

**Diaphragm pressure switches, explosion proof, CE Ex II 2GD Ex d IIC T6 Ex tD A21 IP65 T 85°C -20≤Ta≤+65°C Tp≤+60°C, mod. 3.40/42/43/45 e mod. 3.48/49 (differential pressure)**

**NF1** – Pressure switches, series 3.4x/xx conform to the Essential Requirements of Health and Safety foreseen by European Instruction 94/9/EC for equipment of Group II, 2GD category; such conformity is guaranteed by observance of the provisions of EN 60079-0, EN 60079-1, EN 61241-0 ed EN 61241-1 standards, as reported in the EC Declaration of Conformity, issued by the Manufacturer, and enclosed to the present instructions. They are within the category of safety electrical constructions. No modifications in any way must be introduced unless expressly authorized by NUOVA FIMA, or in any case that alter the structure and the electrical and mechanical functionality of this safety electrical construction.

**NF2** – In accordance to Instruction 97/23/EC (P.E.D.), pressure switches series 3.4x/xx are designed and manufactured according to a "Sound Construction Practice" (SEP-Sound Engineering Practice).

**NF3** - Instruction EMC 89/336/EEC on electromagnetic compatibility (EMC) is not applicable to this product.

**NF4** - The NF instruments are designed and constructed in conformity to the safety provisions contained in the international legislations in force, extracts of which appear on this manual and which nevertheless must be known and observed integrally to allow carrying out installation and commissioning of the instruments. In the absence of Regulations and/or national Laws, within the European Union, the provisions of CENELEC 60079-14, EN 60079-17, EN 61241-14, EN 61241-17 standards, must be observed.

The accessories used for the cable or pipe intakes must conform to directive 94/9/EC, and to provisions of EN 60079-0, EN 60079-1, EN 61241-0, EN 61241-1, for the Ex d IIC and Ex tD A21 method of protection.

**A421** - Safety derives from a careful choice of the model and installation in the instrument's system, as well as from observance of the maintenance

procedures established by the manufacturer. The responsibility of the correct installation and maintenance lies entirely on the user.

**NF5** - The persons assigned to the choice, installation and maintenance must be able to recognize the conditions that will influence negatively the instrument's ability to perform its function and that may lead to an early failure. They must therefore be qualified technicians, trained to carry out the procedures foreseen in the plant engineering regulations.

**NF6** - In order to choose correctly the construction and functional features of the instruments it is recommended to see the catalogue sheets in their most recent updated version, available on-line on site <http://www.nuovafima.com>.

In mod. 3.40/42/43/45 the elastic element is made-up by an AISI 316 diaphragm, while in mod. 3.48/49 it is made-up by an AISI 316 diaphragm complete of an AISI321 double bellows. In both cases the elastic element acts directly on the microswitch, by means of a self-centering articulated pivot, thus ensuring an

conditions. The temperature of the storage area must be between -20 and +65 °C except otherwise specified on the relevant catalogue sheets.

**NF20** - The safety electrical construction must be chosen dependent upon the classification of the hazardous location. The group of the safety electrical construction, and of the equipment/components installed thereon, must be appropriate to the gases, vapours and/or powders present.

(NOTE: this safety electrical construction IS NOT suitable for ZONE 0 and 20, and CANNOT be used to measure inflammable fluid pressures)

**EA431** - Operating pressure – The instrument must be chosen with such a pressure range of operation that the operating pressure is included between 25% and 75% thereof, which must be approximately double the value of the operating pressure. For ranges < 1 bar the application of an accidental vacuum higher in absolute value to the operating range of the instrument, must be avoided.

present on the case body must be screwed against the cover rabbet, thus preventing its removal under normal operating conditions.

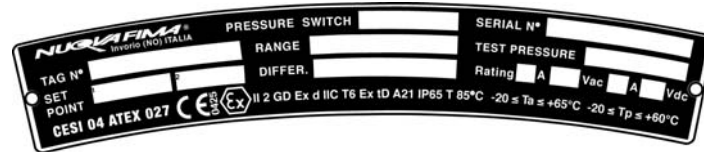
**NF24** - Electric safety – The supply requirements must be satisfied, by making sure not to cause damages to the instrument and the operators. The same care must be taken to the earthing connection procedures of the instrument's conductor parts, with the purpose to prevent that power losses due to damages and/or accidents may be hazardous for the operators and for the near-by equipment. Check that to the safety electrical construction is assigned the service for which it has been manufactured (voltage, frequency, mechanical and thermal stresses within the project values).

