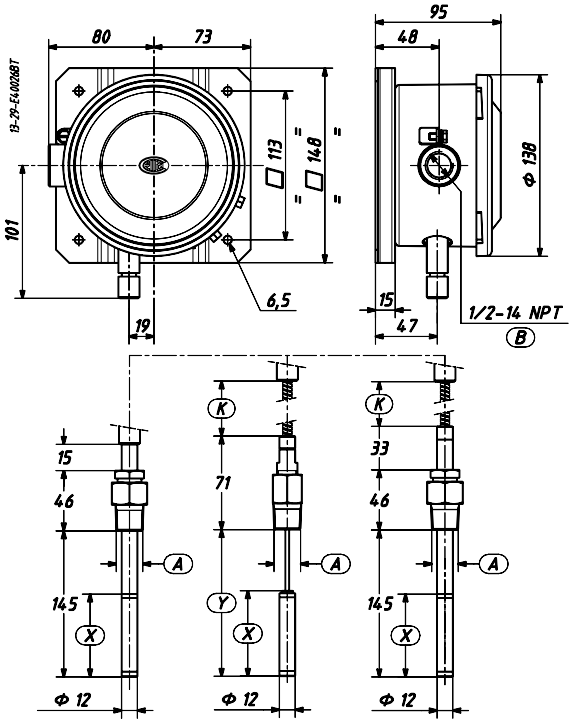
INSTRUCTION MANUAL

NI-401E
Rev. 3 07/99

TEMPERATURE SWITCHES

WEATHERPROOF: SERIES TWG

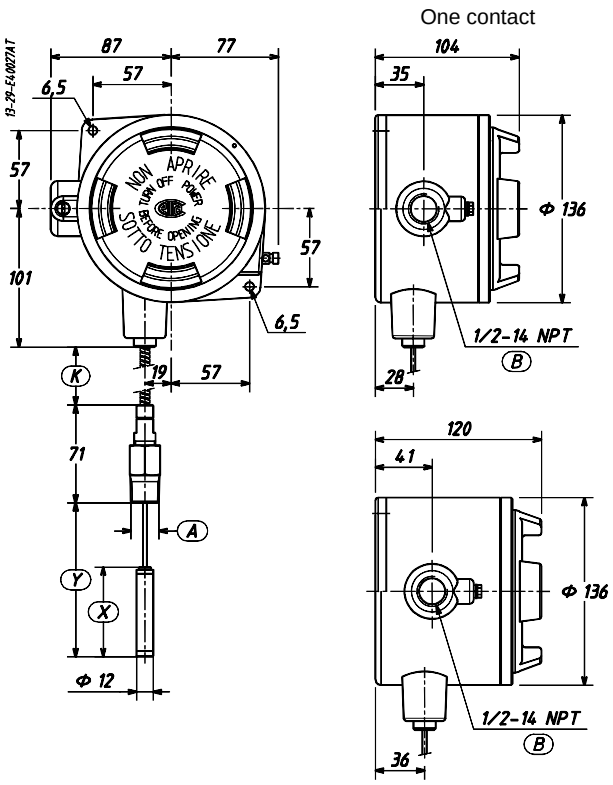


Stem type “B” Stem type “C” Stem type “ F”

A = bulb connection	**X = Bulb sensitive portion**
B = cable entry	**Y = Insertion length**
	K = Capillary length

PESO 2,1 kg dimensions in mm

EXPLOSIONPROOF: SERIES TAG



Two contacts

A = bulb connection	**X = Bulb sensitive portion**
B = cable entry	**Y = Insertion length**
	K = Capillary length

PESO 2,9 kg dimensions 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 must only be carried out following **verification** of the congruity of the instrument **features** with the plant and process requirements.
- The functional **features** of the instrument and its degree of protection are shown on the identification plate fixed to the case.

CONTENTS:

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 follow 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 (vacuum or 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 ratings must **not** be exceeded. Transitory overranges can have a destructive effect on the switch.

