

MT-239-E

ENGLISH

PRESSURE
REGULATOR

STAFLUX MINI

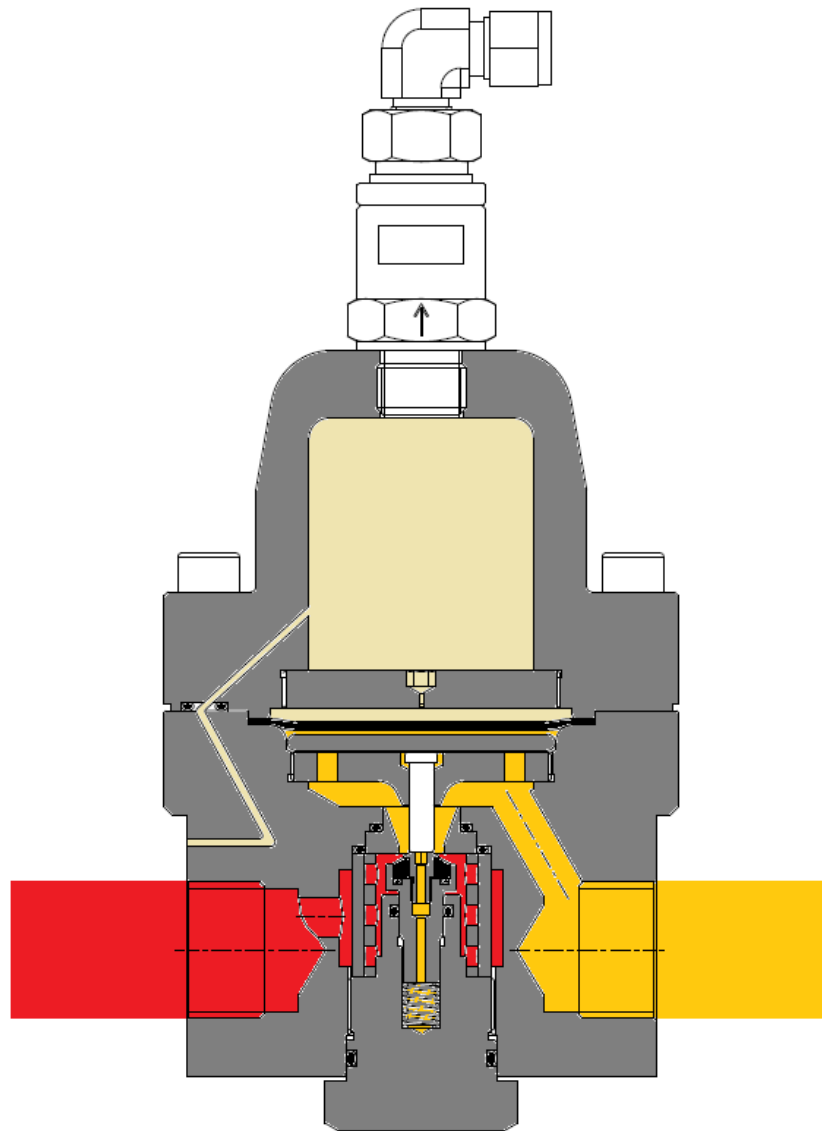


TECHNICAL MANUAL

INSTALLATION, COMMISSIONING AND
MAINTENANCE INSTRUCTIONS

 Pietro
Fiorentini®

STAFLUX MINI



- Pressione d'entrata. *Inlet pressure.*
 Eingangdruck. *Pression amont.*
 Presión de entrada. *Pressão de entrada.*

- Pressione d'uscita. *Outlet pressure.*
 Ausgangdruck. *Pression aval.*
 Presión de salida. *Pressão de ajustante.*

- Motorizzazione. *Motorisation.*
 Steuerdruck. *Motorization.*
 Motorización. *Motorização.*

PRECAUTION

GENERAL PRECAUTION

The apparatus described in this manual is a device subject to pressure installed in systems under pressure. The apparatus in question is normally installed in systems for transporting flammable gases (natural gas, for example).

PRECAUTION FOR THE OPERATORS

Before proceeding with installation, commissioning or maintenance, operators must:

- Examine the **safety provisions** applicable to the installation in which they must work;
- Obtain the **authorisations** necessary for working when required;
- Use the necessary means of **individual protection** (helmet, goggles, etc.);
- Ensure that the area in which they operate is fitted with the means of **collective protection** envisaged and with the necessary **safety indications**.

PACKING

The packing for transportation of equipment and of relevant spare parts are designed and shaped to avoid damage to any part during transportation, warehousing and handling activities. Therefore the equipment and spare parts shall be kept into their packing until their installation in the final site. After packing is open, check that no damage occurred to any goods. If damage occurred inform the supplier and keep packing for any verification.

INSTALLATION

The installation of the pressure regulator has to occur in compliance with the provisions (laws or standards) in force in the place of installation.

Natural gas plants have to show features in compliance with the law provisions and standard requirements in force in the place of installation or at least in compliance with standards EN 12186 or EN 12279. In detail, it is necessary to meet the provisions of paragraphs 6.2, 7.5.2, 7.7, 9.3 of the standard EN 12186 and 6.2, 7.4, 7.6, 9.3 of the EN 12279 standard. The installation in compliance with such standards minimizes the risk of fire hazard and the formation of potentially explosive atmospheres.

