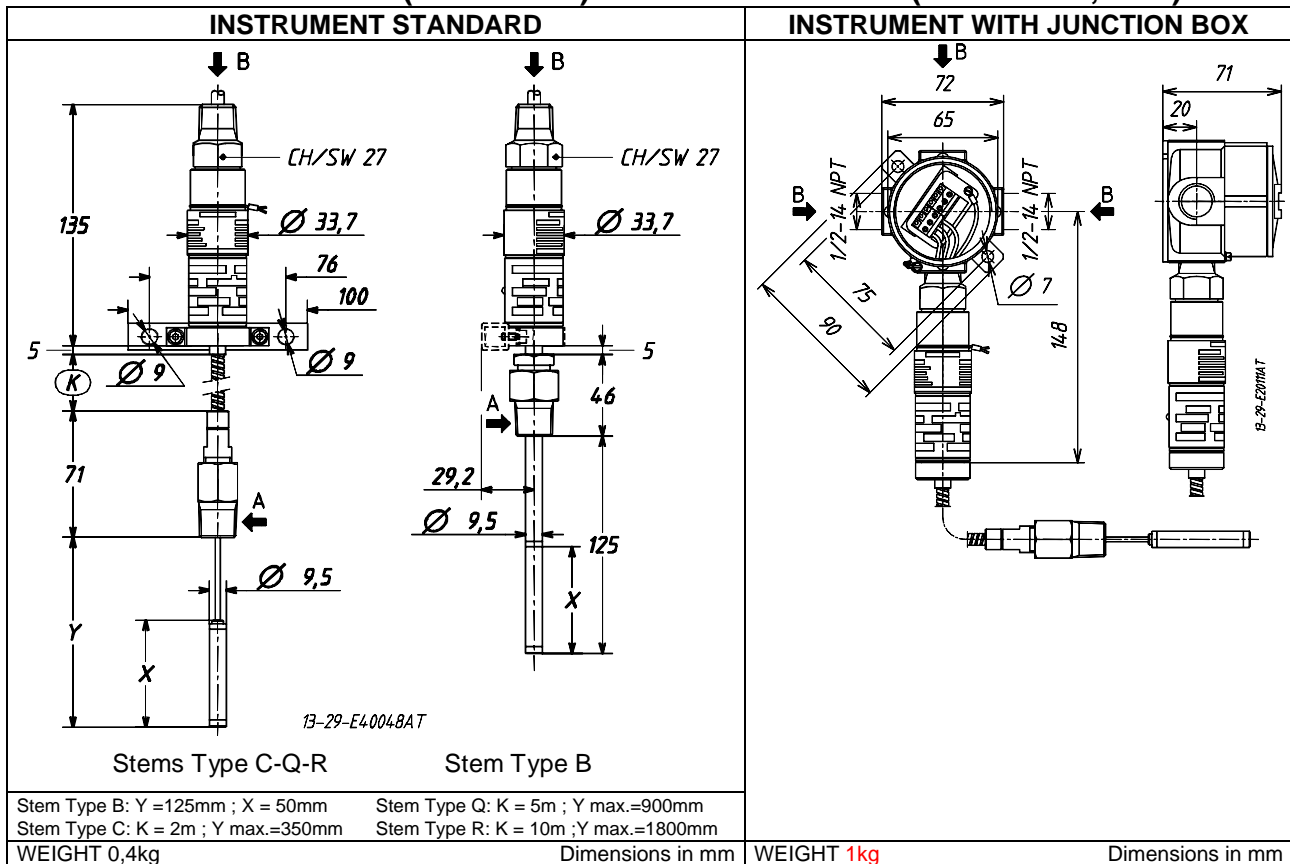


TEMPERATURE SWITCHES SERIES TXS, TXN, TXA

WEATHERPROOF (Series TXS) AND FLAMEPROOF (Series TXA, TXN)



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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- 1 - GENERAL
- 2 - OPERATING PRINCIPLE
- 3 - IDENTIFICATION PLATE AND MARKINGS
- 4 - SPECIAL CONDITIONS FOR SAFETY USE (X)
- 5 - SET POINT ADJUSTMENT
- 6 - SET POINT CALIBRATION
- 7 - INSTRUMENT PLUMBING
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DOCUMENT CORRELATED

to document authenticated with certificates
 N° CESI 05 ATEX 002X
 N° CESI 05 ATEX 003

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 series or a model, 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

Temperatures exceeding the working range can be **occasionally** tolerated provided they remain within the limits stated for the instrument (proof 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 data plate must **not** be exceeded: transitory overranges can have a destructive effect on the switch.

