Pietro Fiorentini S.P.A.

PRESSURE REGULATOR

STAFLUX 187

TECHNICAL MANUAL

MT 110/I

INSTALLATION, COMMISSIONING AND MAINTENANCE INSTRUCTIONS

INDEX

ISSUE 07/03

1.0 INTRODUCTION

This manual aims at providing essential information for the installation, commissioning and maintenance of the pressure regulator Staflux 187.
Moreover, it is deemed suitable to describe in short herein the main features of the regulator.
Figure 1 contains a functional diagram of the regulator.

1.1 MAIN FEATURES

The pressure regulator is suitable for use with previously treated not aggressive gaseous fluids.
The main features of these regulators are:

- top-entry execution body suitable for flanged coupling;
- soft insert on the obturator for a better tightness;
- regulation range applicable without need of modifying any component;
- maximum upstream pressure Pe = 220 bar;
- possible regulation range Wh = 1-65 bar.

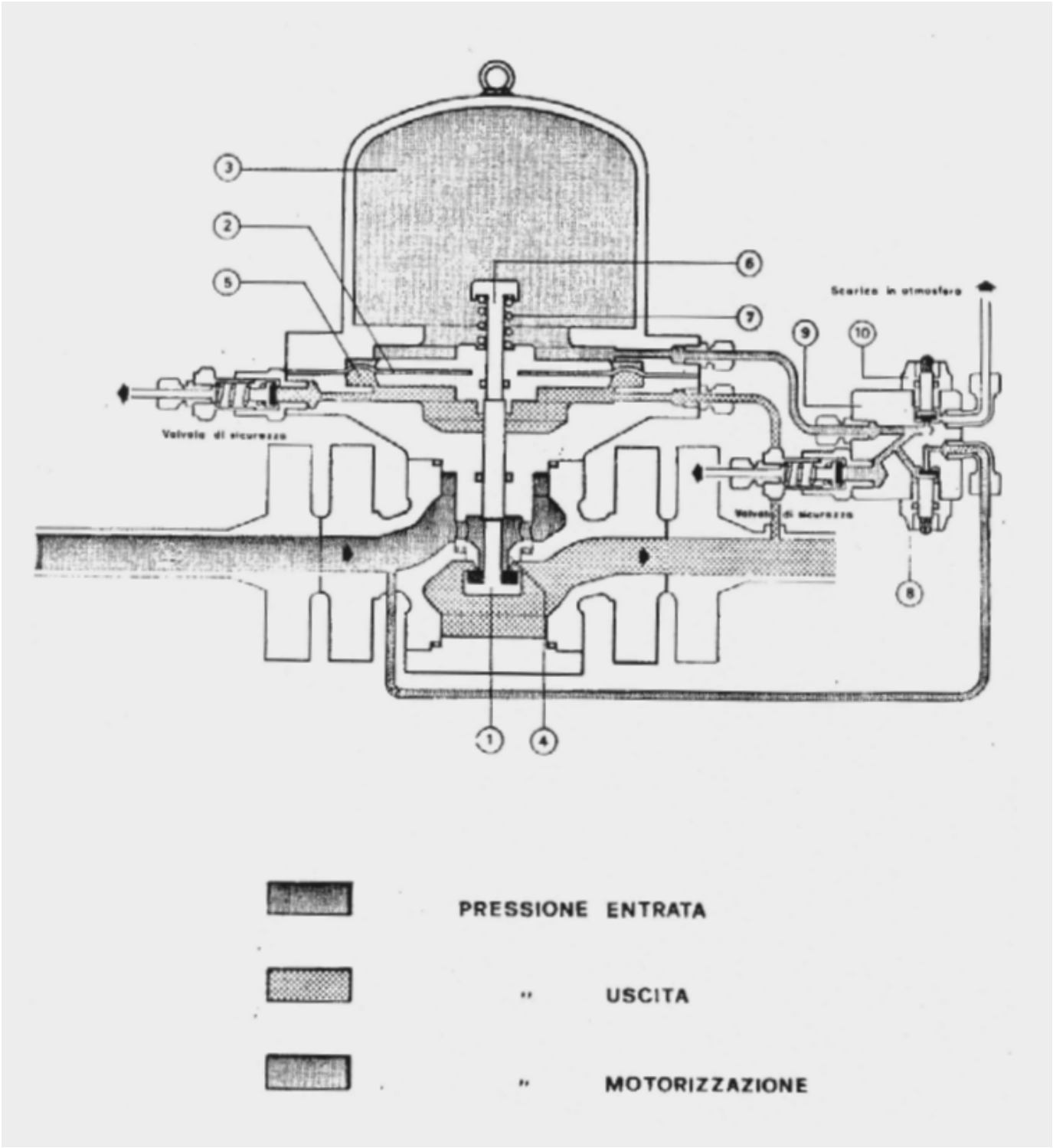

3
2
5
6
7
9
10
Scarico in atmosfera
Valvola di sicurezza
Valvola di sicurezza
8
1
4
PRESSIONE ENTRATA
" USCITA
" MOTORIZZAZIONE

Figure 1

1.2 OPERATION DESCRIPTION

Refer to figure 1.

The pressure regulator Staflux 187 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, 10);
- two relief valves on the chambers 3 and 5.

The regulator Staflux 187 is a direct action regulator with diaphragm control with "fail open" 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 downstream pressure, which through the sensing line, is contained in the chamber 5;
- On the upper side of the diaphragm: the pressure of the fluid contained in the hood 3 to which the weight of the moving equipment shall be added (diaphragm/ stem/obturator system).

If during operation, due to a reduction in the upstream pressure or due to an increase in the flow rate, a reduction in the downstream regulated pressure occurs, a pressured decrease will occur in the sub-diaphragm chamber 5 and, therefore, 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 or due to an increase in the upstream pressure, a pressure increase will occur in the sub-diaphragm chamber 5 and, consequently, 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 10 draining the chamber 3.
These two valves ease the calibration of the regulator (see chapter 3.0).
Both chamber 3 and chamber 5 are protected against any overpressure, each by means of a relief valve.
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. To limit the impact of such phenomenon, it is suggested to thermally insulate the upper hood of the regulator.

1.3 DIMENSIONING OF THE REGULATOR

The pressure regulator Staflux 187 is dimensioned using the formulas given here below:

a) under conditions of critical pressure regulation, i.e. Pe > = 2 x Pa

Q = 0.526 x Cg x Pe

b) under conditions of non critical pressure regulation, i.e. Pe < 2 x Pa

