

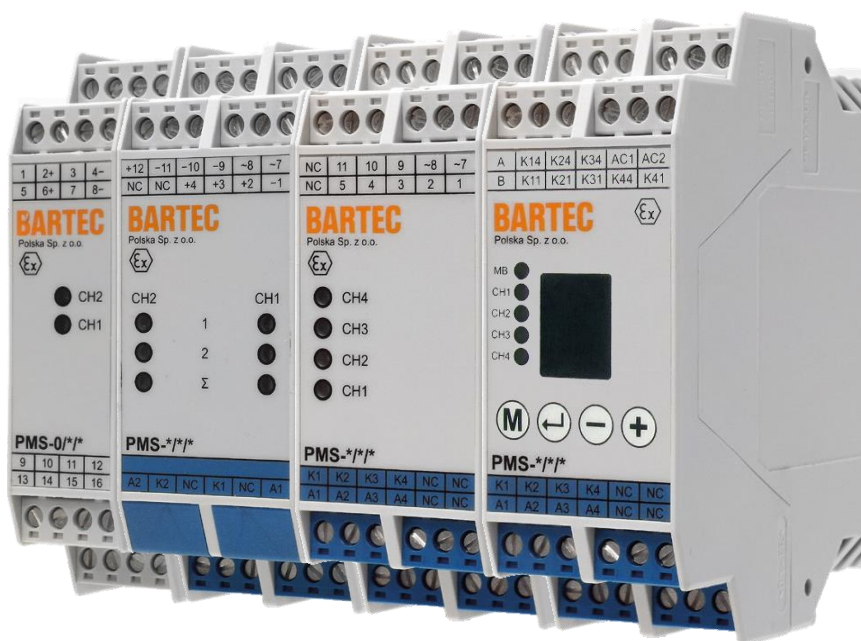
# RELAY CONTROL MODULE

TYPE PMS-\*/\*/\*

OPERATION MANUAL No. BP/IO/16/08



# EXPROTEC



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## 1. Introduction

The Relay control module type PMS-\*/\*\* is designed to test continuity and earth resistance of a receiver or can act as a control relay. The PMS-\*/\*\* relay comes in several versions and configurations:

- module type (actuating relay or measuring module),
- number of channels (two or four),
- output type (relay or open collector output),
- resistance values (50  $\Omega$ , 100  $\Omega$ , 600  $\Omega$ , X  $\Omega$ : 50..2500  $\Omega$ ),
- supply voltage (12 V / 24 V / 42 V AC or DC),
- four versions, either intrinsically safe (i) or non-intrinsically safe ( $\bar{i}$ )  
( $\bar{i}/\bar{i}$ ,  $\bar{i}/i$ ,  $i/\bar{i}$ ,  $i/i$ ).

The PMS-\*/\*\* relay consists of measuring and actuating modules. Each of the modules can operate independently or they can be interconnected with each other.

The measuring modules PMS-1\*/\*\*, ..., PMS-10\*/\*\* come as intrinsically safe or non-intrinsically safe versions. These modules differ in the permissible measurement line resistance. The measuring module has two or four input channels controlled by a rectifier diode e.g. 1N400\*. Each input measurement channel (CH1... CH2 or CH1.. CH4) is controlled by short circuit, break and current flow direction.

For control purposes, the measuring circuit resistance of the PMS relay control module measuring circuit shall not exceed 600  $\Omega$ , for the purpose of monitoring the continuity of the protective (earthing) conductor in the cables and supply wires of the unit, the circuit resistance shall not exceed 100  $\Omega$  (for supply networks with a voltage up to 1000 V AC) and shall not exceed the resistance of 50  $\Omega$  (for supply networks with a voltage above 1000 V AC). The actuating module of the measuring channel can be built based on a relay with a normally open (NO) contact or two open collector (NO) outputs. Depending on the non-intrinsically safe power supply, the relay control module has the following versions: PMS-\*/2\* – for 24 VDC power supply, PMS-\*/3\* – for the power supply of 42 V AC/DC, **PMS-\*/4\* – for the power supply of 24 V/42 V AC/DC.**

The actuating relay module PMS-0\*/\*\* can be powered from a non-intrinsically safe or an intrinsically safe power supply with the protection “ia” or a non-intrinsically safe of 12 V DC or 24 V DC. It provides galvanic isolation between the power source of the module and the contacts of its actuating relays.

Depending on the user's needs, the PMS relay can be used for galvanic separation of intrinsically safe and/or non-intrinsically safe circuits.

The product may be used in underground mines in headings categorised as class “a”, “b” or “c” methane explosion hazard and class “A” or “B” coal dust explosion hazard, only after installation in a flameproof enclosure with Ex d rating.

The product may be used in explosive gas atmospheres classified as zone 1 or 2 (G) and used in the area where explosive dust atmospheres classified as zone 21 or 22 (D) occur, only when installed in a properly rated explosion-proof enclosure.

The manufacturer reserves the right to make changes resulting from advancement of technology and the right to use substitute components with equivalent parameters.

## 2. Type designation

PMS - \* / \* / \*

Version:

1 –  $\overline{i} / \overline{i}$

2 –  $\overline{i} / i$  (only applicable to PMS-0/\*/\*)

3 –  $i / \overline{i}$

4 –  $i / i$  (only applicable to PMS-0/\*/\*)

Supply voltage

1 – 12 V DC (only applicable to PMS-0/\*/\*)

2 – 24 V DC

3 – 42 V AC/DC (only not applicable to PMS-0/\*/\*)

4 – 24 V/42 V AC/DC (only not applicable to PMS-0/\*/\*)

Number and type of measuring modules and of output types:

0 – actuating relay module (without measuring module), relay

1 – dual-channel measuring module up to 600  $\Omega$  (with diode)  $U_o = 5,36$  V, open collector

2 – dual-channel measuring module up to 100  $\Omega$  (with diode)  $U_o = 5,36$  V, open collector

3 – dual-channel measuring module up to 50  $\Omega$  (with diode)  $U_o = 5,36$  V, open collector

4 – withdrawn from production

5 – four-channel measuring module up to 600  $\Omega$  (with diode)  $U_o = 5,36$  V, open collector

6 – four-channel measuring module up to 600  $\Omega$ , 100  $\Omega$  or 50  $\Omega$  (with diode)  $U_o = 5,36$  V (special version with the above-mentioned resistance on any measuring channel), relay

7 – four-channel measuring module up to 100  $\Omega$  (with diode)  $U_o = 5,36$  V, relay

8 – four-channel measuring module up to 50  $\Omega$  (with diode)  $U_o = 5,36$  V, relay

9 – dual-channel measuring module up to X  $\Omega$  (with diode) (50..2500  $\Omega$ ), open collector

10 – four-channel measuring module up to X  $\Omega$  (with diode) (50..2500  $\Omega$ ), relay



11 – four-channel measurement module with independently programmable switch-off and switch-on resistances in each measurement channel (with diode)  $U_o = 13,65$  V, relay

The standard version are the following relay types:

**PMS-0/2/1, PMS-1/4/3, PMS-2/4/3, PMS-3/4/3, PMS-5/4/3, PMS-7/4/3, PMS-8/4/3, PMS-11/4/3**

### 3. Specifications

**Table 1. Technical parameters**

Design details:		
Designation of explosion protection rating	I (M1) [Ex ia Ma] I II (1)G [Ex ia Ga] IIC II (1)D [Ex ia Da] IIIC	
EU type examination certificate	OBAC 08 ATEX 268U	—
Enclosure protection rating	IP20	—
Type of explosion protection for installation in hazardous areas for I M2 and II 2G	Ex d	
Place of installation	mounting bracket: TH 35 / TS 35	—
Cross-section of connected cable	0,25..2,5 (2x1,5)	mm <sup>2</sup>
Length of wire stripping	9	mm
Maximum contact tightening torque	0,3	Nm
Relay dimensions PMS-0/*/* (h×w×d)	114 x 23 x 99	mm
Relay dimensions PMS-1/*/*,..., PMS-11/*/* (h×w×d)	114 x 35 x 99	mm
Relay weight PMS-0/*/*	205	g
Relay weight PMS-1/*/*,..., PMS-9/*/*	225	g
Relay weight PMS-5/*/*,..., PMS-8/*/*, PMS-10/*/*	235	g
Relay weight PMS-11/*/*	250	g