1.3 TEMPERATURES

Due to the temperature of both the environment and the process fluid, the temperature of the instrument could exceed the allowed limits (normally from -40°C to +85°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.

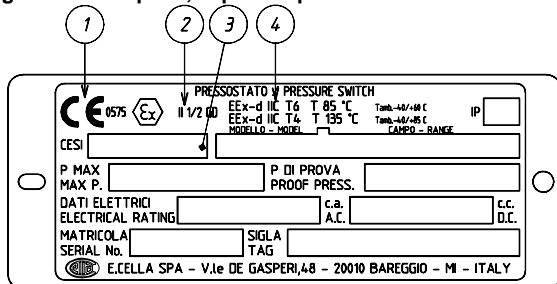
2 - OPERATING PRINCIPLE

The operating principle is based on a pressure measuring element connected via a capillary tubing with a temperature sensitive bulb. The system is partially filled with a volatile liquid generating a pressure that is a non linear function of the bulb temperature; this pressure is applied to a diaphragm acting on a stiff disc with a force directly proportional to the bulb temperature. The force is contrasted by an helical spring loaded 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 - NAMEPLATE AND MARKINGS

The instrument is fitted with a metal plate bearing all its functional characteristics and – in case of explosionproof execution (Series TXA and TXN) – also the markings prescribed by standard EN 50014 and EN 50281-1-1. Fig. 1 shows the nameplate mounted on explosionproof instruments.

Fig. 1 - Nameplate, explosionproof instruments



- 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 Notified body that issued the type certificate and number of said certificate.
- 4 Mode of protection and operating ambient temperature limits.

4 - SPECIAL CONDITIONS FOR SAFE USE (X)

Explosionproof instruments (Series TXA and TXN) installed without a junction box require an electric connection, suitable for the mode of protection chosen, at the free end of the cable (see Point 8).

5 - SET POINT ADJUSTMENT

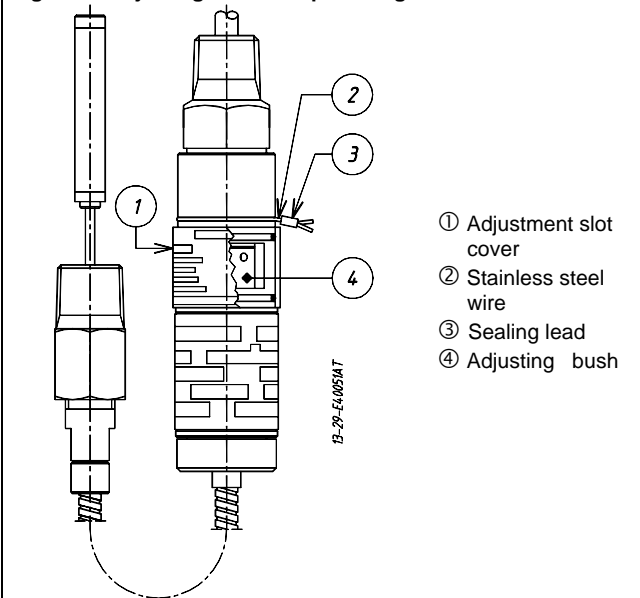
The load of the helical spring can be adjusted by means of the bush in such a way that the switch is released when the temperature reaches (either increasing or decreasing) the desired value (set point). The instrument is usually supplied with the switches set at 0°C, or at the initial range value if this is above 0°C (**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 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 3mm dia. rod or drill into the holes on the bush itself.

6 - SET POINT CALIBRATION

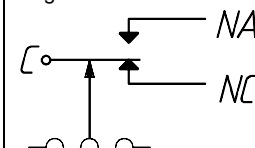
In order to proceed with the calibration and the periodical functional verification of the instrument a suitable **calibration circuit** (Fig. 4) and an adequate temperature source are required.