The valve is not equipped with external pressure limitation devices; therefore, it has to be installed making sure that the operating pressure of the assembly on which it is installed does not exceed the maximum allowable pressure (PS).

Therefore, the user, as deemed necessary by the same, shall install on the assembly suitable pressure limitation systems, as well as provide the plant with suitable relief or drain systems in order to discharge the pressure and fluid contained in the plant before proceeding with any inspection and maintenance activity.

If the installation of the apparatus requires the application of **compression fittings** in the field, these must be installed following the **instructions of the manufacturer** of the fittings themselves. The choice of the fitting must be compatible with the use specified for the apparatus and with the specifications of the system when envisaged.

COMMISSIONING

Commissioning must be carried out by **adequately trained personnel**.

During the commissioning activities, the personnel not strictly necessary must be ordered away and the no-go area must be properly signalled (signs, barriers, etc.).

Check that the settings of the apparatus are those requested; if necessary, reset them to the required values in accordance with the procedures indicated in the manual.

When commissioning, the risks associated with any discharges into the atmosphere of flammable or noxious gases must be assessed.

In installations in natural gas distribution networks, the risk of the formation of explosive mixtures (gas/air) inside the piping must be considered.

- INDEX -

1.0	INTRODUCTION	5
1.1	MAIN FEATURES	6
1.2	OPERATION OF THE PRESSURE REGULATOR STAFUX MINI	6
2.0	INSTALLATION	8
2.1	GENERAL	8
2.2	CONNECTING THE APPARATUSES	9
3.0	RELIEF VALVES	9
3.1	RELIEF VALVE	9
4.0	START-UP	9
4.1	GENERAL	9
4.2	GAS INPUT, CONTROL OF EXTERNAL TIGHTNESS AND SETTING	10
4.3	COMMISSIONING THE REGULATOR STAFUX MINI	11
5.0	TROUBLE-SHOOTING	12
5.1	REGULATOR STAFUX MINI	12
6.0	MAINTENANCE	13
6.1	GENERAL	13
6.2	STAFUX MINI REGULATOR MAINTENANCE PROCEDURE	14
6.3	PRESSURIZED CHAMBER INLET VALVE	16
6.4	RELIEF VALVE VS/FI MAINTENANCE PROCEDURE	
7.0	FINAL OPERATION	19
7.1	CHECKING THE TIGHTNESS AND SETTING	19
7.2	START UP	19

1.0 INTRODUCTION

This manual aims to providing essential information for the installation, commissioning and maintenance of the pressure regulator **STAFLUX MINI**.

Moreover, it is deemed suitable to describe in short the main features of the regulator.

Fig. 1 contains a functional diagram of the regulator.

1.1 MAIN FEATURES

The STAFLUX MINI pressure regulator is a regulator for medium and high pressure.

The STAFLUX MINI is a "fail close" type regulator and therefore closes in the event of:

- rupture of the main diaphragm
- no feed in the pressurized chamber

The main specifications of this regulator are:

- Design pressure PS: up to 250 bar
- Working temperature range: -20°C + 60 °C
- Ambient temperature: -20°C + 60 °C
- Inlet pressure range bpu: 5 to 250 bar
- Regulating range possible Wd: 4 ÷ 75 bar
- Minimum differential pressure 1 bar
- Precision class AC: up to 10 (depending on the operative conditions)
- Closing pressure class SG 10 (depending on the operative conditions)

