

COMPACT PRESS. SWITCHES SERIES PCS & PCA

WEATHERPROOF

EXPLOSIONPROOF

SERIES PCS	SERIES PCA
<p>B = Cable entry A = Pressure connection WEIGHT 1kg</p> <p style="text-align: right;">dimensions in mm</p>	<p>B = Cable entry A = Pressure connection WEIGHT 1kg</p> <p style="text-align: right;">dimensions in mm</p>

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**.

• **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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SAFETY INSTRUCTIONS FOR USE IN HAZARDOUS ATMOSPHERES.

RECOMMENDATIONS FOR PRESSURE SWITCH SAFE USE.

RELATED DOCUMENT

To authenticated document with certificate
N° CESI 02 ATEX 118

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 NOTES

1.1 FOREWORD

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

1.2 ALLOWED OVERRANGE

Pressures exceeding the working range can be **occasionally** tolerated provided they remain within the limits stated in the instrument features (proof pressure). **Continuous** pressures exceeding the working range can be applied to the instrument, provided they are clearly stated in the instrument features. The current and voltage values stated in the technical specifications and ratings must **not** be exceeded. Transitory over-ranges can have a destructive effect on the switch.

1.3 TEMPERATURE

Due to the temperature of both the environment and the process fluid, the temperature of the instrument could exceed the allowed limits (normally from -20°C to +70°C). Therefore, in case it does, suitable measures (protection against heat radiation, fluid separators, cooling coils, heated lockers), aimed at limiting the value, must be taken.

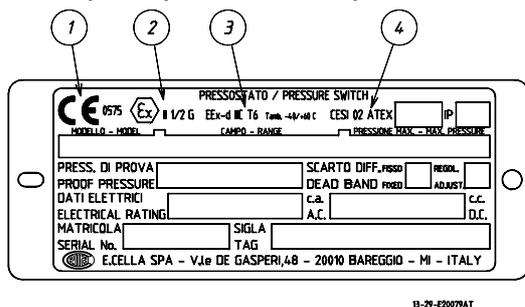
2 - OPERATING PRINCIPLE

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 an helicoidal 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 one or two simultaneous 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 - IDENTIFICATION PLATE AND MARKINGS

The instrument is fitted with a metal plate bearing all its functional characteristics and – in case of explosionproof execution (Series PCA) – also the markings prescribed by standard CEI EN 50014. Fig. 1 shows the plate mounted on explosionproof instruments.

Fig. 1 - Explosionproof instruments plate



- 1 CE marking and identification number of the notified body responsible for production surveillance.
- 2 Apparatus classification according to ATEX 94/9 CE directive..
- 3 Type of protection and ambient temperature limits of operation.
- 4 Notified body that issued the type certificate and number of said certificate.

4 - SET POINT REGULATION

The charge of the helicoidal spring can be regulated by means of the bush (for adjustment) in such a way that the switch is released when the pressure reaches (increasing or decreasing) the desired values (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.

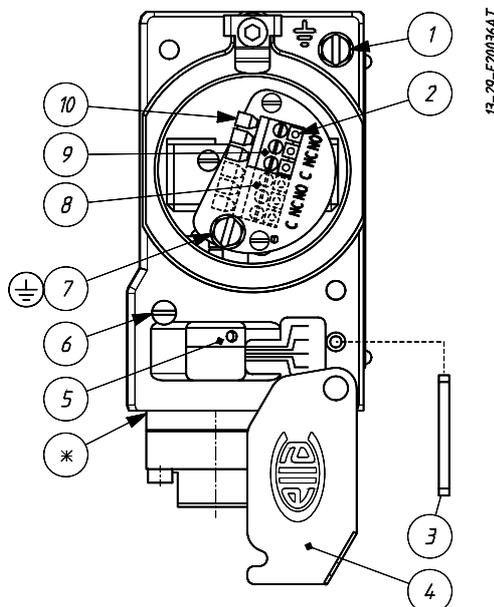
Prior to installation the instrument must be **calibrated** and the definitive calibration values written on the label using a suitable indelible ink pen.

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.



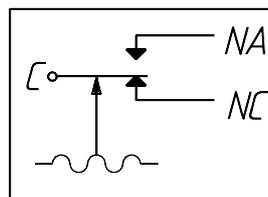
The position of the adjustment bush given in Fig. 2.

