

### PRESSURE SWITCHES SERIE PXS, PXA

**WEATHERPROOF AND INTRINSICALLY SAFE: MODELS PXS; FLAMEPROOF: MODELS PXA**

CORD CABLE INSTRUMENT			INSTRUMENT WITH JUNCTION BOX	
Sensor M	Sensor G	Sensor P		
<b>A = Pressure Connection</b>			<b>B = Electrical Connection</b>	
WEIGHT 0,3 kg			For surface mounting use two screws M6 (not supplied with the instrument)	
Dimensions in mm			WEIGHT 1 kg	
			Dimensions in mm	

E20102AT

**NOTE:** dimensions and weights are not binding unless released on certified drawings.

**CAUTION**

- Before installing, using or carrying out maintenance on the instrument it is necessary to **read** and **understand** the indications given in the attached Instruction Manual.
- The instrument must only be installed and maintained by **qualified personnel** in relation to working with instruments for hazardous areas.



**• INSTALLATION IS TO BE CARRIED OUT ONLY AFTER CHECKING THAT INSTRUMENT CHARACTERISTICS ARE CONSISTENT WITH PROCESS AND PLANT REQUIREMENTS.**



- The functional **features** of the instrument and its degree of protection are shown on the identification plate fixed to the case.

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**DOCUMENT CORRELATED**

to document authenticated with certificates  
 N° IECEx PRE 16.0073X  
 N° IECEx PRE 16.0074X

**SAFETY INSTRUCTIONS FOR USE IN EXPLOSIVE ATMOSPHERES**



**RECOMMENDATIONS FOR THE SAFE USE OF THE INSTRUMENT**



All data, statements and recommendations supplied with this manual are based on information believed by us to be reliable. As the conditions of effective use are beyond our control, our products are sold under the condition that the user himself evaluates such conditions before following our recommendations for the purpose or use foreseen by him.

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### 1 - GENERAL

#### 1.1 FOREWORD

The wrong choice of a models or a version, as well as the incorrect installation, lead to malfunction and reduce instrument life. Failure to follow the indications given in this manual can cause damage to the instrument, the environment and persons.

#### 1.2 ALLOWED OVERRANGES

Pressures exceeding the working range can be **allowed only for testing proposal** up to the proof pressure. **Continuous** pressures exceeding the (adjustable) "RANGE" (see fig 1) can be applied to the instrument provided they are clearly stated in the instrument features (see fig.1, "MAX. PRESSURE").

The current and voltage values stated in the technical specifications and data plate must **not** be exceeded: transitory overranges can have a destructive effect on the switch.

#### 1.3 TEMPERATURES

The temperature of the instrument is influenced by the environmental and process temperature. Special attention must be taken to avoid the exceeding of the limits specified in table 1.

As far as the process temperature, some suitable measures (valves, protection against heat radiation, fluid separators, cooling coils, heated lockers), have to be taken to limit the temperature to the specified values in table 1.

Table 1 – Temperature conditions

Temperature Classification	Ambient temperature range (Tamb)	Max Process temperature (at the process connection of the instrument) (Tp) (see page 1)	Max electrical rating (resistive load)
T6	-50 ... +60 °C	+60 °C	5A@28V dc; 5A@250V a.c See nameplate (electrical rating)
T5			
T4			
T3			
T2	-50 ... +85 °C	+85 °C	
T1			

The process fluid or its impurities must not however solidify in the instrument.

### 2 - OPERATING PRINCIPLE

A pressure-tight diaphragm (or an O-ring sealed piston) applies a force to a stiff disc. This force is directly proportional to the pressure value and is contrasted by a compression spring charged by a suitable bush. When the force balance point is exceeded, the stiff disc shifts and, by means of a rigid rod, **actuates release electric microswitches**. The microswitches are of the snap acting type with automatic reset. When the pressure moves away from the set values, returning towards the normal values, the switch is reset.

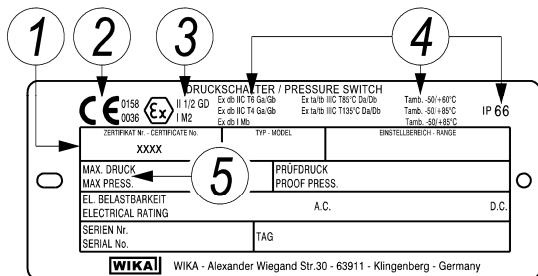
### 3 - MODEL CODE

See Annex 1

### 4 - NAMEPLATE AND MARKINGS

The instrument is fitted with a metal plate bearing all its functional characteristics and in case of flameproof or intrinsic safety execution also the markings prescribed by standard IEC/EN 60079-0. Fig.1 shows the plate mounted on flameproof instruments.