1.3 MECHANICAL VIBRATIONS

Can generally lead to the wearing of some parts of the instrument or cause false actuation. It is therefore recommended that the instrument be installed in a place where there are no vibrations. In cases where this is impossible it is advisable to take measures to lessen the effects (elastic supports, installation with the pin of the microswitch positioned at right angles to the vibration plane, etc.).

1.4 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 cabinets) must be taken.

2 - OPERATING PRINCIPLE

The thermometric bulb is constituted by a rigid constant-volume container. It is connected via capillary tubing to a pressure measuring element (bourdon tube). This system is filled with gas, and its absolute pressure is proportional to absolute temperature (Charles' law). As a consequence, any change in bulb temperature causes a change in gas pressure acting on sensible element, causing its free tip to undergo an elastic deflection which is used to actuate one or two electrical microswitches adjusted at prefixed set point values.

3 - SET POINT REGULATION

3.1 Each microswitch is independent and can be regulated by means of a screw (for adjustment) in such a way that it actuates when the temperature reaches (increasing or decreasing) the desired value (set point).

3.2 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).**

3.3 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.

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

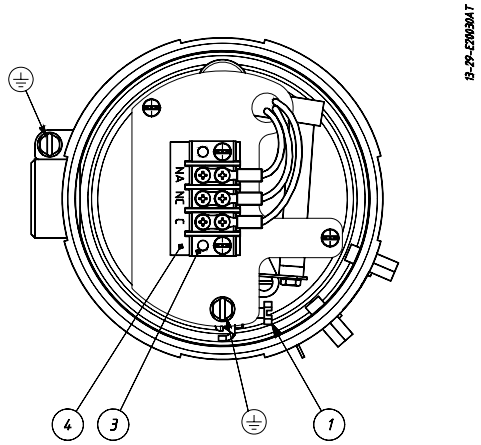
3.5 If the instrument has been expressly ordered with **specific calibration**, it is a good rule to check the calibration values stated on the adhesive label, prior to installation.

3.6 The position of the adjustment screws is given in fig. 1.

3.7 The effect that the direction of rotation of the adjustment screws is described on the adhesive label.

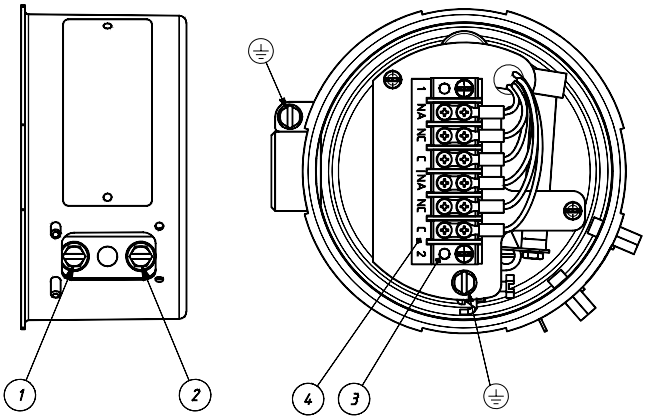
fig. 1 - Electrical connections and adjustment screws

One contact instruments



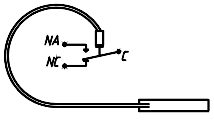
1 - Microswitch set point calibration screw
3 - Terminal block
4 - Electrical connection identification plate

Two contact instruments



1 – Microswitch 2 set point calibration screw
2 – Microswitch 1 set point calibration screw
3 – Terminal block
4 – Electrical connection identification plate

Designation of the contacts:
C - Common
NA - Normally Open
NC - Normally Closed



Microswitch electrical circuit: State of the contacts at initial temperature range (when factory calibrated)

4 - SET POINT CALIBRATION

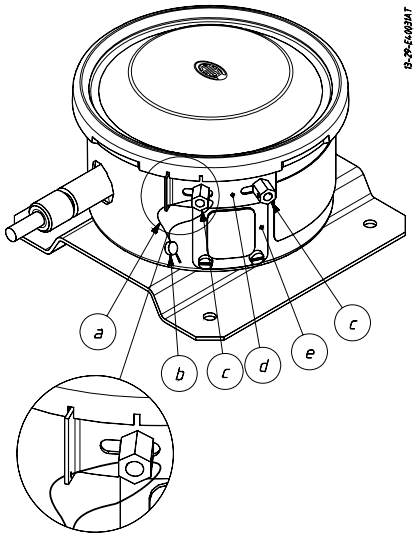
In order to proceed with the calibration and the periodical functional verification of the instrument a suitable **calibration circuit** (fig. 3) and an adequate heat source is required.