Relay type:	Type of contacts:	
	semiconductor	relay
PMS-0/*/1, PMS-0/*/4	—	2x NC, 4x NO
PMS-0/*/2, PMS-0/*/3	—	4x NO
PMS-1/*/*,..., PMS-9/*/*	2x NO	—
PMS-5/*/*,..., PMS-8/*/*, PMS-10/*/*, PMS-11/*/*	—	4x NO

Electrical parameters of control circuits – versions:							
Supply voltage	Permissible supply voltage range					Current input	Input power
	rated	min.	max.	min.	max.		
V AC/DC	V	V DC	V DC	V AC	V AC	mA	VA
PMS-0/1/*	12	10,8	13,2	—	—	—	1,5
PMS-0/2/*	24	21,6	26,4	—	—	—	1,5
PMS-*/2/*	24	19,2	28,8	19,2	28,8	—	3
PMS-*/4/*(*)	24-42	19,2	50,4	19,2	50,4	—	3
PMS-*/4/* — not applicable to PMS-0/*/*							

Operating conditions:		
Elevation above sea level	up to 1000	m
Ambient temperature	-20..+70	°C
Relative humidity at temperature 20°C	do 95	%
Transport temperature	-20..+40	°C
Transport relative humidity	do 95	%
Mechanical exposure – frequency	10..500	Hz
Shock resistance	10	g
Vibration resistance (10 ... 500 Hz)	5	g
Type of operation	continuous	—

**Table 2. Technical and intrinsically safe parameters**

Permissible parameters of circuits at terminals PMS-0/1/1:		
(2+) – (4-), (6+) – (8-) (coil power supply)	Un = 12	V DC
	Umax = 13,2	V
	I <sub>max</sub> = 88	mA
	Pmax = 1,16	W
1-3, 5-7 (NC relay contact) 9-10, 11-12, 13-14, 15-16 (NO relay outputs)	Umax = 240	V
	I <sub>max</sub> = 3	A
	Pmax = 240	VA

Permissible parameters of circuits at terminals PMS-0/1/2:		
(2+) – (4-), (6+) – (8-) (coil power supply)	Um = 250	V
	Un = 12	V DC
	Umax = 13,2	V
	I <sub>max</sub> = 88	mA
	Pmax = 1,16	W
9-10, 11-12, 13-14, 15-16 (NO relay outputs) Protection level "ia"	Ui = 90	— V
	Ii = 2	— A
	Ci = 0	— F
	Li = 0	— H

Permissible parameters of circuits at terminals PMS-0/1/3:		
(2+) – (4-), (6+) – (8-) (coil power supply) Protection level "ia"	Un = 12	— V DC
	Ui = 13,2	— V
	—	— A
	Ci = 0	— F
	Li = 0	— H
9-10, 11-12, 13-14, 15-16 (NO relay outputs)	Um = 250	V
	Umax = 240	V
	I <sub>max</sub> = 2	A
	Pmax = 100	VA

Permissible parameters of circuits at terminals PMS-0/1/4:		
(2+) – (4-), (6+) – (8-) (coil power supply) Protection level "ia"	Un = 12	— V DC
	Ui = 13,2	— V
	—	— A
	Ci = 0	— F
	Li = 0	— H
1-3, 5-7 (NC relay contact) 9-10, 11-12, 13-14, 15-16 (NO relay contact) Protection level "ia"	Ui = 90	— V
	Ii = 2	— A
	Ci = 0	— F
	Li = 0	— H

Permissible parameters of circuits at terminals PMS-0/2/1:		
(2+) – (4-), (6+) – (8-) (coil power supply)	Um = 250	V
	Un = 24	V DC
	Umax = 26,4	V
	I <sub>max</sub> = 46	mA
	Pmax = 1,21	W
1-3, 5-7 (NC relay contact) 9-10, 11-12, 13-14, 15-16 (NO binary outputs)	Um = 250	V
	Umax = 240	V
	I <sub>max</sub> = 3	A
	Pmax = 240	VA

Permissible parameters of circuits at terminals PMS-0/2/2:			
(2+) – (4-), (6+) – (8-) (coil power supply)	Um = 250		V
	Un = 24		V DC
	Umax = 26,4		V
	Imax = 46		mA
	Pmax = 1,21		W
9-10, 11-12, 13-14, 15-16 (NO relay contact) Protection level "ia"	Ui = 90	—	V
	Ii = 2	—	A
	Ci = 0	—	F
	Li = 0	—	H

Permissible parameters of circuits at terminals PMS-0/2/3:			
(2+) – (4-), (6+) – (8-) (coil power supply) Protection level "ia"	Un = 24	—	V DC
	Ui = 26,4	—	V
	—	—	A
	Ci = 0	—	F
	Li = 0	—	H
9-10, 11-12, 13-14, 15-16 (NO binary outputs)	Um = 250		V
	Umax = 240		V
	Imax = 2		A
	Pmax = 100		VA

Permissible parameters of circuits at terminals PMS-0/2/4:			
(2+) – (4-), (6+) – (8-) (coil power supply) Protection level "ia"	Un = 24	—	V DC
	Ui = 26,4	—	V
	—	—	A
	Ci = 0	—	F
	Li = 0	—	H
1-3, 5-7 (styk przekaźnika NC) 9-10, 11-12, 13-14, 15-16 (NO relay contact) Protection level "ia"	Ui = 90	—	V
	Ii = 2	—	A
	Ci = 0	—	F
	Li = 0	—	H

Permissible parameters of circuits at terminals PMS-1/*/*, PMS-2/*/*, PMS-3/*/* PMS-9/*/*:						
A1-K1, A2-K2 (measuring circuit) Protection level "ia"	—		Uo = 5,25		V	
	—		Io = 5,3		mA	
	—		Po = 6,9		mW	
	—		Co = (*)		uF	
	—		Lo = (*)		mH	
	Grupa	I	IIA	IIB	IIC	IIIC
	Co =	1000	1000	1000	71	1000
~7~8 (power supply)	Lo =	100	100	100	100	100
	—		Um = 250		V	
	—		Un = 24		V AC/DC	
(2+) – (4-), (6+) – (8-) (NO binary outputs)	—		Un = 42		V AC/DC	
	—		Um = 250		V	
	—		Umax = 30		V	
(2+) – (4-), (6+) – (8-) (NO binary outputs)	—		Imax = 0,2		A	
	—		—		—	

Permissible parameters of circuits at terminals PMS-5/*/*, PMS-6/*/*, PMS-7/*/* PMS-8/*/*, PMS-10/*/*:							
A1-K1, A2-K2, A3-K3, A4-K4 (measuring circuit) Protection level "ia"	—		Uo = 6		V		
	—		Io = 6		mA		
	—		Po = 9		mW		
	—		Co = (*)		uF		
	—		Lo = (*)		mH		
	Grupa	I	IIA	IIB	IIC	IIIC	—
	Co =	1000	1000	1000	40	1000	uF
	Lo =	100	100	100	100	100	mH
~7--8 (power supply)	Um = 250						V
	Un = 24						V AC/DC
	Un = 42						V AC/DC
5-11, 4-10, 3-9, 1-2 (NO relay outputs)	Um = 250						V
	Imax = 2						A
	Un = 60 (0,5A)						V AC
	Un = 30 (0,5A)						V DC