Fig. 1 - Flameproof instruments plate



- 1 Notified body that issued the type certificate and number of said certificate.
- 2 CE marking and identification number of the notified body responsible for production surveillance.
- 3 Apparatus classification according to ATEX 2014/34/EU directive.
- 4 Type of protection and ambient temperature limits of operation.
- 5 Max working pressure

The following table gives the relationship between hazardous areas, Atex Categories and Equipment Protection Level (EPL) listed on the flameproof instrument nameplate.

Hazardous area		Categories according to 2014/34/EU Directive (ATEX)	EPL
Gas, vapours, fog	Zone 0	1G	Ga
Gas, vapours, fog	Zone 1	2G or 1G	Gb or Ga
Gas, vapours, fog	Zone 2	3G, 2G or 1G	Gc, Gb or Ga
Dust	Zone 20	1D	Da
Dust	Zone 21	2D or 1D	Db or Da
Dust	Zone 22	3D, 2D or 1D	Dc, Db or Da

### 5 - SPECIAL CONDITIONS FOR SAFE USE (X)

The instrument cannot be repaired (see also troubleshooting). The environmental conditions which may adversely affect on the life of the membrane (see wetted parts and corrosive atmosphere) on the version PX\*4M\* and PX\*4G\* has to be avoided.

Should the instrument be installed without a junction box require an electric connection suitable for the mode of protection chosen at the free end of the cable.

Should the instrument be installed on a dangerous process fluid (Zone 0), check wetted materials compatibility with the process fluid.

Should the instruments be installed in mines (Group I) the electrical connection require to be protected by chemical agents. Therefore a mounting with cable protected by tubing is mandatory.

### 6 - SET POINT ADJUSTMENT

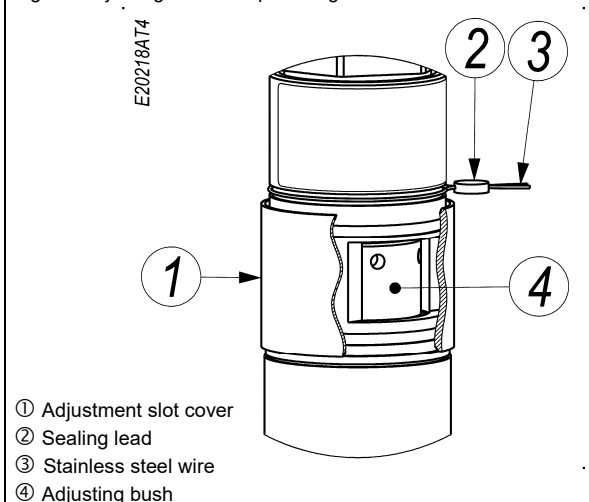
The charge of the compression spring can be regulated by means of the bush (for adjustment) in such a way that the switch is released when the pressure reaches (either increasing or decreasing) the desired value (set point). The instrument is usually supplied with the switches set at the setting range value nearest to zero (**factory calibration**).

The instrument is supplied with an adhesive label showing the set point calibration value. With **factory calibration** the values are not indicated on the label as these are temporary and will be modified with the definitive values. Prior to installation the instrument **must be calibrated** and the definitive calibration values written on the label.

If the instrument has been ordered with a **specific calibration**, it is a good rule to check the calibration values marked on the relevant adhesive label, prior to installation.

The position of the adjusting bush is given in Fig. 2.

Fig. 2 - Adjusting bush and plumbing



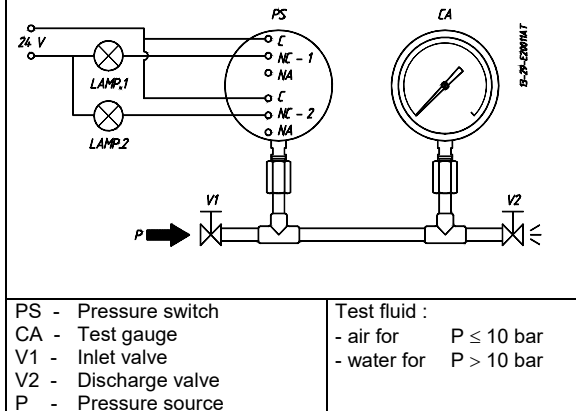
The effect of the sense of rotation of the adjusting bush is shown on the slot cover. Rotate the bush by inserting a **2,5mm** dia. rod

or drill into the holes on the bush itself (It recommends using a drill bit on the side of the shank).