**E721** - Mechanical stresses – The instruments must not be subject thereof. If the installation points are subject to mechanical stresses, the instruments must be mounted at a distance and connected by means of flexible pipes. The instruments must be chosen among those provided with mounting brackets for wall, panel or stakes.

**EA424** – The following applications may become potentially hazardous and must be taken carefully into consideration:

- compressed gas system : par. **NF25**;
- oxygen systems : par. **A4274**;
- corrosive fluids, liquids or gaseous systems: par. **A4331, A4273**;
- vapour under pressure systems: par. **NF25**;
- dynamic and cyclic pressure systems: par. **E723, A4271**
- systems where overranges could be applied accidentally or where low pressure instruments could be installed on high pressure sockets: par. **E724, A4272**;
- systems where the interchangeability of the pressure gauges could give rise to hazardous contaminations: par. **A4274**;
- systems containing toxic or radioactive fluids, liquids or gaseous: par. **A4274**;
- systems that generate mechanical vibrations: par. **A4275, A4276, E722**;
- systems with running temperature different from that of the environment: par. **NF27**.

**NF25** – In the compressed gas systems it is advisable to choose the type of instrument with an adequate degree of safety. In case of unforeseen failure of the elastic element, the compressed gas must



exceptional guarantee of action.

The tag is in stainless steel, irremovable and with indeleible writing.

**NF10** - Transport – The instruments may lose their features during transport in spite of an appropriate packing and they should be checked before use. In this case follow the procedures foreseen for inspection/calibration. A non-kept refitting of the microswitch means a remarkable damage to the instrument.

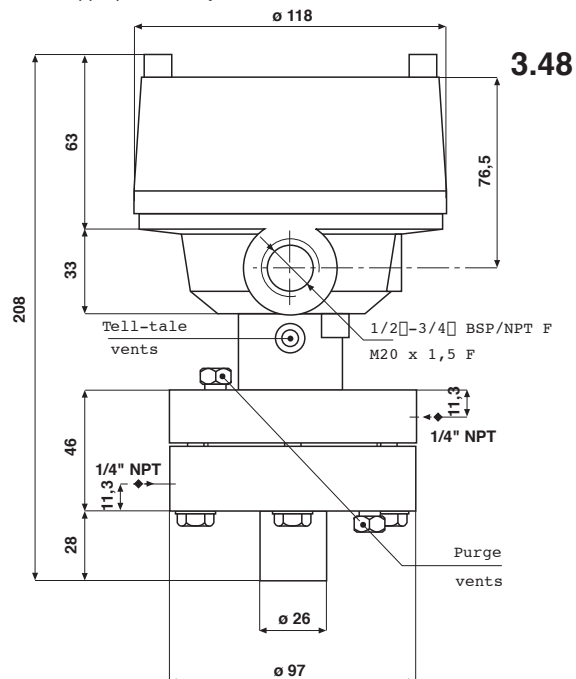
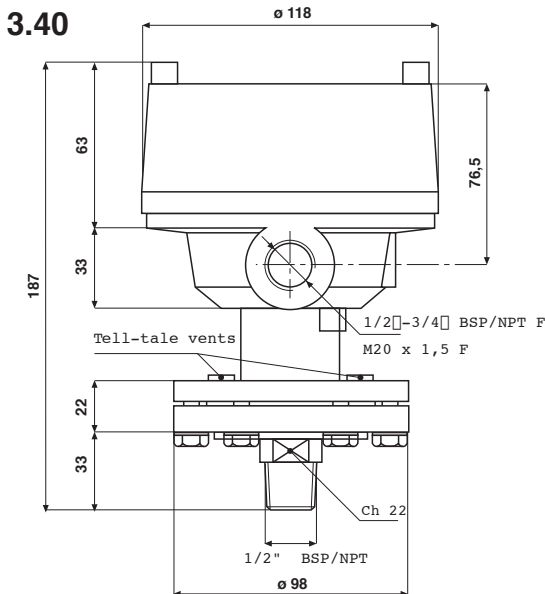
**NF11** - Preservation - The instruments kept in the standard original packing (in cardboard boxes) must be arranged in closed rooms and sheltered from dampness: in this case no particular care is necessary. If the instruments are packed in a special manner, (in wooden crates lined with tar paper or sack barriers) it is always better to place them in rooms possibly closed and in any case sheltered from weather conditions; the conditions of the packed material must be inspected every 3-4 months, especially if the crates are subject to the action of weather

assoluto al campo operativo dello strumento.

