

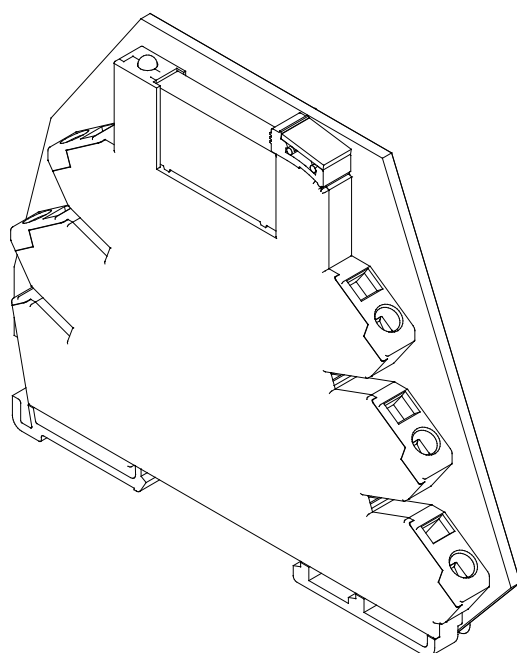
# INTRINSICALLY AND NON-INTRINSICALLY SAFE CIRCUIT RELAY SEPARATOR

PSOI-\*/\*

INSTRUCTION MANUAL NO. BP/IO/11/17



# EXPROTEC



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## 1. Introduction

The PSOI-\*/\* intrinsically and non-intrinsically safe circuits relay separator is a device designed for separation between intrinsically safe and non-intrinsically safe circuits.

The non-intrinsically safe circuit has a relay coil of the PSOI-\*/\* separator and its contact (change-over or NO) is connected to a category Ex ia/ib intrinsically safe circuit. The PSOI-\*/\* intrinsically safe relay circuit separator enables the transfer of information from non-intrinsically safe control circuits to intrinsically safe automation system circuits.

The relay is composed of the following:

- sockets with spring/screw terminals and electronics,
- a miniature electromagnetic relay,
- an insulating spacer.

The PSOI-\*/\* relay is intended for installation in electrical cabinets and boxes designed to operate in harsh environmental conditions of chemical and mining industry. The device is made of insulating material ensuring low weight and small dimensions. A narrow casing and the insulation spacer provide the required distance between two subsequent intrinsically safe circuits.

The product may be used in underground mines in excavation sites categorised as class "a", "b" or "c" methane explosion hazard and class "A" or "B" coal dust explosion hazard only after being installed in an Ex d flameproof enclosure.

The product may be used in explosive gas atmospheres classified as zone 1 or 2 (G) and in explosive dust atmospheres classified as zone 21 or 22 (D) only after being installed in an explosion-proof enclosure.

The manufacturer reserves the right to make changes as a result of technical progress and to use equivalent replacement parts.

## 2. Type designation

PSOI- \* / \* ( - \* / \* )<sup>1)</sup>

		Coil rated voltage <b>Um = 60V:</b>
		<b>1</b> – 12V AC/DC
		<b>2</b> – 24V AC/DC
		<b>3</b> – 42/48V AC/DC
		<b>4</b> – 60V AC/DC
		Coil rated voltage <b>Um = 250V:</b>
		<b>5</b> – 133V AC/DC
		<b>6</b> – 230V AC/DC
		<b>7</b> – 12V DC
		<b>8</b> – <b>24V DC</b>
		<b>9</b> – 24V AC/DC (special design)
		<b>10</b> – <b>42/48V AC/DC</b>
		<b>11</b> – 230V AC
		Contact type:
		<b>1</b> - <b>change-over (11-12-14)</b>
		<b>2</b> - normally open with a diode (11-14)
		<b>3</b> – normally open with NAMUR system R1 = 1kΩ/ R2 = 10kΩ (11-14)
		<b>4</b> - normally open (11-14)



<sup>1)</sup> additional marking (- \* / \*) refers to the PSOI-3/\* version:  
 – no additional marking: standard design R1 = 1kΩ / R2 = 10kΩ,  
 – marking (- 0.62/15) means special design with resistor values  
 R1 = 0.62kΩ / R2 = 15kΩ.

