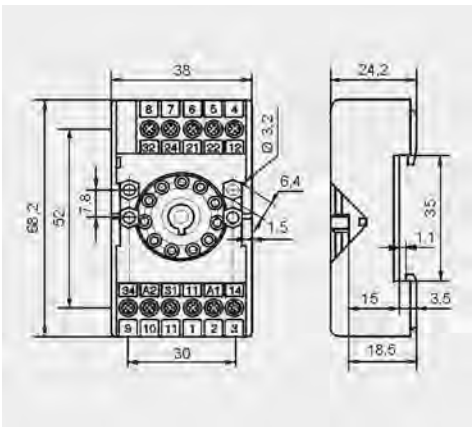
Connection diagram



Accessories


PZ11 0031

Dimensions

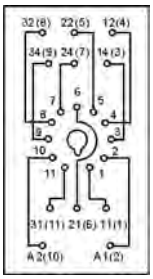


GZU11

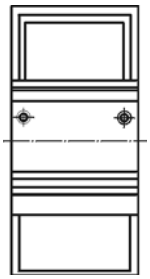
For R15 - 3 CO

Screw terminals
Max. tightening moment
for the terminal: 0,7 Nm
35 mm rail mount
acc. to PN-EN 60715
82 x 35,5 x 25,7 mm
Three poles
10 A, 250 V AC

Connection diagram



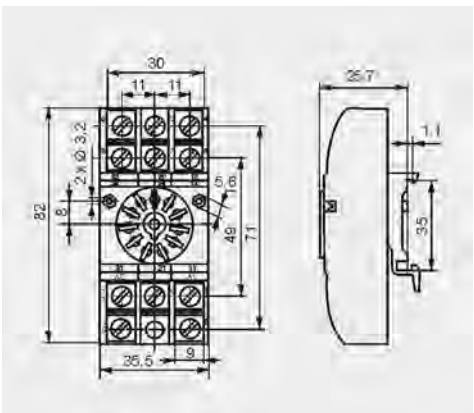
Adaptor



Accessories


GZU 1052

Dimensions



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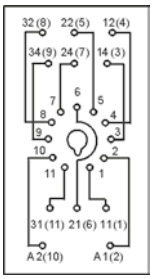
GZ11

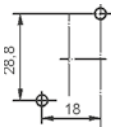
For R15 - 3 CO

Screw terminals
Max. tightening moment
for the terminal: 0,7 Nm
On panel mounting
82,8 x 35,5 x 22,5 mm
Three poles
10 A, 250 V AC

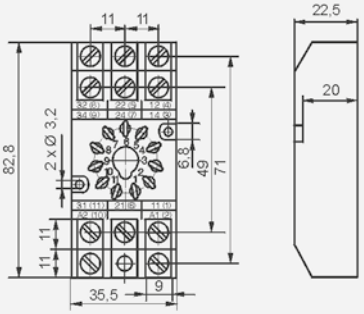
Connection diagram



Mounting dimensions



Dimensions



Accessories

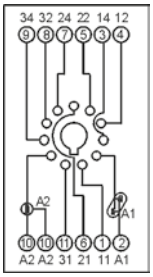
GZ 1050

GZP11

For R15 - 3 CO

Screw terminals
Max. tightening moment
for the terminal: 0,5 Nm
35 mm rail mount
acc. to PN-EN 60715
or on panel mounting
73 x 38,2 x 27,2 mm
Three poles
12 A, 300 V AC

Connection diagram



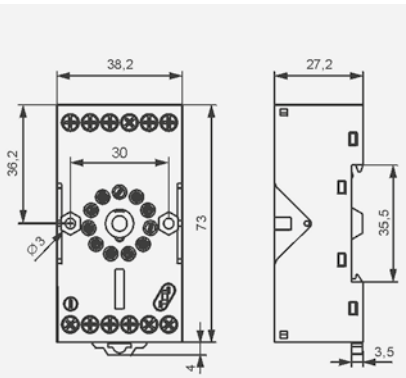
Time module COM3

GZP-0054

GZP-0035

Accessories

Dimensions



GOP11

For R15 - 3 CO

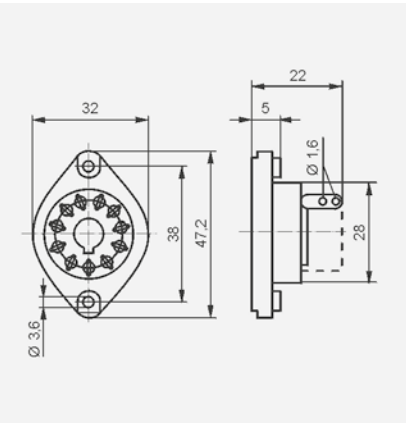
Solder terminals
47,2 x 32 x 22 mm
Three poles
10 A, 250 V AC

R159 1051

R15 5922

Accessories

Dimensions

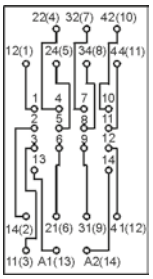


GZ14U

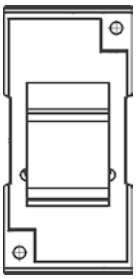
For R15 - 4 CO

Screw terminals
Max. tightening moment
for the terminal: 0,7 Nm
35 mm rail mount
acc. to PN-EN 60715
96,8 x 46,4 x 33,3 mm
Four poles
10 A, 250 V AC

Connection diagram



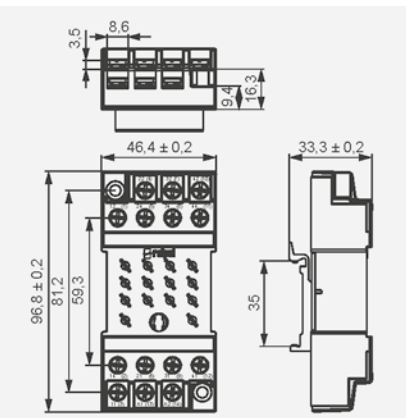
Adaptor



GZ14 0737

Accessories

Dimensions

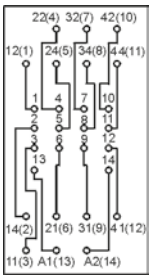


GZ14

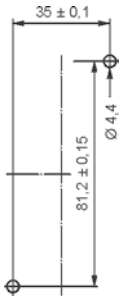
For R15 - 4 CO

Screw terminals
Max. tightening moment
for the terminal: 0,7 Nm
On panel mounting
96,8 x 46,4 x 24,5 mm
Four poles
10 A, 250 V AC

Connection diagram



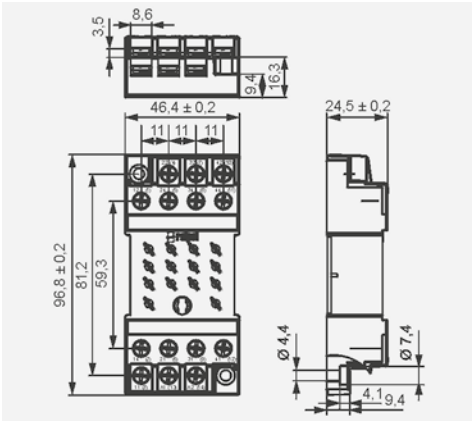
Mounting dimensions



Accessories

GZ14 0737

Dimensions

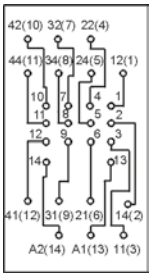


GZ14Z

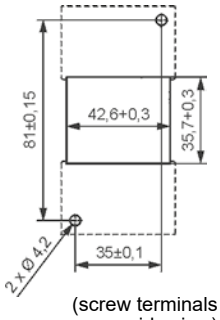
For R15 - 4 CO

Screw terminals
Max. tightening moment
for the terminal: 0,7 Nm
On panel mounting, behind
92,2 x 46 x 23 mm
Four poles
10 A, 250 V AC

Connection diagram



Mounting dimensions

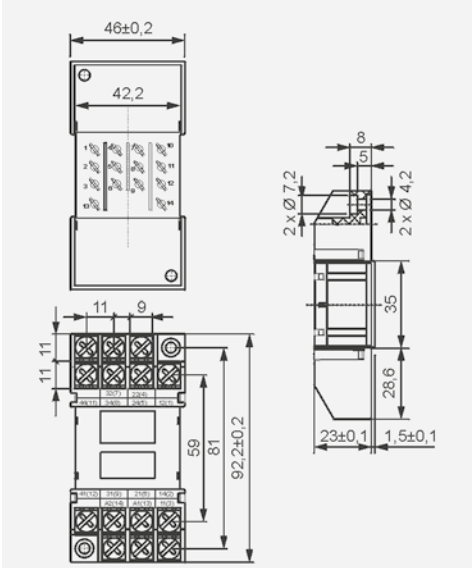


(screw terminals side view)

Accessories

GZ14 0737

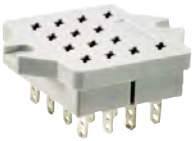
Dimensions



GOP14

For R15 - 4 CO

Solder terminals
50 x 42 x 23 mm
Four poles
10 A, 250 V AC

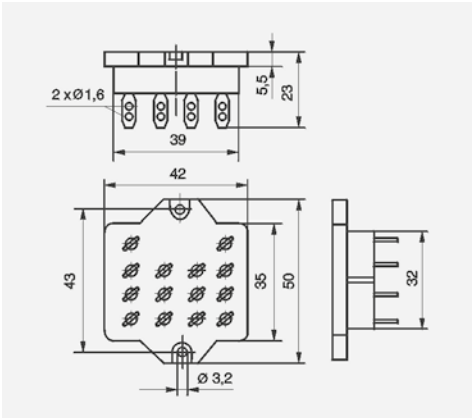


Accessories

R15 0736

R15 5922

Dimensions



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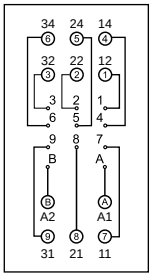
GUC11 ❽

For RUC faston 4,8x0,5, RUC-M

Screw terminals
Max. tightening moment
for the terminal: 0,7 Nm
35 mm rail mount
acc. to PN-EN 60715
or on panel mounting
81,5 x 42,2 x 26,5 mm
Three poles
16 A, 250 V AC

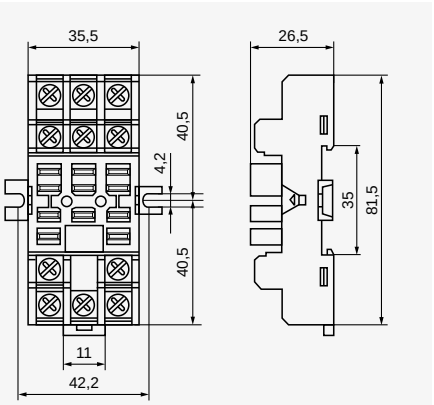
Connection diagram



Accessories

MBA

Dimensions

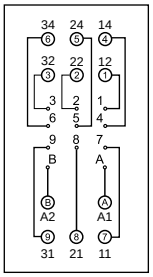


GUC11S ❽

For RUC faston 4,8x0,5, RUC-M

Screw terminals
Max. tightening moment
for the terminal: 0,7 Nm
35 mm rail mount
acc. to PN-EN 60715
81,5 x 35,5 x 26,5 mm
Three poles
16 A, 250 V AC

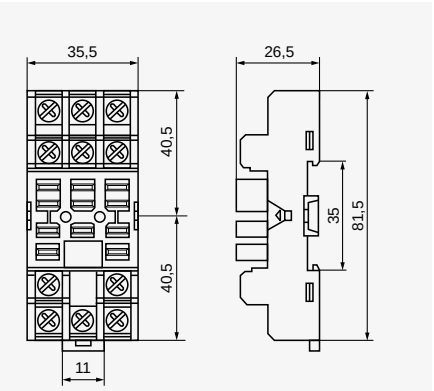
Connection diagram



Accessories

MBA

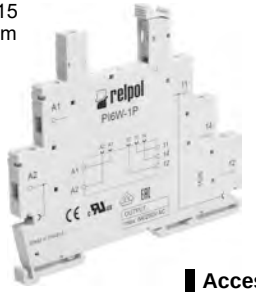
Dimensions



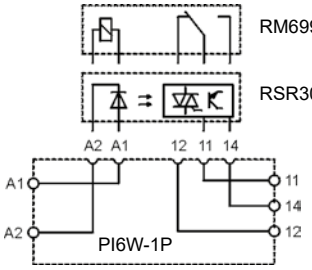
PI6W-1P

For RM699BV, RSR30 ❾

Screw terminals
Max. tightening moment
for the terminal: 0,3 Nm
35 mm rail mount
acc. to PN-EN 60715
98,5 x 6,2 x 85,5 mm
One pole
6 A, 250 V AC



Connection diagram

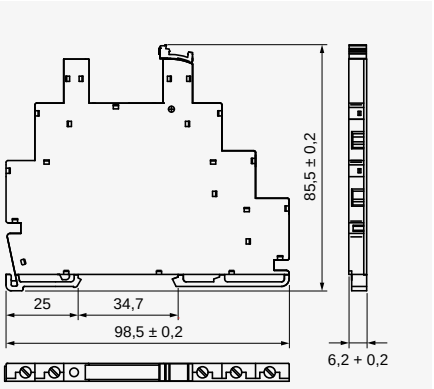


Accessories

ZG20

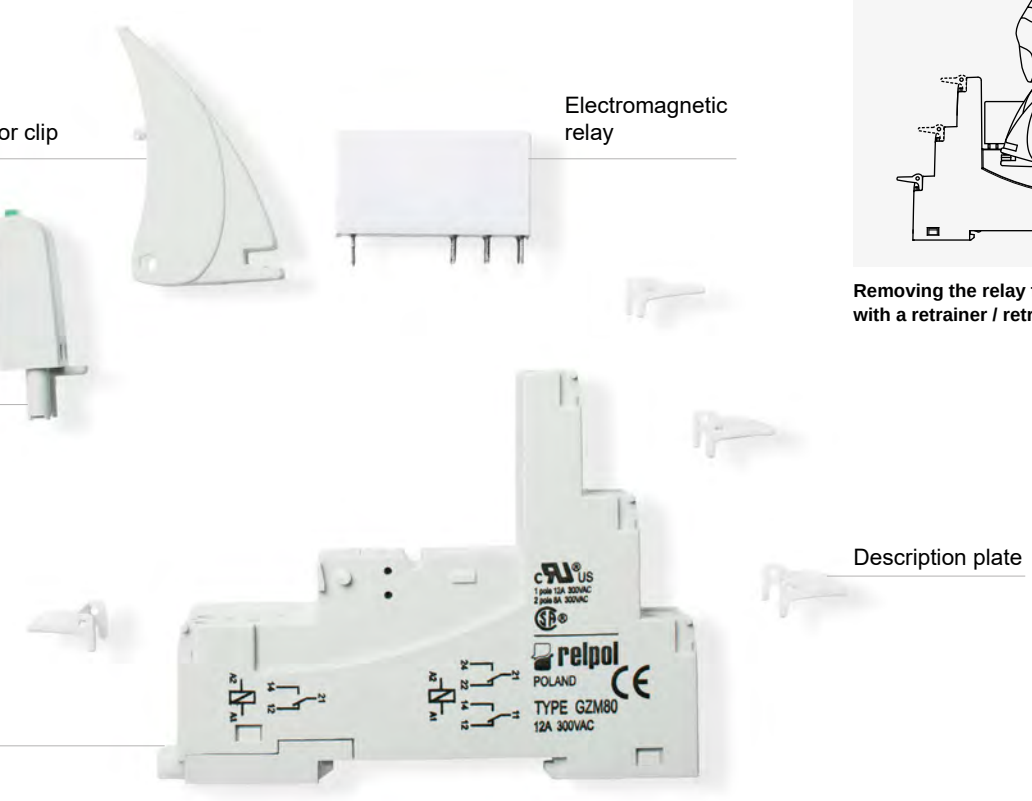
PI6W-1246

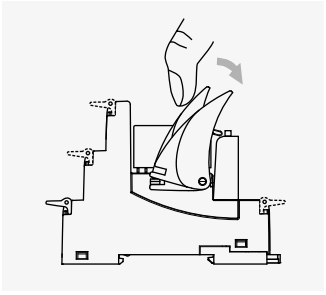
Dimensions



❽ For RUC faston 4,8 x 0,5 and RUC-M, with GUC11 or GUC11S socket, max. switching voltages and coil voltages of relays are limited to 250 V AC / DC.
❾ Solid state relays type **RSR30** - see www.relpol.com.pl

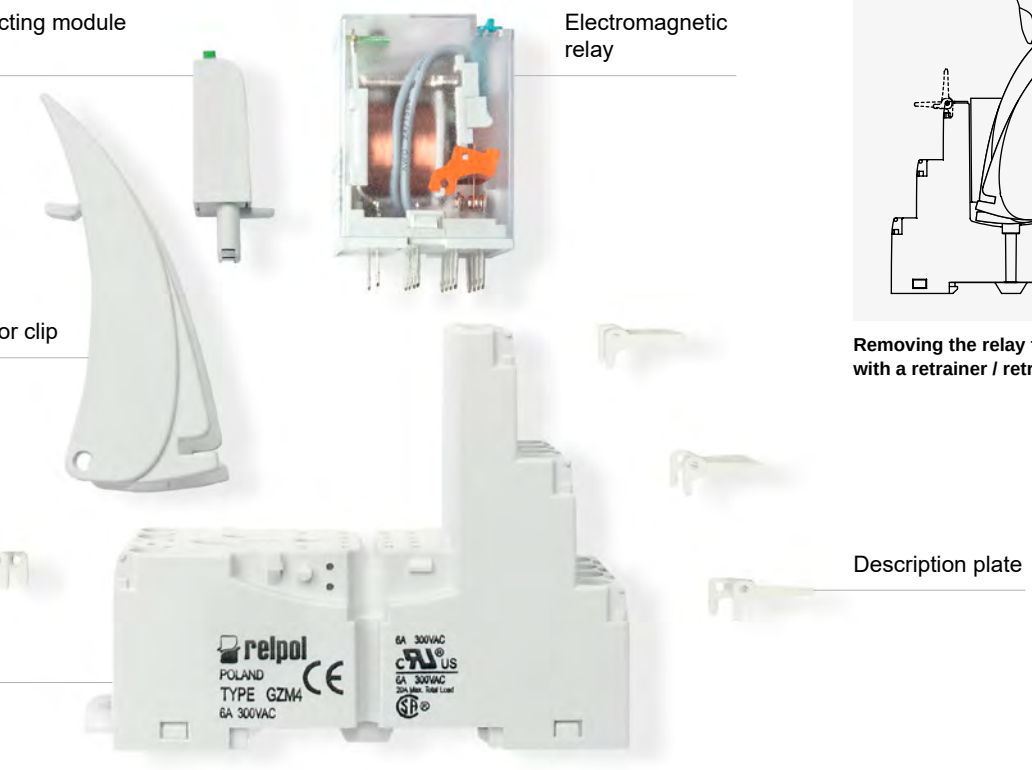
Miniature relays

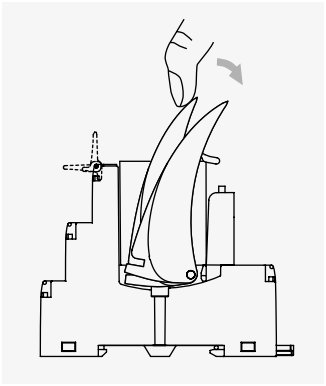




Removing the relay from the socket with a retrainer / retractor clip

Miniature industrial relays





Removing the relay from the socket with a retrainer / retractor clip

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The relays not specified in the table are designed for other manners of mounting.