1.2 OPERATION OF THE PRESSURE REGULATOR STAFLEX MINI

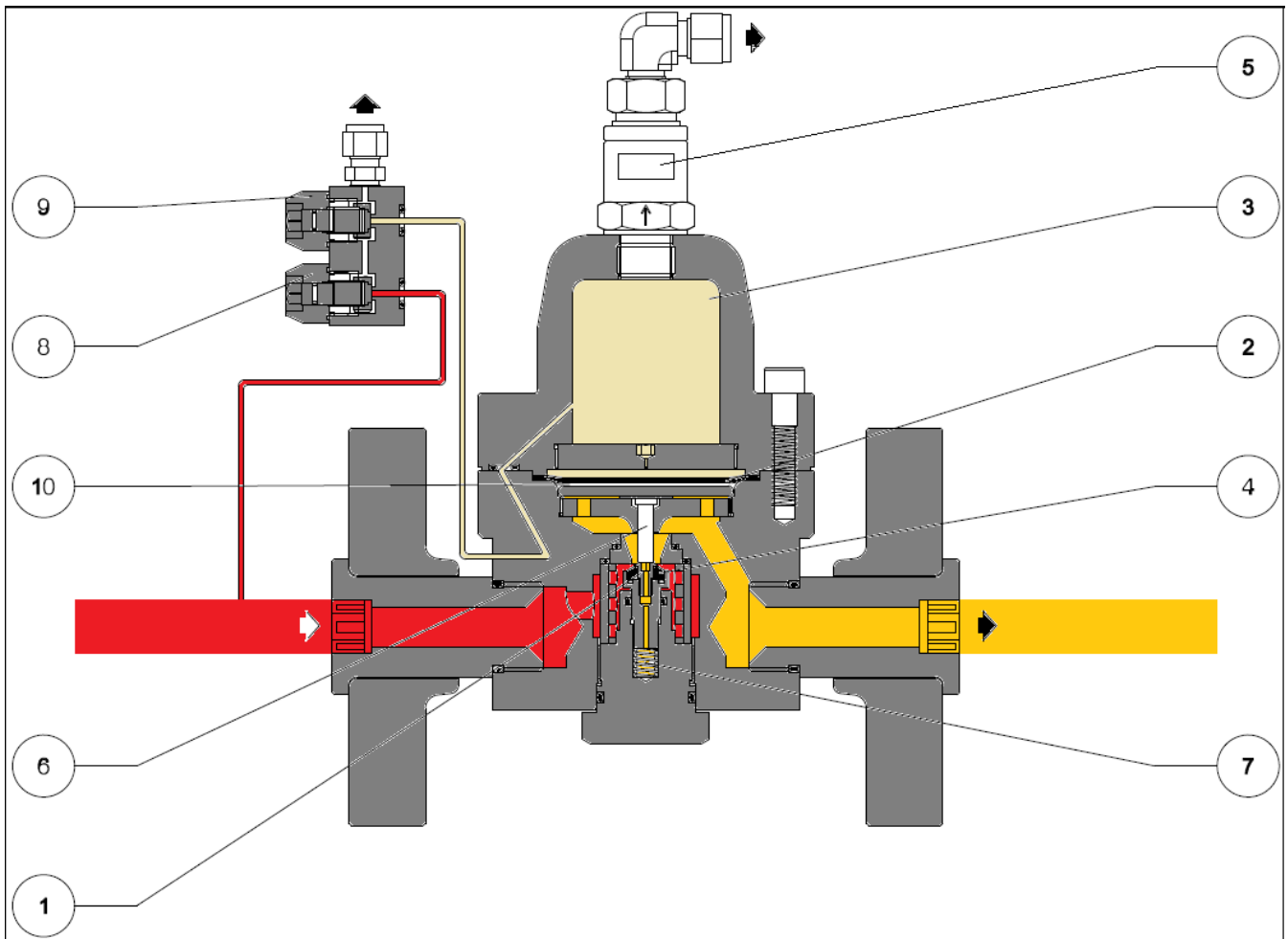


fig. 1

Refer to figure 1.

The pressure regulator **STAFLEX MINI** is a device which being supplied with a gas at variable pressure, reduces its pressure keeping the downstream value stable also when the requested flow rate changes.

The regulator basically consists of:

- a body which houses the obturator (1) and the gasket seat (4);
- a control head (3) where the control diaphragm (2) connected to the stem (6) are inserted;
- a group of calibration valves (8, 9);
- one relief valve (5) on the chambers (3).

The regulator **STAFLEX MINI** is a direct action regulator with diaphragm control with "fail close" reaction.

The operating principle bases on the balance of the forces acting on the diaphragm (2), which is joined to the obturator (1) through the stem (6).

These forces are:

- On the lower side of the diaphragm: the spring load (7) and the downstream pressure contained in the chamber (10);
- On the upper side of the diaphragm: the pressure of the fluid contained in the hood (3)

If during operation, due to an increase in the flow rate, a reduction in the downstream regulated pressure occurs, a pressure decrease will occur in the sub-diaphragm chamber (10) and, therefore, also an unbalance of the forces with the following opening of the obturator until the balance condition is restored.

On the contrary, if the downstream pressure increases due to a reduction in the flow rate, a pressure increase will occur in the sub-diaphragm chamber (10) and, consequently, also an unbalance of the forces with the following closing of the obturator until the balance condition is restored.

The regulator is equipped with a valve (8) providing pressure into the chamber (3) (usually, to pressurize such chamber the gas collected upstream of the regulator itself is used) and with a valve (9) draining the chamber (3). These two valves are necessary for the calibration of the regulator.

Chamber (3) is protected against any overpressure, by means of a relief valve (5).

The calibration of the regulator occurs by means of the gas under pressure contained in chamber 3; ambient temperature changes may lead to changes in the value of the pressure contained in such chamber and, consequently, to changes in the value of the regulated pressure.

2.0 INSTALLATION

2.1 GENERALS

Pressure regulator does not require any supplementary upstream safety accessory for protection against overpressure compared with its design pressure PS, when upstream reducing station is sized for a max downstream incidental pressure

$$P_d \leq 1,1 PS$$

Before installing the regulator it is necessary to ensure that:

- the regulator can be inserted in the space provided and that subsequent maintenance operations will be sufficiently practicable (see dimension in Tab. 2a)
- the upstream and downstream piping is at the same level and capable of supporting the weight of the regulator
- the inlet/outlet flanges of the piping are parallel
- the inlet/outlet flanges of the regulator are clean and the regulator itself has not been subject to damage during transport

