

User Guide

PRESSURE SWITCHES



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1. Important information

The instrument described in this manual has been designed and produced in conformity to the following current standards. All components are submitted to severe quality and traceability controls. The quality management system is certified according to the ISO 9001 standard. This manual contains important information about the use and the installation of the pressure switch in safe conditions. Therefore, the following instructions must be read carefully before using the instrument.

The instrument works in safe conditions when correctly selected and installed in the system and when the instructions concerning the product as well as the maintenance procedures established by the manufacturer are respected.

The staff charged with the selection, installation and maintenance of the instrument must be able to recognize the conditions that may negatively affect the instrument's ability to work and which may lead to premature breakage. The staff must therefore be technically qualified and properly trained, and must carry out the procedures called for in the plant regulations.

Standards

- Directive P.E.D. 2014/68/UE

NUOVA FIMA instruments are designed and manufactured according to the safety regulations included in the current safety international standards some of which are included in this manual. Instrument installation and setting up should be performed in compliance with these standards.

PS ≤200 bar: the instruments must satisfy the essential security requirements. They are designed and produced according to a “Correct Production Procedure” (SEP-Sound Engineering Practice) and the Ce marking is not required.

PS >200 bar the instruments must satisfy the essential security requirements. They are classified in Category 1 and certified according to the A Form. The CE marking is required as reproduced below.



The CE marking testifies the respect of the following European Directives:

- Directive concerning the low tension LVD 2014/35/UE
- Directive RoHS 2011/65/UE



- The manufacturer disclaims all responsibility in case of damages caused by the improper use of the product and by the non-respect of the instructions reported in this manual.
- Follow carefully the specific safety rules in case of measuring oxygen pressure, acetylene, inflammable or toxic gas or liquids.
- Disconnect the instruments only after depressurization of the system.
- The process fluids residuals in the disassembled instruments could affect people, the environment and the system. Therefore, proper precautions have to be taken.



- Before installation be sure that the right instrument has been selected according to the working conditions, notably the range, the working temperature and the compatibility between the material and the process fluid.
- This manual does not concern the instruments which conform to standard 2014/34/UE (ATEX).
- The product warranty is no longer valid in case of non-authorized modifications and non-intended use of the product.
- The user is totally responsible for the instrument installation and maintenance

In order to verify the working and manufacturing features of the instruments read the catalogue sheets in its most up-dated edition available on-line on www.nuovafima.com

1.1 Intended use

Pressure switches are suitable to many uses in the food industry, in the preservation, pharmaceutical, petrochemical industry and in conventional and nuclear power stations. They resist to the most severe work conditions which could be produced by the process fluid aggressiveness.

2. Installation

Fasten the instrument thread using a key which should fit properly with the process connection without forcing on the case with your hands. As far as the cylindrical thread process connection is concerned (Gas or metric), a head gasket, compatible with the system fluid or gas, should be used. (Fig.1).

In case of a conic connection thread (NTP or Conic gas), wrap the male thread with a PTFE tape (Fig.2), to secure the sealing before finalizing the installation.



Figure 1

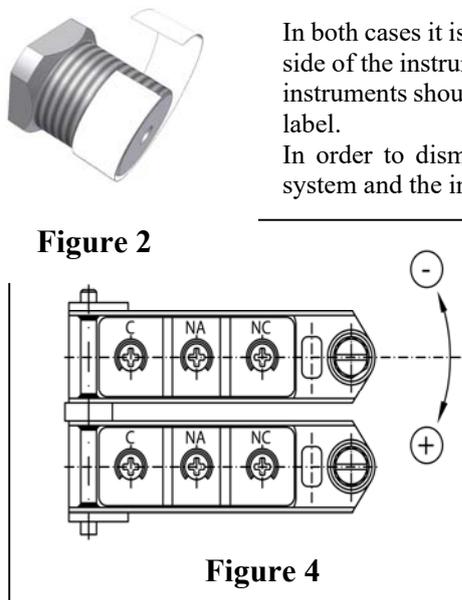


Figure 2

Figure 4

In both cases it is necessary to fasten the instrument using two keys: one on the flat side of the instrument process connection, the other one on the pressure output. All instruments should be mounted in a vertical position unless otherwise shown on the label.