Type of relay	Plug-in sockets			
	Screw terminals			
	on panel mounting	35 mm rail mount acc. to PN-EN 60715	**Spring terminals**	For PCB
Miniature relays				
RM699BV, RSR30 ❶	–	PI6W-1P	–	–
RM84, RM85, RM85 inrush, RM85 105 °C sensitive, RM87L, RM87L sensitive, RM87P, RM87P sensitive	(GZT80, GZM80 ❷), (GZS80, GZF80 ❸)	(GZT80, GZM80 ❷), (GZS80, GZF80 ❸)	GZMB80 ❹	(EC 50, PW80, GD50 ❺)
RM87N, RM87N sensitive	(GZT92, GZM92 ❷), GZS92 ❸	(GZT92, GZM92 ❷), GZS92 ❸	–	(EC 35, GD35 ❺)
RM96 1 CO	ES 32	ES 32	–	–
RM83	–	–	–	(EC 50, PW80, GD50 ❺)
RMP84, RMP85	GZF80 ❸	GZF80 ❸	GZMB80 ❹	(EC 50, GD50 ❺)
Miniature industrial relays				
R2N	(GZT2, GZM2 ❻)	(GZT2, GZM2 ❻)	GZMB2 ❾	SU4/2D ❿
R3N	GZT3, GZM3	GZT3, GZM3	–	–
R4N	(GZT4, GZM4 ❻) GZ4 ❼, GS4 ❽	(GZT4, GZM4 ❻) GZ4 ❼, GS4 ❽	GZMB4 ❾	SU4D ❿
RY2	GZY2G	GZY2G	–	–
R2M	GZ2 ❶	GZ2 ❶	–	S2M ❷
Industrial relays of small dimensions				
R15 - 2 CO	PZ8 ❸, GZ8 ❹, GZP8 ❺	PZ8 ❸, GZU8 ❹, GZP8 ❺	–	–
R15 - 3 CO	(PS11, PZ11 ❸), GZ11 ❹, GZP11 ❺	(PS11, PZ11 ❸), GZU11 ❹, GZP11 ❺	–	–
R15 - 4 CO	GZ14, GZ14Z	GZ14U	–	–
RUC faston 4,8x0,5, RUC-M	GUC11	GUC11, GUC11S	–	–
Time relays				
T-R4	GZT4, GZM4 ❼	GZT4, GZM4 ❼	GZMB4 ❼	–

❶ Solid state relays type **RSR30** - see www.relpol.com.pl ❷ For sockets GZT80, GZT92, GZM80, GZM92 apply retainer / retractor clips GZT80-0040 or spring wire clips GZM80-0041 and description plates GZT80-0035 ❸ For sockets GZS80, GZS92 apply retainer / retractor clips GZS-0040 or spring wire clips GZM80-0041 and description plates TR. For sockets GZF80 apply spring wire clips GZM80-0041, GZM80-0025. For sockets GZF80 not applicable modules type M... and interconnection strips ZGGZ80 ❹ For sockets GZMB80 apply retainer / retractor clips GZMB80-0040, GZMB80-0025 or spring wire clips GZM80-0041, GZM80-0025 and description plates TR. For sockets GZMB80 not applicable interconnection strips ZGGZ80 ❺ For sockets EC 35, EC 50, GD35, GD50 apply: plastic clips MP16-2, MP25-2; spring wire clips MH16-2, MH25-2. For sockets GD35, GD50 apply also spring wire clips GD-0016. For sockets PW80 apply spring wire clips MH16-2, MH25-2 ❻ For sockets GZT2, GZT4, GZM2, GZM4 apply retainer / retractor clips GZT4-0040 or spring wire clips G4 1052 and description plates GZT4-0035 ❼ For sockets GZ4 apply spring wire clips G4 1052 ❽ For sockets GS4 apply spring wire clips GS4-0036 and description plates GS4-0035 ❾ For sockets GZMB2, GZMB4 apply retainer / retractor clips GZMB4-0040 or spring wire clips G4 1052 and description plates TR. For sockets GZMB2, GZMB4 not applicable interconnection strips ZGGZ4 ❿ For sockets SU4/2D, SU4D, SU4/2L, SU4L, G4/2, G4 apply spring wire clips G4 1053. For sockets SU4/2L, SU4L apply also spring clamps G4 1040

Relays mounting options are specified in the table - see pages 20-23

Sockets	Accessories			
Solder terminals	Retainer / retractor clips	Spring wire clips	Description plates	Additional features
–	–	–	PI6W-1246	ZG20
–	GZT80-0040 ❷, GZS-0040 ❸, GZMB80-0040 ❹	GZM80-0041 ❷ ❸ ❹, (MP16-2, MH16-2, GD-0016 ❺)	GZT80-0035 ❷, TR ❸ ❹	M... ❸, ZGGZ80 ❸ ❹
–	GZT80-0040 ❷, GZS-0040 ❸	GZM80-0041 ❷ ❸, (MP16-2, MH16-2, GD-0016 ❺)	GZT80-0035 ❷, TR ❸	M..., ZGGZ80
–	MS 16, GZMB80-0040	GZM80-0041	TR	M..., ZGGZ80
–	–	(MP25-2, MH25-2 ❺)	–	–
–	GZMB80-0025 ❹	GZM80-0025 ❸ ❹, MH25-2 ❺	TR ❹	M... ❸
SU4/2L, G4/2 ❿	GZT4-0040 ❻, GZMB4-0040 ❾	G4 1052 ❻ ❼ ❾, G4 1053 ❿	GZT4-0035 ❻, TR ❾	M..., ZGGZ4 ❾, R4P-0001, R4W-0003
–	GZT4-0040	G4 1052	GZT4-0035	M..., ZGGZ4, R4P-0001, R4W-0003
SU4L, G4 ❿	GZT4-0040 ❻, GZMB4-0040 ❾	G4 1052 ❻ ❼ ❾, GS4-0036 ❽, G4 1053 ❿	GZT4-0035 ❻, GS4-0035 ❽, TR ❾	M... ❼, ZGGZ4 ❾, R4P-0001, R4W-0003
–	–	–	–	–
G2M ❷	–	GZ2 1060 ❶, G4 1050 ❷	–	–
GOP8 ❻	–	PZ11 0031 ❸, (GZ 1050, GZU 1052 ❹), GZP-0054 ❺, R159 1051 ❻	GZP-0035 ❺	R15-M404, R15-M203, COM3 ❺
GOP11 ❻	–	PZ11 0031 ❸, (GZ 1050, GZU 1052 ❹), GZP-0054 ❺, R159 1051 ❻	GZP-0035 ❺	R15-M404, R15-M203, COM3 ❺
GOP14 ❻	–	GZ14 0737 , R15 0736 ❻	–	–
–	–	MBA	–	–
–	–	TR4-2000	GZT4-0035, TR ❼	ZGGZ4 ❼

❶ For sockets GZ2 apply spring wire clips GZ2 1060 and spring clamps GZ2 1111 ❷ For sockets S2M, G2M apply spring wire clips G4 1050. For sockets G2M apply also spring clamps G2M 1020 ❸ For sockets PZ8, PS11, PZ11 apply spring wire clips PZ11 0031 ❹ For sockets GZ8, GZ11 apply spring wire clips GZ 1050. For sockets GZU8, GZU11 apply spring wire clips GZU 1052 ❺ For sockets GZP8, GZP11 apply spring wire clips GZP-0054, description plates GZP-0035 and time modules COM3 ❻ For sockets GOP8, GOP11 apply spring wire clips R159 1051 and spring clamps R15 5922. For sockets GOP14 apply spring wire clips R15 0736 and spring clamps R15 5922 ❼ For sockets GZT4, GZM4 apply description plates GZT4-0035. For sockets GZMB4 apply description plates TR. For sockets GZMB4 not applicable interconnection strips ZGGZ4

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Type	Terminals	Signs credits	Insulation (PN-EN 60664-1)		
				Dielectric strength 50/60 Hz, 1 min.	
			Rated load	between coil and contacts	pole - pole
For RM699BV, RSR30 ❶					
PI6W-1P	screw terminals	cЯUus, VDE, CE, EAC	6 A / 300 V AC	4 000 V AC	–
For RM84, RM85..., RM87L..., RM87P...					
GZT80	screw terminals	ЯUus, CSA, CE, EAC	12 A / 300 V AC	5 000 V AC	3 000 V AC
GZM80	screw terminals	cЯUus, CSA, CE, EAC	12 A / 300 V AC	5 000 V AC	3 000 V AC
GZS80	screw terminals	cЯUus, CE, EAC	10 A / 300 V AC	4 000 V AC	2 500 V AC
For RM84, RM85..., RM87L..., RM87P..., RM83, RMP84, RMP85					
GZF80	screw terminals	CE, EAC	10 A / 250 V AC	2 000 V AC	3 000 V AC
GZMB80	spring terminals	cЯUus, CE, EAC	10 A / 300 V AC	4 000 V AC	4 000 V AC
EC 50	for PCB	EAC	8 A / 300 V AC	2 500 V AC	2 500 V AC
PW80	for PCB	EAC	8 A / 250 V AC	2 000 V AC	2 000 V AC
GD50	for PCB	ЯU, EAC	8 A / 300 V AC	2 000 V AC	2 000 V AC
For RM87N...					
GZT92	screw terminals	cЯUus, CSA, CE, EAC	12 A / 300 V AC	5 000 V AC	–
GZM92	screw terminals	cЯUus, CSA, CE, EAC	12 A / 300 V AC	5 000 V AC	–
GZS92	screw terminals	cЯUus, CE, EAC	12 A / 300 V AC	4 000 V AC	–
EC 35	for PCB	EAC	12 A / 300 V AC	2 500 V AC	–
GD35	for PCB	ЯU, EAC	12 A / 300 V AC	2 000 V AC	–
For RM96 1 CO					
ES 32	screw terminals	CE, EAC	12 A / 300 V AC	2 500 V AC	–
For miniature relays					
EC 32	for PCB	EAC	12 A / 300 V AC	2 500 V AC	–
For R2N					
GZT2	screw terminals	cЯUus, CSA, CE, EAC	12 A / 300 V AC	3 000 V AC	3 000 V AC
GZM2	screw terminals	cЯUus, CSA, CE, EAC	12 A / 300 V AC	4 000 V AC	3 000 V AC
GZMB2	spring terminals	ЯU, CSA, CE, EAC	10 A / 300 V AC	4 000 V AC	4 000 V AC
SU4/2D	for PCB	cЯUus, CSA, EAC	12 A / 250 V AC	2 500 V AC	2 500 V AC
SU4/2L	solder terminals	cЯUus, CSA, CE, EAC	12 A / 250 V AC	2 500 V AC	2 500 V AC
G4/2	solder terminals	cЯUus, CSA, CE, EAC	12 A / 250 V AC	2 500 V AC	2 500 V AC
For R3N					
GZT3	screw terminals	cЯUus, CSA, CE, EAC	10 A / 300 V AC	3 000 V AC	3 000 V AC
GZM3	screw terminals	cЯUus, CSA, CE, EAC	10 A / 300 V AC	4 000 V AC	3 000 V AC

❶ Solid state relays type **RSR30** - see www.relpol.com.pl

General data			Connections (mounting)			
Number of poles	Weight	Ambient temperature (operating)	Protection category (PN-EN 60529)	Max. cross section of the cables (stranded)	Length of the cable deinsulation	Max. tightening moment for the terminal
1	40 g	-40...+55 °C	IP 20	1 x 2,5 / 2 x 1,5 mm^2	9 mm	0,3 Nm
2	45 g	-40...+70 °C	IP 20	2 x 2,5 mm^2	6,5 mm	0,7 Nm
2	44 g	-40...+70 °C	IP 20	2 x 2,5 mm^2	6,5 mm	0,7 Nm
2	37 g	-40...+85 °C	IP 20	2 x 2,5 mm^2	6,5 mm	–
2	30 g	-40...+70 °C	IP 20	1 x 4 / 2 x 2,5 mm^2	7 mm	0,5 Nm
2	41,8 g	-25...+85 °C	IP 20	1 x 0,2...1,5 mm^2	9...11 mm	0,5 Nm
2	4 g	-40...+85 °C	–	–	–	–
2	4 g	-40...+85 °C	–	–	–	–
2	4 g	-40...+85 °C	–	–	–	–
1	38 g	-40...+70 °C	IP 20	2 x 2,5 mm^2	6,5 mm	0,7 Nm
1	40 g	-40...+70 °C	IP 20	2 x 2,5 mm^2	6,5 mm	0,7 Nm
1	33 g	-40...+85 °C	IP 20	2 x 2,5 mm^2	6,5 mm	0,5 Nm
1	4 g	-40...+85 °C	–	–	–	–
1	4 g	-40...+85 °C	–	–	–	–
1	37 g	-40...+85 °C	IP 20	2 x 2,5 mm^2	6,5 mm	0,5 Nm
1	4 g	-40...+85 °C	–	–	–	–
2	52 g	-40...+70 °C	IP 20	2 x 2,5 mm^2	6,5 mm	0,7 Nm
2	68 g	-40...+70 °C	IP 20	2 x 2,5 mm^2	6,5 mm	0,7 Nm
2	65 g	-25...+85 °C	IP 20	1 x 0,2...1,5 mm^2	9...11 mm	–
2	6 g	-40...+70 °C	–	–	–	–
2	6 g	-40...+70 °C	–	2 x 0,75 mm^2	–	–
2	6 g	-40...+70 °C	–	2 x 0,75 mm^2	–	–
3	60 g	-40...+70 °C	IP 20	2 x 2,5 mm^2	6,5 mm	0,7 Nm
3	68 g	-40...+70 °C	IP 20	2 x 2,5 mm^2	6,5 mm	0,7 Nm

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Type	Terminals	Signs credits	Insulation (PN-EN 60664-1)		
				Dielectric strength 50/60 Hz, 1 min.	
			Rated load	between coil and contacts	pole - pole
For R4N, T-R4					
GZT4	screw terminals	cЯUus, CSA, CE, EAC, LR	6 A / 300 V AC	3 000 V AC	3 000 V AC
GZM4	screw terminals	cЯUus, CSA, CE, EAC	6 A / 250 V AC	4 000 V AC	3 000 V AC
GZMB4	spring terminals	ЯU, CSA, CE, EAC	10 A / 300 V AC	4 000 V AC	4 000 V AC
For R4N					
GZ4	screw terminals	CE, EAC	10 A / 300 V AC	2 500 V AC	2 000 V AC
GS4	screw terminals	cЯUus, CE, EAC	6 A / 250 V AC	2 500 V AC	2 000 V AC
SU4D	for PCB	cЯUus, CSA, EAC	6 A / 250 V AC	2 500 V AC	2 000 V AC
SU4L	solder terminals	cЯUus, CSA, CE, EAC	6 A / 250 V AC	2 500 V AC	2 000 V AC
G4	solder terminals	cЯUus, CSA, CE, EAC	6 A / 250 V AC	2 500 V AC	2 000 V AC
For RY2					
GZY2G	screw terminals	CE, EAC	12 A / 250 V AC	2 000 V AC	2 000 V AC
For R2M					
GZ2	screw terminals	CE, EAC	7 A / 250 V AC	2 000 V AC	2 000 V AC
S2M	for PCB	cЯUus, EAC	5 A / 250 V AC	2 000 V AC	2 000 V AC
G2M	solder terminals	cЯUus, CE, EAC	5 A / 250 V AC	2 000 V AC	2 000 V AC
For R15 - 2 CO					
PZ8	screw terminals	ЯU, CSA, CE, EAC, LR	10 A / 250 V AC	2 500 V AC	2 500 V AC
GZU8	screw terminals	ЯU, CSA, CE, EAC	10 A / 300 V AC	2 500 V AC	2 500 V AC
GZ8	screw terminals	CSA, CE, EAC	10 A / 300 V AC	2 500V AC	2 500 V AC
GZP8	screw terminals	cЯUus, CE, EAC	12 A / 300 V AC	4 000 V AC	2 500 V AC
GOP8	solder terminals	CE, EAC	10 A / 250 V AC	2 000 V AC	2 000 V AC
For R15 - 3 CO					
PS11	screw terminals	ЯU, CSA, CE, EAC, LR	10 A / 250 V AC	2 000 V AC	2 000 V AC
PZ11	screw terminals	ЯU, CSA, CE, EAC, LR	10 A / 250 V AC	2 000 V AC	2 000 V AC
GZU11	screw terminals	ЯU, CSA, CE, EAC	10 A / 250 V AC	2 000 V AC	2 000 V AC
GZ11	screw terminals	CSA, CE, EAC	10 A / 250 V AC	2 000 V AC	2 000 V AC
GZP11	screw terminals	cЯUus, CE, EAC	12 A / 300 V AC	2 500 V AC	2 000 V AC
GOP11	solder terminals	CE, EAC	10 A / 250 V AC	2 000 V AC	2 000 V AC
For R15 - 4 CO					
GZ14U	screw terminals	CSA, CE, EAC	10 A / 250 V AC	2 000 V AC	2 000 V AC
GZ14	screw terminals	CSA, CE, EAC	10 A / 250 V AC	2 000 V AC	2 000 V AC
GOP14	solder terminals	CE, EAC	10 A / 250 V AC	2 000 V AC	2 000 V AC
GZ14Z	screw terminals	CE, EAC	10 A / 250 V AC	2 000 V AC	2 000 V AC
For RUC faston 4,8 x 0,5, RUC-M					
GUC11	screw terminals	CE, EAC	16 A / 250 V AC	2 000 V AC	2 000 V AC
GUC11S	screw terminals	CE, EAC	16 A / 250 V AC	2 000 V AC	2 000 V AC

General data			Connections (mounting)			
Number of poles	Weight	Ambient temperature (operating)	Protection category (PN-EN 60529)	Max. cross section of the cables (stranded)	Length of the cable deinsulation	Max. tightening moment for the terminal
4	64 g	-40...+70 °C	IP 20	2 x 2,5 mm^2	6,5 mm	0,7 Nm
4	74 g	-40...+70 °C	IP 20	2 x 2,5 mm^2	6,5 mm	0,7 Nm
4	75 g	-25...+85 °C	IP 20	1 x 0,2...1,5 mm^2	9...11 mm	–
4	40 g	-40...+70 °C	IP 20	2 x 1,5 mm^2	7 mm	0,7 Nm
4	40 g	-40...+70 °C	IP 20	2 x 1,5 mm^2	7 mm	0,7 Nm
4	7 g	-40...+70 °C	–	–	–	–
4	7 g	-40...+70 °C	–	–	–	–
4	8 g	-40...+70 °C	–	2 x 0,75 mm^2	–	–
2	54 g	-25...+55 °C	IP 20	2 x 2,5 mm^2	7 mm	0,7 Nm
2	35 g	-40...+70 °C	IP 00	2 x 2,5 mm^2	7 mm	0,7 Nm
2	8 g	-40...+70 °C	–	–	–	–
2	8 g	-40...+70 °C	–	–	–	–
2	55 g	-40...+70 °C	IP 20	2 x 2,5 mm^2	7 mm	0,7 Nm
2	70 g	-40...+70 °C	IP 00	2 x 2,5 mm^2	9,5 mm	0,7 Nm
2	80 g	-40...+70 °C	IP 00	2 x 2,5 mm^2	9,5 mm	0,7 Nm
2	50 g	-40...+70 °C	IP 20	2 x 2,5 mm^2	6,5 mm	0,5 Nm
2	25 g	-40...+70 °C	–	–	–	–
3	55 g	-40...+70 °C	IP 20	2 x 2,5 mm^2	7 mm	0,7 Nm
3	55 g	-40...+70 °C	IP 20	2 x 2,5 mm^2	7 mm	0,7 Nm
3	70 g	-40...+70 °C	IP 00	2 x 2,5 mm^2	9,5 mm	0,7 Nm
3	80 g	-40...+70 °C	IP 00	2 x 2,5 mm^2	9,5 mm	0,7 Nm
3	55 g	-40...+70 °C	IP 20	2 x 2,5 mm^2	6,5 mm	0,5 Nm
3	27 g	-40...+70 °C	–	–	–	–
4	120 g	-40...+70 °C	IP 20	2 x 2,5 mm^2	9,5 mm	0,7 Nm
4	120 g	-40...+70 °C	IP 20	2 x 2,5 mm^2	9,5 mm	0,7 Nm
4	35 g	-40...+70 °C	–	–	–	–
4	120 g	-40...+55 °C	IP 00	2 x 2,5 mm^2	9,5 mm	0,7 Nm
3	75 g	-40...+70 °C	IP 00	2 x 2,5 mm^2	9 mm	0,7 Nm
3	72 g	-40...+70 °C	IP 00	2 x 2,5 mm^2	9 mm	0,7 Nm