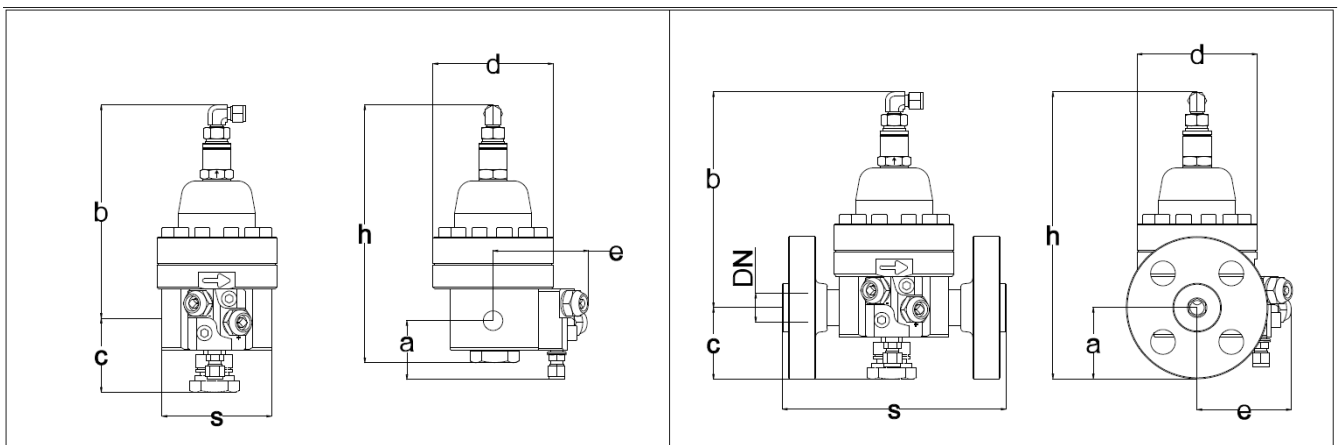


fig. 2a

fig. 2b

Overall Dimensions [mm]

	THREADED CONNECTION	FLANGED CONNECTION
DIMENSION [mm]	25	
Inch	1"	
s	115	235
a	62	75
b	226	
c	77	
d	126	
e	100	
h	270	300

Tab. 2a

Weight [Kg]

	12	20
--	----	----

Tab. 2b

2.2 CONNECTING THE APPARATUSES

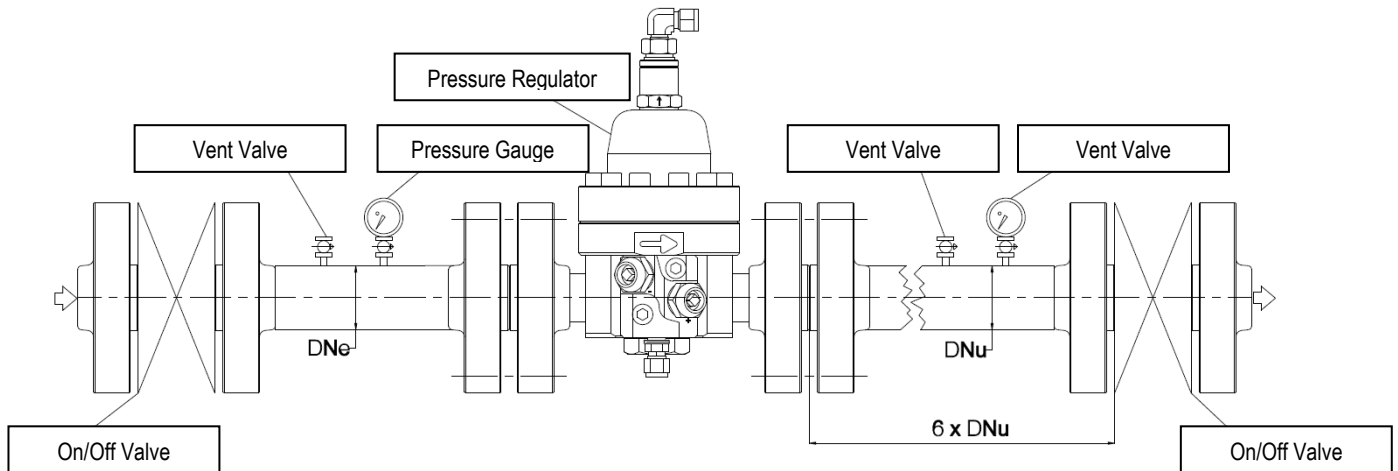


fig. 3

The regulator must be installed in the line with the arrow on the body pointing in the gas flow direction. When the regulator is used in gas pressure reduction stations it must be installed at least according to the requirements envisaged in EN 12186 or EN 12279 standards. Any possible gas leakage at any point, due to diaphragm or sensor malfunction or breakage, must be channelled according to EN 12186 standards. or EN 12279.

The following is recommended so as to prevent the accumulation of impurities and condensate in the lines of the pressure take-off:

- the lines themselves must slope down towards the downstream piping connectors with a slope of about 5-10%;
- the connectors on the piping must always be welded on the top of the piping itself and there must be no burr or inward protrusions in the hole in the piping.

3.0 RELIEF VALVES

3.1 RELIEF VALVE VS/FI

Please consult the correspondent table VS/FI x STAFLUX MINI in table TT673

4.0 START-UP

4.1 GENERAL

After installation, check that the inlet/outlet on/off valves, any by-pass and the bleed valves are closed. Before commissioning, you must ensure that the conditions of use comply with the characteristics of the apparatuses. These characteristics are recalled by the symbols on the specification plates applied to each apparatus (fig. 4). We recommend actuating the opening and closing valves very slowly. The regulator could be damaged by too fast valve operations.