**NF21** - Microswitch – The maximum resistive load values indicated on the tag must not be exceeded. If this should happen, the surface temperatures of the case and of the cable control sheaths could increase, making the installation unsafe. The value of the differential must be considered according to the type of microswitch. See provision NF32

**NF22** - The case is in aluminium with blue polyurethane paint. The cover is in aluminium with beige polyurethane paint. Designed for open-air use. The degree of resistance to corrosion due to the environment present on the site of installation and the weather conditions of the polyurethane paint must be examined, in order that use is guaranteed in complete safety.

**NF23** - Degree of protection – Indicated as by provisions of legislation EN 60529. It refers to the condition of cover completely screwed. An appropriate safety dowel



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exit outside the case through the safety device. The NUOVA FIMA instruments have a safety tell-tale vent that opens as soon as the pressure inside the closed case exceeds a certain safety value, placing it in communication with the environment. Inflammable fluids cannot be measured.

**E723 - Dynamic and cyclic pressures** – These are generally present when the instruments are mounted on pumps and are the cause of a remarkable reduction of the working life of the elastic element and of the microswitch. They are generally highlighted by the occurrence of continuous false alarms. It is necessary to reduce such pulsating pressures by interposing a damper between the source of pressure and the instrument. A wrong choice of the instrument may lead to failure due to fatigue.

**A4271 - Failure due to Fatigue** – It is caused by the mechanical stress induced by pressure and it is revealed by a small crack. These failures are more hazardous if they occur during measurement of compressed gasses rather than liquids. Failures due to fatigue release the fluid slowly, so that the increase of pressure inside the case is noticed by the opening of the safety tell-tale vent.

**E724 - Overage** – Each overrange creates stresses in the elastic element and, consequently, it reduces its working life and accuracy. It is therefore preferable to use an instrument the full scale value of which is greater than the maximum operating pressure and that consequently, absorbs more easily overranges and pressure blows. Pressure blows may be treated in the same way as pulsating pressures. Overranges of long duration may be overcome by installing a calibrated relief valve in the instrument's range. However, it must be considered that rise of even one event may lead to failure due to overrange.

**A4272 - Failure due to Overage** – It is caused by the application of a pressure higher than the declared maximum limit for the elastic element (it may happen for instance, when a low pressure instrument is installed in a high pressure system). The effects of this type of damage, commonly more important in case of compressed gasses measurement, are unforeseeable and may be cause of the explosion of the case, notwithstanding the presence of a safety tell-tale vent. Overage impulses of short duration (spikes) may occur in pneumatic or hydraulic systems, especially further to opening or closing of valves. The amplitude of these impulses can be many times the operating pressure, and the great speed with which they occur prevent detection thereof by the instrument, thus resulting invisible to the operator. They can cause a definite failure of the instrument. A constriction may reduce the amplitude of the overrange peak (spike) transmitted to the elastic element. Use of a pressure relief valve, protects the instrument from all pressures higher than that to which the valve itself is calibrated, thus protecting the instrument from overranges.

**A4331 - The elastic element** is generally characterized by a reduced thickness, and it therefore works under remarkable mechanical stress conditions. The chemical compatibility with the fluid to be measured must therefore be taken into consideration. None of the common materials may be considered immune by chemical etching and various factors influence the entity thereof: concentration, temperature and type of mixture among various chemical substances. Chemical etching may lead rapidly to failure due to corrosion.

**A4273 - Failure due to Corrosion** – It occurs when the material of the elastic element is subjected to chemical etching by substances contained in the fluid to be measured or in the environment surrounding the system under pressure. The damage is revealed under the form

of punctiform loss or the beginning of a fatigue crack further to the weakening of the material. In this case, use of a diaphragm in a material chemically compatible with the process fluid, must be considered.

**A4274 - Failure due to Explosion** – It occurs further to violent release of thermal energy due to chemical reactions, such as that of adiabatic compression of oxygen in the presence of hydrocarbons. The impossibility to foresee the effects of this damage is generally accepted. To avoid hazardous chemical reactions, it is recommended to wash and remove grease on wet parts with suitable products, in case of foreseen interchangeability of the instruments on the installation. It is the same procedure carried out by the manufacturer, for use with highly oxidized agents. It is necessary to inform the manufacturer at the moment of ordering.