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PI85-...-MS-...
(RM85 + GZM80)

ZGGZ80

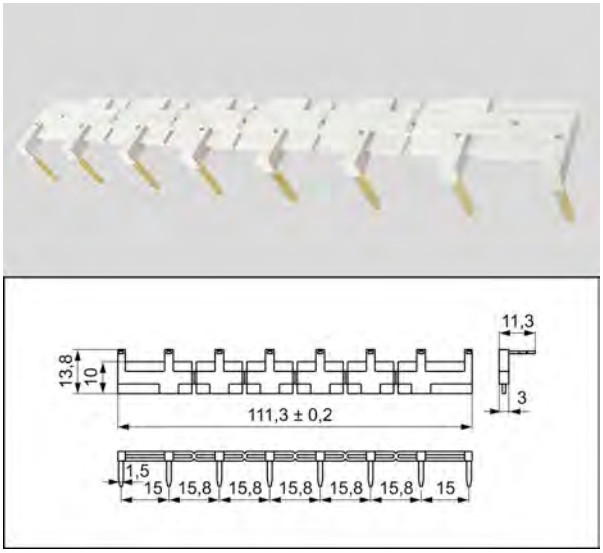
ZGGZ80 for:

Plug-in sockets	Relays for plug-in sockets	Interface relays ❸
GZT80	RM84, RM85, RM85 inrush, RM85 105 °C sensitive, RM87L ❹, RM87P ❹, RM87N ❹	PI84-...-TS-... (RM84 + GZT80)
GZM80		PI84-...-MS-... (RM84 + GZM80)
GZS80		PI85-...-TS-... (RM85 + GZT80)
GZT92		(RM85 inrush + GZT80)
GZM92		PI85-...-MS-... (RM85 + GZM80)
GZS92		
ES 32	RM96 1 CO	

❸ Interface relay **PI84** (**PI85**) is offered as a **set**: plug-in socket **GZT80** or **GZM80** + miniature relay **RM84** (**RM85**) + signalling / protecting module **type M...** + retainer / retractor clip **GZT80-0040** + description plate **GZT80-0035**. ❹ Also versions RM87. sensitive

Interconnection strip ZGGZ80

- designed for the co-operation with plug-in sockets of miniature relays and with interface relays PI84 and PI85, which are equipped with screw terminals; sockets and relays are mounted on 35 mm rail mount acc. to PN-EN 60715,
- bridges common input signals (coil terminals A1 or A2) or output signals - see photo at the top,
- maximum permissible current is 10 A / 250 V AC,
- possibility of connection of 8 sockets or relays,
- colours of strips: **ZGGZ80-1** grey, **ZGGZ80-2** black.



PIR2-...-00L.
(R2N + GZM2)

ZGGZ4

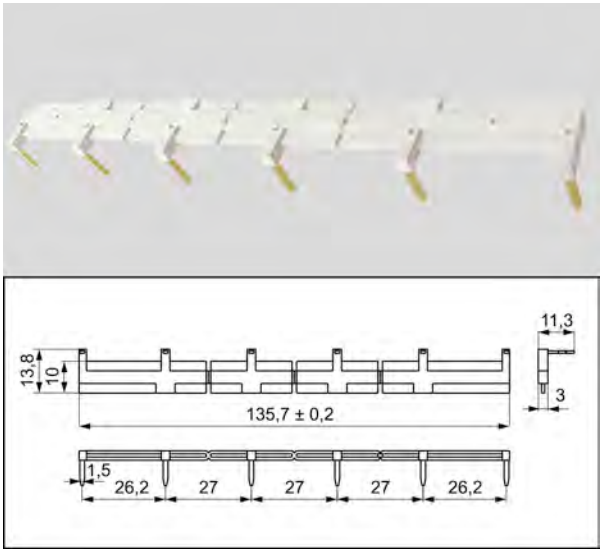
ZGGZ4 for:

Plug-in sockets	Relays for plug-in sockets	Interface relays ❺
GZT2	R2N	PIR2-...-00L. (R2N + GZM2)
GZM2		PIR3-...-00L. (R3N + GZM3)
GZT3	R3N	PIR4-...-00L. (R4N + GZM4)
GZM3		
GZT4	R4N	
GZM4		

❺ Interface relay **PIR2** (**PIR3**, **PIR4**) is offered as a **set**: plug-in socket **GZM2** (**GZM3**, **GZM4**) + miniature industrial relay **R2N** (**R3N**, **R4N**) + signalling / protecting module **type M...** + retainer / retractor clip **GZT4-0040** + description plate **GZT4-0035**.

Interconnection strip ZGGZ4

- designed for the co-operation with plug-in sockets of miniature industrial relays and with interface relays PIR2, PIR3 and PIR4, which are equipped with screw terminals; sockets and relays are mounted on 35 mm rail mount acc. to PN-EN 60715,
- bridges common input signals (coil terminals A1 or A2) or output signals - see photo at the top,
- maximum permissible current is 10 A / 250 V AC,
- possibility of connection of 6 sockets or relays,
- colours of strips: **ZGGZ4-1** grey, **ZGGZ4-2** black.



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Industrial relays for plug-in sockets: R2N, R3N, R4N, R15 - 2 CO ❼, R15 - 3 CO ❼ **with WT features as standard** (**W** - mechanical indicator + **T** - lockable front test button). **Detailed information** on additional features of individual relays can be found in the data sheets on the side of "Ordering codes".

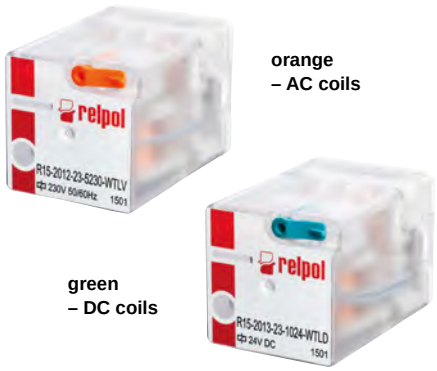
Note:
While the relay operates, the test button of the **T** type becomes heated. In order to push the test button manually, you should first turn the supply voltage off, and wait some time until the button becomes colder (or push the button immediately using a protective glove or an insulated tool). The button shall be pushed smoothly and quickly. The normally open contacts are closed with the button for the time during which the button is pushed. Releasing the button opens the normally open contacts. Normally open contacts may be closed with the blocking function of the button (it shall be turned by 90°). When the button is turned back, the normally open contacts are opened.

Type ❻	Description	For industrial relays
W	mechanical indicator	R2N, R3N, R4N, (R15 - 2 CO, 3 CO ❼)
T	lockable front test button, orange colour - AC coils, green colour - DC coils	R2N, R3N, R4N, (R15 - 2 CO, 3 CO ❼)
L	light indicator (LED diode), located inside the relay	R2N, R3N, R4N, RY2, (R15 - 2 CO, 3 CO, 4 CO ❼) RUC, RUC-M
D	surge suppression element (diode) - only for DC coils	R2N, R3N, R4N, RY2, (R15 - 2 CO, 3 CO, 4 CO ❼)
V	surge suppression element (varistor) - only for AC coils	(R15 - 2 CO, 3 CO ❼)
K	test button without block function	(R15 - 4 CO ❼), RUC

❻ Available combinations:
WT, WTL, WTD, WTLD - in relays R2N, R3N, R4N for plug-in sockets
L, D, LD - in relays RY2 for plug-in sockets
WT, WTL, WTD, WTLD, WTV, WTLV - in relays R15 - 2 CO, 3 CO for plug-in sockets
K, L, D, KL, KD, LD, KLD - in relays R15 - 4 CO for plug-in sockets
K, L, KL - in relays RUC
L - in relays RUC-M
❼ Voltage versions, in covers

Test buttons type T R2N, R3N, R4N

Test buttons type T R15 - 2 CO, 3 CO



Test buttons (no latching) are recommended for R2N...WT, R3N...WT, R4N...WT, R15...WT 2 CO, R15...WT 3 CO relays - **for applications that do not allow permanent contact latching**. By manual operation (pressing the button) relay contacts can get switched for as long time as long the button is pressed. Contacts return to initial position as soon as pressure is released from the button. Those operations can be done while the coil is deenergized [8].

Button **R4P-0001** or **R15-M404** can be easily inserted by the Customer after removal of button type **T** (see Fig. 2). Button type **T** can be removed with screwdriver as shown on Fig. 1.

[8] While the relay operates, the test button becomes heated. In order to push the test button manually, you should first turn the supply voltage off, and wait some time until the button becomes colder (or push the button immediately using a protective glove or an insulated tool). The button shall be pushed smoothly and quickly.

Fig. 1

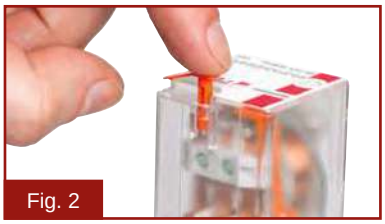
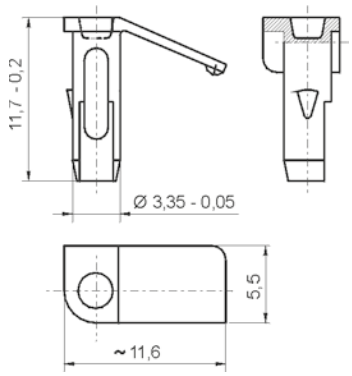


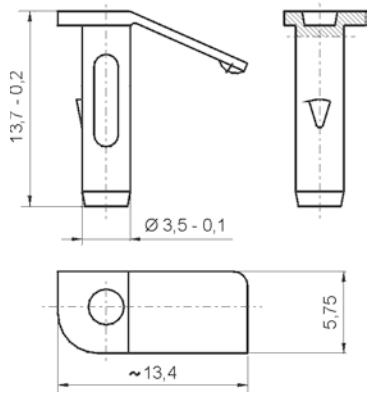
Fig. 2

Dimensions - test button **R4P-0001**
for **R2N...WT, R3N...WT, R4N...WT**



Types of buttons:
R4P-0001-A - orange colour (AC coils)
R4P-0001-D - green colour (DC coils)

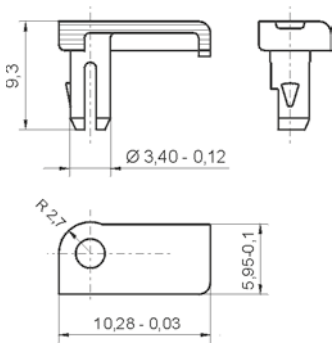
Dimensions - test button **R15-M404**
for **R15...WT 2 CO, R15...WT 3 CO**



Types of buttons:
R15-M404-A - orange colour (AC coils)
R15-M404-D - green colour (DC coils)

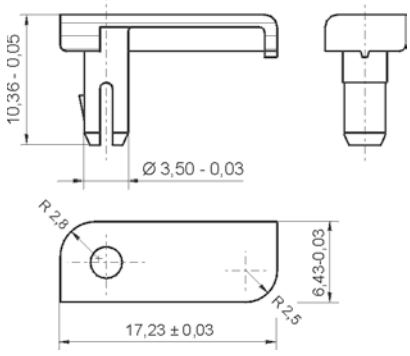
Plugs R4W-0003 or **R15-M203** can substitute button type **T if manual operation (latching and testing) is not allowed**. Changing button type **T** for plug can be done by Customer themselves in the same way as changing button type **T** for button (no latching).

Dimensions - plug **R4W-0003**
for **R2N...WT, R3N...WT, R4N...WT**



Types of plugs:
R4W-0003-A - orange colour (AC coils)
R4W-0003-D - green colour (DC coils)

Dimensions - plug **R15-M203**
for **R15...WT 2 CO, R15...WT 3 CO**



Types of plugs:
R15-M203-A - orange colour (AC coils)
R15-M203-D - green colour (DC coils)

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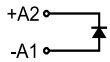
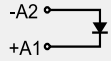
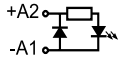
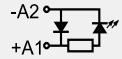
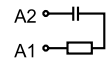
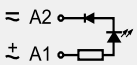
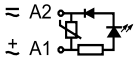
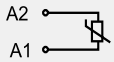
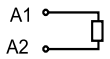
For sockets type:
GZT80, GZM80, GZS80, GZMB80, GZT92, GZM92, GZS92, ES 32, GZT2, GZM2, GZMB2, GZT3, GZM3, GZT4, GZM4, GZMB4

Modules type M... are parallely connected with relay coil.
Polarity P: -A1/+A2. Polarity N: +A1/-A2.

Modules type M...	Layout	Voltage	Type of module ❶ ❷
Module D (polarization P) It limits overvoltage on DC coils.		6/230 V DC	M21P
Module D (polarization N) It limits overvoltage on DC coils.		6/230 V DC	M21N
Module LD (polarization P) It limits overvoltage on DC coils. Coil energizing indication.		6/24 V DC 24/60 V DC 110/230 V DC	M31R, M31G M32R, M32G M33R, M33G
Module LD (polarization N) It limits overvoltage on DC coils. Coil energizing indication.		6/24 V DC 24/60 V DC 110/230 V DC	M41R, M41G M42R, M42G M43R, M43G
Module RC It protects against EMC disturbance. It limits overvoltage.		6/24 V AC/DC 24/60 V AC/DC 110/240 V AC/DC	M51 M52 M53
Module L Coil energizing indication.		6/24 V AC/DC 24/60 V AC/DC 110/240 V AC/DC	M61R, M61G M62R, M62G M63R, M63G
Module LV It limits overvoltage on AC and DC coils. Coil energizing indication.		6/24 V AC/DC 24/60 V AC/DC 110/240 V AC/DC	M91R, M91G M92R, M92G M93R, M93G
Module V It limits overvoltage on AC coils. No indication.		6/24 V AC 110/130 V AC 220/240 V AC	M71 M72 M73
Module R It limits harmful voltage on AC coils induced in long lines which causes unwanted making of the relay.		110/240 V AC	M103

❶ **M...R** - LED red, **M...G** - LED green
❷ When ordering modules indicate their color: gray or black.

MODULE type M...

LED red – M...R

LED green – M...G

Relays
basic information

relpol® S.A.

According to USASI (United States of America Standards Institute) a relay may be defined as an electrically controlled device which opens and closes an electrical circuit in order to affect the operation of other devices in the same or another circuit. Relays are a significant element in the contemporary industrial processes.

Dozens of milliards of relays operate nowadays in the world as an interface between control circuits and electrical load. The technological development has brought miniaturization of mono- and bi-stable relays which need a low or even no supply voltage to carry a high power through the contacts.

Relpol S.A. - almost 55 years of activities and more than 45 years of experience in production of highest-quality relays.

Function of the relay

The relay performs two crucial tasks:
1. Galvanic separation (isolation) of the control section and switching section.
2. Switching of high-power loads with high voltage and/or current of high intensity at low energy consumption (low voltage / low current intensity) even at low electrical signals.

There are numerous applications of relays. Whenever satisfactory operation is needed in electronic and electromechanical conditions, a relay is necessary, e.g. for control equipment, time relays, temperature control, etc.

Main parts of the relay

The electromechanical relay consists of an electromagnetic switch and an electric one.

The former is the control section, and the latter is the switching section which is directly connected to the electrical load.

The electromagnet transforms the electrical current into a magnetic stream that generates the force which moves the switching part.

Electromagnet

Fig. 1. Classic electromagnet unit

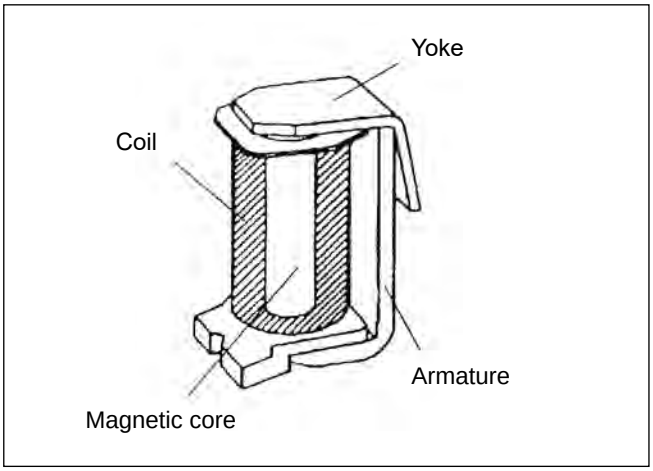
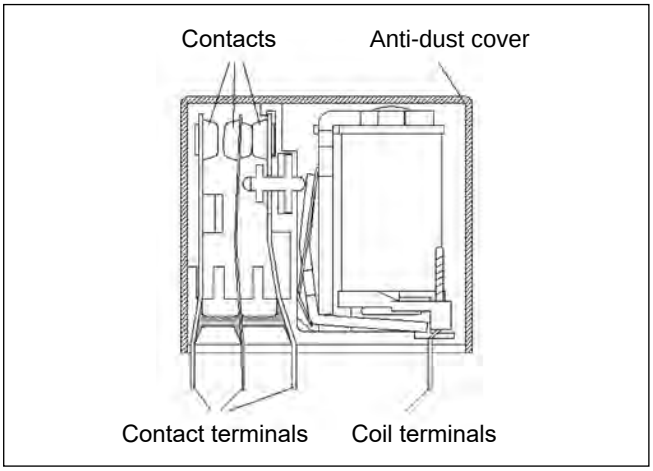


Fig. 1 shows a classic electromagnet unit which consists of four basic parts:
The coil which consists of one or more windings of a copper wire that is usually wound around a spool made of insulating material.
Ferromagnetic core.
Ferromagnetic yoke.
Movable ferromagnetic armature.

Fig. 2. Classic design of a relay



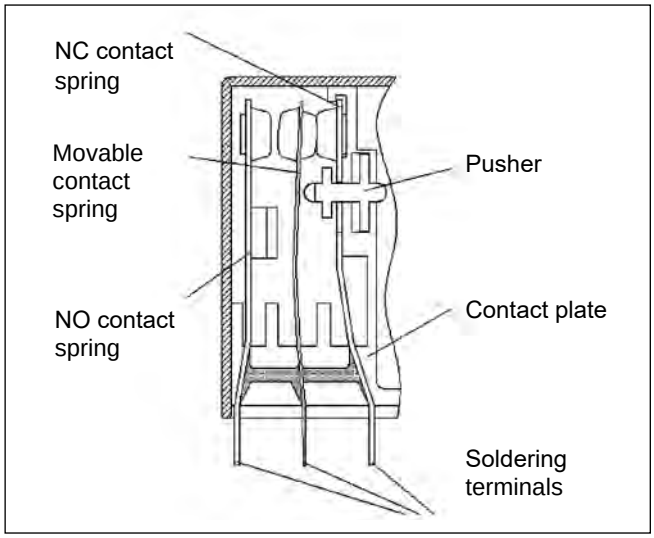
Additional parts:
- Fixed and movable contact springs.
- Contacts.
- Pusher.
- Mounting terminals and coil terminals.
- Contact plate.
- Anti-dust cover.