APPARATUS SPECIFICATION PLATES

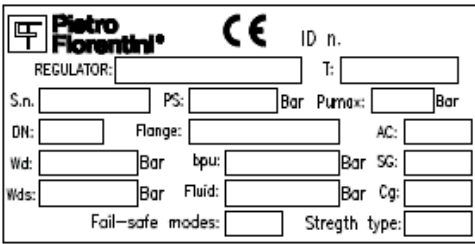


fig. 4

The list of symbols used and their meanings are listed below:

CE = According to 97/23/CE PED Directive

Pumax= maximum operating pressure at the inlet of the apparatus.

bpu= range of variability of the inlet pressure of the pressure regulator in normal operating conditions.

PS= maximum pressure for which the body and its inner metallic partition walls are designed in accordance with the strength requirements in this document.

Cg and KG = experimental coefficient of critical flow.

AC= regulation class.

SG= closing pressure class.

Fail safe mode= fail open regulator o fail closed regulator.

Strength type= strength class (IS o DS).

4.2 GAS INPUT, CONTROL OF EXTERNAL TIGHTNESS AND SETTING

The pressurization of the equipment shall be performed very slowly. Should not any stabilization procedure be carried out, it is recommended to keep gas speed in the feeding piping at a value equal to 5 m/sec during pressurization.

To protect the apparatus from damage, the following operations must never be carried out:

- Pressurization through a valve located downstream from the apparatus itself.
- Depressurization through a valve located upstream from the apparatus itself.

External tightness is guaranteed if no bubbles are visible when a foam medium is applied on the element under pressure.

The regulator is normally supplied with the pressostatic chamber already drained. Only the relief valve VS/FI is set. It is possible for various reasons (e.g., vibration during transport) for the settings to be changed while remaining within the values allowed by the spring installed.

In installation consisting of two lines, we suggest commissioning one line at a time, starting from the one with the lower set-point, known as the "stand-by" line.

Before commissioning the regulator you must check that all the on/off valves (inlet, outlet, any by-pass) are closed and that the gas is at a temperature which will not lead to malfunction.

4.3 COMMISSIONING THE REGULATOR (fig.5)

If there is also a relief valve in the line, refer to par. 3.1 to check it.

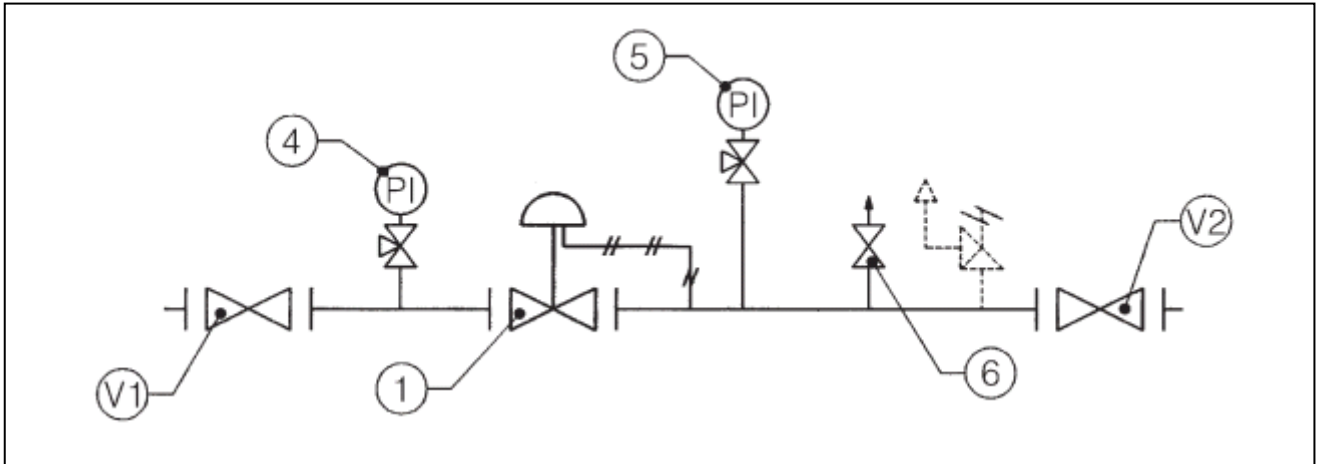


fig. 5

- 1) Open the inlet on-off valve V1 very slowly.
- 2) Partially open the bleed valve 6 checking the outlet pressure value by mean of the pressure gauge 5
- 3) Adjust the setting value by means of the pressurized chamber inlet valve.
- 4) Close the bleed valve 6 and check the lock up pressure.
- 5) Using a foam substance, check the tightness of all the items and joints between the on-off valves V1 and V2.
- 6) Very slowly open the downstream on-off valve V2 to obtain the complete filling of the pipe line.