4.1 PRELIMINARY OPERATIONS

4.1.1 Weatherproof temperature switches (Series TWG) (Fig. 2)

Remove the blocking device fixed to the side of the instrument case and the adjustment screw access plate. Remove the cover be rotating it anticlockwise.

fig. 2 - Weatherproof tempeature switch cover blocking device and plumbing

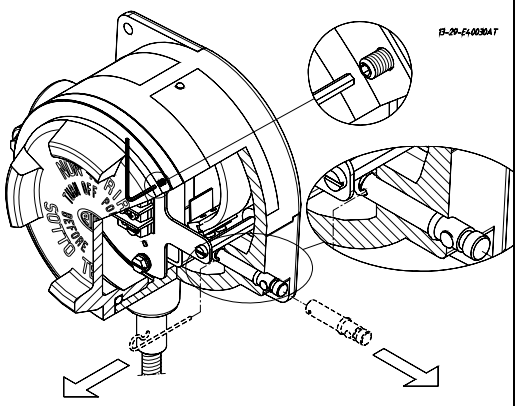


a) Plumbing wire
b) Plumbing
c) Blocking nut
d) Blocking bracket
e) Adjustment screws access plate

4.1.2 Explosionproof temperature switches (Series TAG) (Fig. 3)

Loosen the locking headless screw situated on the cover using a 1,5 hexagonal key then unscrew the cover. Remove the internal blocking device inserted on the closure plugs and slide out the plugs.

fig. 3 - Explosionproof temperature switch cover blocking device



4.1.3

4.2 CALIBRATION CIRCUIT AND OPERATIONS

4.2.1 Prepare the control circuit as indicated in Fig. 4.

4.2.2 The warning lamps should be connected to contact 1 or 2 in the NO or NC position according to the required contact action.

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.
- If the circuit is closed at the working temperature, the switch **opens** the circuit as the temperature **decreases** when the desired value is reached.

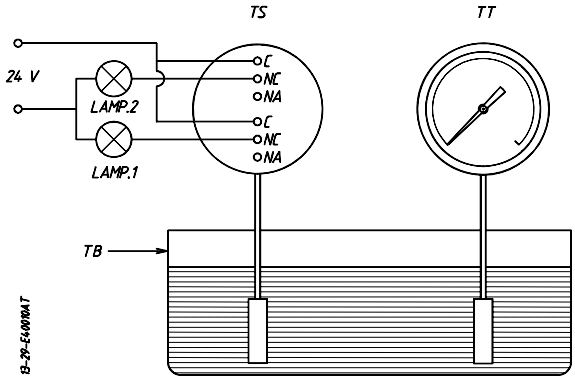
Connection of C and NC terminals

- If the circuit is closed at the working temperature, the switch **opens** the circuit as the temperature **increases** when the desired value is reached.
- If the circuit is open at the working temperature, the switch **closes** the circuit as the temperature **decreases** when the desired value is reached.

4.2.3 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.

4.2.4 The temperature switch must be mounted in the normal installation position, i.e. with the stem or capillary outlet downwards.

fig. 4 - Calibration circuit



TS - Temperature switch
TT - Test thermometer
TB - Thermostatic bath

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

CAUTION: If the switch is of the kind with adjustable dead band (letter R in the contact codes) before proceeding with the following operations (4.2.6-4.2.11) it is necessary to proceed with the adjustment of the differential (see attachment NI-705).

4.2.6 Increase the temperature in the circuit up to the desired set point value for the first microswitch.

4.2.7 Use a wide bladed screwdriver, as indicated on the adhesive label, until the relative lamp turns on (or turns off).

- If the instrument is equipped with only one contact the calibration is complete.
- If it is equipped with two contacts continue in the following manner.

