

COMPACT TEMP. SWITCHES SERIES TCS & TCA

Stem type B	Stem type C, Q, R
Y = 125 mm	Stem type C: K = 2m ; Y max.=350mm Stem type Q: K = 4m ; Y max.=900mm Stem type R: K = 10m ; Y max.=1800mm
WEIGHT 1kg	WEIGHT 1kg
dimensions in mm	dimensioni in mm

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

Temperatures exceeding the working range can be **occasionally** tolerated provided they remain within the limits stated in the instrument features (trial temperature). **Continuous** temperatures 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 overranges 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° to +70°C). Therefore in case it does, suitable measures (protection against heat radiation, heated lockers), aimed at limiting the value, must be taken.

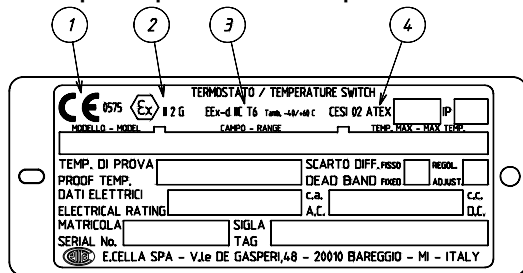
2 - OPERATING PRINCIPLE

The operating principle is based on a pressure measuring element, connected via a capillary tube to a temperature-responding bulb. This system is partially filled with a volatile liquid, the residual free volume being filled by its saturated vapour. In this system a pressure is generated which is a non-linear function of bulb temperature; this pressure acts on a stainless steel diaphragm which applies a force to a stiff disc; this force is directly proportional to the temperature value to which the bulb is submitted 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, **activates one or two simultaneous release electric microswitches**. The microswitches are of the rapid release type with automatic rearm. When the temperature moves away from the set values, returning towards the normal values, the switch is rearmed.

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 TCA) – 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 949 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

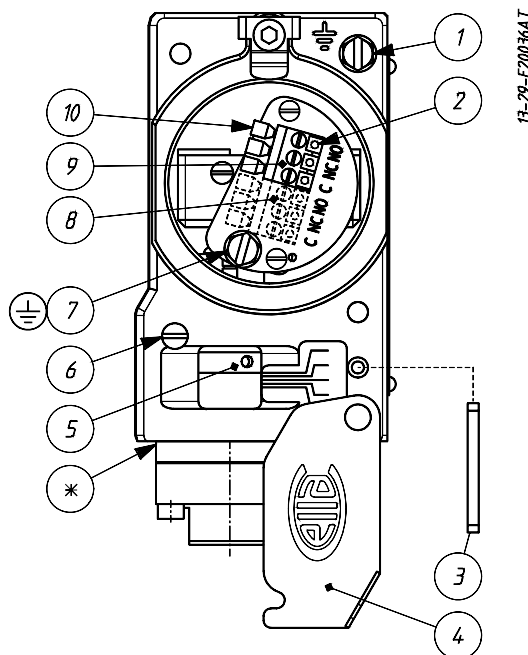
The charge of the helicoidal spring can be regulated by means of the bush (for adjustment) in such a way that the switch is released when the temperature reaches (increasing or decreasing) the desired value (set point). The instrument is usually supplied with the switches set at 0°C or at the lowest setting range value if this is higher than 0°C (**factory calibration**). The instrument is supplied with an adhesive rating plate showing the set point calibration value. With **factory calibration** the values are not indicated

on the ratings 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 adhesive rating plate 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.

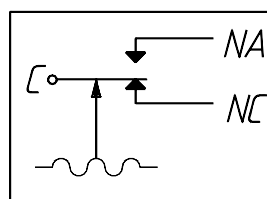
The position of the adjustment bush is given in figure 2

Fig. 2 - Electrical connections and regulating screws (one contact/two contacts 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) Screws for fixing the adjustment bush access plate
- 7) Internal earth screws
- 8) Terminal block for the second microswitch
- 9) Terminal block for the first microswitch
- 10) Pre-insulated test prod thimbles
- 11) Ventilation path

Microswitch electrical circuit: State of the contacts at a temperature of 0°C



Designation of the contacts:

- C - common
- NA - Normally open
- NC - Normally closed

The effect that the direction of rotation of the adjustment bush has is described on the ratings.

The bush must be turned by means of the appropriate 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. 3) and an adequate heat source is required.