Permissible parameters of circuits at terminals PMS-11/*/*:							
A1-K1, A2-K2, A3-K3, A4-K4 (measuring circuit) Protection level "ia"			—		Uo = 13,65		V
			—		Io = 15,5		mA
			—		Po = 53		mW
			—		Co = (*)		uF
			—		Lo = (*)		mH
	Grupa	I	IIA	IIB	IIC	IIIC	—
	Co =	22	18,1	5	0,79	5	uF
	Lo =	100	100	100	100	100	mH
			—		Li = 3		mH
			—		Ci = 0 (negligible)		uF
AC1-AC2 (power supply)	Um = 250						V
	Un =24						V AC/DC
	Un =42						V AC/DC
K11-K14, K21-K24, K31-K34, K41-K44 (NO relay outputs)	Um = 250						V
	Imax = 2						A
	Un = 60 (0,5A)						V AC
	Un = 30 (0,5A)						V DC

## 4. Identification of hazards caused by equipment during its use

### 4.1 Introduction

#### WARNING!

Safe operation of devices requires special training, knowledge and experience. Do not attempt to operate this unit unless you have the appropriate qualifications. Improper or negligent handling may lead to a serious accident or death of such person or other persons.



The unit is designed to meet the specific technical conditions and requirements of the customer.

**WARNING!**

**Modification of equipment for which authorisation has not been granted or use of repaired parts or other replacement parts not meeting the manufacturer's technical specifications may result in serious risk or invalidate the warranty, certification or approvals.**

If modifications of the unit are needed, they should be carried out after receiving written authorisation from the manufacturer.

## 4.2 Hazards during equipment operation

Before starting up the unit, check whether its operation may cause risks to life and health of personnel in its vicinity.

**WARNING!**

**Before starting the unit, check the power cables for integrity and proper screwing to the screw terminals.**

It is forbidden to install temporary connections. For safe operation, observe all the procedures specified in the safety instructions for use.

## 4.3 Special conditions for safe use

**WARNING!**

**Special conditions for safe use**

- Install the unit outside of a hazardous area. If placed in a hazardous area, the unit should be protected by appropriate explosion protection features.
- Ambient temperature range:  $-20^{\circ}\text{C} \leq T_a \leq +70^{\circ}\text{C}$
- The installation should be carried out with the necessary separating distance to external terminals of the unit in accordance with point 6.2.1 PN-EN 60079-11.

**WARNING!**

**The unit may be used in mine headings categorised as class “a”, “b” or “c” methane explosion hazard and class “A” or “B” coal dust explosion hazard, only after installation in a flameproof enclosure with Ex d rating. The unit must be de-energised when methane concentration exceeds the value specified in the applicable regulations.**

**The unit may be used in explosive gas atmospheres classified as zone 1 or 2 (G) and used in the area where explosive dust atmospheres classified as zone 21 or 22 (D) occur, only and exclusively when installed in a properly rated explosion-proof enclosure.**

## 5. Construction and operating principle

### 5.1 Mechanical Part

The relay control module type PMS-\*/\*/\* (Rys. 1, 2, 3) consists of a printed circuit board and a plastic enclosure ME 22.5 or ME 35 made by Phoenix Contact with IP20 rating.

Cables are connected to screw terminals located on the sides of the enclosure. The relay is fitted with sockets and non-interchangeable plugs. To prevent interchanging the plugs and terminal strips have coding inserts. Additionally, colour coding (the colour of intrinsically safe plug-socket is blue, the colour of non-intrinsically safe plug-socket is grey) facilitates the correct connection. The relay enclosure is suitable for mounting on TH 35/TS 35 rail.