$$Q = 0.526 \times Cg \times \text{sen}\left[106.78 \times \sqrt{\frac{Pe - 1}{Pe}}\right]$$

where:
Q = flow rate in Smc/h
Cg = valve gas coefficient = 130
P_e = upstream pressure in bar absolute
Pa = downstream pressure in bar absolute
The argument of sen is to be meant in Deg.

The above mentioned formulas are valid for natural gas having a relative density with reference to air equal to 0.61.
For gases having a different relative density S, it is necessary to multiply the flow rate value by the correction coefficient

$$K = \sqrt{\frac{0.61}{S}}$$

2. INSTALLATION

2.1 GENERAL WARNINGS

Before performing the installation, commissioning or maintenance, the operators shall:

- go through the safety provisions applicable for the installation they have to perform;
- obtain the necessary authorizations to operate, when required;
- be equipped with the necessary personal protective equipment (helmet, goggles, etc.);
- make sure that the area in which they have to operate is equipped with the forecast collective protective equipment and with the necessary safety sings.

The handling of the equipment and of its components shall be performed after having verified that the lifting means are suitable for the loads to be lifted (lifting capacity and functionality). The handling of the equipment shall be performed using the lifting points forecast on the equipment itself.
The used of motorized means is reserved to personnel in charge of such operation.

Should the installation of the equipment or of its accessories require the application of compression fittings, these have to be installed following the instructions of the fittings manufacturer. The selection of the fittings shall be

compatible with the use specified for the equipment and with the plant specifications, if any.

Commissioning shall be performed by duly trained personnel:
During commissioning, not strictly necessary personnel shall be kept away and the area shall be duly marked (signs, barriers, etc.) to prevent access by unauthorized people.

2.2 GENERAL PROVISIONS

Valve installation shall occur in compliance with the provisions (laws or regulations) in force in the place of installation.
In detail, natural gas plant shall show features in compliance with the law or regulation provisions in force in the place of installation or, at least, in compliance with the EN 12186 or EN12279 standards. (It shall be underlined that installation in compliance with such standards minimizes the risk of fire hazard).
The regulator shall be installed making sure that the operating pressure of the equipment where it is installed does not exceed the allowable maximum pressure value (PS) for each of its parts (see chapter 2.4).
Moreover, the user shall provide the plant with suitable relief or drainage systems in order to discharge the pressure and fluid contained in the plant before performing any inspection and maintenance procedure.