In order to dismount the instrument more easily, a shut-off valve between the system and the instrument is recommended.

2.1 Electrical connection

Pressure switches type: 3.10 - 3.20 - 3.25 - 3.40 - 3.42 - pressure switches model 3.48 - 3.49, are provided with a for direct connection by means of fork terminal lug screws terminal screws and clamp for ground connection both with a terminal cable.

3.27 - 3.30 and differential pressure switches model 3.28 - terminal blocks with screws terminals (Figure 5) with should be 2.5 mm² and terminal block for ground external provided with wire terminal.

In order to perform the electrical connection, the pressure switch case top should be opened. connection, the cable size should be suitable to the (1.2...2.5 mm² - 14...16 AWG), in conformity to the

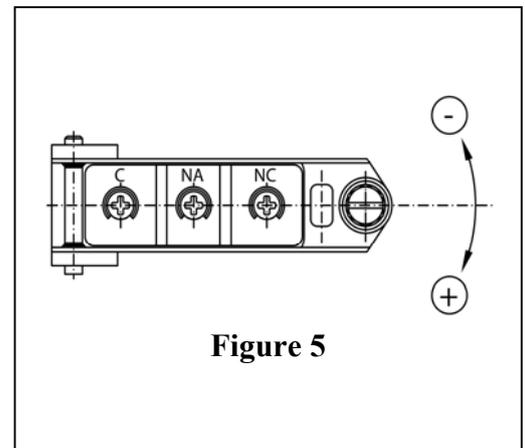


Figure 5

3.43 - 3.45 and differential micro-switch which is suitable through fork (Figure 4), wire internal and external, provided Pressure switches type: 3.26 - 3.29 are provided with internal cables whose maximum section connection both internal and In order to connect the electrical requested electrical charge technical requirements concerning connection and commutation instruments. The cable diameter size should be suitable for insertion into a cable gland if requested.

While connecting the cables pay attention to the following:

- do not torch or pull the cable excessively;
- cables should not be frayed and the isolating sheath should not be cut or damaged;
- false contacts should be prevented and the terminal screws should be properly tightened;
- calibration should not be modified (factory calibration).

No residue should remain inside the case and the top should be fastened by a lock nut.

2.2 Electrical connection calibration

If not otherwise specified in the order, the set point of every supplied instrument is calibrated on the minimal value. Calibration must be carried out by fastening the pressure switch and a control instrument to a test pressure output. (Fig. 6). For calibration please proceed as follows:

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Instrument provided with 1 micro-switch

1. Connect the micro-switch to a warning lamp or a sound source as shown in fig.5 in order to be warned if any malfunction should occur during operation;
2. apply a pressure or a vacuum whose value should be the same as the value of operation;
3. when the proper operation pressure value is reached and no warning signal hasn't been detected, it is necessary to rotate the micro-switch adjustment screw anticlockwise until the successful operation signal is on;
4. Conversely, if the operation signal is shown before reaching the expected pressure value, rotate the adjustment screw clockwise until the operational signal is off.
5. Proceed by producing several pressure ups and downs in order to verify the set point accuracy as described in points 3 and 4.