### 7 - SET POINT CALIBRATION

In order to proceed with the calibration and the periodical functional verification of the instrument a suitable **calibration circuit** (Fig. 3) and an adequate pressure source are required. The test instrument should have a measurement range approximately equal to or slightly wider than the pressure switch range and should have an accuracy consistent with the accuracy required to calibrate the set point.

Fig. 3 – Calibration circuit



#### 7.1 PRELIMINARY OPERATIONS

Slide up the adjustment cover (Fig. 2 item 1).

#### 7.2 CALIBRATION CIRCUIT AND OPERATIONS

Prepare the control circuit as indicated in Fig.3.

If the instrument is equipped with two contacts, remember that they are released simultaneously but within the specification tolerance.

The warning lamps should be connected to the terminals NA or NC according to the required contact action.

Fig. 4 – Color of wires and function

GDN-Internal grounding connection: color yellow/green	
C-Common: <b>color brown</b> NO-Normally open: <b>color blue</b> NC-Normally closed: <b>color black</b>	Micro 1
C-Common: <b>color gray</b> NO-Normally open: <b>color red</b> NC-Normally closed: <b>color white</b>	Micro 2
Contacts status at atmospheric pressure.	
	<p>C - Common NA - Normally open NC - Normally closed</p>

#### Connection between C and NA

- If the circuit is open at the working pressure, the instrument **closes** the circuit when the set point is reached with pressure **on rise (closure on rise)**.
- If the circuit is closed at the working pressure, the instrument **opens** the circuit when the set point is reached with pressure **on fall (opening on fall)**.

#### Connection between C and NC

- If the circuit is closed at the working pressure, the instrument **opens** the circuit when the set point is reached with pressure **on rise (opening on rise)**.
- If the circuit is open at the working pressure, the instrument **closes** the circuit when the set point is reached with pressure **on fall (closure on fall)**.

The pressure switch must be kept in the normal installation position, i.e. with the pressure connection downwards.

Modify the pressure in the circuit up to the desired microswitch set point value.

Using a **2,5mm** dia. rod drill into the holes on the bush (It recommends using a drill bit on the side of the shank).

Adjust its position until the relative lamp turns on (or turns off); then turn it in the opposite direction until the lamp turns off (or on). Slowly turn the bush again until the lamp turns on (or off)

### 7.3 CALIBRATION OF INSTRUMENT WITH SENSOR TYPE P AND G

The pressure switches equipped with sensor P and G, are instruments with a piston sensing element. To perform a very accurate calibration, because of their particular operating principle, it is necessary to adjust the set point by varying the pressure from the normal pressure of operation to the set point of intervention

#### 7.4 SET POINT VERIFICATION

Increase the pressure up to the normal working pressure ( $P_w$ ), wait the stabilization of the pressure. Modify, slowly the pressure up to the set value ( $P_i$ ) and record the set point value. Write the set point value on the adhesive label.

**Note:** the verification of the repeatability have to be tested checking the set point ( $P_i$ ) three times approaching the set point from the same starting point ( $P_w$ ). The pressure cycles have to be performed slowly.

#### 7.5 FINAL OPERATIONS

Disconnect the instrument from the calibration circuit.

Close the adjustment slot by sliding down the slot cover (Fig. 2, 1), then seal with lead the instrument.

Mount on pressure connection the protecting cap supplied with the instrument. It should be definitively removed only **during** the connection steps.



### 8 - INSTRUMENT PLUMBING

The plumbing (see Fig. 2), aimed as a guarantee against possible tampering of the calibration, can be carried out using a flexible steel wire (2), 1 mm<sup>2</sup> in section, wound up around the case in the groove purposely provided.