This valve is designed in order to be connected according to ASME B16.5, UNC bolt and nut. This Standard covers dimensional requirements and recommendations regarding flange bolting. As example, for Staflux 187, bolt is 7/8” and nut is 1” and 5/16” (ca. 33,3mm), nut thickness ¾” (ca. 19mm). Nut M24 is 36mm with thickness 19mm.

2.3 SPECIFIC PROVISIONS

Before installing the regulator, it is necessary to verify that:

- the regulator can be inserted in the forecast space and it can be accessed quite easily to perform the following maintenance operations. Figure 2 provides information concerning dimensions and weights;
- upstream and downstream piping are on the same level of the inlet and outlet connections and can bear the weight of the valve;
- the inlet/outlet flanges of the piping are parallel to the valve tightness surfaces;
- the inner part of the regulator is clean and this latter was not damaged during transport;
- the upstream piping was cleaned to remove any residual impurities such as welding scraps, sand, paint residues, water, etc.

Install the regulator considering that the flow direction is compulsory and indicated by an arrow on the body of the valve itself.

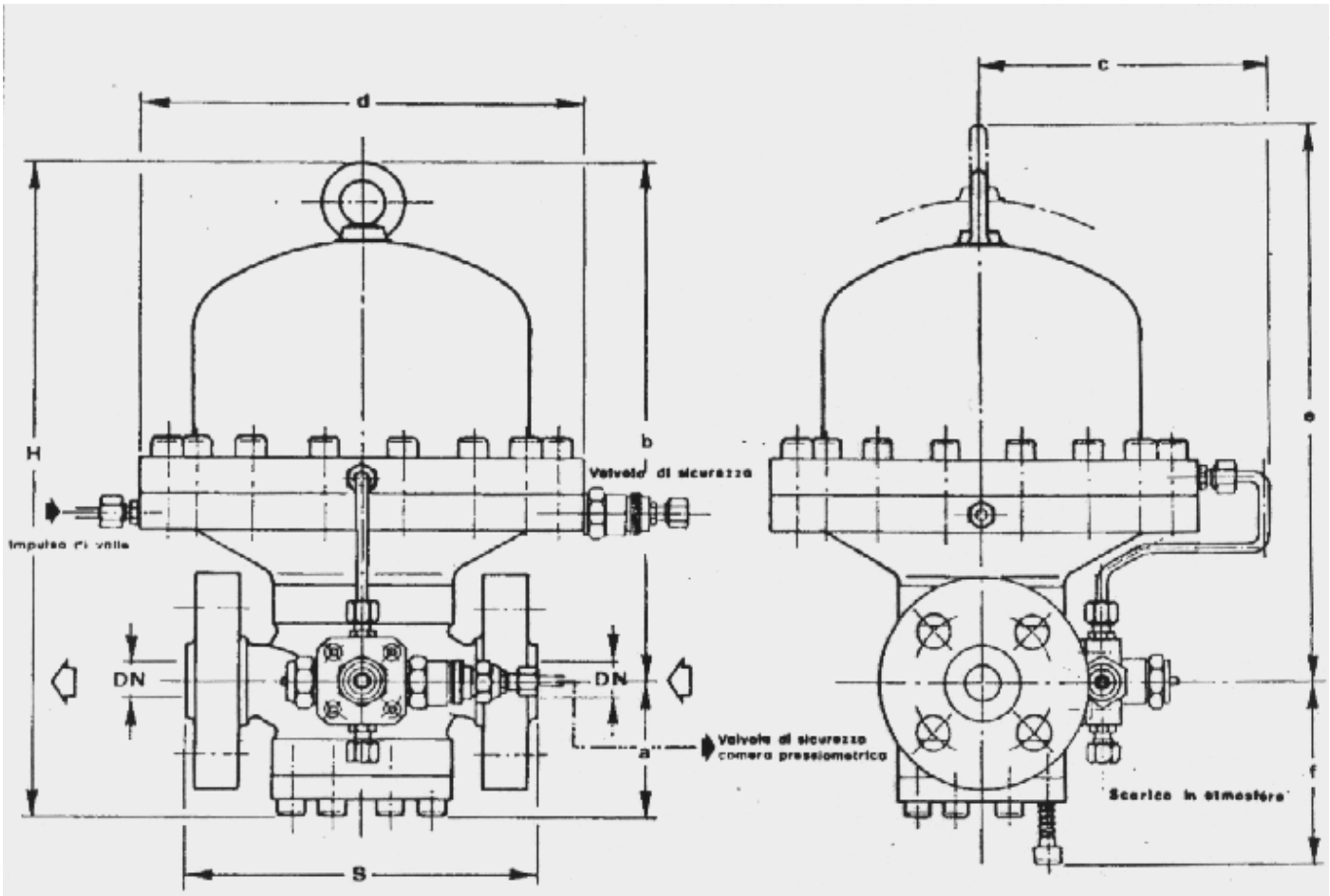
For installation, refer to figure 3.