**A4275 - Failure due to Vibrations** – The most common way of failure due to vibrations is caused by an abnormal wear and tear of the parts in movement.

**A4276 - Failure due to Fatigue induced by Vibrations** – Another effect of wide amplitude vibrations may be that of causing cracks due to fatigue in the structure of the elastic element. In this case leakage of the fluid may be either slow or fast.

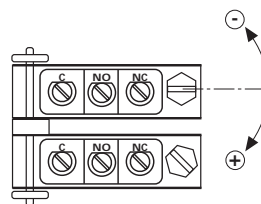
**E722 - Vibrations** – When the effective support of the instrument is subject to vibrations, the instruments must be mounted at a distance and connected by means of flexible pipes (for strong or irregular vibrations). If this should not be possible, the instrument must be mounted in an orthogonal position in relation to the plane of vibrations. Presence of vibrations may be detected by continuous false actions of the microswitch.

**NF26 – The temperature class of the safety electrical construction, and of the equipment installed thereon, must be appropriate to the gasses, vapours and/or powers present.**

**E7251 - Environment temperature:** - 20... +65°C. It is difficult to insulate an instrument from environment temperatures too high or too low. A solution consists in removing it away from the source of heat or cold, when this is possible.

**NF27 – Process fluid temperature:** mass. +65°C, measured at the mouth of the threaded pressure intake. The use of a siphon is advised when the instrument must be employed with vapour or liquids at high temperature. A siphon or a similar device must always be located in proximity of the instrument, and filled with condensed fluid, before pressurizing the installation in order to prevent the hot fluid from reaching the instrument during the initial pressure rise. Inside the elastic element the fluid must not be allowed to freeze or crystallize. However, if the instrument is used to measure points at high temperature, use of a tube with internal diameter of at least 6 mm is recommended for its connection to the pressure intake. A tube of about 1.5-2.0 m. in length reduces the real operating temperature approximately to that of the environment.

**NF30 – Point of calibration** – The NUOVA FIMA pressure switches are supplied with 1 or 2 microswitches, the point of action of which is septated by means of a micrometric adjustment screw, according to drawing. The manufacturer, who will write the point of calibration on the tag in an indelible way, can calibrate them. Otherwise, they will be supplied calibrated at the lowest possible point and the user will therefore proceed for the calibration, taking duly into consideration the differential value. For safety purposes it is recommended to perform the calibration in the laboratory, before installation. Once calibrated, the instrument must carry on the tag the calibration point in an indelible manner.

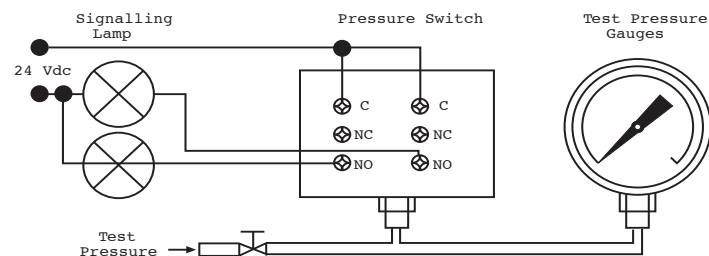


**A4332 - The calibration fluid** and test must be compatible with the fluid to be measured on the pressure system. **Fluids containing hydrocarbons must not be used when the fluids to be measured are oxygen or other oxidizers.**

**NF31 - Calibration** – It is necessary to have available a calibration circuit made up of pressure switch, pressure generator and pressure indicator (pressure gauge or sensor). The set-point accuracy obtainable is a function of that of the indicator used. After having unscrewed the cover, the following operations must be performed:

- connect the microswitch in series to a signalling lamp or sound source as indicated in the figure, in order to have a reference of the set-point thereof;
- apply to the pressure switch a pressure/vacuum equal to the set-point value, by reading it on the comparison instrument;
- for a set-point adjustment on the incline rise, rotate the adjustment screw of the microswitch clockwise to raise the set-point value (this is valid also for instruments that normally operate under vacuum, naturally operation is considered under absolute pressure), anticlockwise to lower it, until insertion of the optical/acoustic signalling;
- lower the pressure until the reinstatement of the set-point;
- repeat the above operations until a set-point value of satisfactory accuracy is obtained;
- for an adjustment of the set-point on the incline drop of the pressure value perform as described above, taking into consideration that accuracy must be according to about the value of refitting;
- repeat the above operations until a value of refitting of satisfactory accuracy is obtained.