Fig. 2 - Electrical connections and adjustment screws (one contact/two contact instruments)



- 1 - External earth screw
 - 2 - Hole for test plug
 - 3 - Adjustment rod for set point calibration
 - 4 - Adjustment bush access plate
 - 5 - Adjustment bush
 - 6 - Screw for fixing the adjustment bush access plate
 - 7 - Internal earth screw
 - 8 - Terminal block for the second microswitch
 - 9 - Terminal block for the first microswitch
 - 10 - Pre-insulated thimbles
- ⊗ - Ventilation path

Microswitch electrical circuit. State of the contacts at atmospheric pressure



Designation of the contacts:
 C - Common
 NA - Normally open
 NC - Normally closed

The effect of the direction of rotation of the adjustment bush has is described on the adhesive plate.

The bush must be **turned** by means of the special adjustment rod which comes with the instrument (Fig.2).

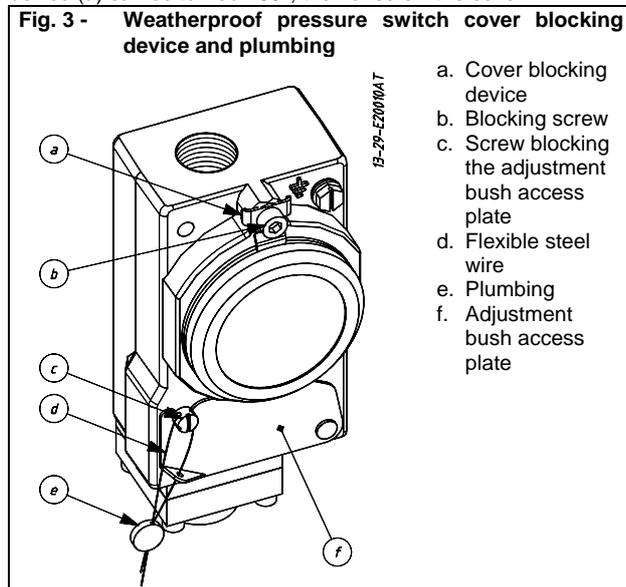
5 - SET POINT CALIBRATION

In order to proceed with the calibration and the periodical functional verification of the instrument a suitable **calibration circuit** (Fig. 4) and an adequate pressure source is required..

5.1 PRELIMINARY OPERATIONS

CAUTION: do not open the cover of explosionproof pressure switches (Series PCA) when energized, in explosive atmospheres.

With reference to Fig. 3 unscrew the screw (b) until the blocking device (a) can be turned 180°; then unscrew the cover.



CALIBRATION CIRCUIT AND The warning lamps should be connected to the contacts in the NA or NO position according to the required contact action.

If the instrument is equipped with two microswitches, take into account that they actuate simultaneously within rated tolerances.

The warning lamps can either be connected by means of a thimble with a maximum diameter of 2.5 mm or by means of a test plug with a diameter of 2 mm to be inserted in the appropriate holes situated frontally beside the terminal screw (see Fig. 2).

Connection of C and NA terminals

- If the circuit is open at the working pressure, the switch **closes** the circuit as the pressure **increases** when the desired values is reached (**MAX. closing**).
- If the circuit is closed at the working pressure, the switch **opens** the circuit as the pressure **decreases** when the desired value is reached (**MIN. opening**).

Connection of C and NC terminals

- If the circuit is closed at the working pressure, the switch **opens** the circuit as the pressure **increases** when the desired value is reached (**MAX. opening**).
- If the circuit is open at the working pressure, the switch **closes** the circuit as the **pressure** decreases when the desired value is reached (**MIN. closing**).

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 precision required to calibrate the set point.

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

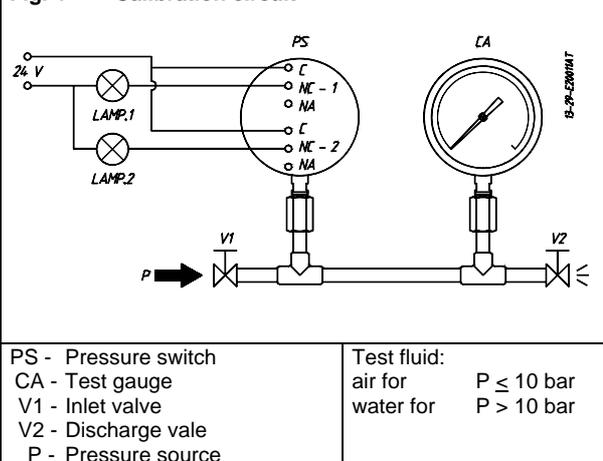
Avoid forcing the microswitch by hand or with tools. This could affect the instrument functioning.

With reference to Fig.3, free the access to the adjustment bush by loosening the screw (c) which holds the closure plate (f).