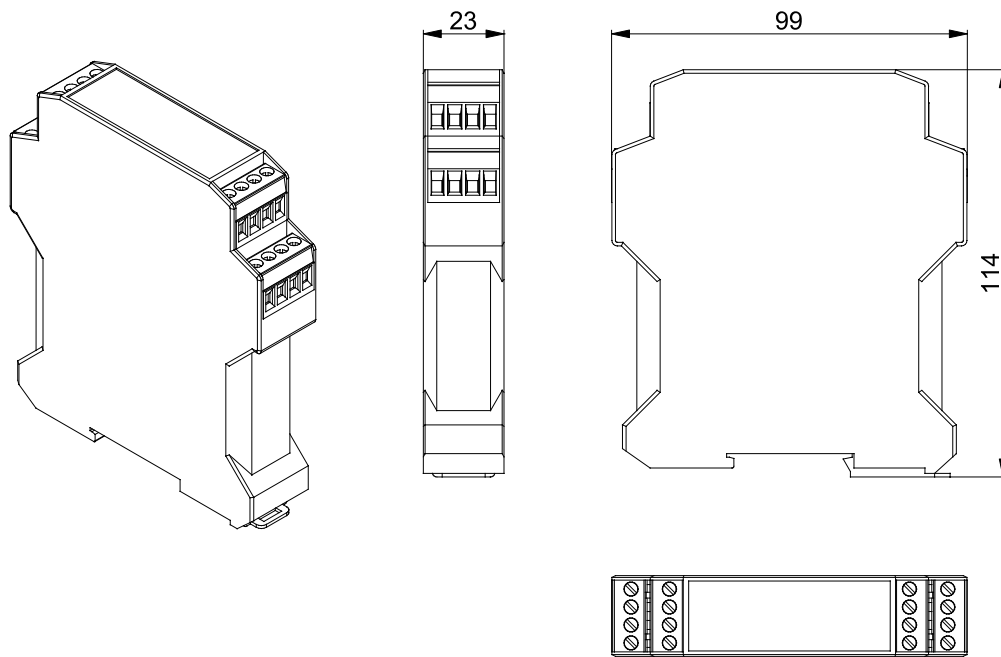


Fig. 1. General view of relay PMS-0\*/\*/\*

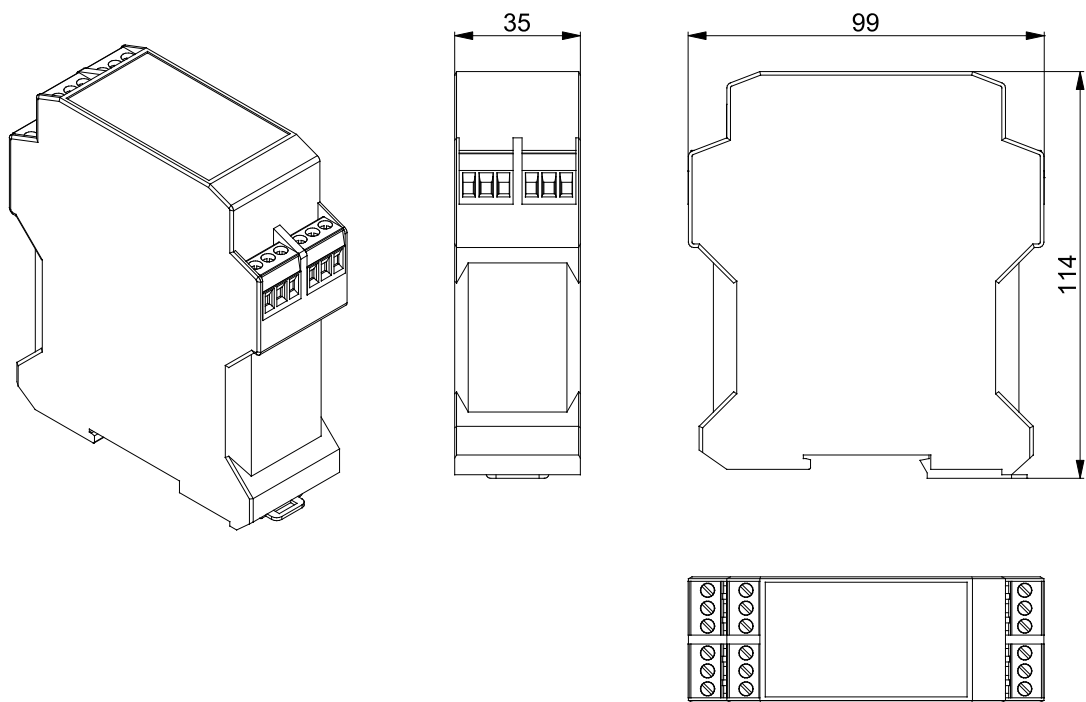


Fig. 2. General view of relay PMS-1\*/\*/\*,..., PMS-11\*/\*/\*

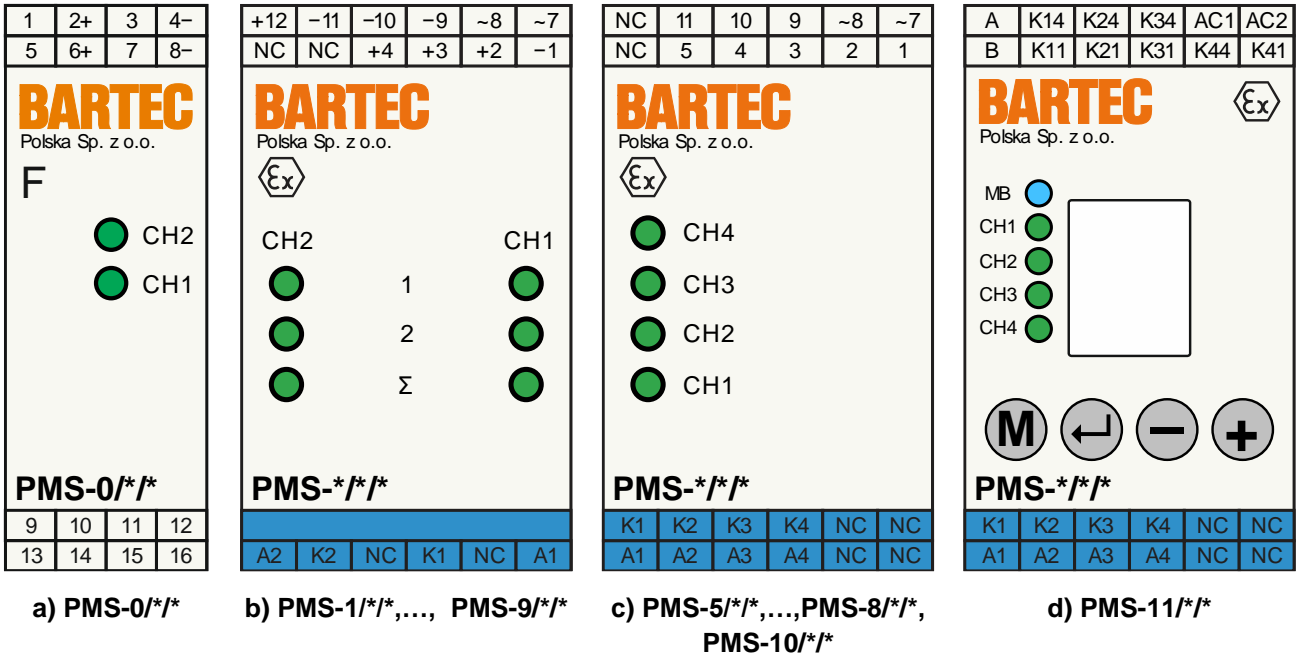


Fig. 3. View of fronts and descriptions of relay PMS-\*/\*/\*

## 5.2 Electrical part

### 5.2.1 PMS-0\*/\*/\*

The relay type PMS-0\*/\*/\* is a dual-channel expansion module designed to multiply the input signal. Each channel consists of two normally open contacts (NO) and one normally closed

acknowledgement contact (NC). Modules PMS-0\*/2 i PMS-0\*/3 are not fitted with acknowledgement contacts (normally closed, NC).

Appropriate levels of protection and reliability are achieved for each channel. The intrinsically safe version uses an input diode, a fuse, two current limiters and the relay is protected by diodes. The channels are controlled by applying the appropriate voltage (12 V DC or 24 V DC) to the input terminals, which results in a short circuit of the output contacts pairs and a short circuit of the acknowledgement contact. In order to avoid mistakes, colour-coded plugs are applied. The actuating relay PMS-0\*/ can also be used as a separator of non-intrinsically safe and intrinsically safe circuits.

### 5.2.2 PMS-1\*/\*, ..., PMS-9\*/\*

Relay type PMS-1\*/\*, ..., PMS-9\*/\* is a dual channel module designed to control the status of the measuring line. Two input channels are controlled using the rectifier diode type 1N400 \*. Each input is controlled by a short circuit, a break and a current flow direction. The input measuring circuit resistance is limited to 600  $\Omega$ , 100  $\Omega$ , 50  $\Omega$  or X  $\Omega$  (50..2500  $\Omega$ ). The relay must be powered by direct or alternating current (in accordance with version) to terminals ~7, ~8 (any polarity). The correct connection of the diode (terminals A1-K1 or A2-K2) will control the **open collector** type outputs. The relay consists of four main parts:

- pulse converter lowering the voltage to 5 V DC or 12 V DC,
- supply system with a high-frequency converter for galvanic separation (4kV) and diode barriers to achieve the protection level of "ia",
- two isolated measuring channels,
- two redundant actuating channels.

The relay type PMS-1\*/\*, ..., PMS-9\*/\* can also be used as a separator of intrinsically safe and non-intrinsically safe circuits.

### 5.2.3 PMS-5\*/\*, ..., PMS-8\*/\*, PMS-10\*/\*

The relay type PMS-5\*/\*, ..., PMS-8\*/\*, PMS-10\*/\* is a four channel module designed to control the status of the measuring line. Four input channels are controlled using the rectifier diode type 1N400\*. Each input is controlled by a short circuit, a break and a current flow direction. The input measuring circuit resistance is limited to 600  $\Omega$ , 100  $\Omega$ , 50  $\Omega$  or X  $\Omega$  (50..2500  $\Omega$ ). The relay must be powered by direct or alternating current (in accordance with version) to terminals ~7, ~8 (any polarity). The correct connection of the diode (terminals A1-K1, A2-K2, A3-K3, A4-K4) will control the **relay** outputs. The relay consists of three main parts:

- pulse converter lowering the voltage to 5 V DC or 12 V DC,
- supply system with a high-frequency converter for galvanic separation (4kV) and diode barriers to achieve the protection level of "ia",
- four isolated measuring channels.

The relay type PMS-5\*/\*, ..., PMS-8\*/\*, PMS-10\*/\* can also be used as a separator of intrinsically safe and non-intrinsically safe circuits.

### 5.2.4 PMS-11\*/\*

The relay type PMS-11\*/\* is a four channel module designed to control the status of the measuring line. Four input channels are controlled using the rectifier diode type 1N4007<sup>1</sup>. Each input is controlled by a short circuit, a break and a current flow direction. The input measuring circuit resistance is configurable from 30 $\Omega$  to 600 $\Omega$ <sup>2</sup>. In addition, the relay reacts by switching off the executive contact if the parallel resistance drops below 2k $\Omega$ . The relay must be powered by direct or alternating current (in

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<sup>1</sup> Using a different type of diode will increase the error of indication of the resistance of the measuring line.