In case the microswitches are 2, keep in mind that these operations are repeated alternatively for one microswitch and then for the other, until obtaining the desired set-point accuracy. This becomes



necessary due to the interaction of the two microswitches on the same measuring element. Once completed the described operations, retighten the cover until the rabbit.

**NF32 - Differential** – The differential or dead band is indicated on the tag and is the difference between the point of action and the point of refitting of the microswitch. Particular attention must be paid so that the point of action and the value of the differential allow refitting of the microswitch. This is of particular importance in the case of the microswitch with adjustable differential from 10% to 50% of the range operating value. The latter is adjusted by acting on the graduated roller present under the microswitch itself. The adjustment roller is graduated from letter

"A" to letter "F" to which correspond the minimum differential (about 10% of the full range value) and maximum (about 40-50% of the full range value), respectively. In the adjustment of the differential it must be kept in mind that the device, by acting on the triggering force of the microswitch, increases the value of the adjusted set-point, leaving fixed the refitting. It is important to consider this, particularly when the instrument, equipped with such a microswitch, is calibrated in the factory and is adjusted subsequently on the installation. It is likewise important considering this when the instrument functions in vacuum (empty).

**NF40 - The pressure switches, series 3.4x/xx, must be installed according to the provisions of the European Standards EN 60079-14 and/or EN 61241-14.**

**E71 - Installation** – To facilitate starting-up, stopping and removal for maintenance purposes, an on-off valve must be inserted between the pressure switch and the installation (root valve). If the pressure switch is differential (3:48/49) a 3 way manifold or 3 distinct valves, must also be inserted, as per drawings in page 3. The pressure connection must be sealed tightly. If the threading of the pressure connection is cylindrical, the sealing is carried out by means of a ring gasket tightened between the two plane sealing faces, one of the pressure intake and the other of the connection to the instrument process. If the threading of the pressure connection is conical, the sealing is realized by means of



simple screwing of the connection on the intake, for at least 5 complete threads. It is common practice nevertheless to carry out a PTFE taping on the male thread, before the coupling (see fig.). In both cases, the twisting moment must be applied by means of two spanners, one applied on the plane faces of the connection to the instrument process, and the other on those of the pressure intake. **Tightening must not be carried out by applying force on the case, because this operation could damage the instrument.** During the first pressure operation, it must be checked that the connection is sealed tightly. All the instruments must be mounted in such a manner that the pressure intake is in a

vertical position  $\pm 5^\circ$ , except if otherwise indicated on the tag. A minimum distance of 20 mm must be guaranteed from any adjacent object to allow action of the safety tell-tale vent device.

**NF41 - Electrical connection** – Use Exd adaptors and cable clamps that do not reduce the grade of protection of the case, and that are according to the legislations in force at the location of installation. At least 5 complete threads must hold tight.

**NF42 - Electrical Cable** – Use, for the connection, cables with sections suitable to the required electrical output (1.2 ... 2.5 mm<sup>2</sup> – 14 ... 16 AWG) and in conformity to the technical provisions for the connection to switching equipment. The external diameter must be suitable to that required by possible cable clamps. The

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cable terminals must be of the spade terminal type.

Code	Electrical connection threading
1 <sup>(2)</sup>	1/2" BSP F UNI 6125
2 <sup>(2)</sup>	3/4" BSP F UNI 6125
3 <sup>(1)</sup>	1/2" NPT F
4 <sup>(1)</sup>	3/4" NPT F
A	M20 x 1,5 F

- (1) primary threading
- (2) on request threading

**NF43 - Electrical connections** – Loosen the safety dowel and remove the cover. Check that there is no voltage in the electrical cable. Connect the cable on the microswitch by carrying out a perfect tightening and taking care that:

- a) it is not subject to torsions or is excessively taut;
- b) it does not have frays or the insulating sheath is cut or damaged;
- c) it does not have false contacts and the connection terminal screws are tightened correctly;
- d) the calibration is not altered (if the latter was performed in the factory).



Ensure that no impurity is left behind inside the case, fix the cable clamp and reassemble the cover by fixing it finally with the safety dowel.