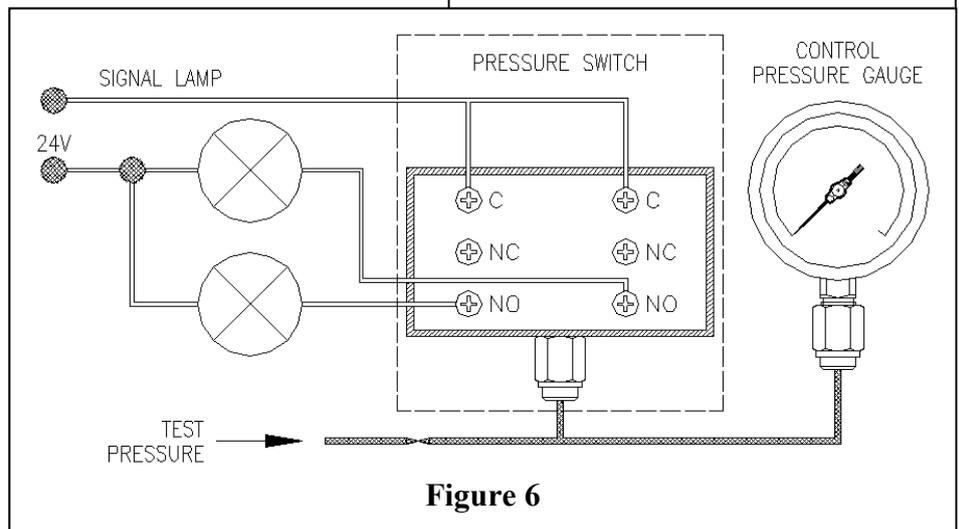


Figure 6

Instrument provided of 2 micro-switches

The calibration procedure is the same as the one described for instruments provided with 1 micro-switch. This operation should be repeated on a single micro-switch, one by one alternatively until the expected accuracy of operation is reached. Since the two micro-switches interact on the same measuring instrument, this kind of procedure is required.

As for model 3.30, the calibration procedure is opposite: the screw should be rotated anticlockwise in order to increase the operation pressure value and clockwise to decrease it. (see fig.7)

2.4 Commissioning

Commissioning should always be performed very attentively in order to prevent any shock or sudden temperature variation. Slowly open the shut-off valves located between the instrument and the process.

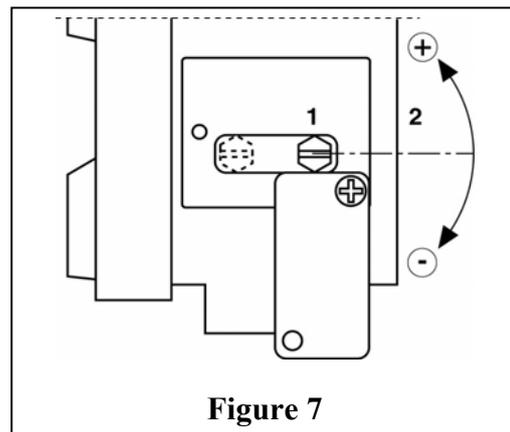


Figure 7

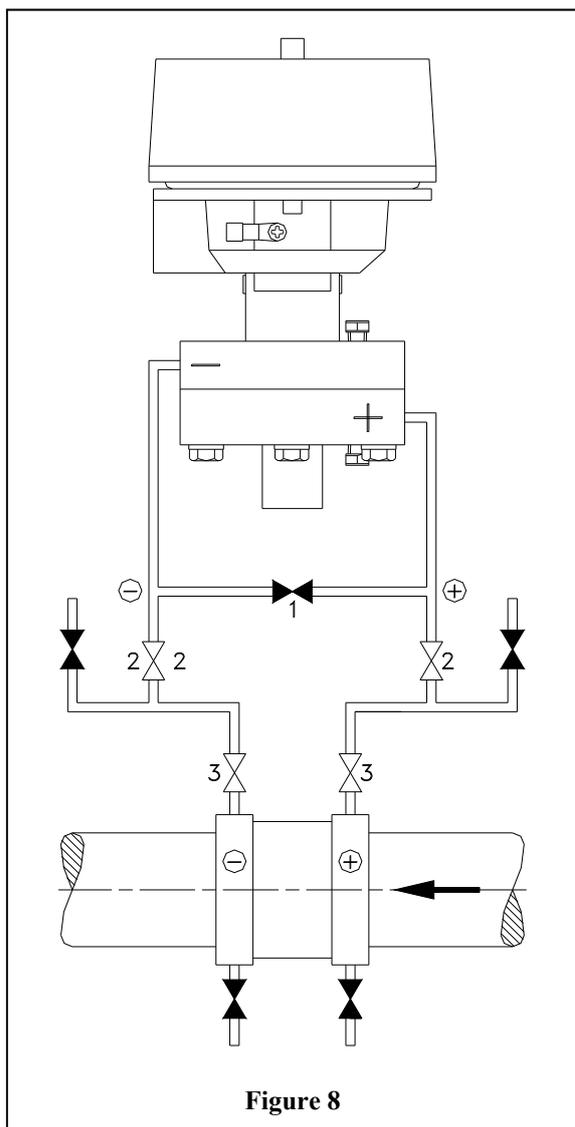


Figure 8

As for differential pressure switches model 3.28, 3.29 3.48 and 3.49, please refer to figure 8 and proceed according to the following instructions:

1. open the by-pass valve "1";
2. open the root valve "3";
3. open the shut-off valve "2" of the positive side (+);
4. shut the by-pass valve "1";
5. open the shut-off valve "2" of the negative side (-).

All obstruction of the sensing element of the pressure abduction pipe should be avoided in order to prevent any repeated and unnecessary rearm of the micro-switch. In case of malfunction, the instrument must be completely depressurized and isolated through a shut-off valve before removal.

3. Operation limits

3.1 Working temperature

This instrument is designed to be used in an ambient temperature between -20 and $+65^{\circ}\text{C}$

3.2 Working pressure

The instrument should be selected among those having an adjustment range between 25% and 75% of the pressure switch range, which is approximately the double of the working pressure. As for ranges < 1bar any accidental vacuum higher than the working range of the instrument should be prevented.

3.3 Cyclic and dynamic pressures

They generally appear when the instruments are installed on pumps where the sensing element and the micro-switch life is severely reduced. They might cause uninterrupted false alarms. Therefore, it is necessary to decrease these pulsations placing a shut-off valve between the pressure source and the instrument. If the instrument is selected inaccurately, a fatigue breakage could occur.

3.4 Overpressure

Overpressure may affect the sensing element decreasing its life and accuracy. Therefore, an instrument performing a full-scale range is wider than the maximum working pressure is highly recommended since it is more likely to absorb overpressure. Shocks could be treated just like the pulsating pressures. Long-lasting overpressure can be prevented by installing a shut-off valve calibrated on site. Even only one overpressure episode could damage the instrument permanently.

3.5 Vibrations

When the instrument support receives vibrations, the instrument should be mounted far from vibrations and connected through capillaries (in case of strong and irregular vibrations). If this is not possible, the instrument should be installed at right angle position to the vibrations plan. Vibrations can be detected when the micro-switch malfunctions permanently.

3.6 Micro-switch

A resistive charge which might be higher than that indicated on the instrument label should not be applied. If this occurs, the case surface and the sheath temperature could increase making the installation unsafe. According to the micro-switch model, it is necessary to consider the differential value between the working pressure and the restored one.

3.7 Differential

The difference between the working pressure value and that of the micro-switch rearm is called differential or dead-band value and it appears on the instrument label. The set point and the differential value should allow the micro-switch to rearm correctly. This is an essential aspect for the micro-switch provided with an adjustable differential ranging from 10% to 50% of the full working scale.

The differential value can be adjusted by turning on the graduated wheel located under the micro-switch. The roller is graduated from letter A to letter F which represent the minimum differential (around 10% of the adjustment range) and maximum differential (about 40-50% of the adjustment range) respectively. While adjusting the differential, be aware that the device increases the set working pressure value leaving the rearm untouched, acting on the micro-switch click force. It is important to remember that when the instrument is provided with a micro-switch, this is calibrated at the factory and then adjusted on site. This has to be taken into account too when the instrument works in vacuum.

3.8 Protection degree

According to CEI EN 60529 regulation. It concerns the instrument's top when this is completely tightened. A special nut lock mounted on the case body should be tightened to the top preventing its removal during normal operating conditions.

3.9 Corrosive fluids and gas liquids

The sensing element thickness is generally moderate so it can work in severe mechanical stress conditions, The chemical compatibility with the fluid to measure has to be considered. No common material can be immune from a chemical attack whose intensity can be influenced by the following conditions: concentration, temperature and the mixture type among different chemical substances. A chemical attack can lead rapidly to a corrosion failure.