The resistor values are from the E24 series. The minimum resistance value is 510Ω.

The standard design is the relay type **PSOI-1/8** and **PSOI-1/10**.

## 3. Technical Data

Table 1. Technical Parameters

Design features:		
Ex-proof protection marking	I (M1) [Ex ia Ma] I II (1)G [Ex ia Ga] IIC T6 II (1)D [Ex ia Da] IIIC T85°C	
EU type-examination certificate	OBAC 05 ATEX 021X	—
Ingress protection rating	IP20	—
Explosion protection type for installation in potentially explosive atmospheres for I M2 and II 2G	Ex d	
Place of assembly	mounting bracket: TH 35 / TS 35	—
Cross-section of connected conductor	0.25..2.5 (2x1.5)	mm <sup>2</sup>
Cable insulation length	9	mm
Max. clamp tightening torque	0.3	Nm
PSOI-*/1..6 relay dimensions (h×w×d)	75.6x6.2x87.8	mm
PSOI-*/7..11 relay dimensions (h×w×d)	84.6x6.2x98.3	mm
Spacer dimensions (h×w×d)	73.1x2.0x92.4	mm
Weight	45	g

Basic parameters of the contacts:			
Rated voltage for insulation	U <sub>insulation</sub>	250	VAC
Rated surge voltage		4000	V
Rated contact break voltage		1000	V
Switching time (trip/return)		8/4	ms
Rated switching frequency AC1		360	cycles/hour
Rated no-load switching frequency		72,000	cycles/hour
Utilisation category		AC1	—
Mechanical life		> 1x10 <sup>7</sup>	cycles
Electrical endurance AC1		> 0.5x10 <sup>5</sup>	cycles
Number of contacts		1	—

Contacts:			
Type of contacts	PSOI-1/*	11-12-14	COM-NC-NO
	PSOI-2/*	11-14	COM-NO
	PSOI-3/*	11-14	COM-NO
	PSOI-4/*	11-14	COM-NO

Electrical parameters of control circuits – design variants:							
Supply voltage	Allowable range of supply voltage					Power consumption	Power input
	rated	min	max	min	max		
V AC/DC	V	VDC	VDC	VAC	VAC	mA	VA
PSOI-*/1	12	9.6	14.4	9.6	14.4	13	0.3
PSOI-*/2	24	18.2	28.8	18.2	28.8	10	0.4
PSOI-*/3	42 AC/48 DC	35	57.6	33.6	51	2.3/9	0.4/0.6
PSOI-*/4	60	43.5	72	43.5	72	5.2	0.5
PSOI-*/5	133	88	159.6	88	159.6	~0.6	0.5
PSOI-*/6	230	184	250	184	250	~0.9	0.5
PSOI-*/7	12	9.6	14.4	—	—	13	0.4
PSOI-*/8	24	18.2	28.8	—	—	15	0.4
PSOI-*/9	24	18.2	28.8	18.2	28.8	15/18	0.4/0.6
PSOI-*/10	42 AC/48 DC	35	57.6	33.6	51	11/15	0.6/0.7
PSOI-*/11	230	—	—	184	250	3	0.5

Operating conditions:		
Operating altitude		up to 1000 m
Ambient temperature for PSOI-*/1..6		-20..+55 °C

Operating conditions:			
Ambient temperature for PSOI-*/7..11		-20..+70	°C
Relative humidity at 20°C		up to 95	%
Transport temperature		-20..+40	°C
Transport relative humidity		up to 95	%
Mechanical exposures – frequency		10..500	Hz
Shock resistance		10	g
Vibration resistance (10...500 Hz)		5	g
Type of operation		continuous	—

**Table 2. Intrinsically safe technical parameters**

Permitted parameters of intrinsically safe circuits on PSOI-1/* terminals:			
11-12-14 Protection level "ia"	Ui = 30	—	V
	Ii = 3	—	A
	Pi = 25	—	VA

Permitted parameters of intrinsically safe circuits on PSOI-2/* terminals:			
11-14 Protection level "ia"	Ui = 30	—	V
	Ii = 0.6	—	A
	Pi = 25	—	VA