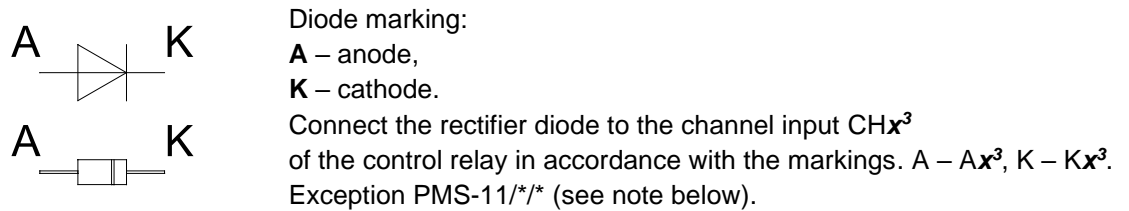
<sup>2</sup> Configuration – see section 6.1.

accordance with version) to terminals ~7, ~8 (any polarity). The correct connection of the diode (terminals A1-K1, A2-K2, A3-K3, A4-K4) will control the relay outputs. The relay consists of three main parts:

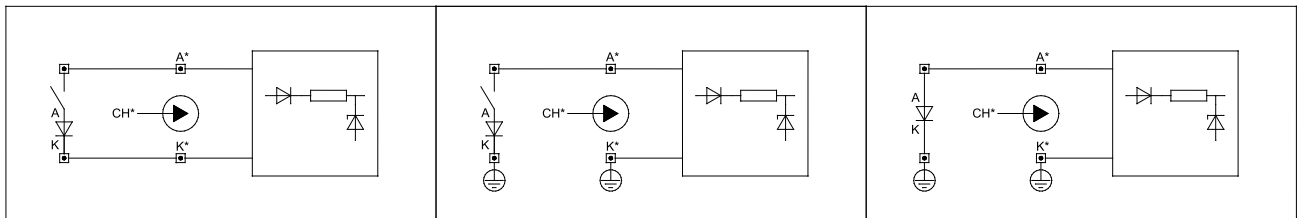
- pulse converter lowering the voltage to 12 V DC,
- supply system with a high-frequency converter for galvanic separation (4kV) and diode barriers to achieve the protection level of “ia”,
- four isolated measuring channels,
- Modbus communication module.

The relay type PMS-11/\*/\* can also be used as a separator of intrinsically safe and non-intrinsically safe circuits.

### 5.2.5 Options for connecting the rectifying diode (PMS-1/\*/\*,..., PMS-11/\*/\*)



**Fig. 4. Rectifier diode symbol and marking**



**Fig. 5. Options for connecting the rectifier diode to the relay input**

**NOTE:** The PMS-11/\*/\* measuring module, unlike other versions (PMS-1/\*/\*,..., PMS-10/\*/\*) recognizes the connection direction of the rectifier diode and can be configured to switch the executive relay on regardless of the direction of diode connection.

### 5.2.6 LEDs

View of fronts and descriptions of relay PMS-\*/\*/\* are shown in Fig. 4.

PMS-0/\*/\* dual channel relay LEDs:

- **CH1** – channel number 1, supplies 12 V or 24 V DC voltage, lights up the CH1 diode,
- **CH2** – channel number 2, supplies 12 V or 24 V DC voltage, lights up the CH2 diode.

LEDs of the dual channel relay PMS-1/\*/\*,..., PMS-9/\*/\*:

- **CH1** – channel number 1, connection of the rectifier diode in accordance with the A/K markings lights up the diodes: the first circuit (1), the second circuit (2) and the product of two circuits ( $\Sigma$ ),
- **CH2** – channel number 2, connection of the rectifier diode in accordance with the A/K markings lights up the diodes: the first circuit (1), the second circuit (2) and the product of two circuits ( $\Sigma$ ).

LEDs of the four-channel relay PMS-5/\*/\*,...,PMS-8/\*/\*, PMS-10/\*/\*:

- **CH1** – channel number 1, connection of the rectifier diode in accordance with the A/K markings lights up the CH1 diode,

<sup>3</sup>  $x$  – channel number.

- **CH2** – channel number 2, connection of the rectifier diode in accordance with the A/K markings lights up the CH2 diode
- **CH3** – channel number 3, connection of the rectifier diode in accordance with the A/K markings lights up the CH3 diode,
- **CH4** – channel number 4, connection of the rectifier diode in accordance with the A/K markings lights up the CH4 diode.

LEDs of the four-channel relay PMS-11/\*/\*:

- **CH1** – channel number 1, connection of the rectifier diode in accordance with the A/K markings (or in the opposite direction if the measuring channel is configured in this way) lights up the CH1 diode,
- **CH2** – channel number 2, connection of the rectifier diode in accordance with the A/K markings (or in the opposite direction if the measuring channel is configured in this way) lights up the CH2 diode,
- **CH3** – channel number 3, connection of the rectifier diode in accordance with the A/K markings (or in the opposite direction if the measuring channel is configured in this way) lights up the CH3 diode,
- **CH4** – channel number 4, connection of the rectifier diode in accordance with the A/K markings (or in the opposite direction if the measuring channel is configured in this way) lights up the CH4 diode.
- **MB** – blinks after receiving a valid communication frame directed to the address of the given device.

**Table 3. Designation and description of contacts PMS-0\*/1, PMS-0\*/4**

Channel No. 1 (CH1)			Channel No. 2 (CH2)		
Designation	Description	Function	Designation	Description	Function
2+	A1	Relay coil power supply	6+	A1	Relay coil power supply
4-	A2		8-	A2	
13	COM	Common contact	9	COM	Common contact
14	NO	Normally open contact	10	NO	Normally open contact
15	COM	Common contact	11	COM	Common contact
16	NO	Normally open contact	12	NO	Normally open contact
1	COM	Common contact	5	COM	Common contact
3	NC	Normally close contact	7	NC	Normally close contact

**Table 4. Designation and description of contacts PMS-0\*/2, PMS-0\*/3**

Channel No. 1 (CH1)			Channel No. 2 (CH2)		
Designation	Description	Function	Designation	Description	Function
2+	A1	Relay coil power supply	6+	A1	Relay coil power supply
4-	A2		8-	A2	
13	COM	Common contact	9	COM	Common contact

14	NO	Normally open contact	10	NO	Normally open contact
15	COM	Common contact	11	COM	Common contact
16	NO	Normally open contact	12	NO	Normally open contact
1	—	—	5	—	—
3	—	—	7	—	—

Table 5. Designation and description of contacts PMS-1/\*/\*,..., PMS-9/\*/\*

Power supply circuit					
Designation	Description	Function			
~7	(+) DC, (~) AC	Power supply circuit, any polarisation			
~8	(-) DC, (~) AC				
Channel No. 1 (CH1)			Channel No. 2 (CH2)		
Designation	Description	Function	Designation	Description	Function
A1	A1	Measuring system input	A2	A2	Measuring system input
K1	K1		K2	K2	
-1	—	Open collector minus	-11	—	Open collector minus
+2	+	Open collector plus	+12	+	Open collector plus
-9	—	Open collector minus	-10	—	Open collector minus
+3	+	Open collector plus	+4	+	Open collector plus

Table 6. Designation and description of contacts PMS-5/\*/\*,..., PMS-8/\*/\*, PMS-10/\*/\*

Power supply circuit					
Designation	Description	Function			
~7	(+) DC, (~) AC	Power supply circuit, any polarisation			
~8	(-) DC, (~) AC				
Channel No. 1 (CH1)			Channel No. 2 (CH2)		
Designation	Description	Function	Designation	Description	Function
A1	A1	Measuring system input	A2	A2	Measuring system input
K1	K1		K2	K2	
5	COM	Common contact	4	COM	Common contact
11	NO	Normally open contact	10	NO	Normally open contact
Channel No. 3 (CH3)			Channel No. 4 (CH4)		
Designation	Description	Function	Designation	Description	Function
A3	A3	Measuring system input	A4	A4	Measuring system input
A3	K3		K4	K4	
3	COM	Common contact	1	COM	Common contact
9	NO	Normally open contact	2	NO	Normally open contact