4.2.8 Vary the temperature until the desired set point value for the second microswitch is reached.

4.2.9 Act on the adjustment screw of the second contact as in point 4.2.7.

4.2.10 Repeat operations 4.2.6 and 4.2.7 on the first contact, then operations 4.2.8 and 4.2.9 on the second contact, until the required set point precision is obtained. This is necessary due to the reciprocal influence which the microswitches have with the sensitive element of the instrument.

4.2.11 Check the calibration values (varying the temperature in the circuit accordingly) and record them on the adhesive label using a pen with indelible ink.

4.3 FINAL OPERATIONS

4.3.1 Disconnect the instrument from the calibration circuit.

4.3.2 Weatherproof temperature switches (Series TWG)

Take the cover, ensure that the sealing gasket is correctly fitted into its seat, insert the cover onto the case, with the blocking gap positioned in correspondence to the blocking bracket.

Turn the cover clockwise closing it tightly.

Mount the adjustment screws access plate, then the blocking device as in figure 2.

4.3.3 Explosionproof temperature switches (Series TAG)

Insert the closure plugs of the adjustment screw access holes, **block** them using the internal device and if necessary seal them with plumbing. Screw on the cover and **block** it using the headless screw with which it is equipped (Fig. 3).

4.3.4 Replace the supplied protection cap on the cable conduit.

IMPORTANT: the protection cap should only be definitively removed **during** the connection steps (see §5)

5 - MOUNTING AND CONNECTIONS

5.1 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 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.

5.2 BULB AND CAPILLARY

With reference to figure 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 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. Run the capillary protected by the armor 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.

5.3 ELECTRICAL CONNECTIONS

5.3.1 Set up the cable protection tube according to the **applicable standards** (especially for explosion-proof prescriptions). In many applications this is associated to the process piping and is subject to condensation. For this reason it is necessary to provide means to prevent condensation from entering the instrument case. The arrangement shown in figure 6 or 7 is therefore recommended.

5.3.2 Check that there is no power in the lines.

5.3.3 Remove the cover and carry out the cabling and connections to the terminal block (see fig. 1).

Flexible cables with a maximum section of 1.2 mm^2 (16AWG) are recommended using pre-insulated fork thimbles. **Do not touch the adjustment screws and do not bend** the elastic microswitch supports in order to prevent the instrument calibration being altered.

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

5.3.5 Once the connection operations have been completed, replace the cover and ensure that it is properly sealed and blocked. See Fig. 2 and 3.

6 - INSTRUMENT PLUMBING

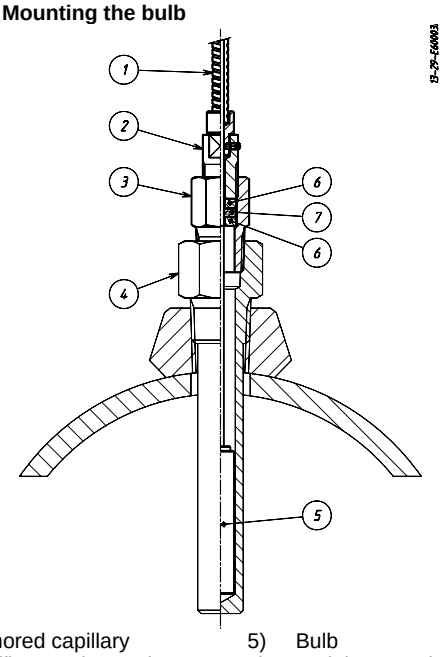
6.1 Weatherproof temperatures switches (Series TWG)

The plumbing, aimed as a guarantee against possible tampering of the calibration and electrical connections, can be carried out using a flexible steel wire (a) inserted into the holes in the locking nut (c) and the bracket (d) provided for this purpose (see figure 2).

6.2 Explosionproof temperature switches (Series TAG)

Plumbing is not necessary as the cover is blocked with a headless screw, the closure plugs of the adjustment screw access holes are blocked by means of the internal blocking device and the instrument **does not** have to be opened when installed.

fig. 5 - Mounting the bulb



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

7 - 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 working as soon as it is connected to an electrical line.