4. Improper use

4.1 Failure for fatigue

Pressure may produce a mechanical stress which could damage the sensitive element permanently since it might crack. The crack can be more dangerous if it happens during compressed and liquid gas measuring because the sensing element leaks slowly so that the pressure inside the case increases and the safety gasket opens.

4.2 Failure for overpressure

It occurs when a higher pressure than the declared one for the sensing element is applied (i.e. when an instrument for low pressures is installed on a system working with high pressure). The effects of this kind of damage, which are commonly more serious in case of compressed gas measuring, are not predictable and may lead to the case explosion despite the safety gasket. Spikes may happen in hydraulic and pneumatic systems especially after the opening and the closing of valves.

Spikes amplitude may be much higher than the working pressure. They cannot be detected by the instrument because of their quickness therefore they are not detectable by the operator. Spikes may affect the instrument permanently. A choke may reduce the overpressure amplitude pike transmitted to the sensing element. A shut-off valve could protect the instrument from pressures higher than pressures the instrument is calibrated for.

4.3 Failure for corrosion

When the sensing element material is attacked by the process fluid chemical substances or by other substances that may be present in the pressure system, a leakage or a stress crack may occur. In this case it is advisable to install a diaphragm compatible with the process fluid or a fluid diaphragm seal.

4.4 Failure for explosion

A powerful release of thermal energy due to chemical reactions such as the oxygen adiabatic compression reaction in presence of hydrocarbons might produce an explosion. The inability to force this kind of damage is generally accepted. It is advisable to clean and de-grease the wetted parts with special products in case the instrument has to be interchanged in order to prevent any chemical reaction in the system. In case of use of highly oxidant agents (e.g. oxygen) the producer should be informed during order procedure.

4.5 Failure for vibrations

The movable components of the instrument can be damaged by vibrations even if they are not too severe. First the accuracy of operation decreases then damages may occur involving the general functioning of the instrument. In order to prevent vibrations damage the instrument should be mounted far from vibrations and connected to the system through a capillary.

4.6 Stress for vibrations

Wide amplitude vibrations could also break the sensing element structure and lead to a process fluid leakage.

4.7 Mechanical stress

Instruments should not receive any mechanical stress. If the installation points are under mechanical stress, the instruments should be mounted far from vibrations and connected to the system through a capillary.

Instruments must be selected among those provided with wall or panel anchorage.

5. Maintenance

The instrument's characteristics should be guaranteed during time in order to prevent damages caused by high temperatures, fire risk and explosion due to possible malfunctions during operation.

As for heavy work instrument operating in severe conditions (vibrations, pulsating pressures, corrosive or sediment fluids, fuel or inflammable fluids) it is advisable to replace it according to the maintenance program schedule. In case the instrument does not work properly it is necessary to proceed to a special checking procedure.

5.1 Regular check

In order to verify the sensing element conditions, it is advisable to install the instrument on the pressure generator adding an shut-off valve between them. Apply the maximum pressure value to the gauge and isolate it from the pressure source through the valve. Any possible leakage of the sensing element can be noticed from the slow restore of the pointer to zero.

5.2 Recalibration

If recalibration results are different from the nominal values declared on the catalogue sheet the recalibration procedure should be repeated. The return of the instrument to NUOVA FIMA is recommended for this procedure.

The verification of the intervention point must be performed according to the operating use conditions of the instrument, notably according to the frequency of intervention.

Just as an example, it is suggested that a control every six months in case of a reduced number of daily interventions while controls should be reduced in case of higher frequencies of intervention.

The next verifications of the intervention point may be established on the basis of the previous verifications results. In case of positive results controls may be increased while in case of negative results they can be reduced.

NUOVA FIMA will not be responsible for any non-authorized intervention on the instrument. Moreover, the contract warranty and the CE Conformity Declaration will be no longer valid.

6. Disposal

Any process fluid residue remaining inside the instrument must be removed before disposal. It is advisable to remove tops and plastic components and to proceed to disposal as aluminum and stainless-

steel material.