Permitted parameters of intrinsically safe circuits on PSOI-3/* terminals:			
11-14 Protection level "ia"	Ui = 24	—	V
	—	—	A
	Pi = 25	—	VA

Permitted parameters of intrinsically safe circuits on PSOI-4/* terminals:			
11-14 Protection level "ia"	Ui = 30	—	V
	Ii = 3	—	A
	Pi = 25	—	VA

Permitted parameters at PSOI-*/1..4 terminals:			
A1-A2	Um = 60	—	V

Permitted parameters at PSOI-*/5..11 terminals:			
A1-A2	Um = 250	—	V

## 4. Identification of hazards of the unit during use

### 4.1 Introduction

#### WARNING!

**Safe operation of the unit requires special training, knowledge and experience. Do not attempt to operate this unit unless you are qualified to do so. Improper or negligent operation may lead to serious accidents or death.**

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

#### WARNING!

**Unauthorised modification of the unit or use of repaired parts or other replacement parts not meeting the manufacturer's technical specifications may result in serious risk or loss of warranty, certification or approvals.**

If modifications to the unit are required, they may be made only after written authorisation has been obtained from the manufacturer.

## 4.2 Hazards during operation of the unit

Before starting the unit, verify that it will not cause any life or health hazards to other personnel.

### WARNING!

**Before starting the equipment, make sure that the dangerous voltage supply cables are undamaged and properly screwed to the screw terminals.**

The installation of temporary connections is prohibited. In order to operate safely, all the procedures specified in the instructions for safe use must be observed.

## 4.3 Special conditions for safe use

### WARNING!

**Special conditions for safe use:**

- Install the unit outside the potentially explosive atmosphere. When placed in a potentially hazardous atmosphere, the unit must be protected by adequate explosion protection.
- Ambient temperature range:
  - 20°C ≤ Ta ≤ +55°C (PSOI-\*/1..6 version)
  - 20°C ≤ Ta ≤ +70°C (PSOI-\*/7..11 version)
- The installation should be done with the required separation distances to the external terminals of the unit according to section 6.2.1 PN-EN 60079-11.
- Use an insulating spacer between two consecutive PSOI-\*/\* relays.
- The use of comb connectors to connect input or output signals is strictly prohibited.

### WARNING!

**The unit may be used in mines in excavation sites categorised as class "a", "b" or "c" methane explosion hazard and class "A" or "B" coal dust explosion hazard only after being installed in an Ex d flameproof enclosure. The unit must be de-energized when the 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 in explosive dust atmospheres classified as zone 21 or 22 (D) only after being installed in an explosion-proof enclosure.**

## 5. Design and principle of operation

### 5.1 Mechanical

The intrinsically safe circuit relay separator type PSOI-\*/\* (Fig. 1, 2 and 3) consists of a socket (pos. 1), a relay (pos. 2) and an insulating spacer (pos. 3). The wires are connected to the spring/screw

terminals on the sides of the housing. The housing body is made of plastic. The relay housing and the installation compartment are designed for mounting on the TH 35 / TS 35 rail.