5.0 TROUBLE-SHOOTING

The problems of various kinds that could arise over time are highlighted below. They derive from phenomena associated with the conditions of the gas as well as the natural ageing and wear of the materials. It must be remembered that all operations on the apparatuses **must be carried out by highly qualified personnel with appropriate knowledge of the subject.** Tampering of the apparatuses by unsuitable personnel relieves us from all responsibility of any kind.

5.1 REGULATOR STAFLEX MINI (FIG. 6)

PROBLEM	POSSIBLE CAUSES	REMEDY
No tightness at Q=0	Valve seat [11] damaged	Replace
	Obturator [13] damaged	Replace
	O-ring [12] damaged	Replace
	O-ring [22] damaged	Replace
	O-ring [17] damaged	Replace
	O-ring [15] damaged	Replace
	Diaphragm [7] damaged	Replace
	Obturator of pressurized chamber inlet valve damaged	Replace
	Dirt or foreign bodies in the sealing area	Clean
Pumping	Stem locked by dirt or foreign bodies	Clean
	Unusual friction of obturator stem group	Celan and in case replace sealing and/or guide elements
Pd pressure increases with Q>0	Reduced downstream volumes	Volume increases
	Broken diaphragm [7]	Replace
	Stem locked by dirt or foreign bodies	Clean
Pd pressure decreases with Q>0	Obturator of pressurized chamber inlet valve damaged	Replace
	Obturator of pressurized chamber inlet valve damaged	Replace
	Stem locked by dirt or foreign bodies	Celan
	Excessive flow rate	Reduce flow rate
	Inlet pressure decreases	Check filter

6.0 MAINTENANCE

6.1 GENERALS

Before carrying out any operation is important to ascertain that the regulator has been cut off both upstream and downstream and that the pressure has been discharged in the sections of piping between the regulator and the on/off valves. Furthermore it is important to ascertain that the pressostatic chamber is completely drained.

The maintenance operations are closely associated with the quality of the gas transported (impurities, humidity, gasoline, corrosive substances) and with the efficiency of the filtering.

Preventive maintenance should be carried out at intervals which, if not established by regulations, depend on:

- the quality of the gas transported
- the cleanliness and conservation of the piping upstream from the regulator. In general, for example, when starting the equipment for the first time, more frequent maintenance is required because of the precarious state of cleanliness inside the piping
- the level of reliability required from the regulation system

Before starting the disassembly operations on the apparatus you should check that:

- a set of recommended spares is available. The spares must be original Fiorentini, bearing in mind that the more important such as diaphragms are marked
- a set of wrenches is available

For a proper maintenance the recommended spare parts are unequivocally identified by the assembly drawing of the apparatus contained in the package of the kit. It is suggestable to replace all rubber parts; for this aim use the relative spare parts kit.

N.B. The use of non-original components relieves Pietro Fiorentini S.p.A. of all responsibility.

The depressurization operation has to be carried out paying attention to discharge the bleed valves to the drains in a safe area. To avoid the risk of generating sparks due to bumps of impurity particles within the discharge lines, it is recommended to keep the fluid speed lower than 5 m/sec.

Moreover, it is suggested to perform reference marks, before disassembling the equipment, on the parts that may show problems of mutual orientation or positioning during re-assembly.

Finally, it shall be underlined that the O-rings and the mechanical sliding parts (stems, etc.) must be lubricated, before re-assembling them, with a thin layer of silicone grease. Before commissioning, the external tightness of the equipment has to be tested at a suitable pressure in order to assure the absence of external leaks.

Such tests are essential to assure the safe use under the foreseen operating conditions. They have in any case to comply with the national regulations in force.

6.2 STAFLUX MINI MAINTENANCE PROCEDURE

Procedure for disassembling, complete replacing of spare parts and reassembly of the gas pressure regulator STAFLUX MINI (fig. 6).

PRELIMINARY OPERATION

- 1) Put the regulator in safety conditions
- 2) Ensure that upstream, downstream and pressostatic chamber pressure are 0
- 3) Perform a reference mark between cover and body

DISASSEMBLY AND REASSEMBLY OF THE UPPER PART

- 1) Remove the screws (4) and remove the cover (3).
- 2) Remove the diaphragm (7) and the diaphragm protection disk (8).
- 3) Pull out the stem (10), clean and cover it with a fine layer of silicon grease.
- 4) Reposition the stem (10)
- 5) Insert the diaphragm protection disk (8) and the new diaphragm (7)
- 6) Reassembly the cover (3) taking care to respect the matching of the reference mark previously performed
- 7) Position the screws (4) and cross them according to a cross schem.

DISASSEMBLY AND REASSEMBLY OF THE LOWER PART

- 1) Unscrew the plug (2). While removing this component, OR (18) and the obturator group (41, 13, 14 and 16) will be pulled out.
- 2) Pull out the piston (16) and replace the or OR (18) e (17)
- 3) Remove the screw (14), unscrew the ring nut (41) from the piston (16) and replace OR (15) and the gasket (13).
- 4) Screw the nut ring (41) and the screw (14) on the piston (16)
- 5) Insert the piston (16) in the plug (2)
- 6) Remove the filter (23) and the filter support (21)
- 7) By mean of the apposite tool, remove the OR (12)
- 8) Remove the seat (11) and the OR (22)
- 9) Replace the or (12) and (22) and reassemble them in the body with the seat (11)
- 10) Reassemble the filter support (21) and the new filter (23)
- 11) Reassemble the plug (2) with the obturator group (41, 13, 14 and 16)

Before re-installing the tightness elements elements (o-rings, diaphragm, etc...), it is necessary to check their integrity. Pay attention to handle the obturator group and the valve seat in order to avoid to damage the seal edges.

