

GENERAL INFORMATION FOR PRESSURE AND TEMPERATURE SWITCHES



INTRODUCTION

All pressure switches are of automatic reset and tested and manufactured under ISO9001 and comply with the following.

Connection threads

All switches have threads according to :
EN 837-1/7.3.1 – 7.3.2 – 7.3.3 and 7.3.4. Parallel pipe thread (symbol G) according ISO 228-1.
Tapered pipe thread (symbol NPT) according ANSI/ASME B1.20.1.

Weatherproof standard for switches

IP65 (IEC529).

Oxygen and acetylene version

Wetted parts materials comply with EN 29539 and EN 837-1/9.7.2/S1.
Free of oil and grease.

Certified material specification

All stainless steel and other exotic materials used in production for connections, flanges, bourdon tubes, diaphragms (wetted parts of the pressure switches) etc. are traceable, all materials are according to DIN EN 10204 – 2.2 or 3.1 (b).

PED directive

All the pressure switches are manufactured according to PED directive in cat. III, with release of relative conformity declaration. The PED directive is not applicable to the temperature switches since these instruments are not pressure apparatus.

ATEX directive

Pressure switches may be manufactured in accordance with ATEX directive gr. II cat. 1/2GD with protection mode EExdIICT6 or supplied with conformity declaration for use in Intrinsically Safe circuits EExialICT6.

Temperature switches are instead available with conformity declaration for use in Intrinsically Safe circuits EExialICT6

Quality control

PCI's instruments are produced under the rigid codes of the instrumentation industry and QA standards EN-ISO9001:2008. Our company ISO procedures are continuously controlled and monitored by NQA.

TERMINOLOGY

Pressure or temperature switch : is a blind instrument, sensitive to the changes of the measured process variable and opens or closes an electric circuit at a pre-set value.

Deadband (or differential of the micro switch) : is the difference between the pre-set value and the value at which the micro switch resets.

Repeatability : It is the shift of the switching point against the set point value initially calibrated during successive switching .It is indicated in percentage of the full scale.

To evaluate the quality of a switch, it is not important to verify the accuracy but its value of repeatability since the accuracy of the set point depends only by the accuracy of the test instrument used to calibrate the set point

INSTRUMENT SELECTION GUIDE

The following requirements must be considered when selecting a pressure switch :

1. Working conditions
2. Function required
3. Type of micro switch
4. Area classification

These will be analyzed with the possible options for each requirement

1. WORKING CONDITIONS

It is important to know the working conditions the gauge will be operating in. Things to consider are:

- **Fluid nature**
- **Fluid temperature**
- **Working pressure**
- **Pulsating pressure and vibrations**
- **Ambient conditions**

The switch's efficiency and life depend on knowing the above conditions.

Fluid nature

Clean and inert : the whole range of standard instruments may be used.

Sedimentary : may be used only instruments with fluid separators or diaphragm type switches with flanged connection.

Corrosive : the whole range of instruments may be used but manufactured with materials suitable to resist the corrosive action of the fluid or with chemical seal.

Fluid temperature

Up to 110°C : no special feature is required .

Between 110 and 150°C : it is suggested the use of a syphon or cooling tower to remove the switch from the hot point to reduce the temperature to the sensing element.

Over 150°C : It is necessary the use of a syphon or a chemical seal with capillary for remote mounting

Working pressure

The calibration range of the instrument must be selected considering that the set point of the switch would be around the middle of the scale. In this way, would be possible to operate successive adjustment of the set without the need to change the instrument .

Pulsating pressure and vibrations

Mechanical vibrations and pulsating pressure (presses, pumps, hydraulic power packs, compressors, etc.) generating rapid and continuous variations , may generate false switching of the micro switch and must be avoided . It is necessary to mount the instrument on a rigid wall and to connect pressure by means of a coil tube. We suggest to put an anti-vibration rubber element between wall and instrument .

In presence of pulsating pressures, it is good practice to calibrate the set point over the 10% of full scale far from the operating pressure .

Ambient conditions

Instruments weatherproof or suitable for use in Intrinsically Safe circuits : Are instruments manufactured completely in stainless steel (case, cover, counter-flange, diaphragm or Bourdon tube, and process connection). Internally, the support of the terminal board and of the micro switch is in stainless steel. With this base configuration, the use of these instruments is allowed practically in every industrial ambient. For particularly aggressive (geothermal ambient or ammonia) or marine ambient, it is suggested the use of micro switches sealed in inert gas.

The ambient temperature allowed is between -20° and $+80^{\circ}$ C. Humidity : 90%.

Instruments in Explosion proof version : Explosion proof instruments have the case and the cover in Aluminium copper free with external epoxy painting .

All other parts (counter-flange, diaphragm or Bourdon tube, and process connection) are in stainless steel. Even in this case, the use of these instruments is allowed practically in every industrial ambient. Even for this type of instrument, for particularly aggressive or marine ambient it is suggested the use of micro switches sealed in inert gas.

The ambient temperature allowed is between -20° and $+60^{\circ}$ C. Humidity 90%

2. FUNCTION REQUIRED

All sensing elements are factory or site configurable. Against traditional instruments with internal counter-reaction spring, this type of instrument warrants a higher sensitivity and offers more configuration possibilities allowing for example:

- the use of 2 independent micro switches with fixed differential:

With this type of instrument, is possible to operate for example a function of alarm HIGH-LOW alarm or HIGH-HIGH or LOW-LOW (which means 2 micro switches with 2 different set point) with the same instrument

- the use of 1 or 2 independent micro switches with adjustable deadband

With these micro switches, it is possible to calibrate the set point and even the reset value. All the measuring ranges start from a bottom scale value of "0". It is important when calibrating to use a value close to the bottom scale. In order to establish the minimum possible set for switching rising the value of the dead band and the repeatability must be considered.