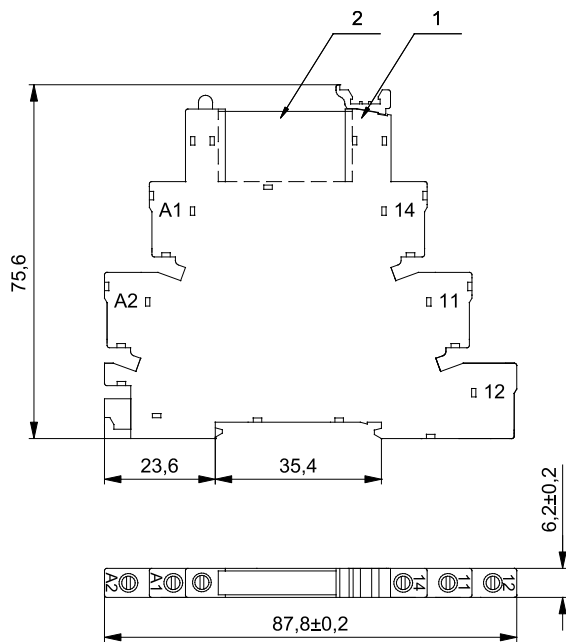


Fig. 1. Overall view of the PSOI-\*/1..6 relay

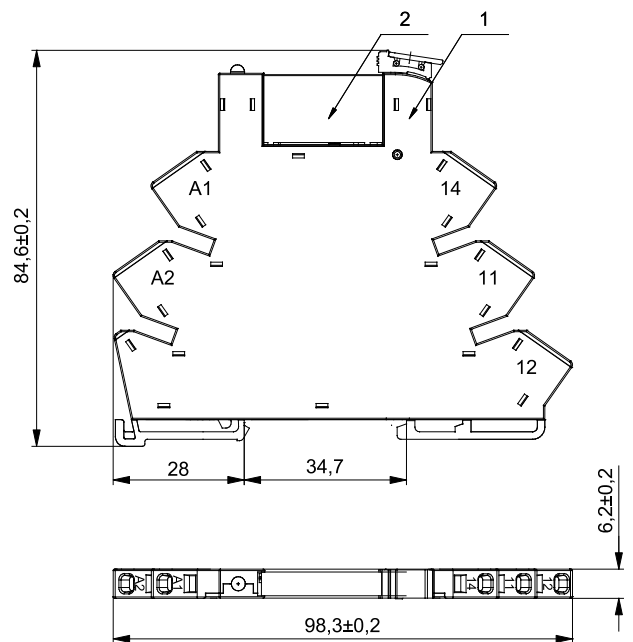


Fig. 2. Overall view of the PSOI-\*/7..11 relay

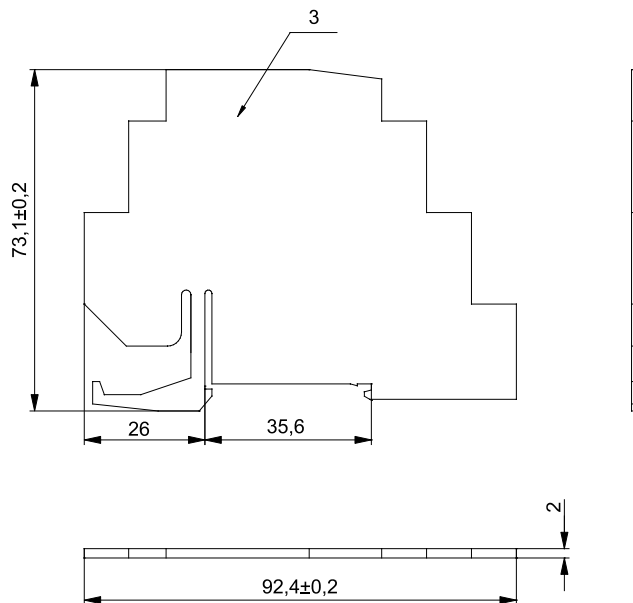


Fig. 3. View of the insulating spacer

## 5.2 Electrical

The PSOI-\*/\* type relay coil is controlled by applying supply voltage to A1 - A2 terminals. The polarity of these terminals is arbitrary. The unit is equipped with a green LED indicating the operating status of the relay.

Table 3. Designation and description of contacts

Terminal no. / Designation	Description	Function	Circuit
----------------------------	-------------	----------	---------

(+/-), (-/+)	A1, A2	Relay coil power supply	Non-intrinsically safe
11	COM	Executive contact (common)	Intrinsically safe
12	NC	Normally closed contact	Intrinsically safe
14	NO	Normally open contact	Intrinsically safe