### 9 - MOUNTING AND CONNECTIONS

#### 9.1 MOUNTING

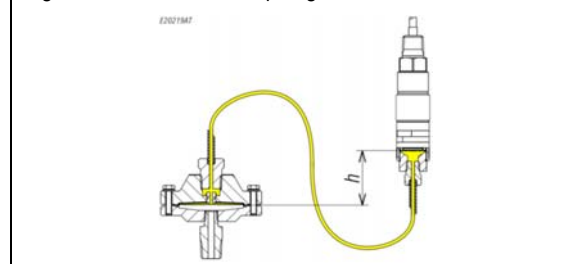
Mount the instrument directly on the pressure valve (Fig.11) or on a surface, through either a manifold (Fig.9) or a junction box (Fig.10). If the optional bracket for surface or pipe mounting is used see Fig.13 and 14.

The chosen position must be such that possible shocks or temperature changes remain within tolerable limits. With gas or vapour process fluid, the instrument **must** be positioned higher than the pressure valve. With a liquid process fluid, the instrument can be positioned higher or lower, indifferently. In this case, during set point calibration the **negative** or **positive** head must be taken into account

#### 9.2 INSTRUMENT WITH DIAPHRAGM SEALS

When the pressure switch is mounted on diaphragm seal with capillary and the set point is less than 10 bar, the gap (distance h) between diaphragm seal and instrument generates a column of liquid, whose pressure equivalent constitutes a drift of set point. The set point has to be adjusted consequently.

Fig. 5 – Instrument with diaphragm seal



#### 9.3 PRESSURE CONNECTIONS

For a correct installation, it is mandatory to:

**Mount** a shut-off valve with drain (root valve) on the process tube to allow the instrument to be excluded and the connection tubing to be drained. It is recommended that said valve has a locking device aimed at preventing it being activated casually and without authorization..

**Mount** a service valve near the instrument to permit possible functional verification on site. It is recommended that the service valve is closed with a plug to prevent the outlet of the process fluid caused by the incorrect use of said valve.

Mount a swivel adapter onto the threaded attachment of the instrument to permit the easy mounting or removal of the instrument itself.

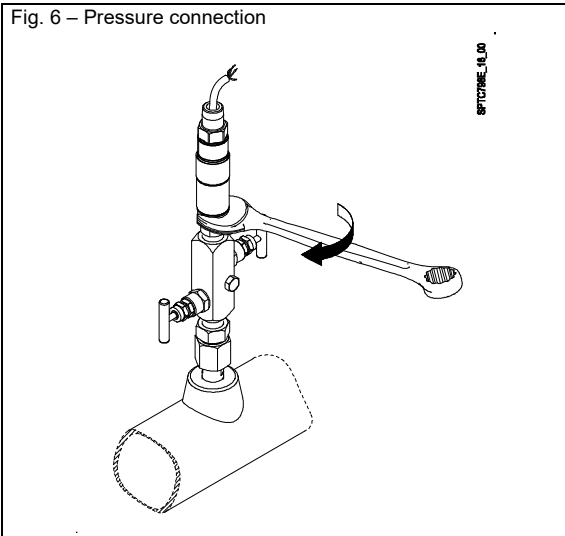


**CAUTION:** Make sure not to exceed the max temperature at the instrument process connection as specified at table 1.



**CAUTION:** the pressure connection is to be tightened applying the wrench **ONLY** on the hex of the pressure connection, **NOT** to the hex of the conduit connection, which may cause the instrument **NOT** to work (Fig.6)

Fig. 6 – Pressure connection



Carry out the connection using a flexible tube in such a way that the tube itself does not force the instrument process connection due to variations in temperature.

Ensure that all the pressure connections are airtight. It is important that there are no leakages in the circuit.



Close the root valve and the relative drain device. Close the service valve fitted with a safety plug.

### 9.4 ELECTRICAL CONNECTIONS

It is recommended to carry out the electrical connections according to the applicable standards. In case of flameproof or intrinsic safety instruments see also the standards EN-60079-14. The following mounting arrangements are possible.

#### 9.4.1 MOUNTING WITH CORD CABLE

Run the cable so that it cannot be easily damaged (e.g. due to too narrow bends, heat sources) and strain it.