Wiring is to be carried out as shown in Fig. 3 and on the slot cover.

Fig. 3 - Electric wiring

GDN - Ground internal : leadwire yellow/green	Micro 1
C - Common : leadwire brown	
NA - Normally open : leadwire blue	Micro 2
NC - Normally closed : leadwire black	
C - Common : leadwire grey	Micro 2
NA - Normally open : leadwire red	
NC - Normally closed : leadwire white	

Microswitch internal wiring. Contacts status with bulb at initial range value.



- C - Common
- NA - Normally open
- NC - Normally closed

6.1 PRELIMINARY OPERATIONS

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

6.2 CALIBRATION CIRCUIT AND OPERATIONS

Prepare the control circuit as indicated in Fig.4.

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

Circuit C/NA

• This circuit **closes** with temperature **on rise** and **opens** with temperature **on fall** when temperature reaches the set point.

Circuit C/NC

• This circuit **opens** with temperature **on rise** and **closes** with temperature **on fall** when temperature reaches the set point.

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 its normal installation position, i.e. with the stem or capillary downwards.

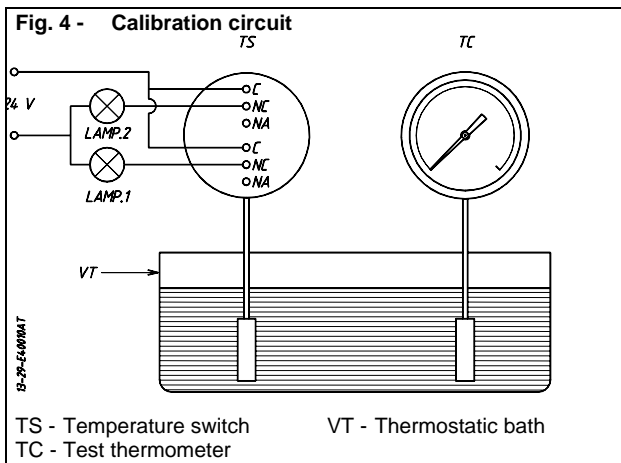
Adjustments

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

Turn the adjusting bush using the adjustment rod 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).



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



6.3 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.

7 - 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 mm² in section, wound up around the case in the groove purposely provided.

8 - MOUNTING AND CONNECTIONS

8.1 MOUNTING

Mount instruments with capillary either on pipe or surface by means of the proper bracket (see Fig. 8 and 9).

Select a location where possible shocks and temperature variations remain within tolerable limits.

CAUTION: for instruments with capillary, the difference in height between bulb and case is not to exceed two meters. If it does, adjust set point temperature value according to the table given in instruction IS-TC.401E.

For bracket mounting, see NI-292E.



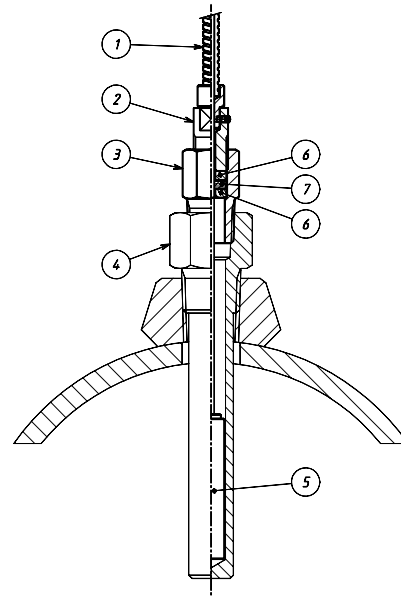
8.2 BULB AND CAPILLARY

With reference to Fig. 5, **unscrew** union (3) from stuffing gland (2) and slide it out from bulb (5).

Mount union (3) on thermowell (4) and tighten it with a proper wrench. Spread on bulb (5) the special paste for better heat transmission and insert it into thermowell (4).