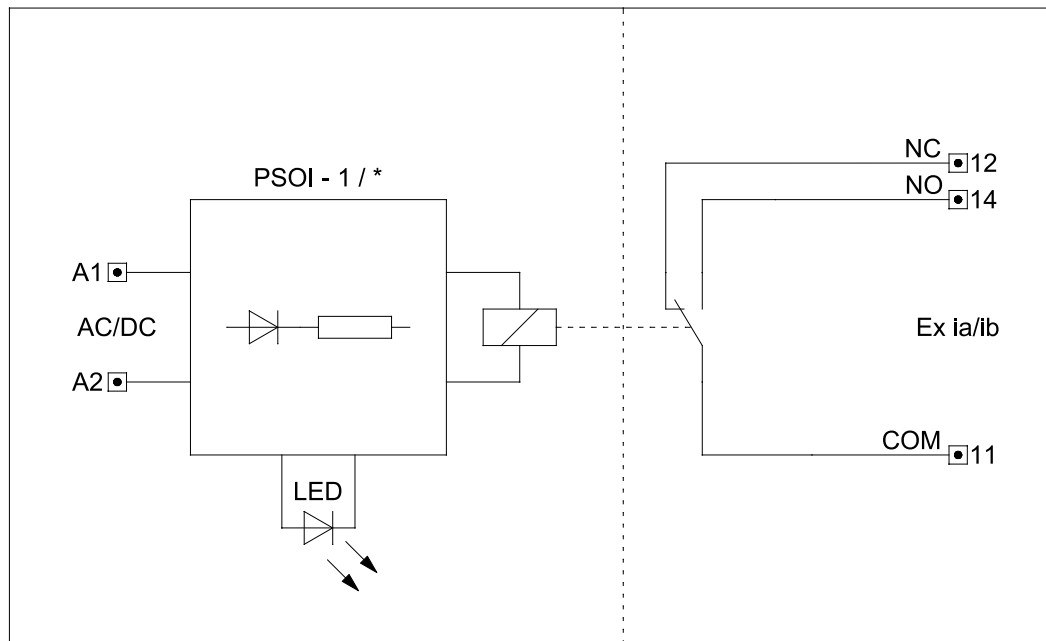


Fig. 4. Electrical diagram of the PSOI-1/\* relay (change-over)