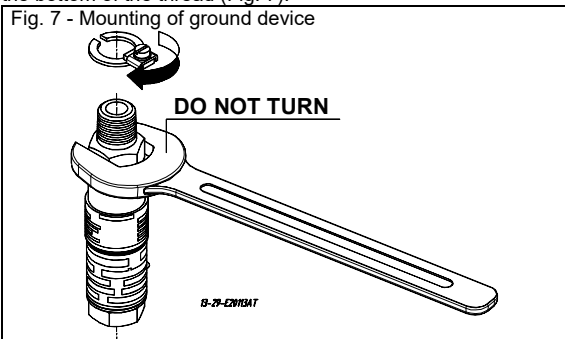
Mount, if provided, the external ground device on the electrical connection of the instrument.



The external ground screw is obligatory for flameproof constructions.

This device is to be threaded on while holding the electrical connection steady with a 27 mm wrench on hex, until it reaches the bottom of the thread (Fig. 7).

Fig. 7 - Mounting of ground device



#### 9.4.2 MOUNTING WITH CABLE PROTECTED BY FLEXIBLE TUBING

Mount, if provided, the external ground device on the electrical connection of the instrument. This device is to be threaded on, while holding the electrical connection steady with a 27 mm wrench on hex, until it reaches the bottom of the thread (fig. 7).

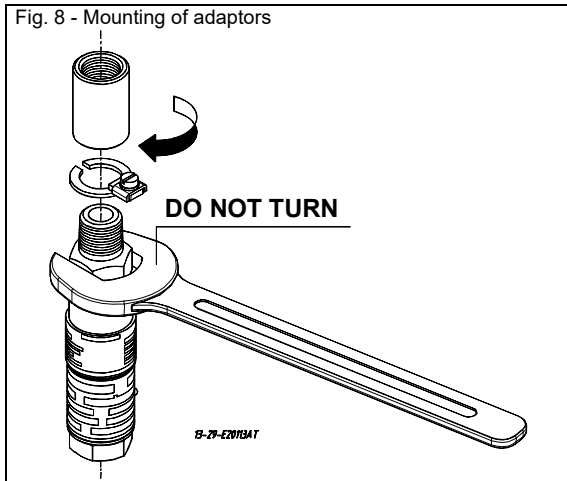
The external ground screw is obligatory for flameproof constructions.

If the flexible tubing is fitted with a male thread, apply a nipple to the electrical connection.

**CAUTION:** the adaptor is to be threaded on while holding the electrical connection steady with a 27 mm wrench on hex (fig.8)



Fig. 8 - Mounting of adaptors



#### 9.4.3 MOUNTING WITH CABLE PROTECTED BY METAL TUBING

**CAUTION:** mounting with cable protected by metal tubing is to be carried out avoiding any torque on the electrical connection while assembling the various fittings.

In order to make easier the instrument removal for check and calibration it is advisable to apply on the instrument a junction box provided with terminals.

**CAUTION:** accessories used for installation have to be certified according to standards EN or IEC



#### 9.4.4 MOUNTING INSTRUMENT WITH JUNCTION BOX

Versions with junction box have three cable entries, three- or six-terminals block with terminals identification plate, internal and external grounding connections.

Terminals are identified as follows:

Identification No.	Function	Micro No.
1	Common	1
2	Normally Open	
3	Normally Closed	
4	Common	2
5	Normally Open	
6	Normally Closed	

Mounting with cable protected in metal tube is to be carried out so as to prevent possible condensate from entering the junction box.

The junction box is to be surface mounted using the bracket supplied with it.

**Warning:** Instruments with aluminium enclosure. The instrument must be protected against accidental impacts of the housing.



The instrument is supplied with two protective earthing connections, one inside and one outside the enclosure.

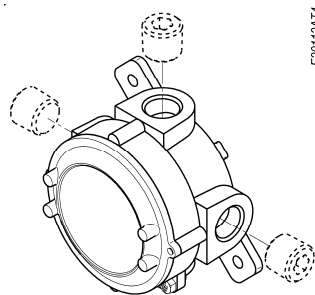
The connection provide effective connection of a conductor with a cross-sectional area of at least 4 mm<sup>2</sup>

**CAUTION:** fittings used for the electrical connection of the flameproof instruments shall be certified according to the IEC or EN standards and shall guarantee instrument degree of protection (IP66)





**CAUTION:** cable entries not used **must** be plugged and sealed with the plugs provided so as to prevent raining water or other from entering the junction box. **In case of flameproof instruments these plugs, if not correctly mounted and blocked to prevent their removal, do NOT guarantee the mode of protection Ex-d.** Furthermore, in order to guarantee the degree of protection IP65 and the non-loosening of blocking joint or packing gland, **it is prescribed** to seal the threads of connection with the same anaerobic sealant used for the plugs. For instance, a sealant like Loctite ® 648 can be applied on the thread of plugs, blocking joint or packing gland before screwing them on the box.