Switching section

A classic arrangement of the switching section refers to a diagram of one changeover contact. It has been used in the explanation below as it is a basic diagram referred to by all other diagrams.

Fig. 3 shows the switching section of a relay with one changeover contact.
The figure presents the following parts:
- fixed normally closed (NC) contact unit,
- movable contact unit,
- fixed normally open (NO) contact unit,
- pusher,
- contact plate,
- soldering terminals.

Fig. 3. Switching section of a relay

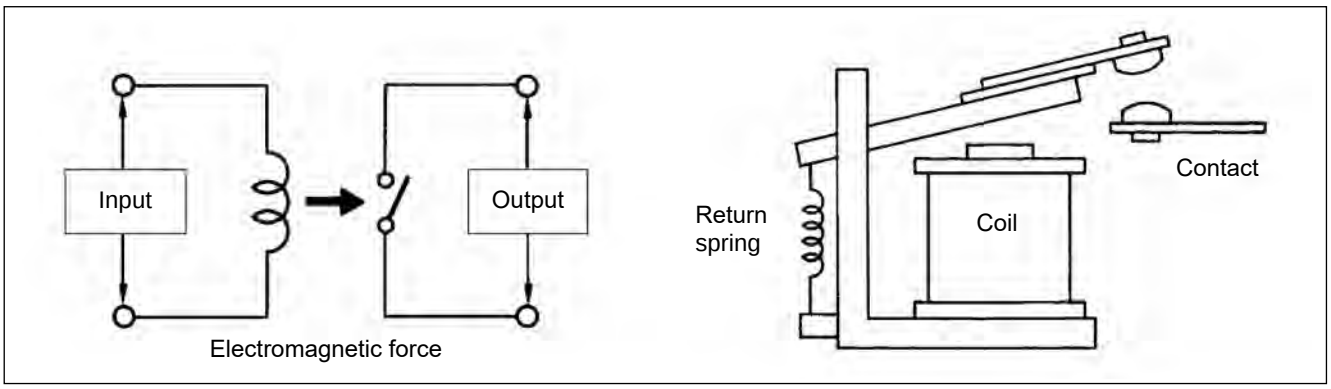


Types of relays

There are two kinds of the device, i.e. electromechanical relay and solid-state relay (SSR).

Electromagnetic and solid-state (SSR) relays

Operation of solid-state relays is very similar to that of electromagnetic relays - it consists in switching the load circuit, which is controlled with a low voltage signal of an insulated input circuit. In an **electromagnetic relay**, the electromagnetic force which moves the yoke and causes switching of the contacts is generated when input voltage is applied to the coil. When the supply voltage is interrupted, the return spring pushes the contacts away from each other, i.e. opens the contacts and disconnetcts the power circuit.



Solid-state relays use an opto-isolator to disconnect the input and output circuits. The opto-isolator changes electrical signal to optic ones and transfers them through the distance which is a galvanic insulation between the input and output sections. SSR's are electronic devices which do not have any movable parts, and the switching elements are thyristors, triacs or transistors.

The input current flows through a light-emitting diode which is usually made of gallium arsenide and it emits radiation in infrared. The diode illuminates the photovoltaic cell which generates voltage to control the output element.

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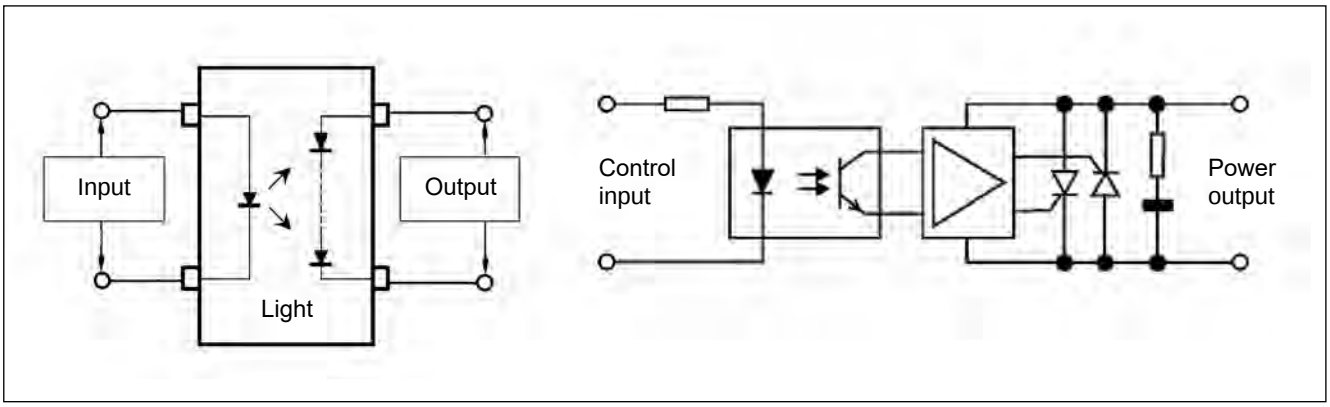
In the opto-isolator, a photodiode, photo-transistor or a photo--thyristor may be be the photodetector.

The opto-isolator carries both direct-current signals and alternating-current ones (analog and digital signals).



Advantages of solid-state relays:

1. Absence of movable parts due to which their operation is completely noiseless, which is of high importance in dwelling rooms, offices, etc.
2. There is no electric arc in the course of switching operation which takes place inside the semiconductor material, the function of making high starting currents, long life and reliable operation.
3. High resistance to shock, vibrations and environmental pollution.
4. No electromagnetic interference owing to completely electronic control.
5. High operation speed and high operation frequency.
6. Low power necessary to control the relay.

Disadvantages:

1. High resistance in switching on state, which causes generation of heat and necessity to use radiators.
2. Considerable voltage drop on the interface (1 - 1,6 V).
3. Sensitivity to overvoltage, necessity to use a varistor or RC circuit.

As compared to solid-state relays, **electromagnetic relays** bear the stamp of negligible small voltage drop (the contact resistance in switching state is on the average about 10 mΩ), and zero leakage current, they are also highly resistant to overvoltage. Due to the mechanical system of contacts and their wear and tear, their life is definitely shorter, and the response time is long and prevents the use of higher operation frequency. The capability of switching surge currents is also considerably smaller.

SSR's provide the possibility of switching at "zero" for resistive load and, then the voltage on the load increases gradually, which, in some cases, e.g. an electric bulb, affects significantly the period of life. This limits surge currents too.
For inductive loads, relays which switch at maximum voltage are useful - conduction occurs at supply voltage peak value, then the surge current is minimized.

Among the basic types of electromechanical relays, monostable and bistable relays should be considered separately.

Mono- and bistable relays

Monostable relays

A monostable relay is an electrical relay which changes its status due to a supply value of the appropriate parameters and returns to the previous status when the parameter ceases or changes.

Bistable relays

A bistable relay changes its status as affected by the appropriate supply value of the appropriate parameters and remains in the changed state even after the value has ceased. Another application of the appropriate supply value is necessary for the relay to change its status again and return to the previous state.

Further classification of relays may be based upon the functions they perform, e.g. all-or-nothing relays, step relays, latching relays, polarized relays, reed relays.

All-or-nothing and step relays

All-or-nothing relays
The term identifies the relays designed for operation at the value that is:
- higher than the make value, or
- lower than the return value.

This type of relays must be supplied by a particular range of voltage (or current).

They may be energized by supply or disconnection of voltage (or current) within a given range.

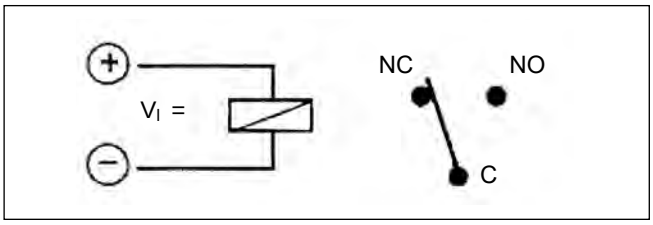
Step relays
The relays have two or more rotational positions, and they move from one step to another in consecutive operations with the use of energizing pulse. They usually move the contacts with the use of cams.

Latching relays

The latching relay is a non-polarized bistable relay. It changes its state at the supply value and remains in the position after the value has ceased. In order to change the state of the relay again, another actuation is necessary. The crucial part of the latching relay is the core made of special magnetic iron which remains magnetized ever after a voltage pulse has been applied. The core consists of a nickel base with aluminum, titanium or niobium added (55-85% Co, 10-12% Ni).

Function
Energizing condition: OFF state
As the wiring is supplied with a voltage pulse of direct current V1 (selected from the recommended supply voltage range) for the duration of ti, the electromagnetic field grows immediately, the core becomes magnetized and the relay is energized (the normally open contact closes). When the pulse declines, the relay remains in the ON state owing to the permanently magnetized core (Fig. 4).

Fig. 4. Latching relay, electrical circuit

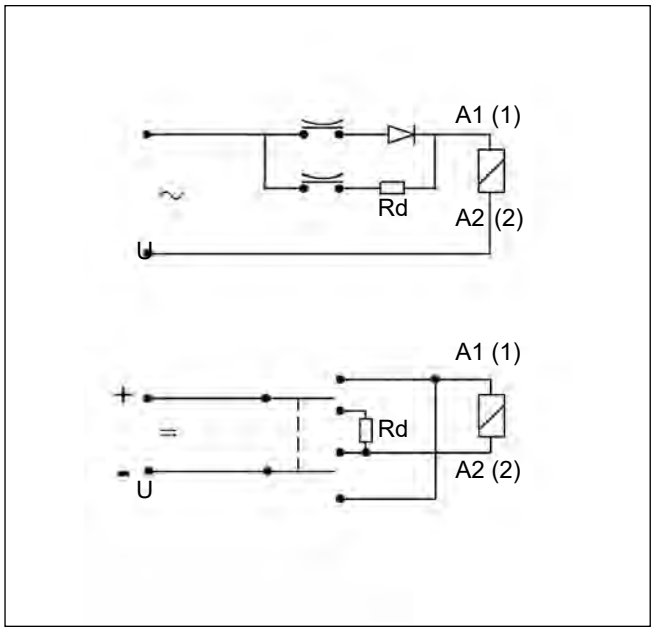


Thus, the magnetic polarization of the relay depends on the polarity of the supply voltage. The relay switches to the OFF state on supply of the voltage of the opposite polarity which changes the magnetic polarization of the core. The sole change of the supply polarity will not cause the release of the relay. This requires a change of the polarity, and the value of the energy supply must be within the range of the actuation (energizing) values.

The circuit applied
There are two different types of the latching relays:

- **single winding** latching relays with the external release resistance to limit the current intensity (Fig. 5).

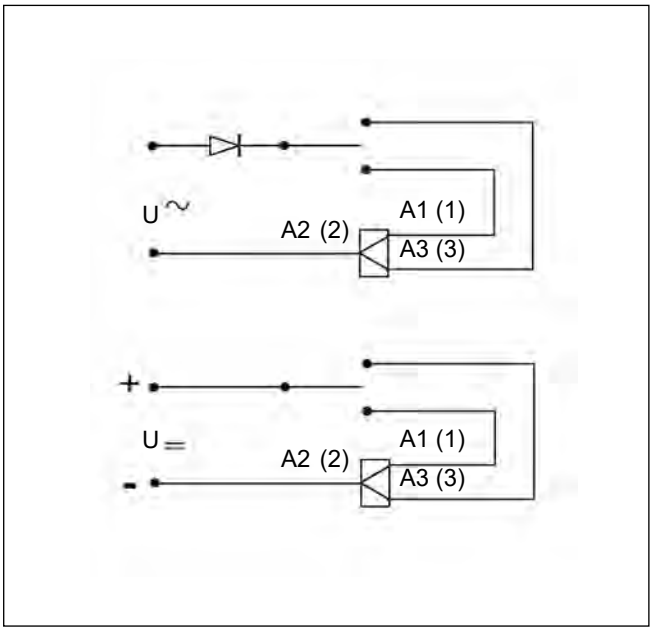
Fig. 5. Circuits with single winding latching relays



- latching relays with **two windings** and two different voltage ranges for ON / OFF operation (Fig. 6).

It is important to bear in mind that for the appropriate operation the relays require a **minimum pulse** of 10 ms. In order to avoid overheating, the maximum time of supply is usually limited, too. The aforementioned relays may also be supplied with alternating voltage owing to the external diode which rectifies the alternating current to the pulses of minimum duration of 10 ms (half of the period). The applications of latching relays are the same as the applications of the normal version relays.

Fig. 6. Circuits with two winding latching relay



Polarized relays

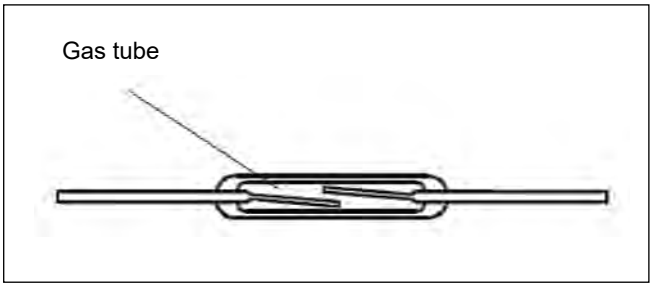
Polarized relay is a relay with permanent magnet which provides additional magnetic force that reduces the energy consumption. The magnetic field required for pulling the armature is partly generated by the coil and partly by the magnet.

The magnetic streams overlap. The supply value must be of the appropriate polarity, i.e. the same as the polarity of the magnet. There are mono- and bistable versions of these relays.

Reed relays

The remarkable advantage of the reed relays is that they are hermetically sealed and, thus, resistant to atmospheric corrosion. They are very fast (10 to 20 times faster than electromechanical relays) and at the range of the rated contact load they offer highly reliable switching operations, and extremely long life. The fundamental part of a reed relay is a hermetic glass tube, commonly called the magnetic (reed) contact.
The magnetic (reed) contact consists of two flat, ferromagnetic lap contacts of the reed relay separated by a small air-clearance, hermetically closed in a glass tube. The contacts of the reed relay are fixed to the ends of the glass tube and, thus, they serve as supports. If the free ends of the reed contacts are exposed to the magnetic field, the stream in the clearance between the reed contacts will make them cooperate.
When the magnetic field ceases, the reed contacts will part from each other as a result of the stress of the spring placed in the contacts. This way, the contacts provide an operating magnetic clearance, and they close and open the electrical circuit.

Fig. 7. Hermetic contact



Terminology

Actuation condition - in case of a monostable relay: specific status of a relay while it is supplied with a given supply value which has been energized; in case of a bistable relay: a status opposite to rest condition indicated by the manufacturer.

Actuation - change from rest condition to actuation condition

Return - in case of a monostable relay: change from actuation condition to rest condition

Reset - in case of a bistable relay: change from actuation condition to rest condition

Constant operation - operation during which a relay remains actuated for the time long enough to reach heat balance.

Cycle operation - operation during which a relay performs several make cycles, where intervals of actuation and absence of actuation are defined; actuation time of the relay is such that heat balance of the relay is impossible to be achieved.

Coil thermal resistance - the ratio of increment of the coil temperature and the input power, measured after the time sufficient for achieving heat balance.

Make voltage - the coil voltage value at which the relay is actuated

Return voltage - the coil voltage value at which a monostable relay returns to the previous condition.

Reset voltage - the coil voltage value at which a bistable relay is reset.

Normally open contact - a contact which is closed when the relay is actuated, and open when the relay does not operate.

Normally closed contact - a contact which open when the relay operates, and closed when the relay does not operate.

Changeover contact - a set of two contact circuit made of three members of which one is common for two contact circuits; when one of the circuits is open, the other is closed.

Contact gap - a gap between contacts at open contact circuit

Making capacity - the highest value of electric current which may be connected by a contact when specific conditions are met, e.g. making voltage, number of operations, power factor, time constant.

Maximum continuous current - the maximum value of the current which may flow through a closed contact continuously in specific conditions.

Isolating air gap - the minimum distance in the air between two conductive parts or between a conductive part and exposed surface of the relay

Isolating surface gap - the minimum distance on the surface of the isolating material between two conductive parts

PTI - indicator of resistance to creeping current - numerical value of proof voltage expressed in Volts, which may be resisted to by the isolating material without formation of conductive tracks, defined in specific conditions of experiments.

CTI - a comparative indicator of resistance to creeping current - numerical value equal to maximum voltage expressed in Volts, which may be resisted to by the isolating material without formation of conductive tracks, defined in specific conditions of experiments.

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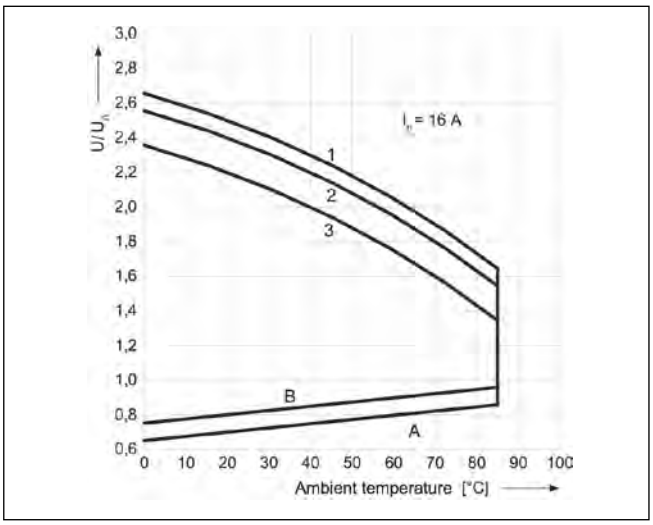
Coil operating voltage range

The admissible operating voltage range for the coil as the function of the ambient temperature is shown in the chart for RM85 relay.

The maximum operating voltage of the coil is limited by the increase of the coil temperature caused by the heating of the winding. The increase shall not exceed the admissible temperature defined for insulation materials.

The switching voltage is the minimum operating voltage of the coil. The switching voltage grows along with the increase of the winding temperature. Since the resistance of the copper wire changes by 0,4% per Centigrade, the growth of the coil temperature caused by a higher ambient temperature or by contact load results in the drop of the coil current and, thus, the increase of the voltage required for the relay electromagnet to operate.

Fig. 8. Coil operating range - DC



A - relations between make voltage and ambient temperature at no load on contacts. Coil temperature and ambient temperature are equal before coil energizing. Make voltage is not higher than the value read on Y axis (multiplication of rated voltage).
B - relations between make voltage and ambient temperature after initial coil heating up with 1,1 U_n, at continues load of I_n on contacts. Make voltage is not higher than the value read on Y axis (multiplication of rated voltage).
1, 2, 3 - values on Y axis represent allowed overvoltage on coil at certain ambient temperature and contact load:
1 - no load.
2 - 50% of rated load.
3 - rated load.