8 - FUNCTIONAL VERIFICATION

This will be carried out according to the Client's control procedures. Series **TWG** instruments can be verified. Series **TAG** instruments can only be verified on the plant if test equipment suitable for the environment is available and if **there is no current in the electric line**.

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. Verification consists in c**hecking the calibration value** and possibly regulatory the adjustment bush (see §4).

9 - 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's original characteristics.

MALFUNCTION	PROBABLE CAUSE	REMEDY
Set point shift	■ Wear of contact surfaces between microswitch pin and sensing element tip. ■ Wear of contact surfaces between microswitch cradle and adjustment screw. ■ Possible encrustations or corrosions on above listed surfaces. ■ Permanent deformation of the sensitive element due to fatigue or non-tolerated over-ranges. ■ Loss of filling fluid.	■ Recalibrate ■ Recalibrate ■ Clean surfaces and recalibrate. Check housing tightness. ■ Recalibrate or replace the sensitive element with another made of a suitable material. If necessary apply a fluid separator. ■ Replace sensing element with another one of same type
Poor Repeatability	■ Assembling screws loosened.	■ Check terminal screws, microswitch, electrical subassembly, fastening screws
Slow Response	■ Encrustations on bulb or thermowell	■ Check and clean encrustated surfaces
Failed or Undue Actuation	■ Microswitch contacts damaged ■ Electrical joints loosened ■ Electrical line interrupted, or short circuit	■ Replace microswitch ■ Check all electrical joints ■ Check state of electrical line
Undue Actuation	■ Accidental impacts or excessive mechanical vibrations	■ Modify installation arrangement

10 - 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.

10.1 Remove the power supply (signal) from the electrical line.

With reference to figure 5.

10.2 Loosen and remove the stuffing nat (2) being careful not to bend the capillary and protective sheath (1).

10.3 Loosen and remove the fitting (3) then extract the bulb (5) from the thermowell (4) holding it by the capillary tube (1), without bending it.

Do not waste in to environment the process fluid if polluting or harmful to people.

With reference to figures 6 and 7.

10.4 Unscrew the three piece joint (8) (electrical cable tubing).

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

10.6 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.

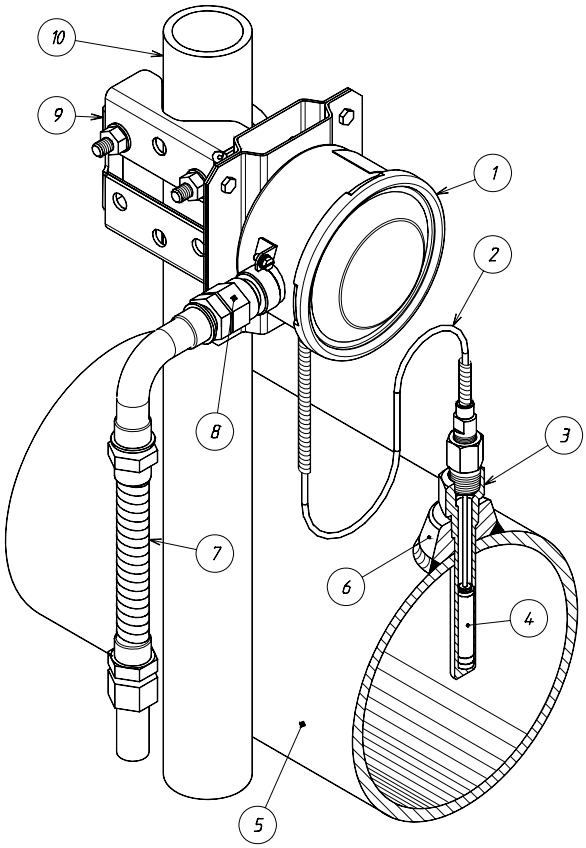
Replace the instrument cover. Insulate and protect the conductors remaining on the plant. Temporarily plug the thermowell.