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### 9.5 WIRING

The cable used for electric wiring has a 7 mm OD silicone sheath for one contact versions, 8 mm OD for two contact versions. Each wire has a section of 0,5 mm<sup>2</sup> (20 AWG) and is silicone insulated. Wires ends are factory tinned. The colour of insulator defines the contact function (see Fig. 4 and stampings on slot cover).

**Before starting wiring, check that electric lines are not powered.**



The instrument is to be grounded **according to applicable electrical codes**. Make use of the internal yellow-green wire and, if the cable is not protected by metal tubing, connect the external screw of the grounding device supplied with the instrument.

Should the instrument be fitted with junction box, make sure that no deposits or wire ends remain inside the box.

In case of instrument with junction box tightening and blocking the cover as the wiring of the instrument is finished.



**Warning:** The instrument may be equipped with micro switches SPDT or DPDT. Where two microswitches are fitted, than the two switches must be part of intrinsically safe circuits.

The entry parameters relevant for intrinsic safety are listed on the nameplate of the instrument.

### 10 - PUTTING INTO OPERATION

The instrument starts operating as soon as is energized and the root valve is opened. Any possible drainage of the connection tubing can be carried out by removing the safety plug and **opening** the service valve **with the necessary caution**.



Do not dispose of the process fluid into the environment, if this can cause pollution or damage to people.

### 11 - VISUAL INSPECTION

Periodically check the external condition of the enclosure. There should be no trace of leakage of process fluid outside the instrument.

In case of flameproof or intrinsic safety instruments, inspections of the electrical installation are to be carried out also according to customer procedures and at least in accordance with Standard EN-60079-17.

The flameproof and the intrinsic safety instruments installed in explosive atmospheres for the combustible dust presence, must be periodically cleaned up externally in order to avoid dust accumulating.



### 12 - FUNCTIONAL VERIFICATION

This will be carried out according to the Customer's control procedures.

The instruments can be verified on the plant if installed as illustrated in Fig. 9,10 and 11.

To avoid any risk it is recommended check the set point on site without open the cover of the junction box, without dismount the cable gland, without unplugging the power cable.

Flameproof and intrinsic safety instruments can be checked on-site only if apparatus suitable for explosive atmosphere are used.



If this is not the case it is necessary remove the instrument from the plant (see § 13) and carry out the verification in a testing room.

If the verification of the set point is performed unplugging the power cable from the terminal block it is recommended power off the instrument to avoid any electrical hazard

**WARNING: Instrument models PXA, flameproof.**

Before open the cover of the junction box or the cable gland check the absence of explosive atmosphere and check that the instrument is **de energized**



Verification consists in **check the calibration value** and possibly regulating the adjustment bush (see §6) that is separate from the electrical compartment.

### 12.1 INSTRUMENT WITH DIAPHRAGM SEAL OR SENSOR TYPE G

This instrument, because of their particular operating principle, if used as an alarm of max pressure, have to be functional inspected every year as minimum.



### 13 - STOPPING AND DISMOUNTING

Before starting the following operations, **ensure** that plant and equipments have been put in **conditions** allowing to carry out them safely



**With reference to Fig 10.**

Remove the power supply (signal) from the electric line. Close the root valve (10) and open drain. Remove plug (5), open valve (6) and wait for process fluid to drain out.

Do not dispose of the process fluid into the environment, if this can cause pollution or damage to people.



Unscrew the three-piece joints (11)

**WARNING: PXA version instruments, flameproof.**

Before open the cover of the junction box or the cable gland check the absence of explosive atmosphere and check that the instrument is **de energized**



Unscrew the three-piece joints (3) (electric cable tubing).

Remove cover from junction box and disconnect wires from terminals and grounding screws.

Remove the screws fixing the box to the panel (or pipe) and remove the instrument taking care to slide electric conductors out from the case

Mount the cover of the junction box. Insulate and protect cables around, if any. **Temporarily plug the process connection.**

In case of flameproof or intrinsic safety instruments it is recommended to follow - at least - the standard EN-60079-17 for the withdrawal from service of electrical apparatus.