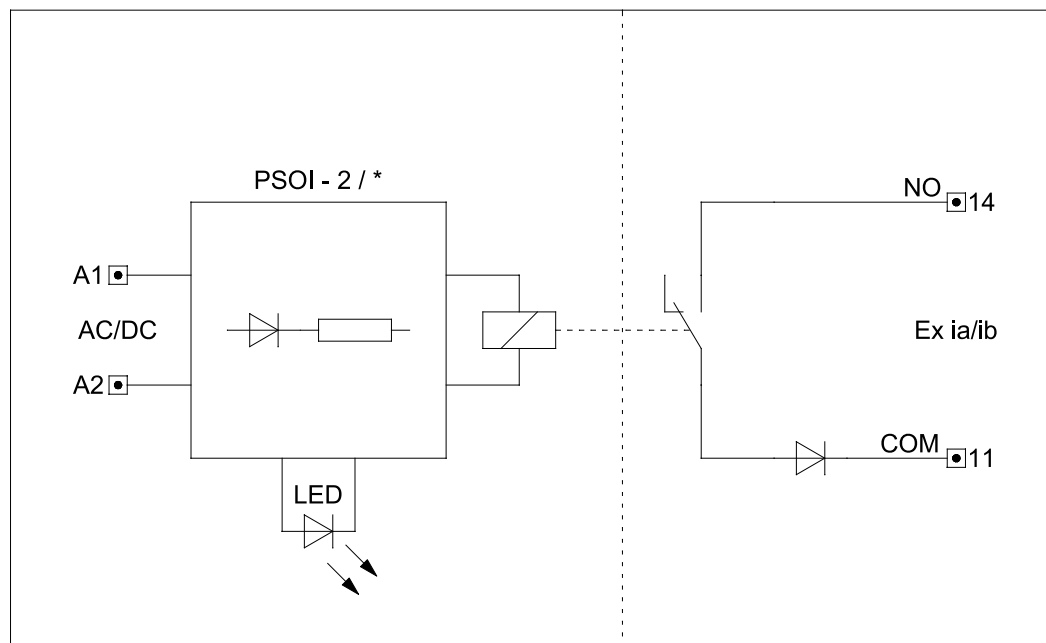
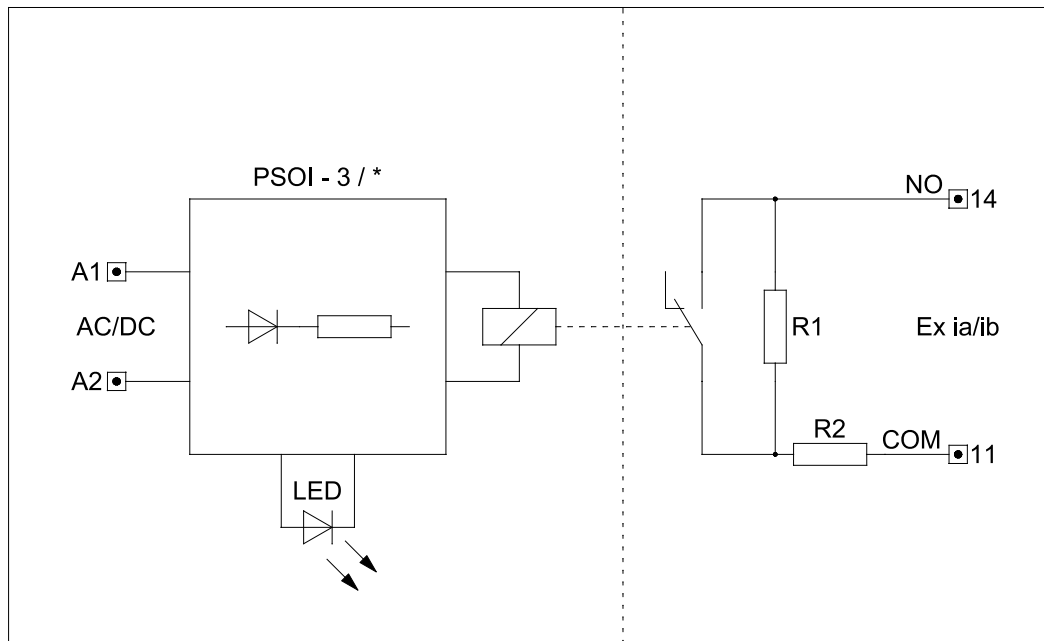
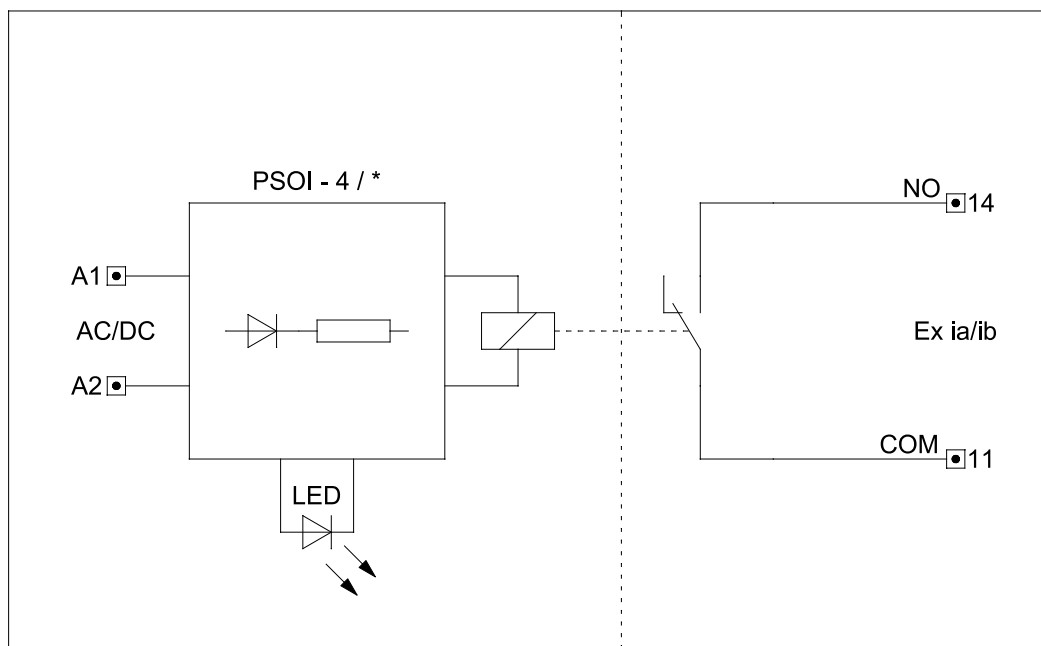


Fig. 5. Electrical diagram of the PSOI-2/\* relay (normally open with a diode)





**Fig. 6. Electrical diagram of the PSOI-3/\* relay (NAMUR normally open)**



**Fig. 7. Electrical diagram of the PSOI-4/\* relay (normally open)**

## 6. Marking

Each unit has a rating plate made of a self-adhesive paper label attached to the housing cover (on the outside) with the following data: CE mark, supervising unit number, manufacturer's name, device name, type, Ex symbol in a hexagon, explosion protection marking, relay coil supply voltage range, intrinsically safe parameters, protection rating, serial number / year of manufacture.