**Table 7. Designation and description of contacts PMS-11/\*/\***

Power supply circuit					
Designa- tion	Description	Function			
AC1	(+) DC, (–) AC	Power supply circuit, any polarisation			
AC2	(–) DC, (–) AC				
Data transmission circuit					
Designa- tion	Description	Function			
A	+	RS-485 serial transmission			
B	–				
Channel No. 1 (CH1)			Channel No. 2 (CH2)		
Designa- tion	De- scription	Function	Designa- tion	De- scription	Function
A1	A1	Measuring system in- put	A2	A2	Measuring system input
K1	K1		K2	K2	
K11	COM	Common contact	K21	COM	Common contact
K14	NO	Normally open contact	K24	NO	Normally open contact
Channel No. 3 (CH3)			Channel No. 4 (CH4)		
Designa- tion	De- scription	Function	Designa- tion	De- scription	Function
A3	A3	Measuring system in- put	A4	A4	Measuring system input
K3	K3		K4	K4	
K31	COM	Common contact	K41	COM	Common contact
K34	NO	Normally open contact	K44	NO	Normally open contact



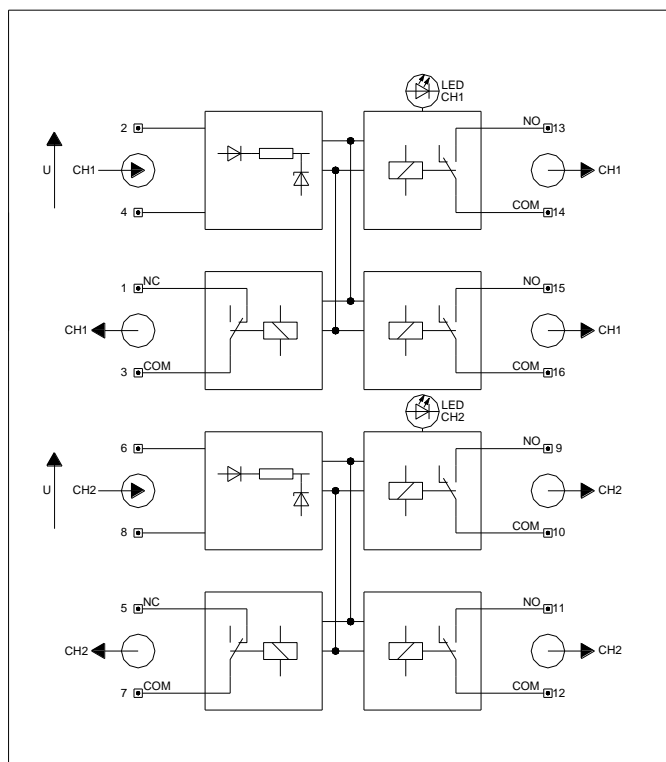


Fig. 6. Wiring diagram, relay PMS-0\*/1, PMS-0\*/4

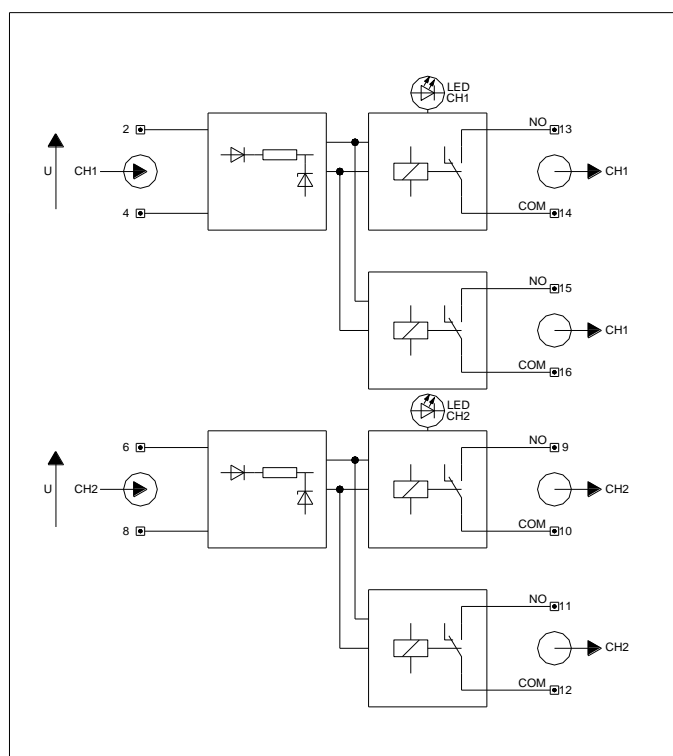


Fig. 7. Wiring diagram, relay PMS-0\*/2, PMS-0\*/3

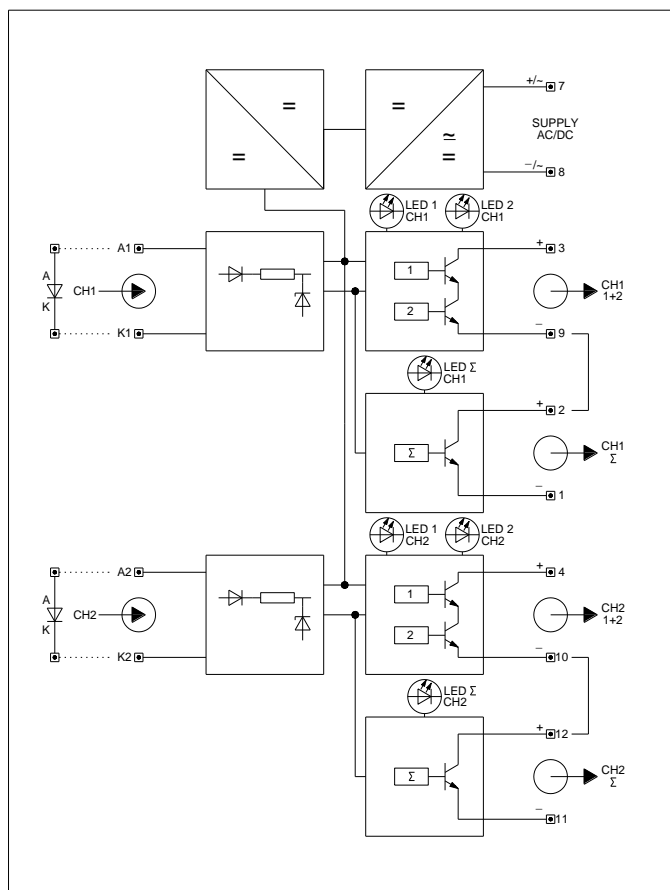


Fig. 8. Wiring diagram, relay PMS-1/\*/\*,..., PMS-9/\*/\*

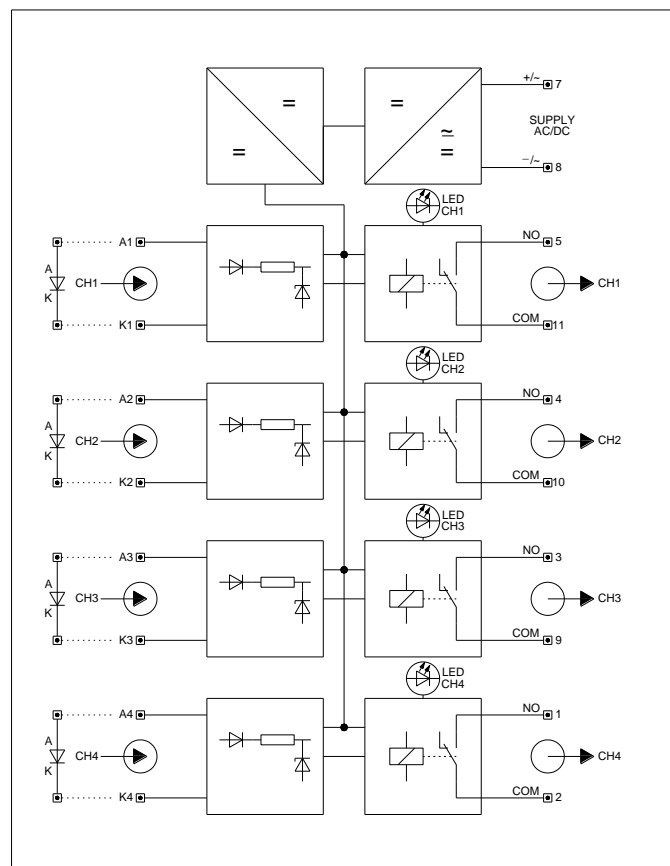


Fig. 9. Wiring diagram, relay PMS-5/\*/\*,..., PMS-8/\*/\*, PMS-10/\*/\*

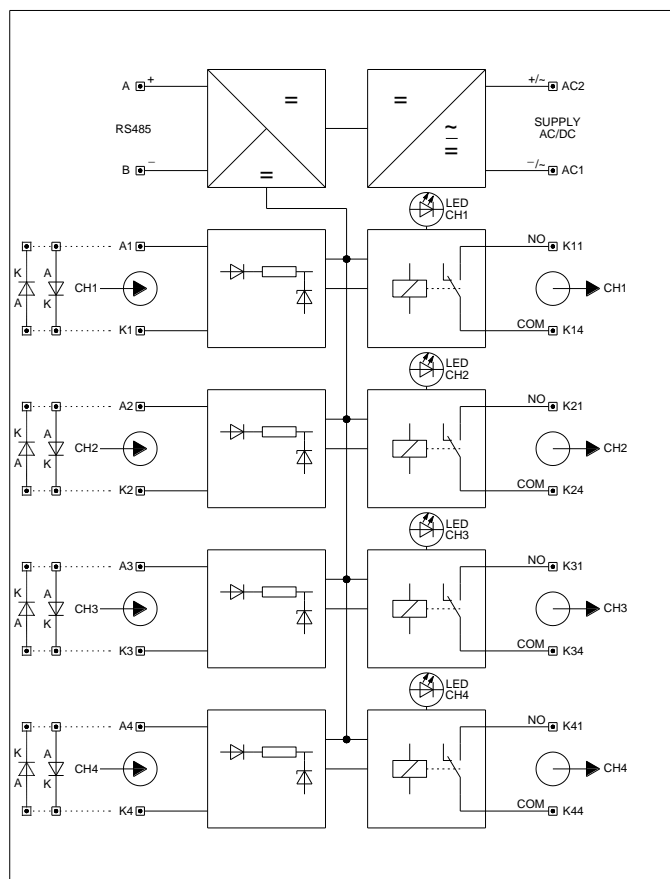


Fig. 10. Wiring diagram, relay PMS-11/\*/\*

## 6. Configuration of the PMS-11/\*/\* relay

The relay in PMS-11/\*/\* version allows independent configuration of off and on resistances for each measuring channel.

During normal operation, the measured resistance for each channel is presented on the built-in display next to the descriptions and signalling LEDs that are next to the display. In the event of a short circuit or a break in the measuring line, the corresponding graphic symbols are displayed (—○—○, —○—○). An example of the display's appearance during normal operation is shown in Figure 11a.



When navigating the device's menu, the active items are marked with one of the ▲ ► symbols displayed next to the item.

### 6.1 PMS-11/\*/\* relay menu

The device is equipped with four buttons:

Table 8. PMS-11/\*/\* relay buttons

Name	Symbol	Description
Menu	Ⓜ	Responsible for entering the menu, switching between screens, confirming the selection of options when exiting the menu.
Enter	↵	Responsible for switching between individual positions on a given screen.
Minus	⊖	Responsible for reducing the selected value setting.
Plus	⊕	Responsible for increasing the selected value setting.