Be sure that bulb reaches thermowell bottom. Insert into union (3) PTFE washer (7) with relevant st. st. washers (4). Screw stuffing gland (2) into union (3) taking care not to twist capillary and its armor, then tighten it until PTFE washer presses against capillary.

Fig. 5 - Bulb mounting



- | | |
|---------------------------|-------------------|
| 1) Armored capillary | 5) Bulb |
| 2) Stuffing gland (SW 12) | 6) St. st. washer |
| 3) Union | 7) PTFE washer |
| 4) Thermowell | |

Run armored capillary avoiding too narrow bends, then staple it. Excess capillary, if any, is to be rolled up around a 200 mm dia. min., then firmly secured.

8.3 ELECTRICAL CONNECTIONS

It is recommended to carry out the electrical connections according to the applicable standards. In case of explosionproof instruments (Series TXA) see also the Standards EN-60079-14 and EN-50281-1-2.



The following mounting arrangements are possible.

8.3.1 MOUNTING WITH CABLE LOOSE (Fig. 10)

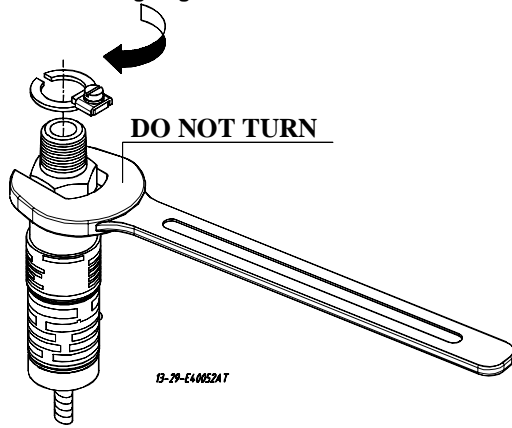
Run the cable so that it cannot be easily damaged (e.g. due to too narrow bends, heat sources) and strain it.

Mount, if provided, the external ground device on the electrical connection of the instrument. 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. 6).

The external ground screw is obligatory for explosionproof constructions.



Fig. 6 - Mounting of ground device



8.3.2 MOUNTING WITH CABLE PROTECTED BY FLEXIBLE TUBING

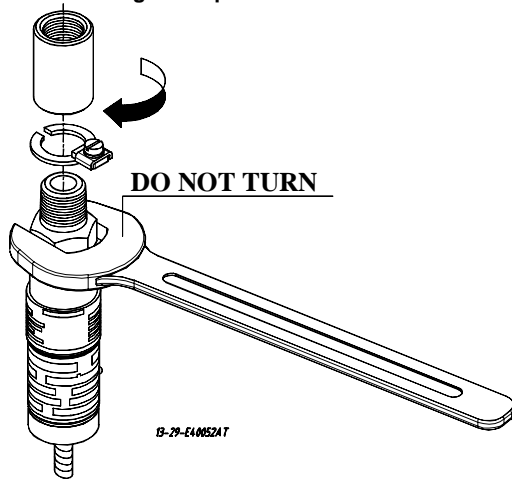
Mount, if provided, the external ground device on the electrical connection of the instrument. This device is to be threaded on, while holding the electrical connection steady with a 27 mm wrench on hex, until it reaches the bottom of the thread (Fig. 6).

The external ground screw is obligatory for explosionproof constructions.

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

CAUTION: the sleeve is to be threaded on while holding the electrical connection steady with a 27 mm wrench on hex (Fig.7)

Fig. 7 - Mounting of adaptors



8.3.3 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 (Fig. 7).

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

CAUTION: accessories used for installation have to be certified according to standards EN 50014, 50018, EN 50281-1-1 and guarantee the degree of protection of the instrument (IP65).

8.3.4 MOUNTING WITH INSTRUMENT FITTED WITH JUNCTION BOX

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

Terminals are identified as follows:

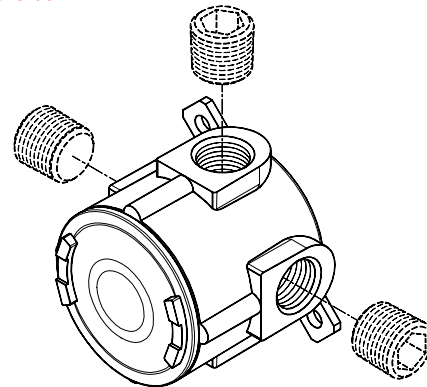
Identification No.	Function	Micro No.
1	Common	1
2	Normally Open	
3	Normally Closed	
4	Common	2
5	Normally Open	
6	Normally Closed	

Mounting with cable protected 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.