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

Turn the adjustment bush using the adjustment rod with which the instrument is equipped (Fig. 2) 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).

Fig. 4 - Calibration circuit



Check the calibration value (varying the pressure in the circuit accordingly) and register it, using a pen with indelible ink, on the ratings.

5.2 CALIBRATION USING REGULATION SCALE

See the specific instructions attached with instruments with this option.

5.3 FINAL OPERATIONS

Disconnect the instrument from the calibration circuit.

With reference to Fig. 2, insert the adjustment rod into the appropriate seat; close the access to the adjustment bush by rotating the closure plate (4) and tighten the relative screw (6). Take the cover, ensure that the sealing gasket is correctly fitted into its seat, insert the cover onto the case and turn it clockwise until the cover is closed.

With reference to Fig. 3 turn the blocking device (a) 180° sliding the tongue into the appropriate seat in the cover; tighten the blocking screws (b).

Mount on pressure connection and cable entry the protection caps supplied with the instrument.

CAUTION: the protection caps should only be definitively removed during the connection steps (see § 7).

6 - INSTRUMENT PLUMBING

The plumbing, aimed as a guarantee against possible tampering of the calibrations, can be carried out using a flexible steel wire (d) inserted into the holes in the screw (c) and the adjustment bush closure plate provided for this purpose (see Fig. 3).

7 - MOUNTING AND CONNECTIONS

7.1 MOUNTING

Surface mount the instrument by mean of the holes, or pipe mount using the appropriate bracket (see Fig. 8) or mount directly on the plant in a vertical position (with the pressure connection downwards). The chosen position must be such that the possibility of shocks or temperature changes are within tolerable limits. The above also applies to direct mounting. With gas or vapour process fluid, the instrument **must** be positioned higher than the pipe inlet (see Fig. 7). With a liquid process fluid, the instrument can be positioned higher or lower, indifferently (see Fig. 6 and 7). In this case, during set point calibration the **negative or positive head** must be taken into account.

CAUTION: positions other than vertical are allowed provided environmental conditions do not cause condensation to form or water to enter the instrument through the ventilation path.

7.2 PRESSURE CONNECTIONS

For a correct installation it is necessary 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 capstan-blocking device aimed at preventing it being activated casually and without authorisation.

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 three piece joint onto the threaded attachment of the instrument to permit the easy mounting or removal of the instrument itself.

Carry out the connection using a flexible tube in such a way that the tube itself does not force the instrument attachment 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.

7.3 ELECTRICAL CONNECTIONS

It is recommended to carry out the electrical connections according to the applicable standards. In case of explosionproof instruments (Series PCA) see also the Standard EN-60079-14. If the electrical connection is carried out in a protected tube, it shall be made so that condensate is prevented from entering instrument enclosure.

The arrangement shown in Fig. 5 or 6 is therefore recommended.

CAUTION: fittings used for the electrical connection of the pressure switch Series PCA (explosionproof) shall be certified to Standards EN 50014 and 50018, and shall guarantee instrument degree of protection (IP65).

Check that there is no power in the lines.

Remove the cover and carry out the cabling and connections to the terminal block (see Fig. 2).

Flexible cables with a maximum section of 1,2 mm² (16AWG) are recommended using the pre-insulated thimbles with a maximum diameter of 2,5 mm supplied with the instrument.

When inserting cables into the enclosure pay attention not to force the microswitch with cable or tools, otherwise instrument calibration or even its operation could be compromised. The microswitch has been factory mounted and positioned in order to obtain the best performances. Any tampering made on site without following instructions authorised by the E. CELLA SPA may result in instrument malfunction.

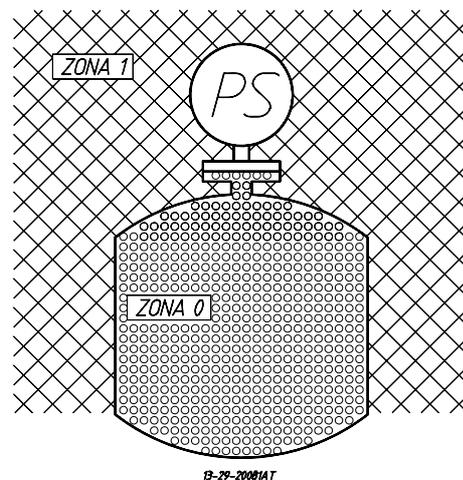
Ensure that no deposits or wire ends remain inside the case.

Once the connection operations have been completed, replace the cover and ensure that it is properly sealed and blocked. See Fig. 3.