Coils - overvoltage protection

While using electromagnetic relays in electric circuits, it should be borne in mind that coils are the source of significant overvoltage which may disturb the operation of the equipment in which electromagnetic relays are applied. Furthermore, due to overvoltage the equipment in which electromagnetic relays are used may not meet the requirements of electromagnetic compatibility.

Relay coils have high inductance during operation, which causes a rapid increase of the coil voltage on switching off. Such a situation occurs in both DC and AC voltage coils. If, for example, the coil is switched off by a transistor, the latter may be damaged. Moreover, such pulse disturbances my affect negatively the nearby electronic systems.

Fig. 9. DC coil voltage during switching off

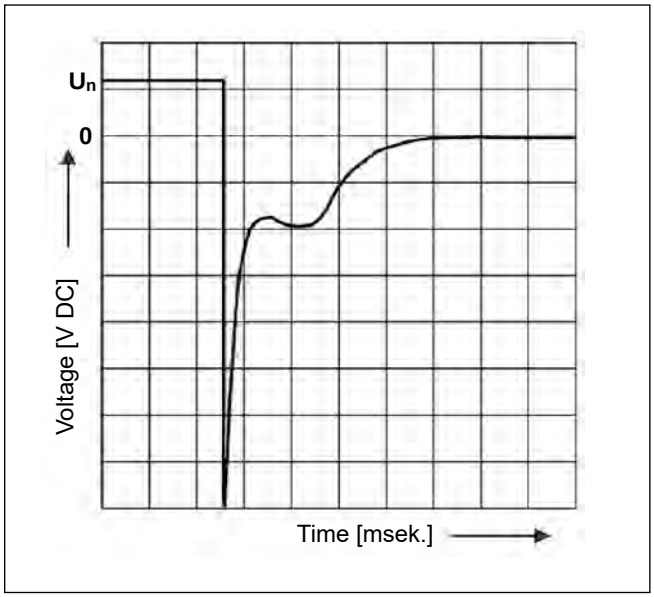
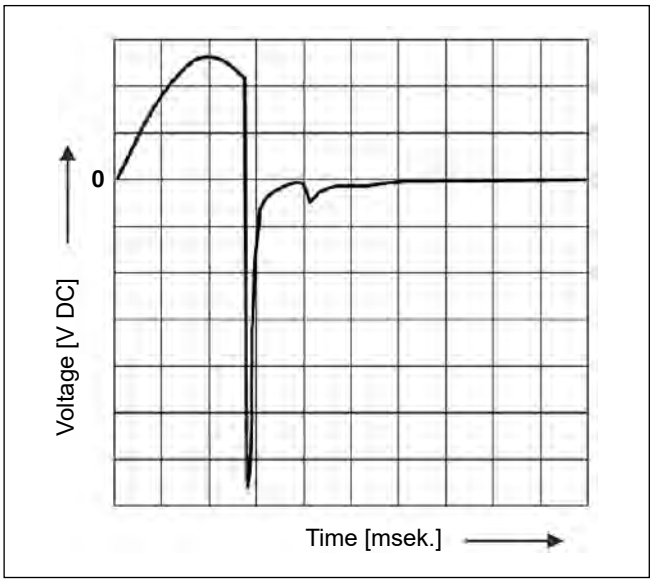


Fig. 10. AC coil voltage during switching off



For coils supplied with DC voltage, the best and simplest solution of the problem is a parallel connection of a standard rectifying diode to the coil terminals. During the current flow, the diode has a reversed bias due to the voltage drop on the coil. On switching off the coil voltage, the diode starts conducting which results in the coil voltage increase merely by the voltage drop on the conducting diode. Designers of electronic systems with electromagnetic relays practically always use suppressing diodes connected in parallel to the relay coil. The 1N4007 diode is a perfect solution in most of such cases. Diodes remove overvoltage extremely efficiently, they are a cost-effective and reliable way of suppressing coil self-induction voltage, which does not involve complicated calculations The only weak point of the diode system is a remarkable (threefold) increase of the relay release time. The release time may be reduced by connecting an additional resistor in serial to the diode in which case, however, the overvoltage value grows while the coil is being switched off.

The **diode protection** cannot obviously be used with AC coil relays. In such cases, two types of protection are commonly used, i.e.:
- varistor protection, and
- R-C two-terminal network protection.

Metal-oxide **varistors** have similar current-voltage characteristics to that of a bidirectional Zener diode. When the voltage between the varistor terminals exceeds a given limit value, it starts conducting, and, thus, it shunts the inductive load (the relay coil) with its differential resistance. The maximum overvoltage value on switching off depends on the limit voltage of the varistor.

Furthermore, when the varistor is supplied from the mains, the varistor protects also the relay coil from being damaged by the voltage pulses that occur in the mains. The varistor protection may be also applied in DC coil relays. However, the overvoltage values on switching off are much higher than in the case of protection with the use of a suppressing diode.

Another way to limit the overvoltage values during coil switching off is a parallel connection of an **R-C two-terminal network** to the coil. The network limits the overvoltage well, it is inexpensive, and it only slightly increases the relay release time.

No ceramic **capacitors** should be used whereas it is recommended to use foil capacitors. On selection of a **resistor**, it should be taken into consideration that quite a large amount of power dissipates on it during the transition process and, thus, the resistor's power shall not be less than 0,5 W.

Relpol S.A. offers both relays with integrated **overvoltage protection elements** (diodes or varistors) and ready-to-use **overvoltage protection modules** to be mounted in plug-in sockets.

R2N, R3N and R4N relays with DC coils are also in the version with suppressing diode mounted inside the relay. However, varistors are not mounted inside these relays. Ready-to-use overvoltage protection modules of M series may be used with the relays and then the modules are mounted in GZT., GZM. and GZMB. series plug-in sockets. Modules with a diode (DC coils) or with a varistor (DC or AC/DC coils) are available.

R15 relays are manufactured solely with the overvoltage protection element integrated, i.e. with the suppressing diodes for DC coils (two-, three-, and four-pole versions) and with varistors for AC coils (two-, and three-pole versions). In the case of a suppressing diode as the overvoltage protection element, the coil supply polarity must be as follows: A1 terminal "+", A2 terminal "-". note: the specified polarity does not refer to the relays R15 4 CO – four-pole for which the coil supply polarity must be as follows: A1 terminal "-", A2 terminal "+".

Ordering codes of the overvoltage protection elements integrated in the relays (as add-on equipment) are as follows:
D - suppressing diode;
V - varistor.

While using an overvoltage protection element, the user may be assured that the overvoltage that occurs on switching the coil off will not affect negatively the coil control circuits or any other electric and electronic circuits.

Switching section: main diagrams and mechanical solutions

There are various contact configuration diagrams related with different application requirements, i.e. normally open contacts (NO), normally closed contacts (NC) and changeover contacts. These are the basic configurations used for designing all the contact diagrams of relays. With the use of the basic contacts, many relay circuits may be built in order to apply relays successfully. The only theoretical limitations are the dimensions of relays, electromagnetic energy, switching energy and the complexity of drawings. The contact configurations available in a relay are determined by the number of poles, type of the contacts (changeover or normally open/closed), and normal position of the contacts (normally open or normally closed). In table next are listed **symbols depicting exact type of contacts**.

Other manufacturers of relays apply also different ways of defining the configuration of contacts. They may be found in catalogs and catalog cards published by the companies.

Contact type	Marking		
	Relpol S.A.	**Zettler**	**USA**
CO	1	C	SPDT
NO	2	A	SPST-NO
NC	3	B	SPST-NC

SP = single pole
ST = single contact (normally open or normally closed)
NO = normally open contact
NC = normally closed contact
DP = two contacts
DT = changeover contact

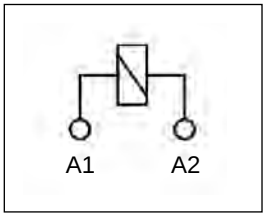
Terminals marking

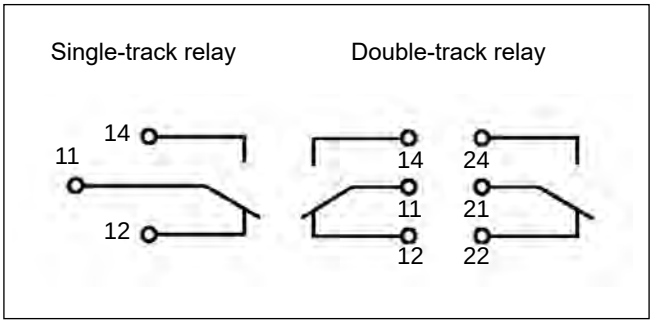
Terminals marking under Polish Standard PN-EN 50005.

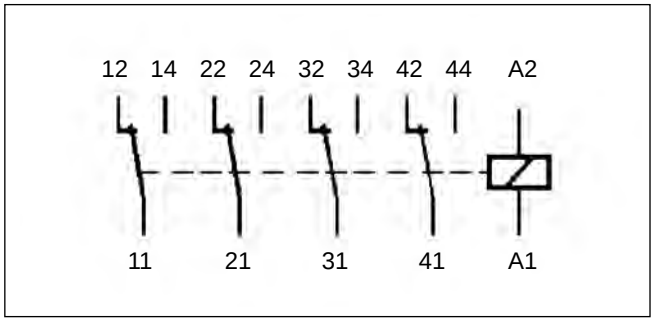
Contacts terminals are always marked numerically with two digits, where:
- the unit digit is the number of functions,
- the decimal digit is the number of sequences.

Coil terminals are always literal--numerical.

The scheme of marking of terminals of contacts and coil for a four-track relay (see below).







Contacts and shapes of contacts

Contact pressure

When two contacts come together to close the electrical circuit, they touch each other within the area that depends on the shape of the contacts. The force (N) with which the contacts push against each other as measured on the contact axis, divided by the area of the contact (mm^2) equals the contact pressure (N/mm^2). It is practically impossible to determine the real contact area as it depends also on the roughness of the contact surface. The contact pressure is determined by the contact force. In order to obtain a large contact area, the contact force must be increased so that the contact area roughness may be deformed. A low force means a few effective contact points and a small area of the contact (i.e. a high contact resistance). On the other hand, a stronger force increases the number of contact points and the total contact area (lower contact resistance). The contact force may be increased only to the limit defined by the mechanical strength of the parts and as much as it is allowed by the supply voltage sensitivity.

Manufacturers of relays use **different shapes** of contacts according to the relay designs and applications.

Fig. 11. Effect of the contact force

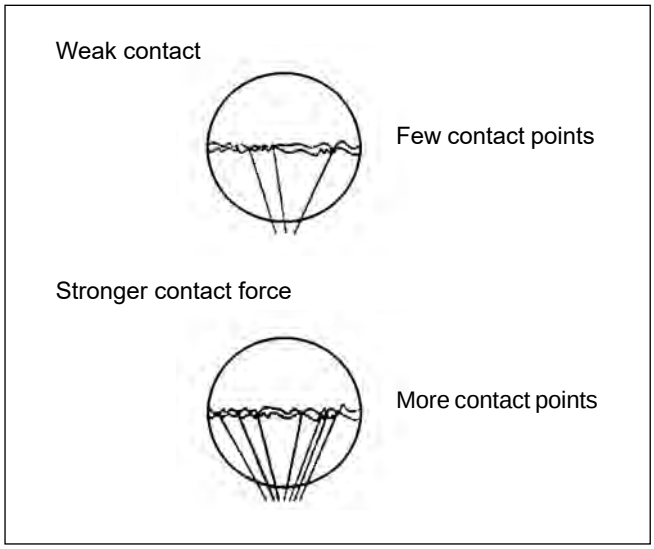
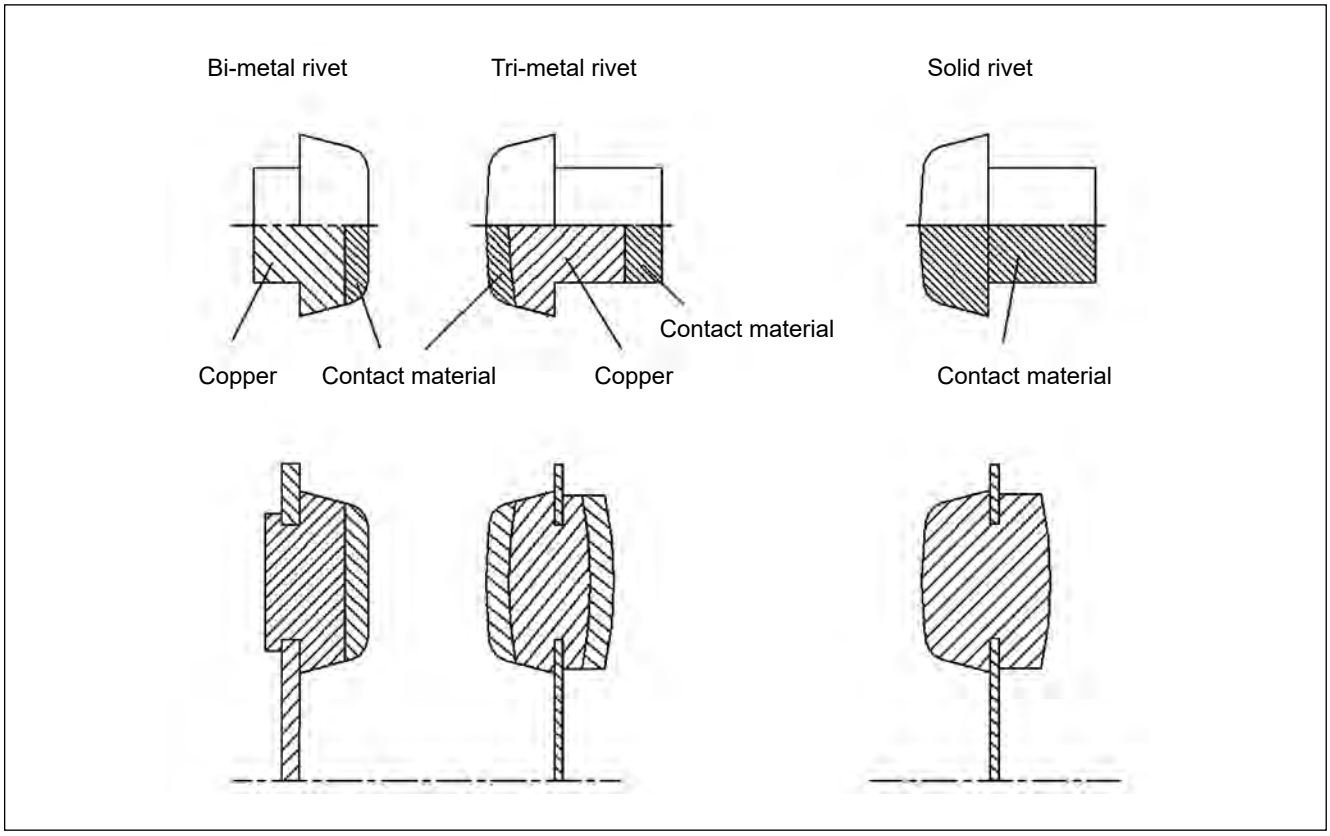


Fig. 12. Shapes of contact rivets



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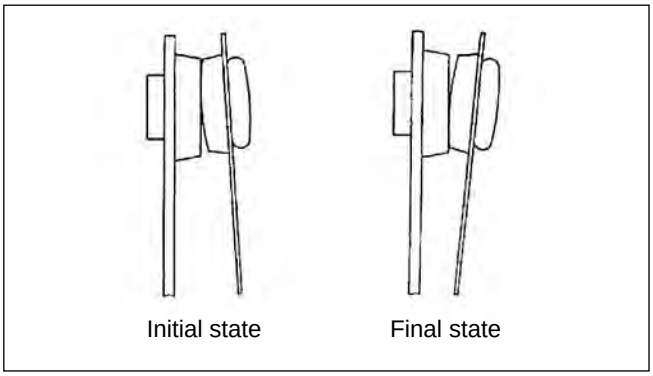
Cylindrical contact rivets

Cylindrical contact rivets are usually used in their bimetallic, solid or other versions, similarly to the contact parts of miniature relays owing to their optimal switching capabilities and easy assembly. Normally, the contacts are connected between the flat surface of the fixed contact and the spherical surface of the movable contact (the common contact). Principally, the common contact is a solid one whereas the fixed contacts (NC and NO, when in switching operation) are bimetallic ones (Fig. 12). The head of the central solid contact is ready to use on one side, and it is shaped during assembly on the other side. The flat-spherical connection between the contact surfaces is necessary for the reduction of the area of connection with the simultaneous increase of the contact pressure. Moreover, relative surface movement (roll) occurs then, which is useful in terms of enhanced contact performance (Fig. 13).

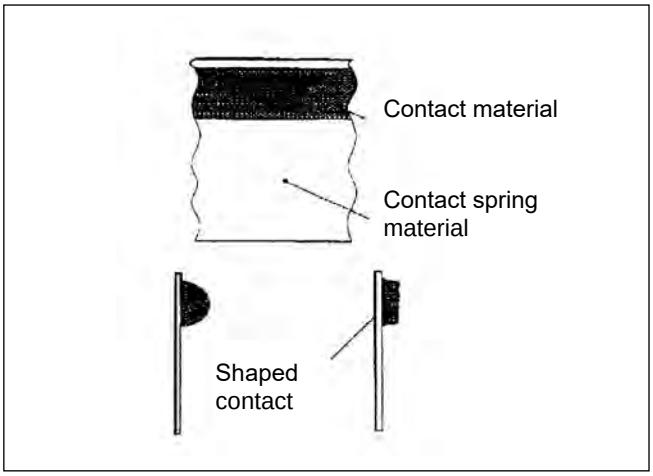
Fig. 13. Contact movement



Small-profile contact

A pressed strip of metal or contact alloy is automatically welded to the spring material prior to the cutting process. During the cutting process, the spring strip is cut together with the contacts, and the contact is formed to the required shape (Fig. 14). This solution is useful as it provides avoiding a dangerous voltage drop on the spring-contact connection. This allows the appropriate selection of the contact shape.

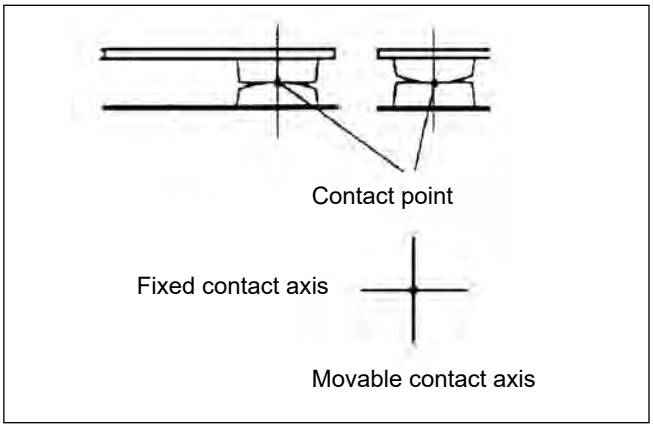
Fig. 14. Small-profile contact



Cross contacts

While using small-profile contacts it is possible to design a contact coupling with cylindrical surfaces and perpendicular axes. This way, a limited contact area and high contact pressure may be obtained. Moreover, during switching, two contacts operate like ”two knives”, thus maintaining a very clean contact surface.