## 7. Preparing the unit for operation

### 7.1 Installation

The unit should be installed inside control cabinets and boxes. The permissible deviation from the vertical axis should not exceed the value given in the technical data. Connect the power and control circuits according to the electrical documentation.

### 7.2 Protection against electric shock

**WARNING!**

**The housing of the unit does not provide protection of live parts against direct contact**

## 8. Storage and transport conditions

The unit should be stored in closed storage rooms in a temperature and relative humidity specified in the technical data, in an environment free from harmful vapours and corrosive gases. Transport horizontally or vertically, secured against displacement.

## 9. Inspection and maintenance conditions

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

- **Ad-hoc inspections:**
- Ad-hoc inspections shall be carried out whenever the unit is relocated and after each replacement of components or parts.
- **Scheduled inspections:**
- Scheduled inspections shall be carried out on the product every 6 to 12 months, depending on the operating conditions on site.

**WARNING!**

**Safety precautions must be observed before starting and during maintenance or servicing. The unit must be maintained and serviced by qualified personnel only. This work must be carried out with the supply voltage securely switched off.**

## 9.1 Inspections and maintenance

### 9.1.1 External

The housing of the unit should be checked for mechanical damage. Any damage found shall be repaired with suitable components and consumables. In order to maintain cleanliness inside the unit body, all doors and covers of the outer covers must be tightly closed.

### 9.1.2 Electrical wiring connections

Check the electrical connections in order to detect possible mechanical damage to the insulation of the wires connected to the terminals of the unit. If wiring insulation is damaged, replace the affected wire.

### 9.1.3 Checking the unit

Following each maintenance and inspection, the entire mechanical and electrical systems must pass a functional check. These include: checking the completeness of the unit and checking the

movable mechanisms. An electrical check is always required after repairs and maintenance of electrical connections. The checks can be limited only to the parts and components which were repaired before the compact station check.

## 10. List of spare parts

The installation of the individual components listed in the following list and their electrical connections are made in accordance with the drawings attached to this manual.

**Table 4. List of materials**

#	Name and type	Manufacturer	Labelling	Certificate no.	Item
1.	Insulating spacer	Exprotec Sp. z o.o.	I (M1) [Ex ia Ma] I II (1)G [Ex ia Ga] IIC T6 II (1)D [Ex ia Da] IIIC T85°C	OBAC 05 ATEX 021X	A033146

## 11. Standards and regulations

This unit complies with the following standards and regulations:

**Table 5. 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 IEC 61000-6-2:2019-04</b> (EN IEC 61000-6-2:2019)	Electromagnetic compatibility (EMC) – Part 6-2: General standards. Immunity for industrial environments.
<b>PN-EN IEC 61000-6-4:2019-12</b> (EN IEC 61000-6-4:2019)	Electromagnetic compatibility (EMC) – Part 6-4: General standards. Emission standard for industrial environments.

## 12. End-of-life disposal

Once the product has reached the end of its useful life, it shall be disposed of in accordance with the applicable environmental protection regulations.

If you do not know what to do with this, contact your local municipality.

## 13. Ordering and Service

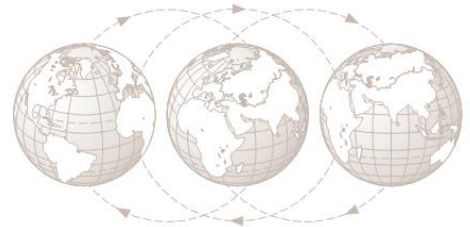
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The product enclosure components are only replaced by the manufacturer or an authorised service contractor.

The manufacturer shall not be liable for the quality of the products after repairs or replacement of components by the buyer.

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