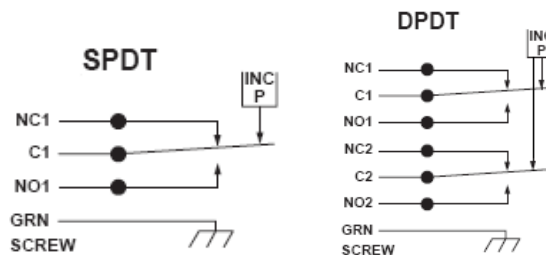
For example:

For an instrument with range 0/10bar, the minimum possible set for rising switching:

0,10mbar (typical dead band) +0,10mbar (repeatability 1%) = 0,20mbar

For set point with switching falling, this limit may not be considered because the dead band is in the positive operating range. When choosing the set point value, it is necessary to ensure that the operating pressure is not the same.

3. TYPE OF MICRO SWITCH



Instruments using "SNAP ACTION" micro switches are SPDT type. The DPDT function is obtained by 2 independent micro switches type SPDT, calibrated at the same value. Dead band may be fixed or adjustable.

They may be equipped with one or two completely independent micro switches in the following configuration :

- In air, silver contacts
- Splash proof silver contact
- In air, golden plated contacts
- Silver contacts, sealed in inert gas
- Gold plated contacts, sealed in inert gas
- Silver contacts in air with adjustable dead band

For the relative ratings of the contacts, consult the technical leaflet .

4. AREA CLASSIFICATION

Instruments may be used in presence of explosive gas and powder for the following areas and with the following protection mode :

PRESSURE SWITCHES

- zone 0/1+20/21 ; 1+21 ; 22: certification ATEX gr. II cat. 1/2GD with protection mode **EExdIICT6**
 certificate number : CE ATEX 03.0103.06/2536X

- zone 0 + 20 : declaration of conformity for use in Intrinsically Safe circuits **EExialICT6**

According to normative EN60079-11, switches are to be considered simple apparatus, for which it is not necessary the emission of a certificate by an external notified body.

It is necessary that the instruments would be foreseen suitable for such use (which means with micro switches sealed in inert gas or gold plated), supplied complete of conformity declaration and that it is electrically connected through a certified safety barrier.

TEMPERATURE SWITCHES

- zone 0/1+20/21 ; 1+21 ; 2+22: certification is still pending

- zone 0 + 20 : declaration of conformity for use in Intrinsically Safe circuits **EExialICT6**

SENSING ELEMENT

For the PRESSURE SWITCHES, are used 3 different type of sensing elements.

- Bourdon tube type
- Diaphragm
- Capsule or bellow

Bourdon tube pressure switch: the sensing element is a metal tube drawn in elliptical section and shaped in form “C” horse-shore, or spiral. One end is closed while the other is joined to a socket which the process connection is manufactured from. Movement is than transferred to the actuation mechanism of the switch. These instruments are used for high pressure ranges.

Diaphragm type pressure switch: The sensing element is a corrugated horizontal diaphragm deformed by the action of the pressure. Movement is than transferred to the actuation mechanism of the switch These instruments are used in presence of medium-high pressure ranges.

Capsule type pressure switch: The sensing element is a capsule deforming under the action of the pressure and to which a spring situated inside the sensing element is opposed. Movement is than transferred to the actuation mechanism of the switch. These instruments are used with very low pressure.

For the TEMPERATURE SWITCHES, we use only one type of sensing element, Inert gas expansion type

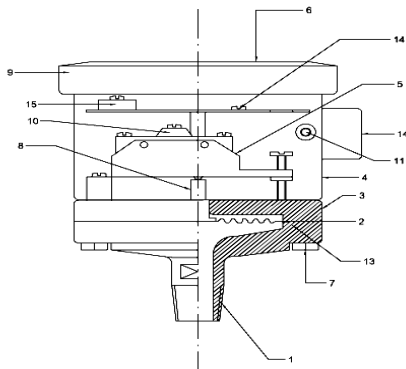
OVER PRESSURE

Instruments are manufactured to withstand an overpressure (or over temperature) much higher than the full scale value. The instrument may withstand a continuous pressure value higher than the full scale value, without any modification of characteristics or shift of set point. In case the process reaches the PROOF PRESSURE (or TEMPERATURE) the instrument will not be damaged, but would be possible that the set point will drift. Over this value however, the instrument may be damaged.

SWITCH COMPONENTS

WEATHERPROOF PRESSURE SWITCHES

Pos.	Component
1	Process connection
2	Diaphragm
3	Upper flange
4	Case
5	Micro support
6	Cover
7	Bolts
8	Action stem
9	Wiring diaphragm
10	Micro switch
11	External ground terminal
12	Internal ground terminal
13	Seal
14	Cable inlet
15	Terminal board



EXPLOSION PROOF PRESSURE SWITCHES

Pos.	Component
1	Process connection
2	Diaphragm
3	Upper flange
4	EExd case
5	micro support
6	cover
7	Bolts
8	Action stem
9	Cover seal
10	Micro switch
11	External ground terminal
12	Internal ground terminal
13	Seal
14	Cable inlet
15	Terminal board