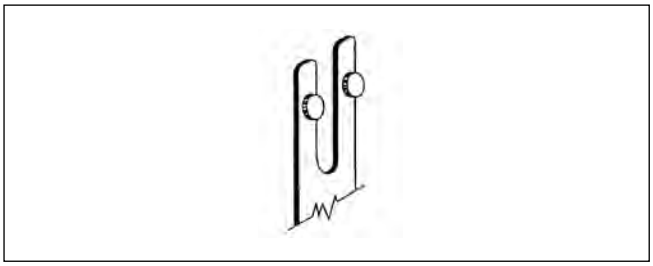
Fig. 15. Cross contact



Twin contacts

For some applications (e.g. low-level signals - safety systems), in order to enhance the contact reliability, twin contacts are used. Small-profile rivets or contacts are placed one next to another on the same forked spring (springs of fixed and movable contacts). Thus, duplication of the contact points may reduce the probability of error occurrence by half.

Fig. 16. Twin contact



Contact materials

In the issues related with switching, contact materials and special alloys play an important role, and each application requires the appropriate assessment of the electric load, ambient conditions and other information in order to make the proper choice.

Surface finishing

Precious contact materials are widely used due to their high conductivity. However, it is silver and its alloys that are exposed to the effects of the surface corrosion caused by sulfur contaminations in the atmosphere (SO_2 - sulfur dioxide). Layers of sulfur deposit on the contact surfaces, which is highly harmful to the contact resistance. The aforementioned materials may be plated with gold or another noble metal (metals that are more resistant to corrosion and/or oxidation, i.e. platinum, palladium, etc.).

Cleaning

Cleanliness is very important for the process of relay assembly due to the necessity to keep the internal parts of relays free of dust and other particles which may affect the area between the contacts and disturb the proper course of switching operations. That is why contacts, working parts and (in some applications) the whole relay without a dust cover are cleaned immediately prior to their enclosing.

Plastic contaminants

Due to temperature, internal parts of the relay made of plastic may produce gases and vapors. If they are not removed from the relay, they may deposit on the contact surface, which will increase the contact resistance. This is often the case in tight relays where it may appear extremely dangerous if the plastic has not been previously treated in a special manner. The treatment consists in high-temperature degassing process in which, at low atmospheric pressure, plastics emit gases and vapors. The process ends with stabilization of the ambient pressure which allows avoiding reactions inside the relay that might occur in the presence of humidity and oxygen.

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Contact resistance and influencing factors

The main function of electric contacts is to close an electric circuit to provide flow of current (I) at voltage (U). This "simple" operation requires certain special characteristics of contacts, which depend on materials, shapes, mechanical parameters, etc. When current (I) flows through an electric circuit, the circuit resistance (R) reacts against the current flow according to the following rule: **U = R x I**

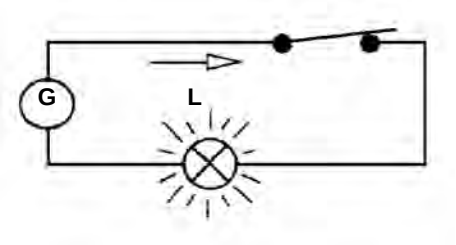
The value of R consists of two different resistances: **circuit resistance R_c and contact resistance R_r**.
Thus:

$$R = R_c + R_r \text{ oraz } U = I \times (R_c + R_r)$$

The dissipated power **P_w in the entire circuit** equals:

$$P_w = P_c + P_r = (R_c + R_r) \times I^2$$

Fig. 17. Basic circuit



G = Generator **L** = Load

The value of the circuit resistance R_c usually spreads evenly along the length of the circuit (cables, wires, printed circuits, etc.), and P_c dissipates in the same manner (low increase of temperature); on the other hand, however, R_r is entirely concentrated inside the relay (problems related with the temperature rise). This proves the extremely important role of maintaining the relay contact resistance on as low a level as possible. This is important in applications of both high and low power. In the first instance, there is the problem of temperature rise inside the relay whereas in the second case high contact resistance may disturb the proper operation of the device.

Question:
Find the values of power (W) dissipation in the relay contact circuit under the following circumstances:
- electric load: I = 5 A, U = 250 V AC,
- relay contact resistance (mΩ):

a) 10 mΩ
b) 50 mΩ
c) 300 mΩ
Solution:
a) $R_c \times I^2 = 10\ m\Omega \times (5\ A)^2 = 0{,}25\ W$
b) $R_c \times I^2 = 50\ m\Omega \times (5\ A)^2 = 1{,}25\ W$
c) $R_c \times I^2 = 300\ m\Omega \times (5\ A)^2 = 7{,}50\ W$

Based on the above, it may be stated that the power dissipation inside the relay reaches undesirable levels at high contact resistance.

Question:
Find the value of the voltage drop caused by the relay contact resistance in the next circuit under the following circumstances:
- electric load: I = 1 mA, U = 5 mV,
- relay contact resistance (mΩ):

d) 10 mΩ
e) 100 mΩ
f) 400 mΩ
Solution:
The voltage drop on the contact equals:
d) $R_c \times I = 0{,}01 \times 0{,}001 = 0{,}01\ mV$
e) $R_c \times I = 0{,}10 \times 0{,}001 = 0{,}10\ mV$
f) $R_c \times I = 0{,}40 \times 0{,}001 = 0{,}40\ mV$

High values of resistance cause a significant percentage of voltage drop which may be dangerous in some devices. This is important because high contact resistance usually means instability of the contact resistance. In applications of low-level signals (measurements, etc.) the capability of reaction to the contact resistance is a fundamental requirement. The following factors affect the contact resistance:
- contact pressure,
- materials,
- surface finishing,
- cleaning,
- internal contaminations of the plastic relay parts.

Each individual influence must be taken into account.

Alloys and contact materials

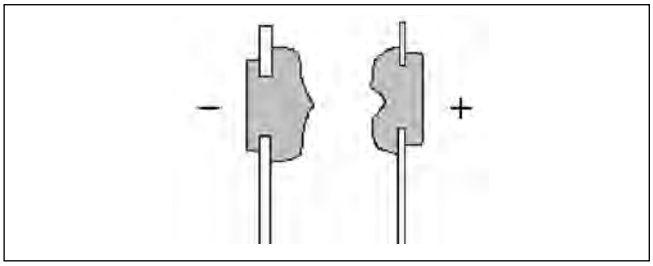
The choice of the contact material depends on the application. The following are the most commonly used materials:

Silver Ag
Pure silver (99% Ag) is of the highest electrical and thermal conductivity as compared to any other known metal, and it proves good resistance to oxidation but it is affected by the presence of sulfur in the atmosphere. The sulfur forms silver sulfide which increases the contact resistance. In order to avoid the problem, the contact surface is plated with gold (5 µm) as the latter remains free of silver sulfide (no chemical reaction). This is a good version of the contact widely used for switching low-level loads from µV to 24 V DC and AC, and from µA to 0,2 A, and in any case with no electric arc as it might damage the layer of gold and expose silver to the harmful presence of sulfur.

Silver - cadmium oxide AgCdO
This compound (90% Ag - 10% CdO) has a wide range off applications in power loads owing to its good resistance to welding and the effect of electric arc suppression. The compound may be used from 12 to 380 V AC and from 100 mA to 30 A. It is used particularly for resistive and inductive applications such as motor loads, heating resistors, lamp loads, solenoids, etc. The material is a standard one to meet most of the requirements of the customers. The problems related to sulfur do affect it but the presence of electric arc and relatively high voltage and intensity of current make the problem imperceptible (the electric arc and voltage pierce the sulfide layers).

Silver - nickel AgNi
The alloy (90% Ag - 10% Ni) is the most suitable one for switching DC loads and avoiding material transfer that appears at DC and at medium voltage and intensity of current (1-10 A; 6-60 V DC). This is a physical phenomenon of moving the material from one contact to the other (from cathode (-) to anode (+)). This results in quick wear of contacts and dangerous reduction of the contact clearance.

Fig. 18. Transfer of contact material



Tungsten
This is the hardest material, highly resistant to sticking. It has, however, a relatively high contact resistance. Because of these characteristics it is usually used in electric circuits where short current peaks appear, and where the material prevents the contacts from welding to each other: leading loads, motor loads, lamp loads (especially fluorescent lamps), etc. The range of applications starts from 60 V and 1 A.

Silver + tin oxide (tin dioxide) - $AgSnO_2$
The $AgSnO_2$ material is of similar properties to those of AgCdO. However, the former has a higher thermal stability and better resistance to transfer of material from one contact to the other, which provides longer life in DC applications. The $AgSnO_2$ contacts wear evenly and they are recommended for applications at the loads that create inrush current and at inductive loads.
The contact ratings depend to a great extent on the level of the oxide in the compound, the manufacture method and the presence of admixtures which are used by contact materials manufacturers mainly to reduce the contact resistance and to enhance the resistance to material transfer.
The $AgSnO_2$ material offered by Relpol S.A. in miniature relays contains a low admixture of indium oxide (In_2O_3) which is a universal material. Apart from good results achieved at lamp loads, the material performs perfectly at resistive loads and switching currents up to 16 A.

Gilding - Au
Contact gilding with 0,2-0,5 µm gold layer is usually applied in order to protect the basic material from oxidation during product storage. The protective gilding is not resistant to mechanical wear and it is quickly destroyed in course of the relay switching. Contact gilding with 3-5 µm layer of gold is used as protection from corrosion and to enhance signal circuits switching. Thick gilding provides the lack of microscopic pores, perfect resistance to corrosion and to formation of non-conductive layers.
However, gold is very soft, easily becomes mechanically worn, and its low melting point may limit the electric life of the contacts which switch high currents.

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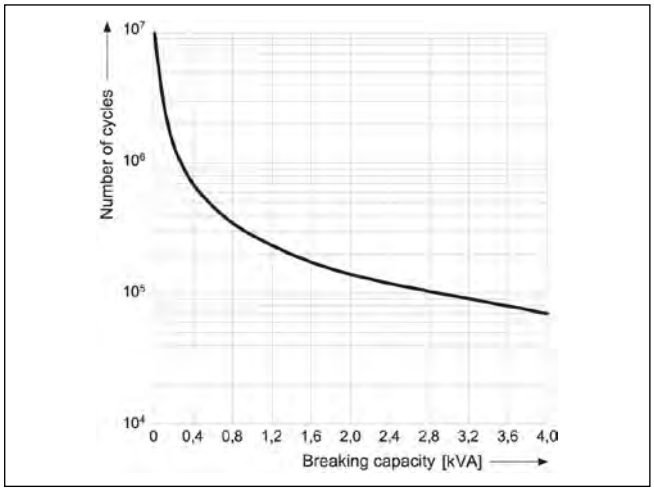
Electric life of relays

The electric life or switching capacity is expressed as the minimum number of cycles which the relay may perform at a given load and under certain circumstances. The ”cycle” means a full switching operation from OFF state to ON state and to OFF state again. The electric life ends when the contacts are no longer capable of switching electric load within the range of the contact resistance (or contact voltage drops) which stops the switching operations after it has reached a higher value (the limits depend on the application). The specifications of relays indicate the electric life as the number of cycles at rated current and voltage, and at constant frequency and ambient temperature.

For example, the electric life of the RM85 relay is:
Number of cycles: 7 x 10^4 at 16 A and 250 V AC - 50 Hz, resistive load, 600 cycles/hour - ambient temperature 85 °C.
In practice, customers require electric life also at lower values of current intensity. Thus, on the basis of tests, the curve of electric life is defined and the curve shows the dependence of electric life (number of cycles) on switching capacity (Fig. 19).

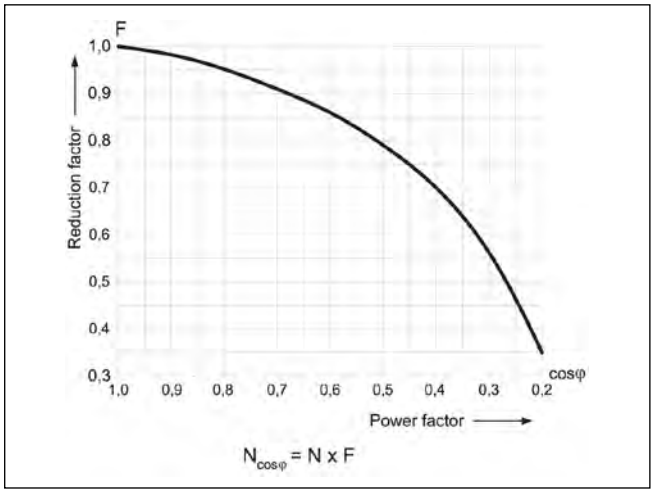
Fig. 19. Chart of electric life of a relay



Inductive loads cause high contact wear which reduces the relay life. The reduction has been defined on the basis of tests, and it is expressed as the correction factor for resistive electric life (depending on the load power factor) which should be used to define the projected life.

Question:
What is electric life of the RM85 type relay for the following electric load: 8 A / cosφ = 0,4 / 250 V AC; 600 cycles/hour. The chart in Figure 19 shows that the projected life is approximately 150 000 cycles at resistive load (cosine = 1).
The chart presented in Fig. 20 proves that at the cosine power factor which equals 0,4 the correction factor is 0,7. Thus, the projected electric life under the aforementioned conditions is 150 000 x 0,7 = 105 000 cycles.

Fig. 20. Ratio of correction coefficient to power coefficient



Reliability

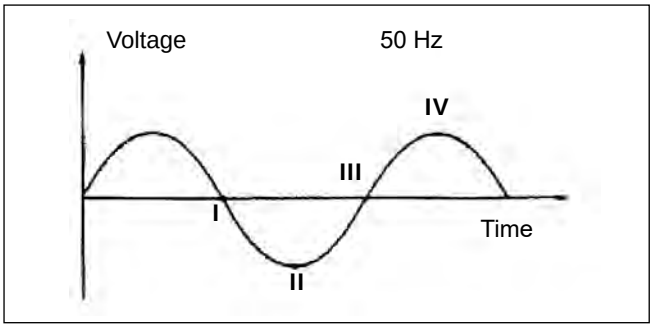
Charts of electric life of a relay in the function of load power are useful in estimating the reliability parameters. The value found in such charts may be used for defining the statistical parameter of B10 life, i.e. the number of cycles following which 10% of the relays population will fail. Electromagnetic relays are unreparable elements and, thus, any damage to them in a device means the necessity of replacement. Given the frequency of operations of a relay in a device and the number of cycles defining its life, the mean time to failure (MTTF) may be estimated, which may then be used for calculation of MTBF for the device.

Switching at alternating and direct current

Various problems occur at switching AC and DC loads of high power, and various aspects shall be taken into account in order to understand the nature of the phenomenon. In AC current circuits (of the frequency approx. 50 - 60 Hz), the relay contacts may open in two possible states of the operating voltage due to the course of the voltage and the phenomenon of the electric arc (see Fig. 21).

Switching at point I:
Voltage value is close to zero.
No electric arc occurs.

Fig. 21. Switching states (I, II) at the frequency of 50 Hz of alternating current



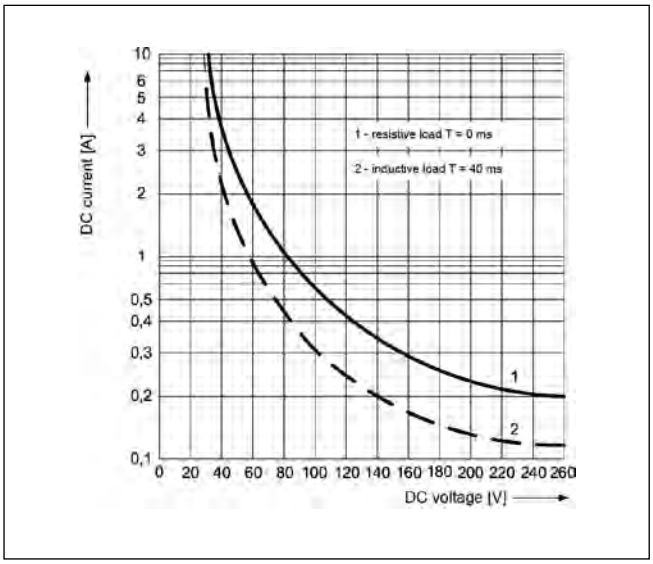
Switching between points I and II:
There may be two situations in which the voltage grows or drops. In both cases, arc discharge occurs but it is suppressed due to the transfer of the voltage via the zero value. The electric arc discharge depends on the voltage value, contact clearance, current intensity, shape of contacts and on materials. Due to these reasons, in miniature relays there are physical limits related to the above parameters, which reduce the maximum AC switching voltage to approximately 380 V. The inductive loads of AC are worse as compared to the resistive loads due to contacts wear since the load inductance grows and, thus, a constant arc appears together with its harmful effects.

Arc breaking

In DC devices, the arc breaking is a crucial problem because the voltage does not transfer via the zero value as it does at alternating current. Thus, when the electric arc appears, only the contact clearance and the properties of the contact materials contribute to the arc suppression. Relays usually have a physical limit that depends on the above parameters which make the relays incapable of switching the load at current intensity and voltage higher than the specified values. The values are expressed in the form of a curve which defines the maximum switching energy (U x I) at the constant time value L/R of resistive and inductive loads while L (inductance) is expressed in henries and R (resistance) in ohms.
L/R is principally expressed as a value that equals 40 ms (miliseconds) for inductive loads, i.e. a mean value for devices.

Example (Fig. 22):
The maximum admissible switching intensity of direct current for the R3N relay at 230 V DC at resistive and impedance loads are 210 mA and 120 mA respectively. The values assure the arc suppression. Suppressing circuits are also useful for alternating current devices.

Fig. 22. Maximum switching capacity at direct current



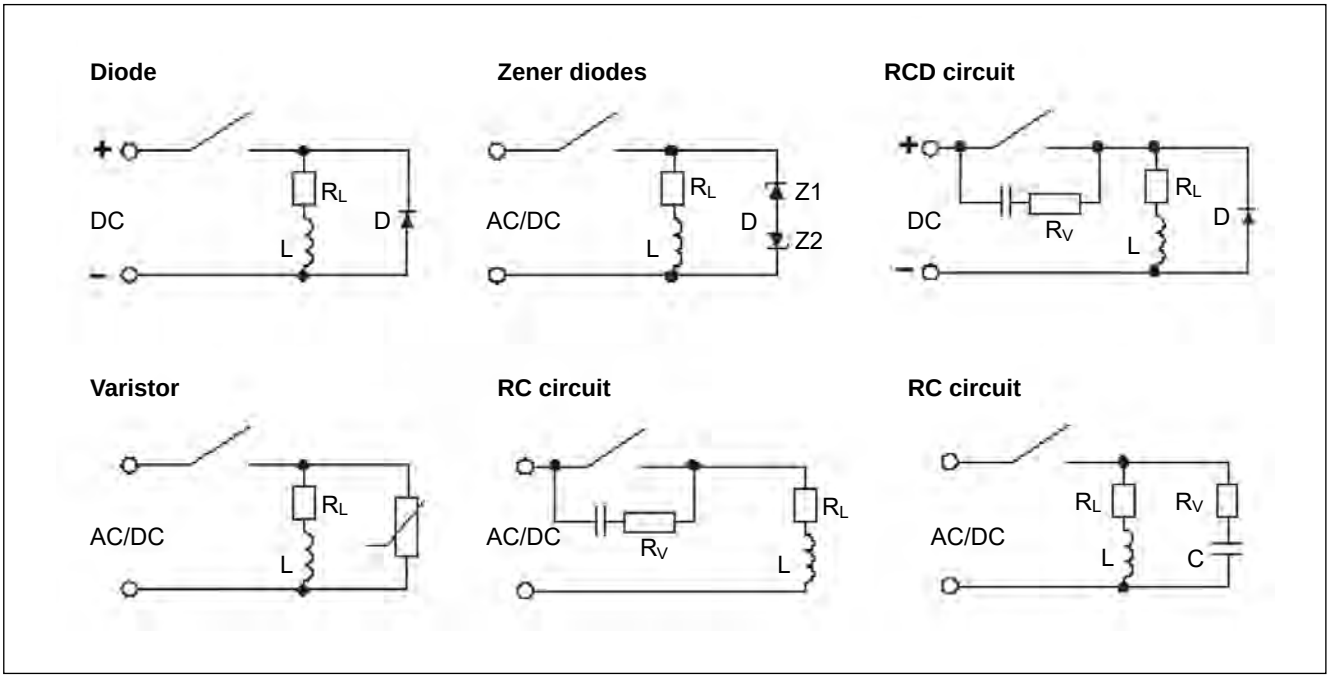
Suppressing circuits

In order to protect contacts against their damage by electric arc, protection circuits are used which are fitted in parallel to contacts of the relay or to the load. Appropriate suppressing elements may also be connected both to the contacts and the load.