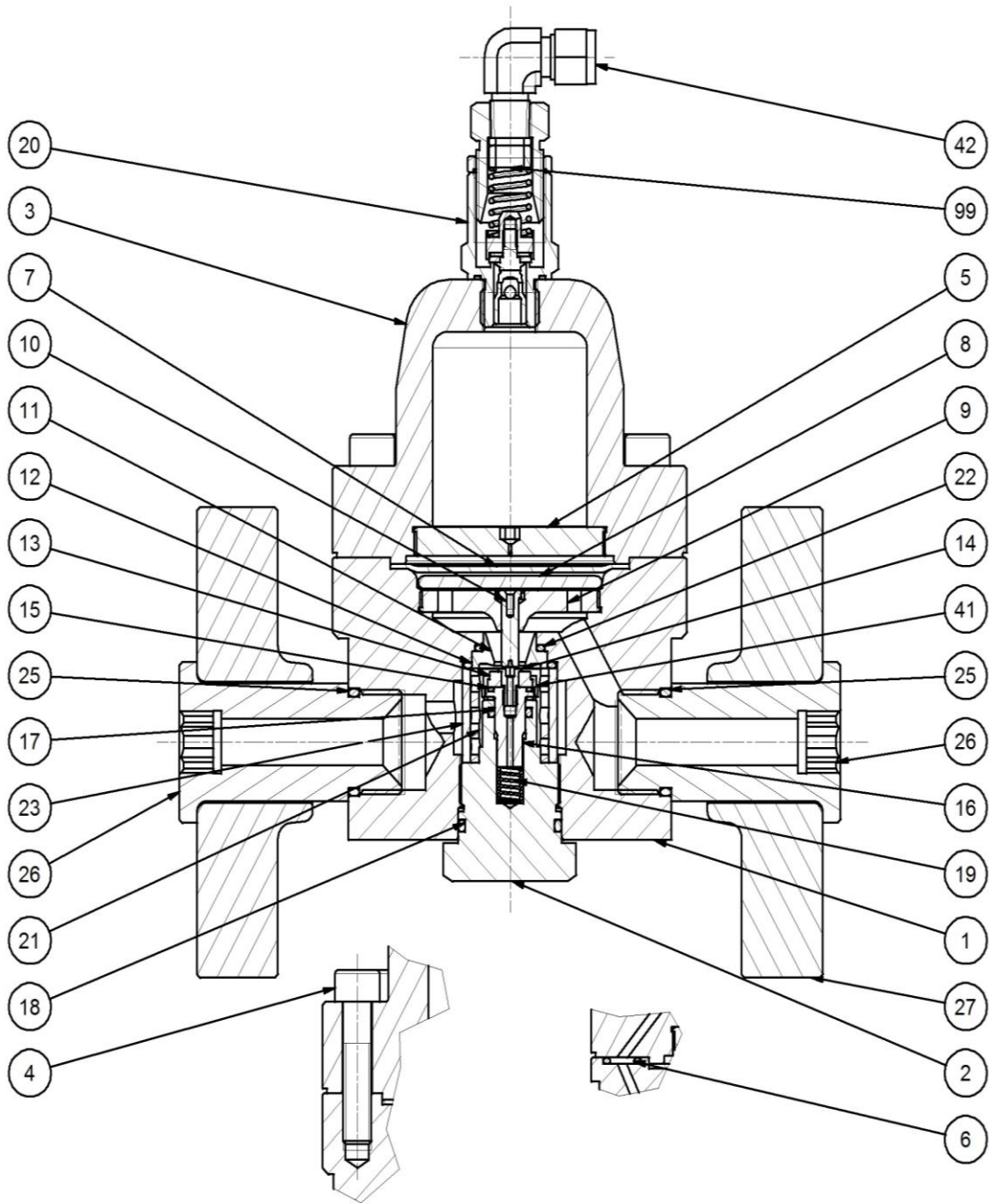


fig. 6

6.3 PRESSURIZED CHAMBER INLET VALVE MAINTENANCE PROCEDURE

Procedure for disassembling, complete replacing of spare parts and reassembly of the pressurized chamber inlet valve (fig. 7 and fig. 8).

PRELIMINARY OPERATION

- 1) Put the regulator in safety conditions
- 2) Ensure that upstream, downstream and pressostatic chamber pressure are 0

DISASSEMBLY AND REASSEMBLY

- 1) Remove the screws (31)
- 2) Remove and replace the OR (33) e (34).
- 3) Unscrew each tap (+) and (-) and replace the OR (36) and (40)
- 4) Remove and replace the gasket (38)

To reassemble the pressurized chamber inlet valve you can run the other way the operations described for the disassembling process.

6.4 RELIEF VALVE VS/FI MAINTENANCE PROCEDURE

Refer to the technical manual MT159 of the valve VS/FI.