CAUTION: accessories used for installation have to be certified according to standards EN 50014, 50018, EN 50281-1-1 and guarantee the degree of protection of the instrument (IP65).

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 explosionproof instruments these plugs, if not correctly mounted and blocked to prevent their removal, do NOT guarantee the mode of protection EEx-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.



8.4 WIRING

The cable used for electric wiring has a 7 mm OD silicone sheat for one contact models, 8 mm OD for two contact models. Each wire has a section of 0,5 mm² (20 AWG) and is silicone insulated. Wires ends are factory tinned. The colour of insulator defines the contact function (see Fig. 3 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 groundig 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. The wiring completed, put the cover on and tighten it.

8.5 SPECIAL NOTE FOR THE INSTALLATION OF TEMPERATURE SWITCHES CATEGORY 3GD, MODE OF PROTECTION EEx - nC

Explosionproof instruments Series TXN are to be installed using electric accessories prescribed for this execution. For instance, junction boxes are to be suitable for mode of protection n. Apply to standards EN-50021 for any construction detail and to EN-60079-14, EN-50281-1-2 for installation.

9 - 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 those in charge of the plant.

The instrument starts operating as soon as it is powered.



In case of explosionproof instruments (Series TXA and TXN), initial inspections are to be carried out according to customer procedures and at least in accordance with Standards EN-60079-17 and EN-50281-1-2.

Otherwise it is necessary to stop them working, remove them and carry out checks in a test room. The verification consists in **checking the calibration value** and adjusting it if required (see §5).

In case of explosionproof instruments (Series TXA and TXN) inspections of the electrical installation are to be carried out also according to customer procedures and at least in accordance with Standards EN-60079-17, EN-50281-1-1.



10 - FUNCTIONAL VERIFICATION

It will be carried out according to customer control procedures.



Explosionproof instruments (Series TXA, TXN) installed in hazardous areas due to the presence of inflammable dusts should be periodically cleaned externally to avoid dust accumulation.

Instruments Series TXS may be checked on site if installation has been made according to Fig. 9 to 12.



Instruments Series TXA, TXN may be checked on site but if testing equipments are suitable for the environment and **electric supply is off**.

11 - TROUBLE SHOOTING



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

12 - STOPPING AND DISMOUNTING



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

Remove the power supply (signal) from the electric line.

With reference to Fig. 5.

Loosen stuffing gland (2) taking care not to twist capillary and its armor.

Loosen and slide out union (3), then extract bulb from thermowell holding the capillary, without twisting it.

With reference to Fig. 9.

Unscrew the electrical three-piece joint. Remove junction box cover and disconnect electric wires from terminals and ground screws.

Unscrew fixing screws of junction box and remove instrument sliding out the electric wires.



Replace the junction box cover, insulate and protect loose leadwires. Temporarily plug the thermowell. In case of explosionproof instruments (Series TXA, TXN) it is recommended to follow - at least - the Standards EN-60079-17 and EN-50281-1-2 for the withdrawal from service of electrical apparatus.



13 - DEMOLITION

The instruments are mainly made of stainless steel and aluminium; 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.

14 - NOTES FOR INSTALLATION

14.1 TEMPERATURE SWITCHES CLASS SAMA II A

A difference in height between bulb and case exceeding two meters causes a systematic error in the 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.