To make changes to the device configuration, press the button . A screen will then appear (Fig. 11b), that allows you to enter the password, which is factory set to "00000000". After entering the correct password and confirming with the button  the first screen will be displayed, which will allow you to configure the measuring channels.

For each measuring channel (Fig. 11c) you can independently configure the switch-off and switch-on resistance. Selecting the "2-way" option will make the connection of the rectifier diode in any direction correct. The screens for all measurement channels are the same.

After the last of the screens for configuring measuring channels, the screen for configuring data transmission parameters will be shown (Fig. 11d). This screen allows to configure the parameters of communication with using of Modbus protocol. The "Address" position allows to select an address at which the protection is available in the network. The "Stop" position allows to select the number of stop bits. The "Parity" position allows to select the parity control of sent data or to disable it. The "Rate" position allows to set the rate of data exchange in bits per second.

The next screen (Fig. 11e) allows you to change the password to access the device menu. The password contains eight digits. In order to change this password enter all the digits of the current password and all the digits of a new password. In addition to that the user should confirm that he wants to change the password by checking the "Change" option. If this option is checked and there is any error or omission in the old or new password, then it will be impossible to quit the menu until the data are corrected.

The next screen (Fig. 11f) allows you to change menu settings. On this screen, the "Brightness" item can be used to select the display intensity. The option "Timeout" allows to set up the idle time with active menu, after which the menu will be quitted automatically. The option "Flip" flips the screen by 180°. The option "Language" allows to select in which language the protection communicates with user.

**NOTE:** *Changes visible on this screen during settings are not permanent.* The settings should be saved in order to remember the changes.

Last screen 11g) allows you to decide what to do with changes introduced during configuration. The "Discard" option causes that the introduced changes will be forgotten. The "Test" option will cause that the changes will be applied without their saving (e.g. after restart the previous settings will be read in). The "Revert" option will cause that the stored settings will be read in and applied. The "Save" option will cause saving and applying of new settings. The last option "Default" will cause that the factory settings will be read in and applied (except passwords and menu language).