7.4 SPECIAL NOTE FOR INSTALLATION OF CATEGORY 1 / 2 G PRESSURE SWITCHES

Explosionproof pressure switches (Series PCA) can be installed on processes requiring apparatus of group II category 1 in an ambient requiring apparatus of group II category 2 (see Fig. 5).

Fig. 5 - Installation of Group II Cat. 1 / 2 G instruments



8 - PUTTING INTO OPERATION

As the signal transmitted by the instrument is used in a complex system, it is necessary that the means of putting it into operation are established by personnel in charge of the plant.

The instrument comes into operations as soon as 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.

In case of explosionproof instruments (Series PCA), initial inspections are to be carried out according to customer procedures and at least in accordance with Standard EN-60079-17.

9 - FUNCTIONAL VERIFICATION

This will be carried out according to the Client's control procedures. Series PCS instruments can be verified on the plant if installed as illustrated in Fig. 6 and 7.

The instruments Series PCA may be checked on site only if apparatus suitable for explosive atmosphere are used and provided that the electric line is not energized.

If this is not the case it is necessary to stop operation, dismant by means of the three piece joints and carry out the verification in a test room.

CAUTION: do not open the cover of explosionproof pressure switches (Series PCA) when energized, in explosive atmospheres.

Verification consists in check the calibration value and possibly regulating the adjustment bush (see §5).

In case of explosionproof instruments (Series PCA), 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.

10 - TROUBLESHOOTING

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

MALFUNCTION	PROBABLE CAUSE	REMEDY
Set point shift	<ul style="list-style-type: none"> ■ Permanent deformation of the sensitive element due to fatigue or excess over-ranges. ■ Variation of the elastic features of the sensitive element due to its chemical corrosion. ■ O-ring wear (only PCS2P, PCS3P, PCA2P and PCA3P). 	<ul style="list-style-type: none"> ■ Recalibrate or replace the sensitive element. ■ Recalibrate or replace the sensitive element with another made of a suitable material. If necessary apply fluid separator. ■ Replace the piston subgroup and recalibrate.
Poor repeatability	<ul style="list-style-type: none"> ■ O-ring wear (only PCS2P, PCS3P, PCA2P and PCA3P). ■ Air bubbles or condensation (only for types with pressure < 1 bar). 	<ul style="list-style-type: none"> ■ Replace the piston subgroup and recalibrate. ■ Drain the process connection lines and if necessary modify them.
Slow response	<ul style="list-style-type: none"> ■ Clogged or obstructed connection line. ■ Root valve partially closed. ■ Too viscous fluid. 	<ul style="list-style-type: none"> ■ Check and clean line. ■ Open valve. ■ Provide instrument with suitable fluid separator.
No actuation or undue actuation	<ul style="list-style-type: none"> ■ Root valve closed. ■ Microswitch contacts damaged. ■ Loosened electrical joints. ■ Interrupted or short-circuited. 	<ul style="list-style-type: none"> ■ Open the valve. ■ Replace the microswitch. ■ Check all electrical joints. ■ Check the conditions of the electric line.
Undue actuation	<ul style="list-style-type: none"> ■ Accidental shocks. 	<ul style="list-style-type: none"> ■ Modify the mounting.

11 - STOPPING AND DISMOUNTING

Before proceeding with these operations **ensure** that the plant or machines have been put into the **conditions** foreseen to allow these operations.

With reference to figures 6 or 7

Remove the power supply (signal) from the electrical line.
Close the root valve (6) and open the drain.

Remove the plug (2), open the valve (3) and wait until the process fluid has drained from the tubing through the drain.

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

Unscrew the three piece joint (8).

CAUTION: do not open the cover of explosionproof pressure switches (Series PCA) when energized, in explosive atmospheres.

Unscrew the three piece joint (10) (electrical cable tubing).

Remove the instrument cover and disconnect the electrical cables from the terminal block and earth screws.

Remove the screw fixing the case to the panel (or pipe) and remove the instrument, taking care to slide the electrical conductors out from the case.