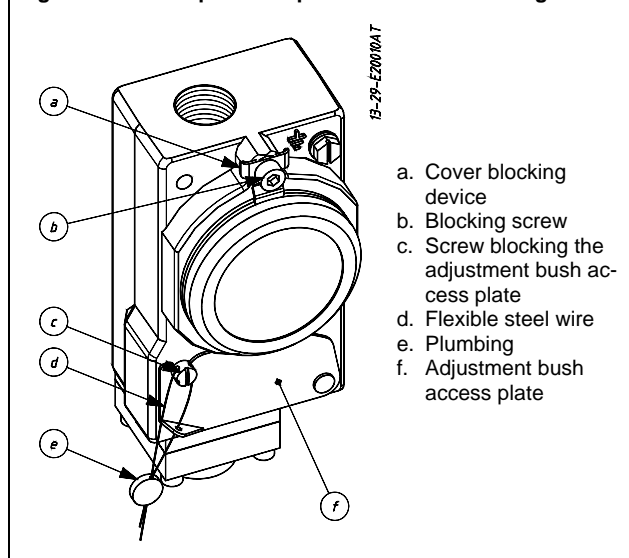
5.1 PRELIMINARY OPERATIONS



CAUTION: do not open the cover of explosionproof temperature switches (Series TCA) 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.

Fig. 3 - Weatherproof temperature switch blocking device



- a. Cover blocking device
- b. Blocking screw
- c. Screw blocking the adjustment bush access plate
- d. Flexible steel wire
- e. Plumbing
- f. Adjustment bush access plate

5.2 CALIBRATION CIRCUIT AND OPERATIONS

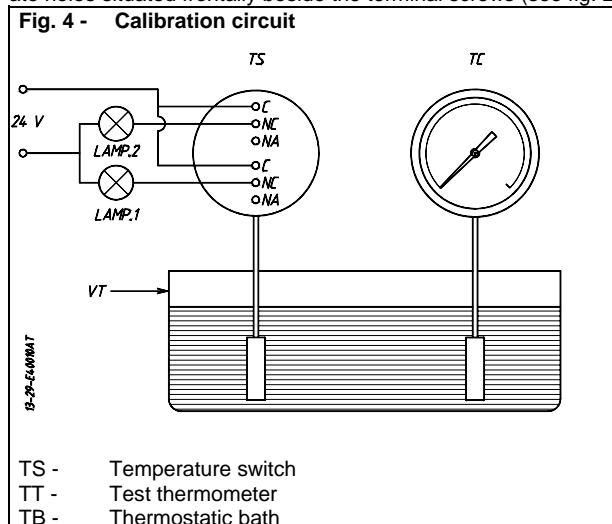
Prepare the control circuit as indicated in Fig. 4.

The warning lamps should be connected to the contact in the NO or NC 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 test prod 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 screws (see fig. 2).



Connection of C and NO terminals

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

Connection of C and NC terminals

- If the circuit is closed at the working temperature, the switch **opens** the circuit as the temperature **increases** when the desired value is reached (**MAX. opening**).
- If the circuit is open at the working temperature, the switch **closes** the circuit as the temperature **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 temperature switch range and should have an accuracy consistent with the precision required to calibrate the set point.

The temperature switch must be mounted in the normal installation position, i.e. with the stem or capillary outlet downwards. Avoid forcing the microswitch by hand or with tools. This could affect the instrument functioning.

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

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

5.3 FINAL OPERATIONS

5.3.1 Disconnect the instrument from the control circuit.

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

Replace the supplied protection cap on the cable conduit.

CAUTION: the protection cap 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 calibration, 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 means of the holes provided, or pipe mount using the appropriate bracket (see figures 6 and 7) in a vertical position (with the stem or capillary outlet pointing downwards). The chosen position must be such that vibrations, accidental shocks or temperature changes are within tolerable limits. The above also applies to direct mounting. For the instruments equipped with capillary the difference between the bulb and the case must not exceed two metres.

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 BULB AND CAPILLARY

With reference to figure 5 **svitare** il raccordo (3) dal premiguarnizione (2) e sfilarlo dal bulbo (5).

unscrew the fitting (3) from the seal press (2) and slide it off from the bulb (5).

Mount the fitting (3) on the thermowell (4) and tighten it using the appropriate key.