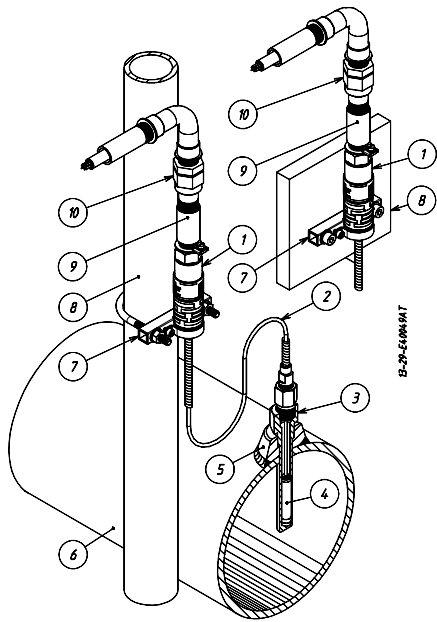
14.2 TEMPERATURE SWITCHES CLASS SAMA II C

The temperature switch **must** be installed with a difference in height between bulb and case not exceeding 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.

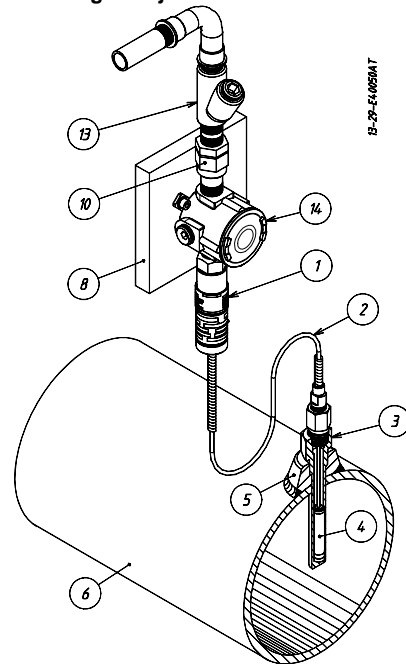


Fig. 8 - Examples of mounting



- | | |
|---------------------------------|----------------------|
| 1) Temperature switch Series TX | 5) Coupling |
| 2) Capillary tubing | 6) Process line |
| 3) Thermowell | 7) Mounting bracket |
| 4) Bulb | 8) 2" pipe / Surface |

Fig. 9 - Mounting with junction box



- | | |
|-----------------------|--------------------|
| 9) Sleeve | 13) Blocking joint |
| 10) Three-piece joint | 14) Junction box |
| 11) Box | |
| 12) Extension | |

Fig. 10 - Mounting with cable loose

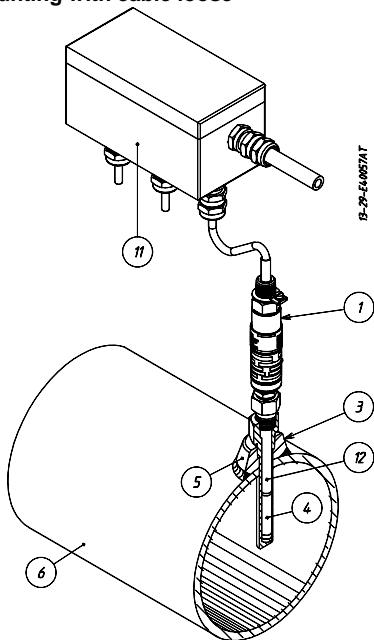


Fig. 12 - Mounting directly on box

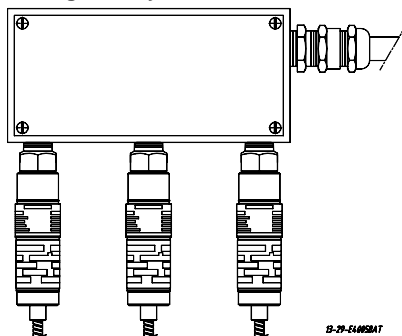
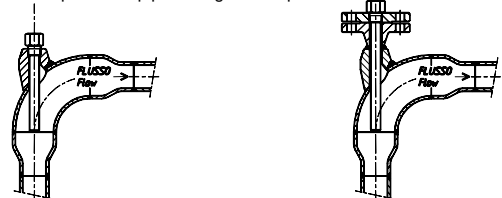


Fig. 11 - Thermowells: examples of installation

Mounting on elbow - Minimum pipe size is to be 3", if less, provide a pipe enlargement up to 3".



Mounting on straight pipe - Minimum pipe size 3", if less provide a pipe enlargement up to 6".