The most common method of arc suppression in DC circuits is using a **diode** in parallel to the load. This is an efficient and cost-saving solution applicable at various values of the load. The inverse voltage of the diode should be at least 10 times higher than the rated voltage of the circuit, and the conduction current should be equal to or higher than the load current. It must be emphasized that diodes prolong the time of switching off the relay considerably, which delays opening of the contacts and this is conducive to their burnout.

In order to decrease the effect of the arc suppressing circuit, on switching off the load, **two Zener diodes** may be used instead of the diode parallel to the load. In such a circuit, the inverse voltage is limited by Zener diode do the regulated voltage. The breakdown voltage of the Zener diode must be higher than the supply voltage of the circuit. The disadvantage of this solution is its lower effectiveness and higher cost.

Fig. 23. Protection circuits

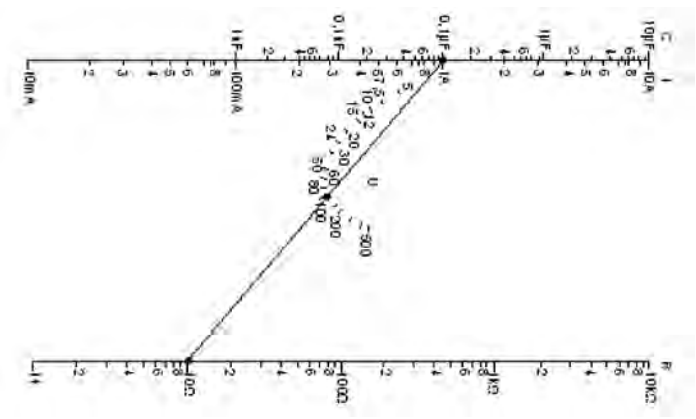


A **varistor** is another protection element of current-voltage ccharacteristics similar to Zener diode. For low voltages it shows high resistance and, then, it is practically disconnected from the circuit whereas when the voltage exceeds certain voltage, characteristic for the given varistor, its resistance decreases quickly and, then, it shunts the inductive load with its internal resistance.

Unlike diode and varistor circuits, **RC circuits** may be connected in parallel both to the load and to the contacts of the relay. When the contact opens, the capacitor connected in parallel starts charging itself and its voltage grows at the time constant of R and C values. This helps to maintain low voltage on the relay contacts and, thus, diminish the effect of the electric arc. Ehen the contact closes, the capacitor connected in parallel to the capacitor consists limitation of current. Thus, the RC circuit optimizes all the intermittent processes in the course of opening and closing of the contacts. At AC voltages the load impedance must be lower than the RC circuit impedance.

In order to enhance the effectiveness of arc suppression in direct current circuits of high inductiveness of the load, **RCD circuits** may be used, where the RC element is connected in parallel to the relay contact and the diode - in parallel to the load.

Fig. 24. Nomogram for defining optimal values of R and C



Special loads

Bulb load

Closing of the contact with bulb loads (a lamp with tungsten fiber) causes problems due to high current peaks related with the low resistance of the fiber when it is cold. For example, a 60 W - 220 V AC bulb has the ”cold” resistance of approximately 60 Ω which corresponds with a current intensity of 3,66 A (for a few milliseconds). On the other hand, the current intensity of a hot bulb is 0,273 A (the ratio is then 1:15). This illustrates the high load that occurs on the contacts during the bulb switching (a hazard of contact welding or sticking).

The following must be taken into account for bulb load switching:
- maximum load of the bulb,
- contact material.

For example, for the RM96 relay with AgCdO contacts the maximum admissible bulb load is some 1,000 W which corresponds with the current intensity of 4,5 A and the alternating current voltage of 220 V. In other relays of higher loads the contacts are made of $AgSnO_2$.

Motor loads

The motor loads are inductive loads which operate in a particular manner while switching on. A current peak occurs as a result of the motor inertia which is related to the mechanical load used in the motor, and which in the starting phase is 5-10 times higher than the current in the steady state. Furthermore, when the motor is being switched off, harmful action related with impedance loads occurs. Thus, the correct choice of contact material is related with the aforementioned load characteristics, especially when the capacitor is connected to the motor. In such particular cases, the contacts are made of tungsten and $AgSnO_2$. The motor load is usually expressed in HP (horsepower) where 1 HP equals approximately 745 W.
Example: R15 relay - the rated motor power of the contact is 1/2 HP.

Capacitance loads

This is the worst contact load as for switching on due to a sudden increase of the current intensity peak which occurs when the capacitor is discharged (a phenomenon similar to a short circuit). The current intensity at the peak to be switched on may reach the values of hundreds of Amperes in a very short time (microseconds).

The problem of contact welding may be avoided in two ways:
- via using the $AgSnO_2$ contacts,
- via reduction of the current intensity peak by introduction of a resistor to limit the current.

The same problem occurs at contacts closing with a charged capacitor, i.e. a rapid discharge occurs.

Switching time and contact bounce

On the relay coil supply during opening and/or closing, the operation lasts in time depending on the electric and mechanical inertia of the parts. The delay between the coil supply impulse and the preset closing and/or opening of the contacts is the sum of the effect of the electromagnetic system and the switching section.

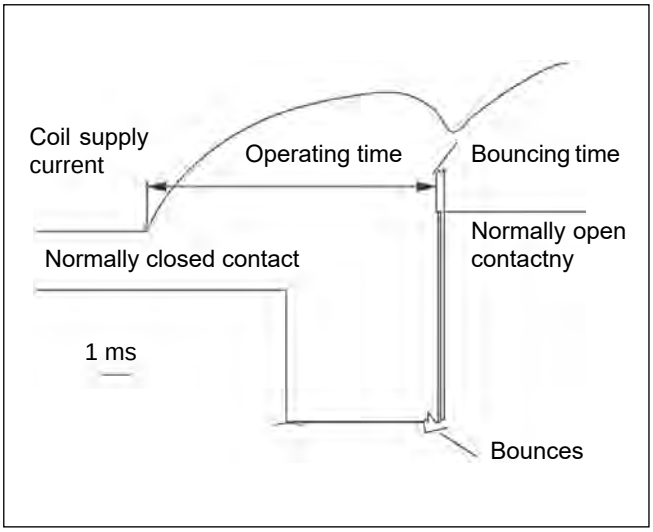
Electromagnetic system

The current flows through the coil with the delay caused by the coil inductance which resists to the current stream. Furthermore, the movable parts such as the armature and the pusher react to the movement due to the action of the magnetic stream.

Switching section

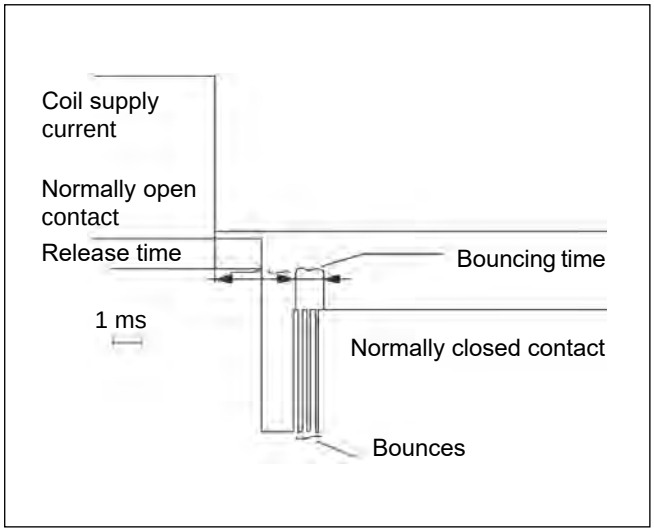
The elastic forces stored in the contacts and springs, and their elastic strain, react to the movement of the relay parts. The phenomenon is also affected by the inertia of the contacts mass. The delay times of the miniature relays usually reach the value of a few milliseconds (5-15 ms) during the switching phase. During the release phase the operating time is shorter due to the absence of the magnetic circuit delay. It is really so that on removing the supply voltage from the terminal, the current that flows through the coil wire stops suddenly and the relay is released with the elastic energy stored in the contacts.

Fig. 25. Switching time



The **operating time** of an inactive relay is the time interval from the moment of the supply of the voltage to the relay coil to the time of the first closing (or opening) of the contact.
If the relay has more than one contact, the time of closing (or opening) of the last of the contacts is taken into account.
The operating time includes the time of opening the normally closed contact and the time of closing the normally open contact.

Fig. 26. Release time



The **release time** of the active relay is the time interval from the absence of the supply voltage to the first opening (or closing) of the contact.
If the relay has more than one contact, the time of opening (or closing) of the last of the contacts is taken into account.
The release time includes the time of opening of the normally open contact and the time of closing the normally closed contact.

Bouncing

In the phases of switching and release, when the contacts close, they never perform the operation at the same time but the clash between two contacts makes the contacts bounce. The ”contact bouncing” cause constant closing and opening of the contacts. This particularly affects the contact ratings such as electric life and signal switching.

Sinusoidal vibrations

The electromechanical relay is strongly affected by dynamic phenomena which may change its projected characteristics constantly or temporarily. The devices in which vibrations occur must be thoroughly tested so that we might find out the quality and essence of the stress. Machine tools, automotive devices, assembly machines, and principally every instrument in which the electronics of the drive is affected by the presence of movable parts (motors, vibrators, valves, etc.), may be exposed to the consequences of the problem. Relpol S.A. usually tests the relays via exposing them to sinusoidal vibrations at the constant acceleration (G) within a particular range of frequency. Moreover, the relays are tested along the main axes (x, y, z) and in two basic directions for each axis. As a rule, the relays are tested with the printed circuit board mounted (sockets, materials, etc.).
The tests are made in two stages, i.e. resonant test and fatigue test. The relays are tested at the states where the coil voltage is on or off. The contact continuity is monitored with an oscilloscope at a low-level load on the contacts. The test allows defining of the frequency range [Hz] and maximum value of the acceleration, at which the relay may operate with no loss of contact continuity (interval of 10 μs) or without any durable damage. The standard values (which meet the requirements of a wide line of devices) for miniature relays reach 10 G at the frequency range from 25 to 100 Hz. The values refer to the worst case which usually occurs in the most critical test conditions (the relay with no supply in a given axis of vibrations). For tests at a low frequency range (a few hertz), instead of the constant acceleration, a constant movement is simulated which corresponds with a given value of acceleration (e.g. from 10 to 25 Hz for the amplitude of 2,5 mm). The tested frequency at which the constant movement changes into the constant acceleration is called the ”transition frequency”, e.g. at 55 Hz 10 G it corresponds with 1,5 mm.

Current surges

The maximum value for miniature relays is 10 G for maximum peak acceleration and 11 ms of the impulse duration. As for the sinusoidal vibrations, the sample shall be subject to an ohm test for surge both at the ON and OFF states within the arrangement of the three main axes (x, y, z), in two basic directions for each axis. Three surges shall be applied to each state. The tested relay shall not open the contacts (10 μs interval), and it must operate perfectly at the end of the test.

Hermetic relays - soldering and cleaning

The necessity to use tightly closed and hermetic parts in devices arises from two different reasons, i.e. protection of the internal parts (contacts, mechanisms, wires) from penetration of the stream in the process of soldering and cleaning, and protection of the internal parts from atmospheric contamination.

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Soldering process

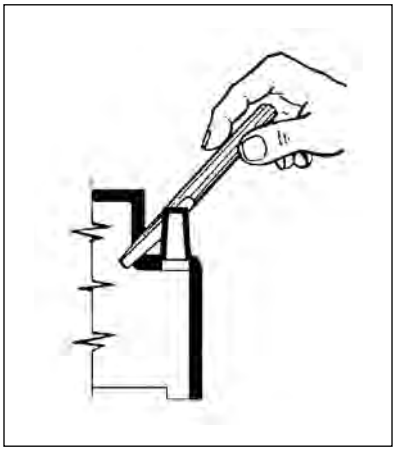
The contemporary electronic technology widely uses automatic soldering processes for mounting elements on printed circuit boards. This allows soldering of the whole circuit at one stage. The melted tin in a special machine forms a wave that "touches" the bottom side of the circuit to solder the terminals (pins) of the elements with the copper paths of the circuit. Prior to this operation, the circuit is sprinkled with a liquid (stream) which supports soldering via prevention from copper oxidation. There are many various types of such liquids composed of organic and non-organic acids, but all of them are more or less harmful to the internal parts of the relay and for other elements.

Thus, it is important that the circuit should be cleaned following the soldering process. Commonly used methods of cleaning are washing with hot water or washing with fluorocarbons with or without the use of ultrasounds.
It is obvious that the materials used for the construction of relays (anti-dust cover, sealing resin, print paints) must be physically and chemically resistant to the cleaning chemicals which they contact. With each individual application, it is important to know the processes and sometimes the reactions between the relay and the chemicals must be examined.

Environmental contamination

The environment of the relay may adversely affect its operation. Humidity, industrial air, dust and particles that penetrate the inside of the relay may affect the contacts, internal parts and isolation. The environmental conditions in which the relay and the device will be used shall be analyzed in order to avoid such problems as resistance growth and corrosion of the metallic parts.
If the ambient conditions are not arduous and/or the electric load of the contacts is not critical (cleaning presence of the arc), it is better to open the relay following the soldering and cleaning processes to allow the useful exchange of the air with the external atmosphere.
What is important for the thermal exchange (high switching power) is the gas emission caused by the electric arc and the residual contaminations with plastics. As explained before, the process of sealing the relay includes degassing of plastics, filling the relay with inert gas (nitrogen), and the process of label closing or other methods.

Fig. 27. Opening of the relay

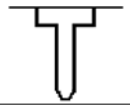
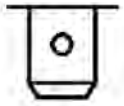


Leadless soldering

Eliminating of the lead used in the solders required both changing of the material and the production process which had to be adapted to different properties of the leadless materials.
The differences between the physical properties of lead alloys and their leadless equivalents available on the market are significant and, thus, the applicable features of soldering alloys shall be thoroughly considered, and the flux must be precisely selected in order to provide optimal conditions for the process. Generally, leadless alloys have slightly higher melting point, higher surface tension and lower moistening than SnPb. This may cause production problem, i.e. damages to components due to thermal impacts, deforming of the PCB's, flux splashes, extending of the operation time to good joining, deforming of plastics, etc.

Sn97Cu3 and Sn99Cu1 are good materials for soldering internal elements and for covering the terminals. They are modern alloys widely applied in electronics owing to their good physical properties. They are also a good and popular alternative for Sn60Pb40 and Sn63Pb37.
In order to provide good tin-plating and soldering of the terminals, it is important to select appropriate flux. Higher melting point of leadless alloys results in higher oxidation and lower moistening and, thus, appropriate flux must be selected and its quantity shall be adapted to the temperature profile of the process. Too much heat delivered may cause evaporation of flux before it moistens the solder, and use of stronger, aggressive fluxes in higher quantities may require introduction of the operation of washing away the residues of the soldering process.

Types of relay terminals

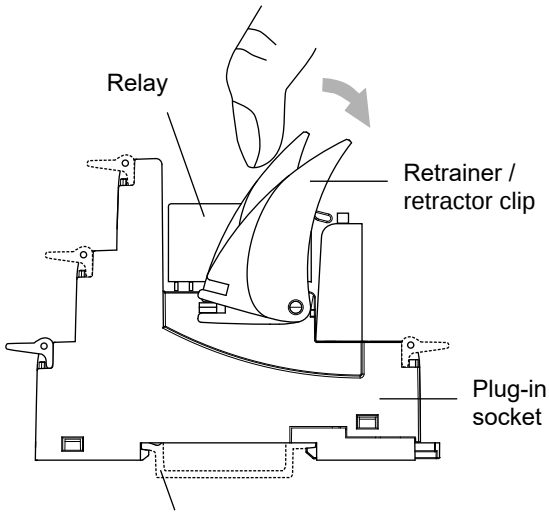
Surface mounted terminals (SMT)	
PCB mounted terminals	
Terminals to solder wires and for sockets	
Terminals for flat slide-in (faston) connections	

In miniature relays of high power to be mounted on printed boards universal terminals are made so to provide fitting the relays also in sockets mounted **on 35 mm rail mount**. Then, relay terminals are connected to wires with screw terminals of the socket. This allows mounting miniature relays on a mounting board and enhances technical service of the device. Sockets are fitted with retrainer / retractor clips which facilitate dismounting of the relay and, when it is mounted in the socket, the lever serves as a reliable latch which secures the relay on the mounting board.

Electrical connections to voltage and current sources are made with appropriate joints and wires of cross-sections specified in the table aside.

While mounting relays **on printed boards**, the openings on the board must match the raster of the relay terminals and have appropriate diameter, which shall enable its easy connection. Otherwise, terminals may be bent, contacts deformed or the cover tightness may be disturbed. Printed paths from the relay contacts should be as wide as possible, which results in lower losses in the course of current flow and good removal of heat from the contacts. For the purpose of providing good insulation strength, it is necessary to arrange the circuits appropriately on the board and to apply protection mask.

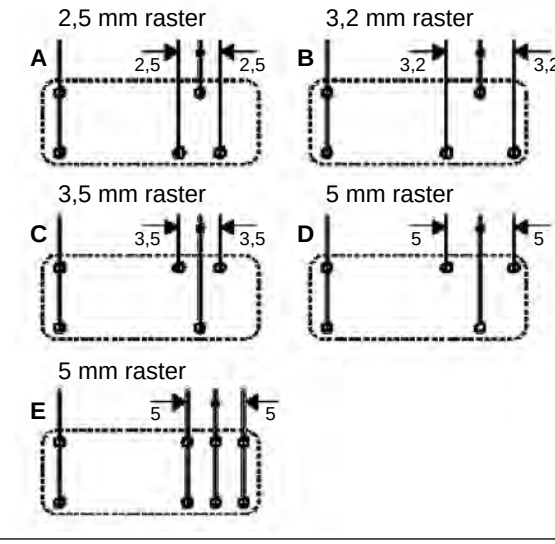
Fig. 28. In course of mounting of the relay in the socket, the clip functions also as a relay protective latch.



35 mm rail mount acc. to PN-EN 60715

Current flowing via terminal [A]		Wire and stranded conductors
above	including up to	cross-section [mm^2]
–	3	0,5
3	6	0,75
6	10	1
10	16	1,5
16	25	2,5
25	32	4
32	40	6
40	63	10

Fig. 29. Typical rasters of terminals of miniature relays



The table shows various **limiting currents** of printed circuits of different thickness of the copper layer and with various conducting paths.