**NF44 - NF44 - Earthing** – Points of earthing, of protection or of equipotentiality are foreseen internally and externally of the case. Once checked the integrity and the continuity of these conductors, connect one or both, according to the specifications of the installation in force, by carrying out a perfect tightening.

**NF50 – The user must be aware of the risks due to the electrical current and to the chemical and physical features of the gases, vapours and/or powders present in the installation.**

**E8 – Commissioning** – Commissioning must always be carried out with care to avoid pressure blows or sudden temperature variations. Therefore, the on-off valves must be opened slowly. For the differential pressure switches, and by

referring to the drawings of page 3, follow the following instructions:

- open by-pass valve "1";
- open root valve "3";
- open on-off valve "2" of the positive (+) side and the instrument will measure pressure equal to zero;

- close by-pass valve "1";
- open on-off valve "2" of the negative (-) side.

**NF51** - Make sure that the non-kept refitting of the microswitch for an extended time is not due to obstruction of the pressure feeding conduit to the elastic element. Particularly, in case of absence of action, make sure there is no pressure inside the instrument before the eventual disassembly, insulating it by means of the on-off valve.

**NF60 - Maintenance operations must be carried out according to the provisions of European Standards EN 60079-17 and/or EN 61241-17. Use of a safety electrical construction, object of actions not explicitly authorized by NUOVA FIMA, excludes any responsibility thereof and will bring about the invalidation of the relative EC Declaration of Conformity and of the contract guarantee.**

**NF61 - Maintenance** is a combination of operations performed for the purpose of maintaining or reinstating a safety electrical construction in the conditions in which it is able to satisfy the provisions of the pertaining specifications and to carry out the required functions. Maintaining in time the initial safety electrical construction features must be guaranteed by a precise maintenance program, devised and managed by qualified technicians and which duly considers the typology of the concerned electrical constructions, their requested service and the environment conditions in which they operate.

Maintenance must guarantee functionality of the electrical constructions in terms of safety, and since safety is a legal obligation such is also the preservation of all the conditions from which it depends. The safety electrical constructions, in all their constitutive parts, must be installed and maintained, in such a manner to prevent

the hazards originating from accidental contacts with the elements under voltage, and at high temperatures, and the risks of fire and explosion originating from possible abnormalities that occur during their operation. The maintenance operations must be assigned to personnel duly qualified and instructed on the specific features of the equipment. In case the actions lie outside normal maintenance, authorized and qualified personnel of NUOVA FIMA must carry them out. All maintenance operations must be carried out with the safety electrical construction insulated from all the power sources. If the safety electrical construction is subject to vibrations, check carefully that the means of junction and the pipe and/or cable intakes are well tightened, and that the necessary anti-loosening and/or anti-vibration devices are present. Check the correct installation and the correct fixing of the accessories.

**NF62 - Heaping of powders on the pressure switch case must not exceed a thickness of 5 mm. A cycle of cleaning must be foreseen appropriate for this purpose.**

**NF63** - In case that the maintenance program does not foresee it, every 3/6 months of operation it is recommended to control the accuracy of action, the wear and rear of the parts in movement, the corrosion level of the elastic element and the presence of condensate inside the case. For the instruments used on installations under heavy conditions (vibrations, pulsating pressures, corrosive fluids, or with sediments, etc.) their substitution according to the frequency foreseen by the maintenance program, must be provided.

**NF64 - The safety electrical construction must be opened only after having been insulated electrically.**

**NF65 - Recalibration** – The instruments under checking phase must be insulated from the installation, disassembled and subjected to the inspection/calibration procedure described under point NF 31. The residual process fluid inside the connection instrument process must not be dispersed in the environment to avoid pollution or damages to persons.

**NF70 - Possible malfunctionings –**

Absence of action or of refitting: Electric line interrupted, Microswitch damaged, Root valve closed. Fluctuation of the set-point (false set-point): Excessive mechanical vibrations due to wrong installation. Displacement of the point of action: Deformation of the elastic element due to fatigue, high overrange or temperature of the process fluid. Slow response: Pressure conduits partially obstructed or fluid too viscous.

**NF80** - The only operation to be performed by the user that can be possible for safety purposes is the substitution of the microswitch. The manufacturer's authorization is nevertheless indispensable, whose procedures of action in force must be followed by the certified personnel.

**NF90 - Demolition** – It is recommended to separate the electrical part and then scrap like aluminium and stainless steel.