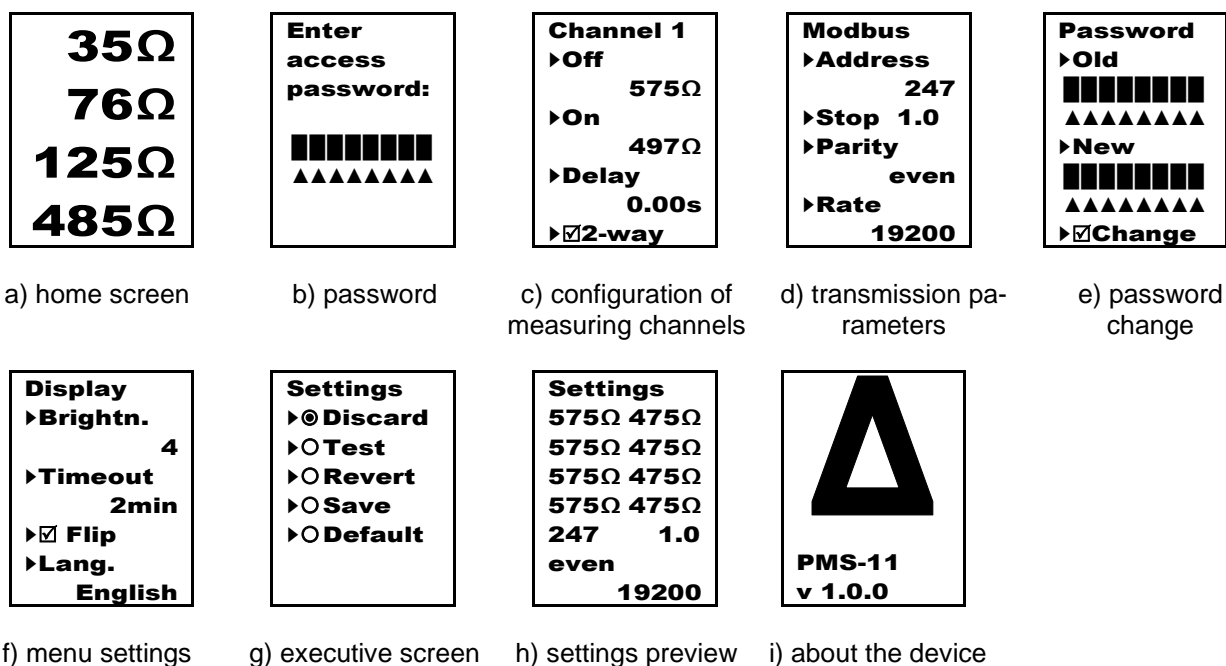





Fig. 11. PMS 11/\*/\* relay menu

**NOTE:** It is not possible to select more than one option. Selecting of any option will cause that an appropriate action will be performed and the menu will be quitted. If no option is selected then the display will return to the screen with configuration of the first measurement channel. These actions will be performed when the  button is pressed.

In addition, from the main screen level, pressing the  button shows the screen (Fig 11h) of the preview of the device settings. These are from the top: switch-off and switch-on resistance of channels 1, 2, 3 and 4, and the Modbus configuration parameter: address, stop bits, parity and baudrate.

However, pressing the  button shows the screen (Fig. 11i) with information about the device: device type and firmware version.

## 6.2 Communication with the PMS-11/\*/\* relay

The PMS-11/\*/\* relay is adapted to cooperate with external control and monitoring systems through the RS-485 communication port using the Modbus transmission protocol. It is possible to read the state of measuring inputs, current values of series and parallel resistance as well as the state of executive relays. In addition, it is possible to parameterize the device settings.

The method of communication and description of the Modbus protocol function for the relay is provided in a separate document: "Relay Control Module type PMS-11/\*/\*. Modbus communication protocol" No. BP/IOM/02/20.

## 7. Marking

Each intrinsically safe device has a nameplate, made of a self-adhesive paper label, affixed to the enclosure lid (on the outside) containing the following data: supervisory unit number, manufacturer's name, name of the unit, type, Ex symbol in a hexagon, explosion rating version designation, voltage range of the relay coil, intrinsically safe parameters, ingress protection rating, serial number/year of manufacture.

Each non-intrinsically safe device has a nameplate, made of a self-adhesive paper label, affixed to the enclosure lid (on the outside) containing the following data: CE mark, manufacturer's name, name of the unit, type, version designation, voltage range of the relay coil, ingress protection rating, serial number/year of manufacture.

## 8. Preparation for operation

### 8.1 Installation

The unit must be installed inside the cabinets and control boxes. The permissible deviation from plumb should not exceed the value specified in the technical data. Connect the power supply and control circuits in accordance with the electrical documentation.

### 8.2 Electrical safety

#### **WARNING!**

**The unit enclosure does not protect live parts against direct touching**

## 9. Storage and transport conditions

The unit should be stored in indoor storage areas at the temperature and relative humidity specified in the technical data, in an environment free of harmful vapours and corrosive gases. Transport in a horizontal or vertical position secured against any displacement.

## 10. Inspection and maintenance rules

During operation, ad hoc and periodic inspections should be carried out to ensure trouble-free operation of the device.

- **Ad hoc Inspections:**  
Ad hoc inspections should be carried out when the site is changed and where defective components or subassemblies must be replaced.
- **Periodic inspections:**  
Depending on the operating conditions periodic inspections should be carried out at intervals of 6 to 12 months.

#### **WARNING!**

**Observe safety precautions before and during maintenance or inspection activities. Maintenance and repair activities can only be carried out by qualified personnel. Such activities should only be carried out with power supply locked out and tagged out.**

## 10.1 Inspection and maintenance

### 10.1.1 On the outside

Check the unit's enclosure for any mechanical damage. Any damage must be repaired using suitable components and measures. To keep inside of the unit's body clean, all doors and enclosure covers must be tightly closed.

### 10.1.2 Electrical connections

Check the electrical connections in order to detect any possible mechanical damage to the insulation of the cables connected to the unit's terminals. If insulation is damaged, replace the cable with a new one.

### 10.1.3 Check the device

After completion of inspection and maintenance, a complete functional check of the mechanical and electrical parts must be carried out. These include checking the unit for completeness and checking the moving mechanisms. Electrical inspection is always required after repairs and maintenance of electrical connections. These checks may be limited to repaired parts.

## 11. List of spare parts

No spare parts are expected to be used by the manufacturer. Any repairs and overhauls shall be carried out only by the manufacturer's service centre.

## 12. List of standards and regulations

This device is compliant with the following standards and regulations:

**Table 9. Standards and regulations**

Directive/Standard	Description
<b>Directive 2014/34/EU</b>	Equipment and protective systems intended for use in potentially explosive atmospheres (ATEX)
<b>PN-EN IEC 60079-0:2018-09</b> (EN IEC 60079-0:2018)	Explosive atmospheres – Part 0: Equipment. General requirements.
<b>PN-EN 60079-11:2012</b> (EN 60079-11:2012)	Explosive atmospheres – Part 11: Equipment protection by intrinsic safety "i".
<b>PN-EN 50303:2004</b> (EN 50303:2000)	Group I, Category M1 equipment intended to remain functional in atmospheres endangered by firedamp and/or coal dust.
<b>Directive 2014/30/EU</b>	Electromagnetic compatibility (EMC).
<b>PN-EN 61000-6-2:2019-04</b> (EN 61000-6-2:2019)	Electromagnetic compatibility (EMC) — Part 6-2: Generic standards. Immunity for industrial environments.
<b>PN-EN 61000-6-4:2019-12</b> (EN 61000-6-4:2019)	Electromagnetic compatibility (EMC) — Part 6-4: Generic standards. Emission standard for industrial environments.
<b>Additional</b>	
<b>PN-G-50003:2003</b>	Ochrona pracy w górnictwie – Urządzenia elektryczne górnicze – Wymagania i badania.
<b>PN-EN 61508-1:2010</b> (EN 61508-1:2010)	Functional safety of electrical/electronic/programmable electronic safety-related systems -- Part 1: General requirements.

## **13. Disposal**

After the service life period the device must be disposed of in accordance with the applicable environmental regulations.

If you do not have the appropriate knowledge in this area, please consult your local municipal or communal office.



## 14. Orders and maintenance service

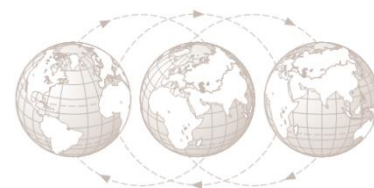
**EXPROTECT Sp. z o.o.**  
**ul. Graniczna 26A**  
**43-100 Tychy**  
**Polska/Poland**  
**Tel: +48 32 326 44 00**  
**Fax: +48 32 326 44 03**  
**E-mail: [biuro@exprotec.pl](mailto:biuro@exprotec.pl)**  
**Web: [www.exprotec.pl](http://www.exprotec.pl)**

The components of the enclosure are replaced by the manufacturer or by a company authorised by the manufacturer.

The manufacturer shall not be liable for the quality of the equipment in the event of unauthorised repairs or replacement of components by the customer.

# EXPROTEC

**EXPROTEC protects  
people and the  
environment  
through the safety  
of components,  
systems and  
equipment**



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