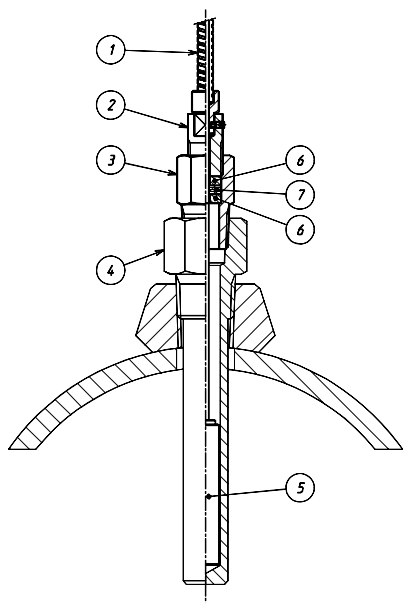
Insert the bulb (5) into the thermowell (4) after covering it with the paste to improve the transmission of heat.

Verify that the bulb touches the bottom.

Insert the PTFE seal with the relative stainless steel washers into the fitting (3).

Screw the seal press (2) onto the fitting (3) taking care not to bend the capillary and relative sheath and tighten until the PTFE seal is tight on the capillary tube.

Fig. 5 - Mounting the bulb



- | | |
|-----------------------------|---------------------------|
| 1) Armored capillary | 5) Bulb |
| 2) Stuffing nut (SW 12) | 6) Stainless steel washer |
| 3) Rotating fitting (SW 22) | 7) PTFE washer |
| 4) Thermowell | |

Extend the capillary protected by the sheath in the established direction, avoiding tight bends, and block using the stainless steel bands.

If a large amount of capillary remains this should be rolled up and fixed tightly. The coil must not have a diameter of less than 200 mm.

7.3 ELECTRICAL CONNECTIONS

It is recommended to carry out the electrical connections according to the applicable standards. In case of explosionproof instruments (Series TCA) 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. 6 or 7 is therefore recommended.

CAUTION: fittings used for the electrical connection of the pressure switch Series TCA (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.

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"> ■ Deposits on thermowell or bulb. ■ Filling fluid leakage. 	<ul style="list-style-type: none"> ■ Check and clean surfaces. ■ Replace the instrument.
Slow response	<ul style="list-style-type: none"> ■ Deposits on thermowell or bulb. 	<ul style="list-style-type: none"> ■ Check and clean surfaces.
No actuation	<ul style="list-style-type: none"> ■ Loosened electrical joints. ■ Interrupted or short-circuited electrical line. ■ Microswitch contacts damaged. ■ Filling fluid leakage. 	<ul style="list-style-type: none"> ■ Check all electrical joints. ■ Check the conditions of the electrical line. ■ Replace the instrument. ■ Replace the instrument.
Undue actuation	<ul style="list-style-type: none"> ■ Accidental shocks. ■ Interrupted or short-circuited electrical line. 	<ul style="list-style-type: none"> ■ Modify the mounting. ■ Check the conditions of the electrical line.

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 test prod 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.

8 - MESSA IN FUNZIONE

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 starts working as soon as it is connected to an electrical line.

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

9 - FUNCTIONAL VERIFICATION

Si effettuerà secondo le modalità previste dal piano di controllo del Cliente. Series TCS instruments can be verified on the plant if mounting is done as illustrated in Fig. 6 and 7.

The instruments Series TCA 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, dismount by means of the three piece joints and carry out the verification in a test room.

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

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

In case of explosionproof instruments (Series TCA), 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.

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 and 7

Remove the power supply (signal) from the electrical line. Loosen and remove the seal press being careful not to bend the capillary and protective sheath (Fig. 5). Loosen and remove the fitting then extract the bulb from the thermowell holding it by the capillary tube, without bending it. Unscrew the three piece joint (8).



CAUTION: do not open the cover of explosionproof temperature switches (Series TCA) 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 screws 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 the thermowell. In case of explosionproof instruments (Series TCA) 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.

13 - INSTALLATION NOTE

13.1 TEMPERATURE SWITCHES CLASS SAMA II A

Difference in height of more than two meters between bulb and instrument enclosure causes a systematic error of set point calibrated value ("bulb elevation error").

This error can be corrected during calibration by either increasing or decreasing the set point value by a constant depending on the difference in height foreseen for the installation. The "bulb elevation error" can be corrected using the table attached to our technical instruction IS-TC.401E, available on request.