Load current [A]	Width of the copper printed path [mm]			
	Copper thickness 70 µm		Copper thickness 35 µm	
	Single-side path	Double-side path	Single-side path	Double-side path
16	8	5	inadmissible	inadmissible
14	6,5	4	inadmissible	inadmissible
12	5	3	7,5	5
10	3,5	2	6	4
8	2,5	1	4	2,5
6	1,5	is not applied	2,5	1,5
4	1	is not applied	1,5	1
2	0,7	is not applied	1	is not applied

International standards

Relays manufactured by Relpol S.A. are designed and tested in compliance with the requirements of the following international standards:

PN-EN 61810-1 Electromechanical non-specified time all-or-nothing relays. Part 1: General requirements.

PN-EN 61810-5 Electromechanical non-specified time all-or-nothing relays. Part 5: Insulation coordination

PN-EN 60664-1 Insulation coordination for equipment within low-voltage systems. Part 1: Principles, requirements and tests.

PN-EN 116000-3 Generic Specification: Electromechanical all--or-nothing relays. Part 3: Test and measurement procedures.

PN-EN 61812-1 Adjustable time relays for industrial purposes - Requirements and tests

PN-EN 61131-2 Programmable controllers. Part 2: Requirements and equipment tests

Plug-in sockets manufactured by Relpol S.A. are designed and tested in compliance with the requirements of the following international standard:

PN-EN 61984 Connectors - Safety requirements and tests.

Insulation

The classification of insulation groups to define the properties of insulation of the device in compliance with the insulation coordination was previously done according to the VDE 0110 Standard.
Electric devices were classified in insulation categories A, B, C or D due to their application and possible reduction of the insulation properties caused by the impact of the environment, i.e. dust, humidity, aggressive gases, insulation clearance and creepance.
The insulation category was indicated together with the reference voltage which was the basis for defining of the requirements related to the insulation distances for rated voltage up to the reference voltage value.

At present, while dimensioning the insulation distances in accordance with the PN-EN 60664-1 Standard, the overvoltage category and the ambient pollution degree must be defined. The latter indicates the expected pollution of the microenvironment. The transient overvoltage values are the basis for defining the rated surge voltage which determines the minimum contact clearance related with the insulation coordination.

The following **overvoltage categories** are defined:
IV - devices at the front of the installation,
III - devices in fixed installation in cases where reliability and availability of the device is subject to special requirements,
II - receiving devices supplied from the fixed installation,
I - devices connected to circuits where measures have been taken (either in fixed installation or in the equipment) to limit transient overvoltage to the appropriately low level.

Four **pollution degrees** have been defined to estimate the contact creepance and clearance:

1 - no pollution or only dry and non-conducting pollution; the pollution has no effect,

2 - only non-conducting pollution occurs; the vapor condensation, however, may be expected to cause temporary conductivity of the pollution from time to time,

3 - conductive pollution or dry and non-conductive pollution occurs which may become conductive due to condensation,

4 - the pollution proves constant conductivity caused by the conductive dust, rain or snow.

The **rated surge voltage** is defined on the basis of the overvoltage category and the rated voltage of the device.

The rated voltage of the supply system according to PN-IEC 60038		Phase voltage defined on the basis of AC or DC nominal voltages up to the value of	Rated surge voltage			
			Overvoltage category			
Three-phase	Single-phase		I	II	III	IV
	120-240	150	800	1500	2500	4000
230/400		300	1500	2500	4000	6000

The **insulation creepance** are dimensioned on the basis of the following factors:
- root-mean-square value of rated voltage,
- pollution degree,
- group of insulation materials.

Insulation materials are divided into four groups with reference to the value of the indicator of resistance to creeping current:

Group I 600 ≤ CTI
Group II 400 ≤ CTI ≤ 600
Group IIIa 175 ≤ CTI ≤ 400
Group IIIb 100 ≤ CTI ≤ 175

Insulation materials testing

1. Glow wire test

The test simulates exposure to heat originating from such heat sources as glowing parts or overloaded subassemblies in order to assess fire hazard.

The consistency with the requirements for resistance to heat and fire is checked in glow wire test at the temperature of 650 °C.

Some applications of the relay extort more strict requirements. The PN-EN 60335-1 Standard: "Household and similar electrical appliances", provides that the insulation parts supporting elements which conduct current higher than 0,2 A must meet the following requirements as for resistance to fire:

a) GWFI (Glow Wire Flammability Index) with a value 850 °C according to the PN-EN 60695-2-12 Standard.
b) GWIT (Glow Wire Ignition Temperature) with a value 775 °C according to the PN-EN 60695-2-13 Standard.

2. Ball pressure test

The purpose of the test is to assess the resistance of the material to mechanical pressure at higher temperature with no significant deformations.

The test is performed in a heating chamber at higher temperature, where a steel ball of 5 mm diameter is pressed to the surface of the sample with the force of 20 N. The diameter of the indentation shall not exceed 2 mm. The test is made under PN-EN 60695-10-2 Standard.

3. Resistance to proof tracking

The test shows relative resistance of solid insulation materials to proof tracking for voltages up to 600 V when the surface of the insulation, at electrical tension, is exposed to contaminated water.

Proof tracking is probable between parts of different potential and between live parts and earthed metal parts.

Compliance with the requirements is checked under the PN-EN 60112 Standard for PTI index.

In case the type of the relay application requires more strict requirements, PTI 250V, PTI 400V or PTI 600V proof tracking resistance indices shall be assumed.

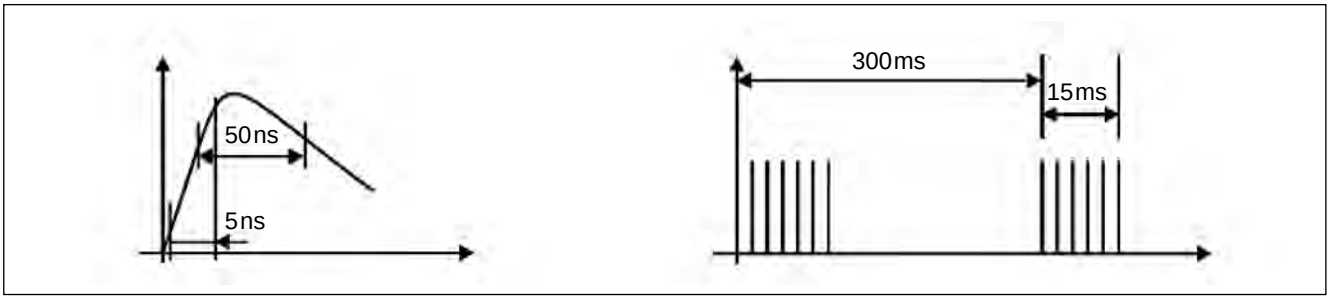
Electromagnetic compatibility

Electromagnetic compatibility is the ability of an electric or electronic appliance to operate correctly in a given electromagnetic environment and not to emit disturbances not tolerated by other appliances which operate in the same environment. The relay is insensitive to high frequency disturbances but presence of high power electromagnetic fields in the proximity of the relay coil may affect making and releasing voltages of the relay. On installation of a relay in the proximity of transformers, electromagnets and electric motors, it is recommended to check making and releasing of the relay.

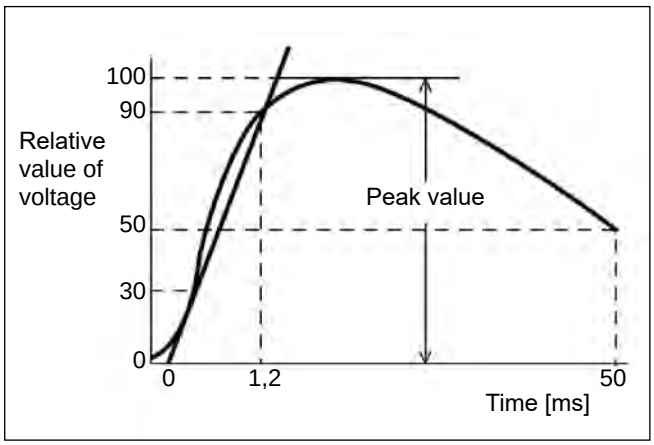
An electromagnetic relay may initiate disturbances, particularly when operating with inductive load of contacts. An electric arc occurring while switching, and overvoltage cause emission of disturbances which may affect the operation of a sensitive electronic appliance in the proximity of the relay. In such cases, circuits of protection of contacts shall be applied, which will allow decreasing the level of disturbances to a safe level. Relays, as components, are not covered with the **EMC** Directive. However, each electric appliance which includes relays is covered with the Directive and subject to its requirements.

EMC test	Standard
Resistance to electrostatic discharges	PN-EN 61000-4-2
Resistance to electromagnetic field of radio frequency	PN-EN 61000-4-3
Resistance to quick pulse beams	PN-EN 61000-4-4
Resistance to surges	PN-EN 61000-4-5
Resistance to conductive disturbances induced by fields of radio frequency	PN-EN 61000-4-6
Resistance to voltage dips, short breaks and changes	PN-EN 61000-4-11
Measurements of radiated and conducted emissions	PN-EN 55011

The most frequent disturbances in installations are quick, repeatable transient states - beams of electric disturbances called **BURST**. These are transient disturbances occurring in supply, signal and control connections. They origin from transient switching states and occur on switching by the contact of inductive loads - electromagnets, motors, etc. They have the form of a beam of high voltage and low power pulses, as the pulse increment time is merely 5 ns and its duration is 50 ns. In tests the duration of a pulse beam is defined as 15 ms, and the period - 300 ms.



Another type of disturbances occurring frequently, due to atmospheric discharges, in low voltage installations are surges (**SURGE**) in supply lines. Similar disturbances may be also caused by connection processes of high power, e.g. switching of leading loads, etc.
Surge pulses are of definitely higher power than burst pulses due to much longer duration - 50 µs.



Protection against ambient effect

As for the protection from **ambient effect**, the PN-EN 116000-3 Standard distinguishes the following types of relays:

RT0 - open relay - a relay without protective cover.

RTI - dustproof relay - a relay with cover to protect its mechanism from dust.

RTII - relay resistant to soldering alloy - a relay adapted to automatic soldering process which prevents soldering alloy from spreading beyond indicated areas.

RTIII - liquid-proof relay - a relay soldered automatically and then subject to washing process for the purpose of removal of the residue of the liquid soldering alloy where the relay cover is prevented from being penetrated by the solder or the washing liquid.

RTIV - tight relay - a relay equipped with a cover with no ventilation openings; all the gaps are filled with a sealing compound to prevent penetration of liquids in course of production, flow soldering or washing. The tightness of relays is tested with a submersion test according to PN-EN 60068-2-17 Standard. During the test, the relays are submerged in distilled water of 85 °C for 1 minute while no air bubbles shall be released from the relay.

RTV - hermetic relay - a tight relay of enhanced tightness level, in a metal cover, terminals sealed with glass, gas-filled.

Cover protection degrees according to PN-EN 60529 Standard. The first digit refers to the protection from foreign solids penetration. The second digit refers to the protection from water penetration.

Examples of indications:

IP20 - protection against solids of the diameter of 12,5 mm and larger, with no protection against water penetration.

IP40 - protection against penetration of solids of 1 mm diameter and larger, with no protection from water penetration.

IP50 - protection against dust; dust penetration is not excluded entirely but dust shall not penetrate in quantities which might disturb correct operation of the appliance or reduce safety.

IP64 - dustproof protection, protection against water splashes - water splashed onto the cover from any direction does not cause harmful effects.

IP67 - dustproof protection, protection against the effects of momentary submersion in water.

Electric load

Electromagnetic auxiliary relays manufactured by Relpol S.A. are designed for a wide range of applications and for switching several loads of diversified characteristics.
Electric loads are classified according to their nature (resistive, capacitive or inductive loads), type of supply (DC or AC), load value and the current curve course shape (lamp, motor, electromagnetic, etc. loads).

Contact application categories according to PN-EN 116000-3 Standard

Application category	Voltage [V]	Current [A]
0 (CA 0)	< 0,03	< 0,01
1 (CA 1)	0,03 < U < 60	0,01 < I < 0,1
2 (CA 2)	5 < U < 250	0,1 < I <1
3 (CA 3)	5 < U < 600	0,1 < I < 100

Application categories according to PN-EN 60947-4-1 and PN-EN 60947-5-1 Standards

Application category	Typical application
AC-1	Resistive or slightly inductive loads, resistance furnaces
AC-2	Slip-ring motors: start-up, switching off
AC-3	Squirrel-cage motors: start-up, switching off motors during running time
AC-4	Squirrel-cage motors: start-up, reversing (countercurrent braking), pulsing
AC-5a	Discharge lamps
AC-5b	Electric bulbs
AC-6a	Transfomers
AC-6b	Capacitor banks

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Application categories according to PN-EN 60947-4-1 and PN-EN 60947-5-1 Standards

Application category	Typical application
AC-7a	Slightly inductive loads in household appliances and similar applications
AC-7b	Motors in household appliances
AC-8a	Hermetic refrigerant compressor motors with manual overload resetting
AC-8b	Hermetic refrigerant compressor motor control with automatic overload resetting
AC-12	Control of resistive loads and solid state loads with opto-isolators
AC-13	Control of solid state loads with transformer isolation
AC-14	Control of small electromagnetic loads (≤ 72 VA)
AC-15	Control of AC electromagnetic loads (> 72 VA)
DC-1	Resistive or slightly inductive loads
DC-3	Shunt-motors: start-up, breaking
DC-5	Series-motors: start-up, countercurrent braking, pulsing. Dynamic switching-off of DC motors
DC-6	Bulbs
DC-12	Control of resistive loads and solid state loads with opto-isolators
DC-13	Control of DC electromagnets
DC-14	Control of DC resistive loads having economy resistors in the circuit

Certifications

Compliance with national and international standards provides for safe use of the product, and proves high quality and durability of the product. In some countries (e.g. USA, Canada, Russia), the product certification to prove its compliance with the requirements of appropriate national standards is obligatory, and the product must undergo the procedure of compliance assessment at certifying agencies in order to be approved for sale. In other countries it is the manufacturer's responsibility to provide the compliance of the design and production with the requirements of appropriate standards (e.g. the countries of the European Union).
Certification agencies carry out the testing procedure in accordance to applicable standards, and then they regularly audit the production process in order to confirm that the requirements are observed in current production of the certified product. The European Union applies European Standards (EN) as set forth by the European Committee for Electrotechnical Standardization (CENELEC), and international standards set forth by the International Electrotechnical Commission (IEC).
The products manufactured and offered by Relpol S.A. have numerous certifications issued by renowned research institutions such as VDE, UL, CSA International, GOST or BBJ-SEP. The electromagnetic relays have been certified to comply with the following standards: EN 60255-1 and EN 61810-1 - VDE, BBJ-SEP, UL508 - Underwriters Laboratories, C22.2 - CSA International, GB14048.5 - China Quality Certification Centre. Apart from the certifications which prove the safety and high durability of the products, some of Relpol's products have certifications required for applications of relays in special conditions, e.g. Lloyd's Register certification which acknowledges compliance with the requirements for electrotechnical products to be used on vessels and in devices which operate in adverse climatic conditions, or certificates of AUCOTEAM GmbH, Berlin or Railway Institute to confirm meeting of railway requirements.

PRECAUTIONS:
1. Ensure that the parameters of the product described in its specification provide a safety margin for the appropriate operation of the device or system and never use the product in circumstances which exceed the parameters of the product. **2.** Never touch any live parts of the device. **3.** Ensure that the product has been connected correctly. An incorrect connection may cause malfunction, excessive heating or risk of fire. **4.** In case of any risk of any serious material loss or death or injuries of humans or animals, the devices or systems shall be designed so to equip them with double safety system to guarantee their reliable operation.

You have not found the relay you wanted? The catalog does not show the information about the switching capacity for the type of load you are looking for? Detailed contact data is presented on the last page of the catalog and at **www.relpol.com.pl**

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subminiature
and miniature relays

industrial and
installation relays

interface relays

NEED – programmable
relays

time relays

monitoring relays

solid state relays

plug-in sockets
for relays

RIK – installation
contactors

softstarts

power supplies

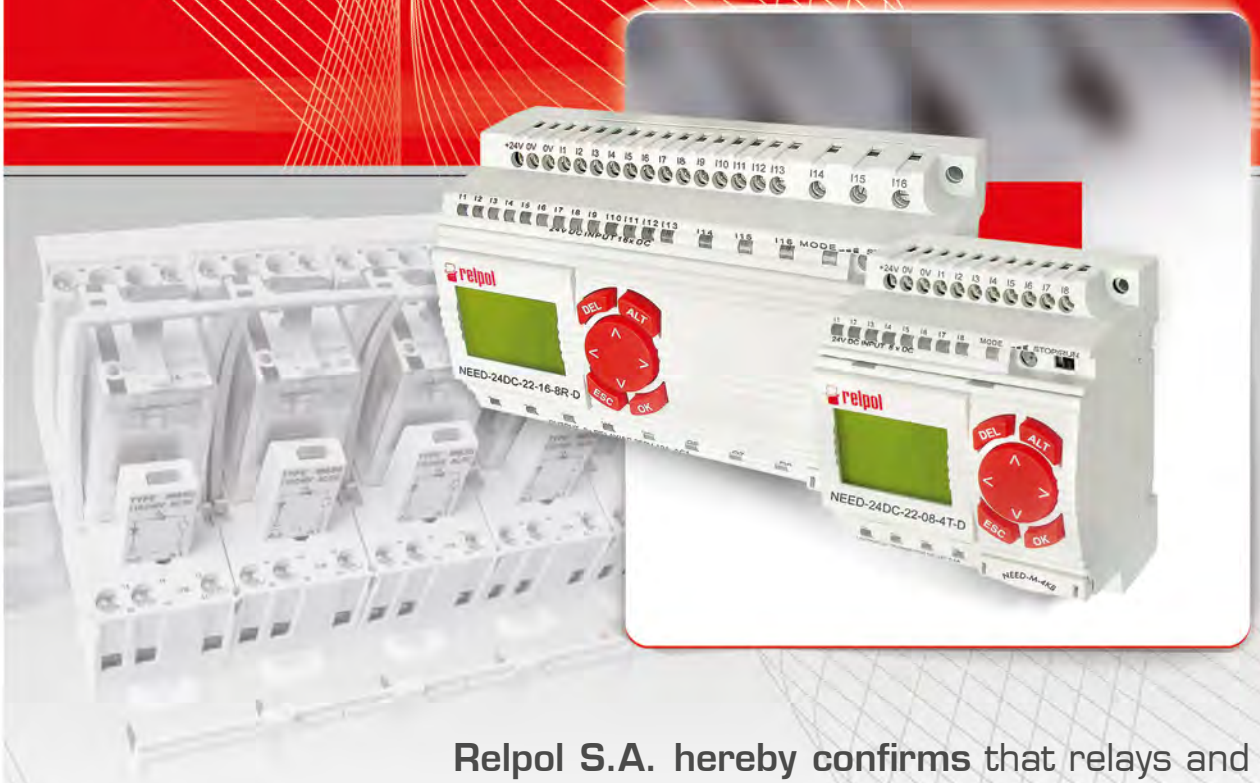
overvoltage arresters

SMP – radiation
portal monitors

CZIP®-PRO – protection
relays

Declaration of conformity

RoHS



Relpol S.A. hereby confirms that relays and plug-in sockets for relays supplied by our company meet the requirements of the Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment – **RoHS 2011/65/UE**.

01.10.2014

Date

Quality and Environmental Management Department Director
Sylwia Sochoń-Miezio

relpol® S.A.

RoHS conform

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подробно смотрите ниже: каталог, описание, технические, характеристики, datasheet, параметры, маркировка, габариты, фото

QR код