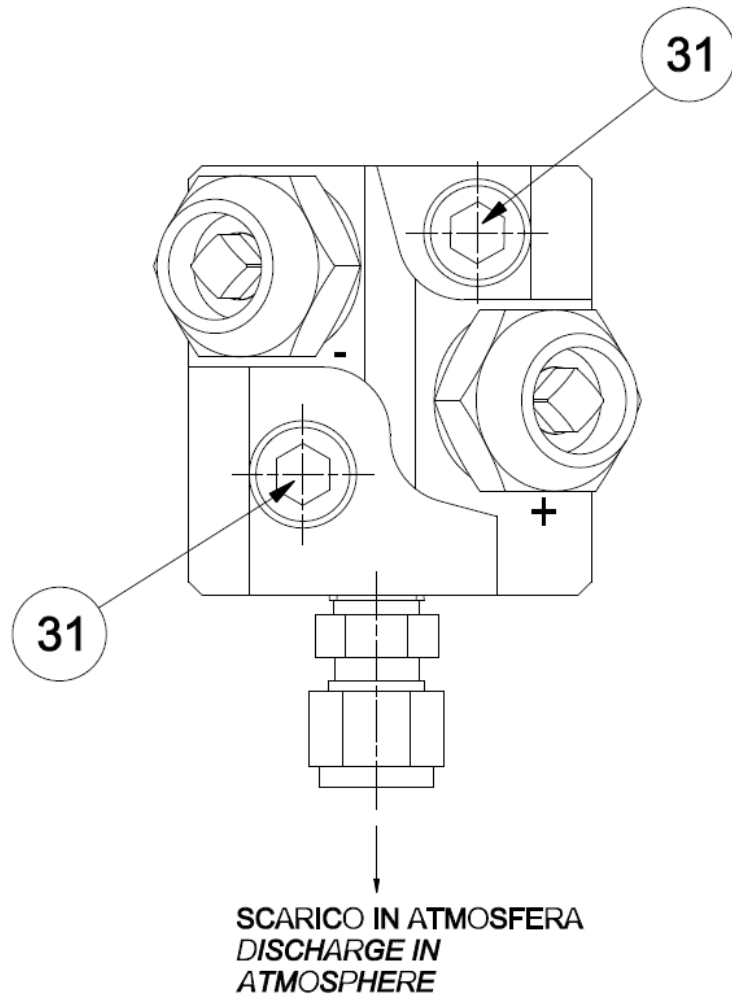


fig. 7

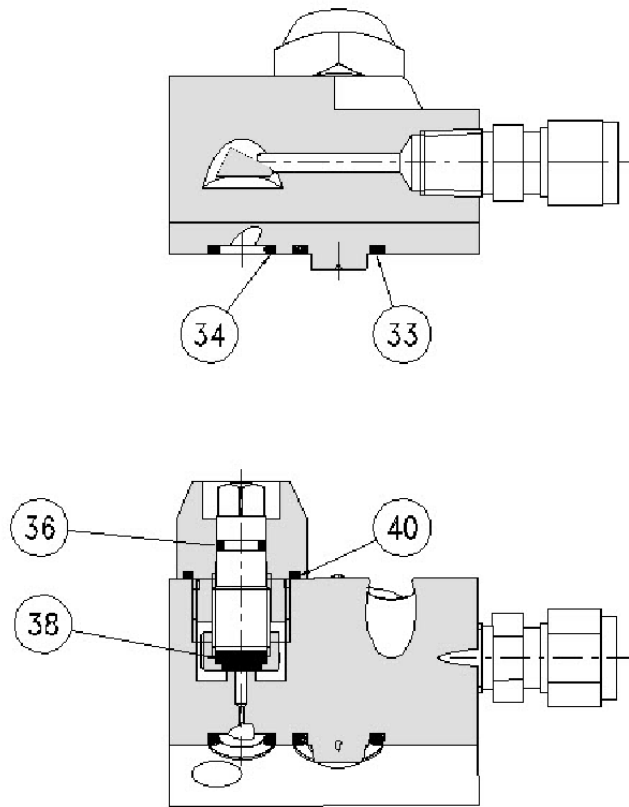


fig. 8

7.0 FINAL OPERATION

7.1 CHECKING THE TIGHTNESS AND SETTING

- 1) Very slowly open the on/off valve upstream from the regulator
- 2) Open a bleed cock the atmosphere downstream from the regulator to create a small gas flow.
- 3) Act on the pressurized chamber inlet valve until the desired set-point value is reached.
- 4) Close the bleed valve to the atmosphere.
- 5) Check the tightness of the regulator (internal tightness).
- 6) Using a foam solution or the like, check the tightness of the external surfaces of the regulator

7.2 START UP

Very slowly open the downstream valve and, if necessary, adjust the regulator setting by adjusting the pressure on the pressostatic chamber by means of the pressurized chamber inlet valve.



Pietro Fiorentini S.p.A.
via E.Fermi 8/10
I-36057 Arcugnano (VI) Italy

Tel. +39 0444 968.511
Fax. +39 0444 960.468

www.fiorentini.com

via Rosellini 1
I-20124 Milano
Italy

Tel. +39 02 696.14.21
Fax. +39 02 688.04.57

MT239-E September 2015