13.2 TEMPERATURE SWITCHES CLASS SAMA II C

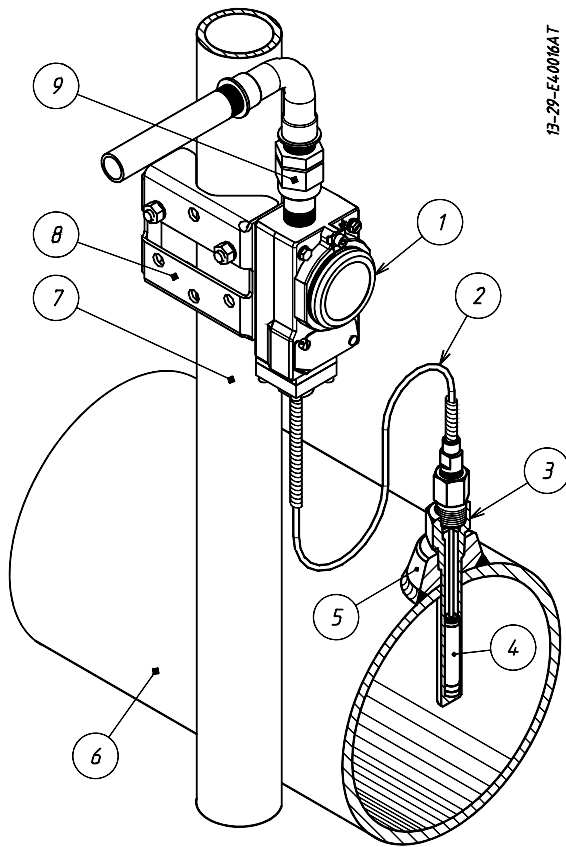
Difference in height between bulb and instrument enclosure when installed **must not exceed two meters**.

With a difference of approximately two meters the set point value fixed during calibration may be affected by an error depending on the normal reference temperature, the working temperature and the set point temperature. In the worst operating conditions the set point temperature value fixed during calibration may be affected by a maximum error of 1.5°C. For further clarification request IS-TC.401E.



WEATHERPROOF

Fig. 6 - Example of connections -

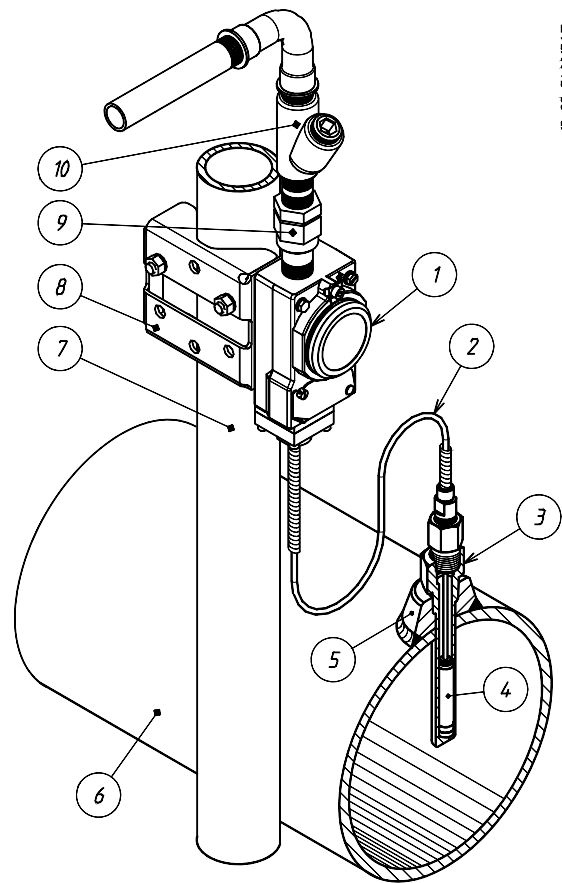


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- | | |
|---|------------------------|
| 1) Weatherproof temperature switch series TCS | 6) Process piping |
| 2) Capillary | 7) 2" pipe |
| 3) Thermowell | 8) Bracket for 2" pipe |
| 4) Bulb | 9) 3 piece joint |
| 5) Derivation | |

EXPLOSIONPROOF

Fig. 7 - Example of connections -

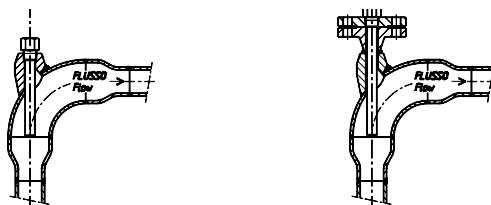


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- | | |
|--|------------------------|
| 1) EEx-d temperature switch series TCA | 6) Process piping |
| 2) Capillary | 7) 2" pipe |
| 3) Thermowell | 8) Bracket for 2" pipe |
| 4) Bulb | 9) 3 piece joint |
| 5) Derivation | 10) Blocking joint |

Fig. 8 - Thermometric wells: example of installation

Minimum dimension 3": for lesser dimensions provide for an increase in diameter up to 3"



Minimum dimension 6": for lesser dimensions provide for an increase in diameter up to 6"