### 14 - DISPOSAL

The instruments are mainly made of stainless steel and aluminium and therefore, once the electrical parts have been dismantled and the parts coming into contact with fluids which could be harmful to people or to environment have been properly dealt with, they can be scrapped.



### 15 - TROUBLE SHOOTING



**IMPORTANT NOTE:** operations involving replacement of essential components must be carried out at our workshop, especially for instruments with flameproof certificate; this is to guarantee the user the total and correct restoration of the product original characteristics.



MALFUNCTION	PROBABLE CAUSE	REMEDY
<b>Set point shift</b>	<ul style="list-style-type: none"> <li>■ Permanent deformation of the sensitive element due to fatigue or excess over-ranges.</li> <li>■ Variation of the elastic features of the sensitive element due to its chemical corrosion.</li> </ul>	<ul style="list-style-type: none"> <li>■ Recalibrate or replace the instrument.</li> <li>■ Recalibrate or replace the instrument with another made of a suitable material. If necessary, apply diaphragm seals.</li> </ul>
<b>Slow response</b>	<ul style="list-style-type: none"> <li>■ Clogged or obstructed connecting line.</li> <li>■ Root valve partially closed.</li> <li>■ Too viscous fluid.</li> </ul>	<ul style="list-style-type: none"> <li>■ Check and clean line.</li> <li>■ Open the valve.</li> <li>■ Provide instrument with suitable diaphragm seals.</li> </ul>
<b>No actuation or undue actuation</b>	<ul style="list-style-type: none"> <li>■ Root valve closed.</li> <li>■ Microswitch contacts damaged.</li> <li>■ Loosened electrical joints.</li> <li>■ Interrupted or short-circuited line.</li> </ul>	<ul style="list-style-type: none"> <li>■ Open the valve.</li> <li>■ Replace instrument.</li> <li>■ Check all electrical joints.</li> <li>■ Check conditions of the electric line.</li> </ul>
<b>Undue actuation</b>	<ul style="list-style-type: none"> <li>■ Accidental shocks.</li> </ul>	<ul style="list-style-type: none"> <li>■ Modify mounting.</li> </ul>

Fig. 9 - Surface mounting

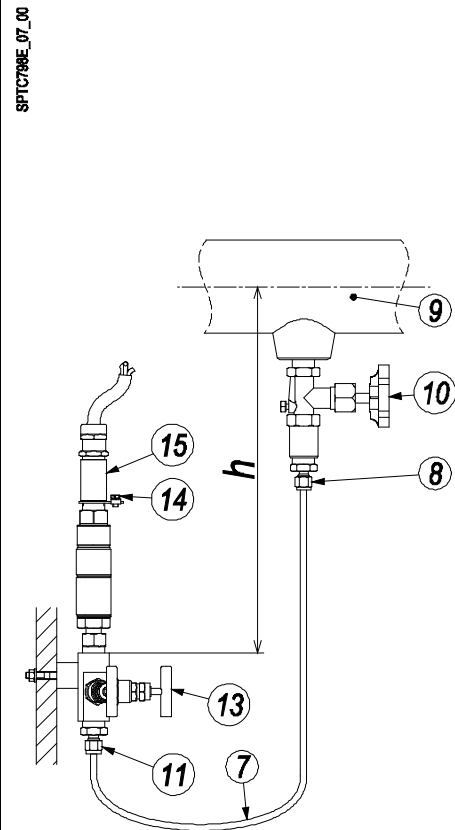
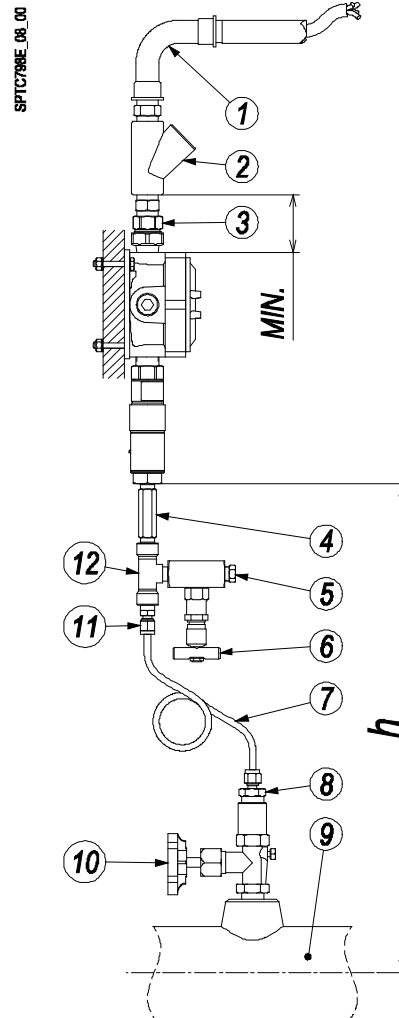