**E727 - Effect of the liquid columns** – The fitter must be aware of the fact that if the load originating from a liquid column acts on the instrument, calibration must be performed compensating such influence. This occurs when the instrument measures liquids and is mounted in a position overhead or underneath the pressure intake to which it is connected (figures 1, 2) in the case of gas or vapour this does not occur. In this case mounting of the instrument in an overhead position in relation to the pressure intake is recommended, to avoid that possible condensates alter the values. For the measurements of the liquid levels with differential pressure switches it is necessary that the installation point of the instrument is at least 50 cm below the minimum level of the tank (fig. 3) and that the difference of height between the tank minimum level and the condensate keg level is equal or slightly inferior to the instrument's differential scale range.

Fig. 1

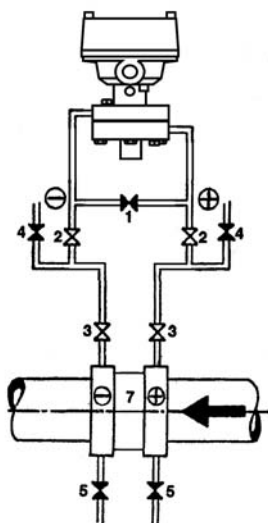


Fig. 2

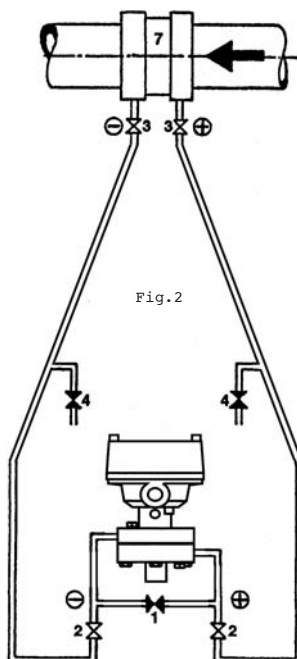
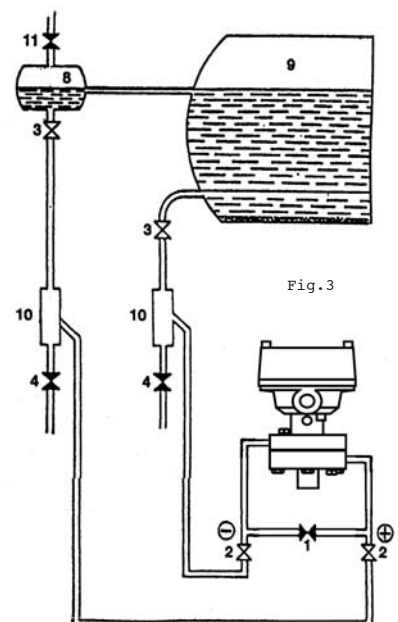


Fig. 3



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**DICHIARAZIONE CE DI CONFORMITÀ**  
*EC DECLARATION OF CONFORMITY*

Noi / We

**NUOVA FIMA S.p.A.**  
**Fabbrica Italiana di Manometri e Termometri**  
**Via C. Battisti, 59/61 – 28045 INVORIO (NO) - ITALIA**

dichiariamo sotto la ns. responsabilità che / declare under our own responsibility that

I Pressostati Ex d IIC T6 Ex tD A21 IP65 T 85 °C | **3.4x/xx**  
-20≤Ta≤+65°C Tp≤+60°C, Serie  
*The Pressure switches Ex d IIC T6 Ex tD A21 IP65 T 85 °C*  
-20≤Ta≤+65°C Tp≤+60°C, Seriesono conformi alle Norme | **EN 60079-0:2006, EN 60079-1:2007**  
*comply with the Standards* | **EN 61241-0:2006, EN 61241-1:2004**ed alla direttiva europea | **94/9/CE**  
*and with the european directive*per il gruppo e la categoria | **II 2GD**  
*for group and category*Certificato di esame CE del tipo | **n° 04 ATEX 027**  
*CE type examination certificate*rilasciato dall'Organismo Notificato | **CESI - Milano**  
*issued by the Notified Body*Organismo Notificato incaricato della sorveglianza | **0425**  
*Notified Body in charge for surveillance*Data / **27/05/2008**  
date: \_\_\_\_\_

Firma / signature

**NUOVA FIMA**  
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**Federico Zaveri****NUOVA FIMA**  
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**Stefano Zaveri**