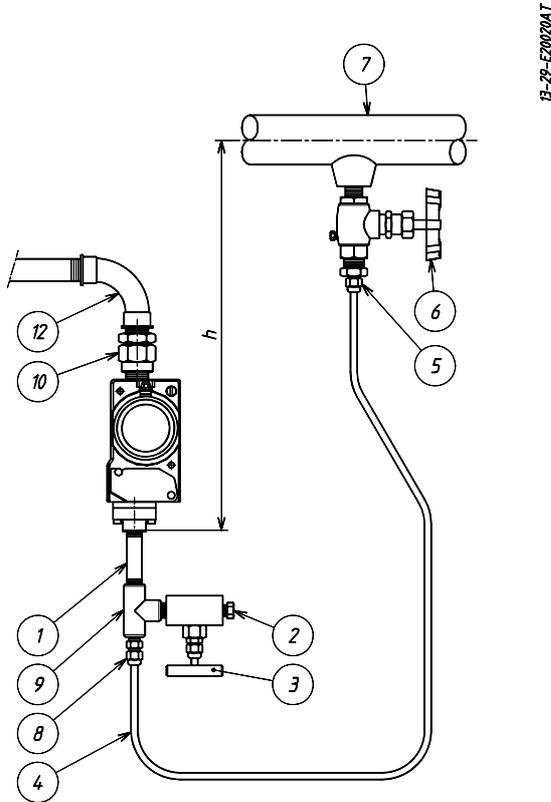
Mount instrument cover. Insulate and protect cables around, if any. Temporarily plug pipes not connected to the instrument. In case of explosionproof instruments (Series DE) it is recommended to follow - at least - the standard EN-60079-17 for the withdrawal from service of electrical apparatus.

12 - DEMOLITION

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 the environment have been properly dealt with, they can be scrapped.

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Fig. 6 - Example of connections



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Fig. 7 - Example of connections

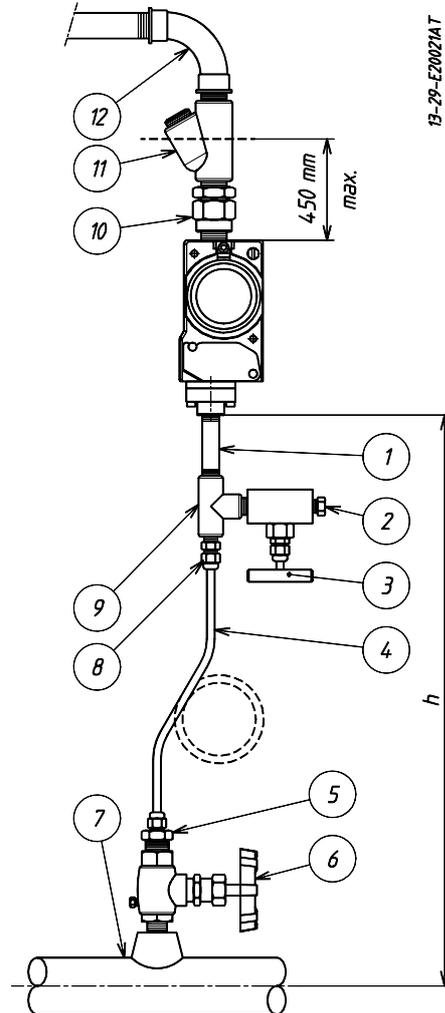
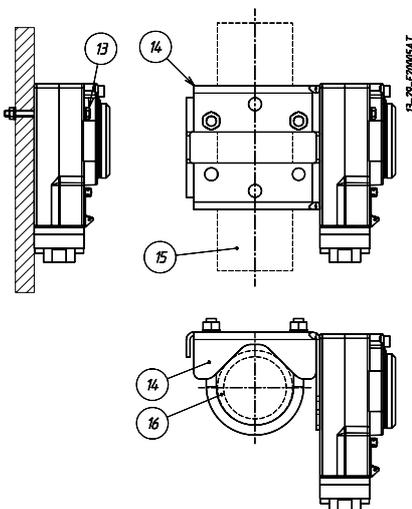


Fig. 8 - Surface or bracket mounting for 2" pipe (weatherproof and explosionproof instruments)



LEGEND

- | | |
|---------------------------|--------------------------|
| 1 - Fitting | 9 - "T" fitting |
| 2 - Drain plug | 10 - Three piece fitting |
| 3 - Service valve | 11 - Blocking joint |
| 4 - Piping | 12 - Curve |
| 5 - Three piece fitting | 13 - M5 screws (No. 2) |
| 6 - Root valve with drain | 14 - Bracket for 2" pipe |
| 7 - Process piping | 15 - Vertical pipe |
| 8 - Three piece fitting | 16 - Horizontal pipe |

NOTE: With gas or vapour process fluid, the instrument must be positioned higher than the pipe inlet (see Fig. 5). With a liquid process fluid, the instrument can be positioned higher or lower, indifferently (see Fig. 5 and 6). In this case, during set point calibration the negative or positive head must be taken into account (distance h in Fig.5 and 6).