11 - DEMOLITION

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

WEATHERPROOF

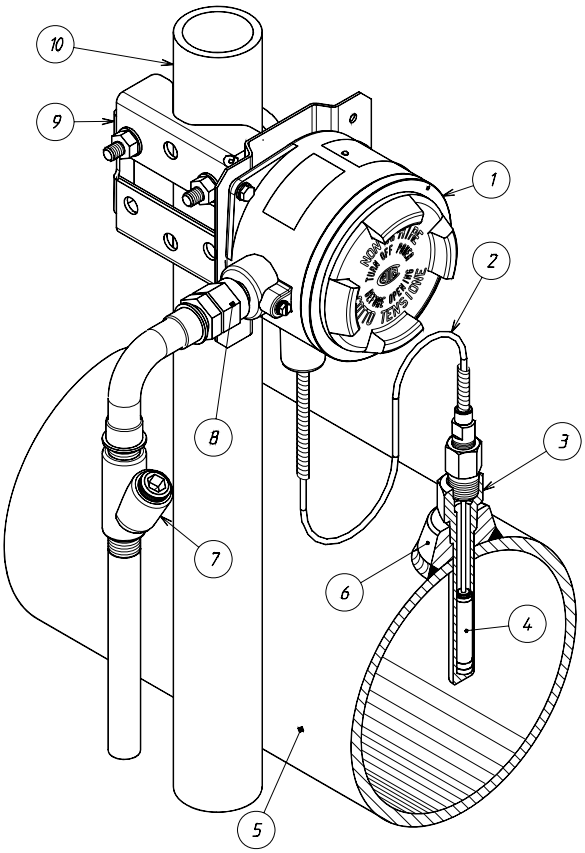
fig. 6 - Example of connections -



1) Weatherproof temperature switch series TWG
2) Capillary spacer
3) Thermowell
4) Bulb
5) Process piping
6) Derivation
7) Flexible armour
8) Cable gland
9) Bracket for 2” pipe
10) 2” pipe

EXPLOSIONPROOF

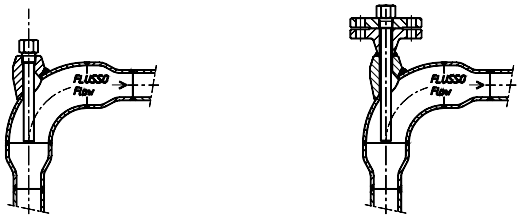
fig. 7 - Example of connections -



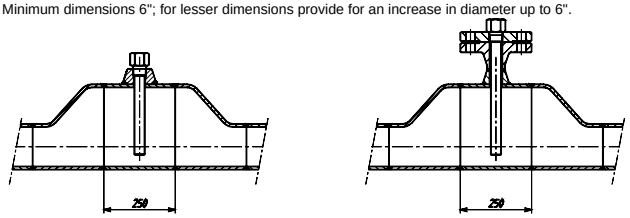
1) Explosionproof temperature switch series TAG
2) Capillary spacer
3) Thermowell
4) Bulb
5) Process piping
6) Derivation
7) Blocking joint
8) Cable gland
9) Bracket for 2” pipe
10) 2” pipe

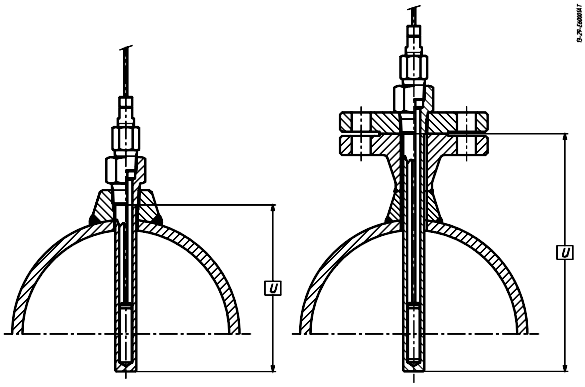
fig. 8 - Thermometric wells: example of installation

Minimum dimensions 3"; for lesser dimensions provide for an increase in diameter up to 3".



Minimum dimensions 6"; for lesser dimensions provide for an increase in diameter up to 6".





ETTORE CELLA SPA Viale de Gasperi, 48 - Casella Postale (P.O. Box) 96 - I 20010 Bareggio (MILANO) ITALY
Telefoni +39 029036.1146/1237/1241 – FAX +39 029036.1331
e-mail: cella@ecellaspa.com