Fig. 10 - Surface mounting



**NOTE:** With gas or vapour process fluid, the instrument must be positioned higher than the pipe inlet (see Fig. 10). With a liquid process fluid, the instrument can be positioned higher or lower, indifferently (see Fig. 9 and 10). In this case, during set point calibration the negative or positive head must be taken into account (distance h in Fig.9 and 10).

Fig. 11 – Direct mounting

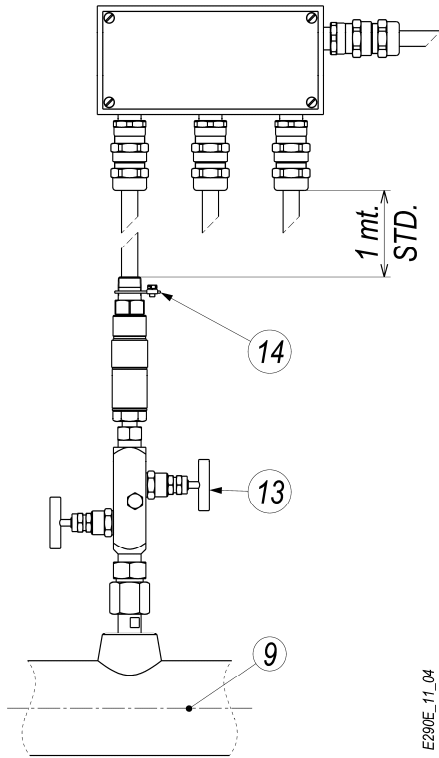
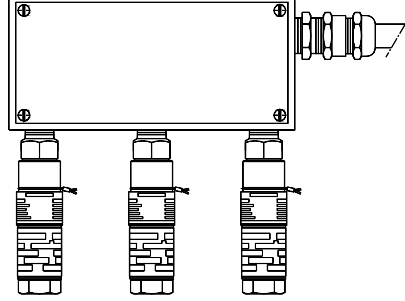


Fig. 12 – Typical installation



- 1 – Elbow fitting
- 2 – Conduit seal
- 3 – Swivel adapter
- 4 – Adapter
- 5 – Drain plug
- 6 – Service valve
- 7 – Tubing
- 8 – Swivel adapter
- 9 – Process piping

- 10 – Root valve with drain
- 11 – Swivel adapter
- 12 – Tee fitting
- 13 – Manifold valve SB&B
- 14 – Ground ring
- 15 – Conduit fitting

Fig. 13 – Bracket for wall mounting

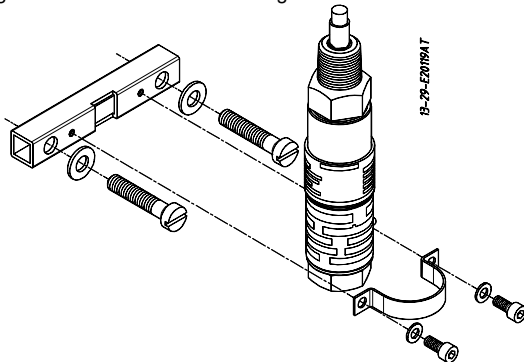
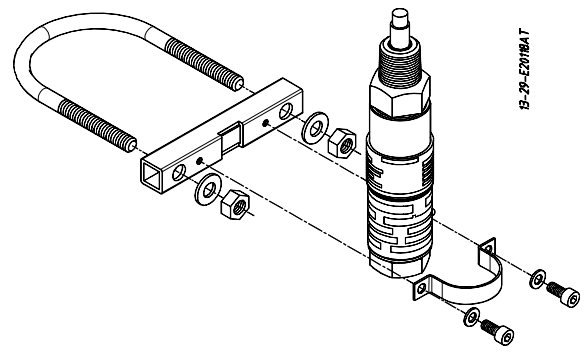


Fig. 14 - Bracket for 2 pipe"



### Annex 1 – Model code