To obtain a good regulation, it is essential that the sensing line connected to the piping downstream of the regulator is tightened to a straight segment of the piping, having a constant diameter for a segment length equal to 4 diameters upstream of the fitting and 2 diameters downstream.

As highlighted by figure 4, the fitting for the sensing line shall be installed on the upper part of the pipe to prevent deposits of condensates or impurities from affecting the regulation of the downstream pressure.

The regulator sensing line has to be connected using compression fittings, according to the plant specifications.

The connections to the inlet and outlet piping are performed using standardized flanges whose dimensions and types are indicated on the rating plate (see chapter 2.4); the selection of the connection screws and of the sealing gaskets shall be performed by the installer considering such information and the use conditions available in the place of installation.



ANSI 1500	DN
	1"
a	105
b	350
c	200
d	280
e	455
f	135
H	455
S	235

tabella dimensioni di ingombro

ANSI 1500	53

peso in Kg.

Figure 2

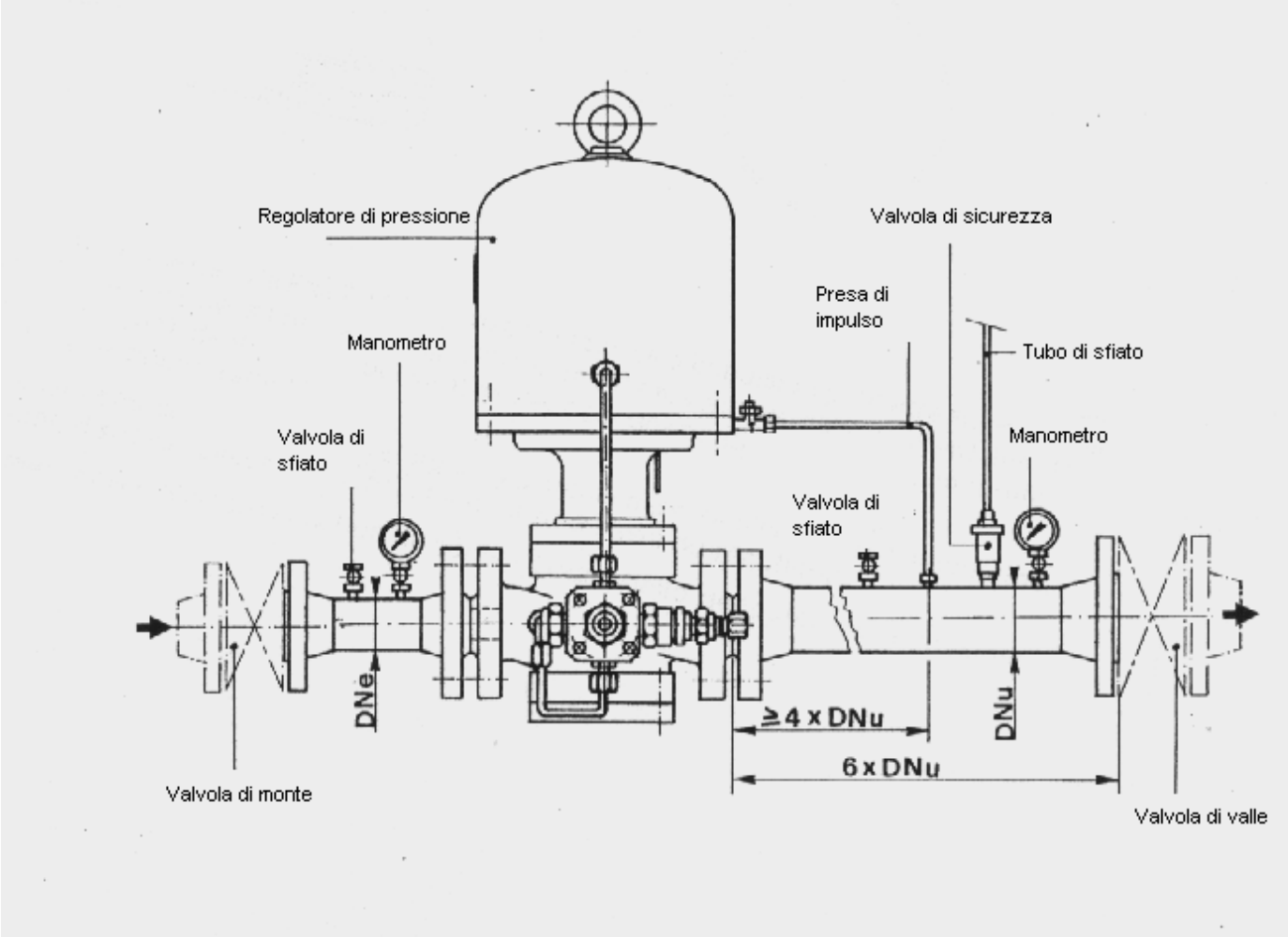


Figure 3

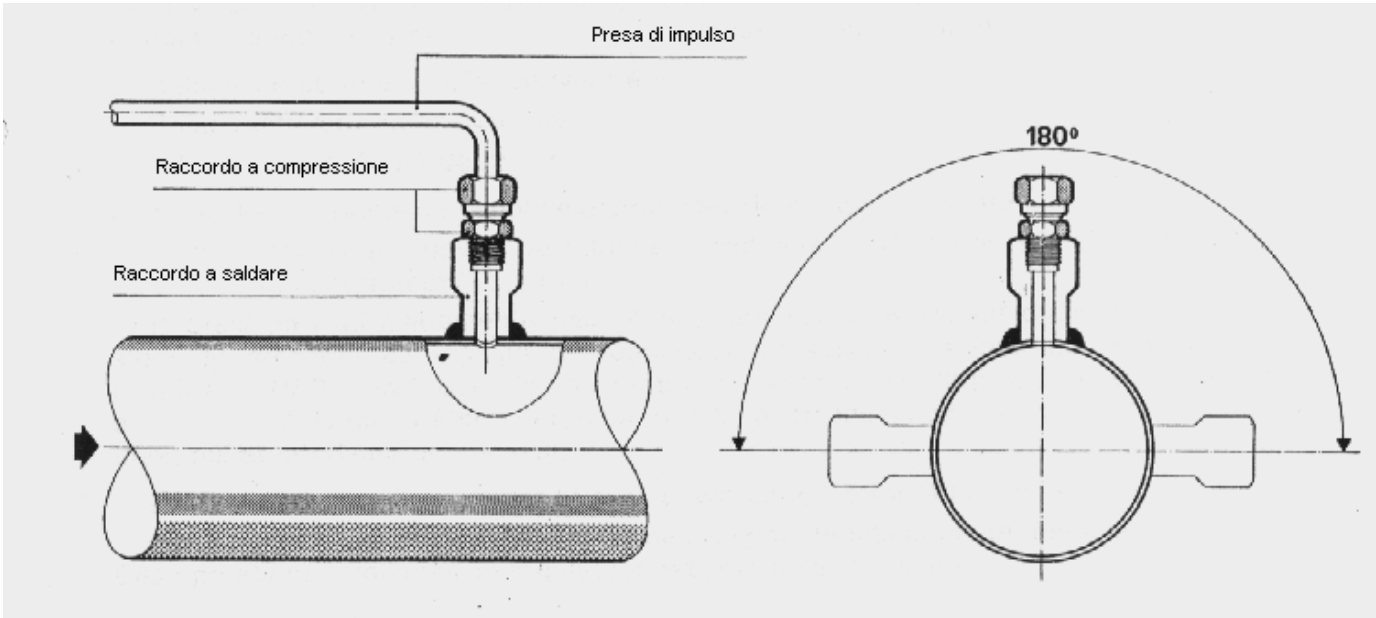


Figure 4

2.4 USE CONDITIONS

Before commissioning, it is recommended to verify that the use conditions do comply with the equipment features.

Such features are given on the rating plates with which each regulator is equipped (figure 5).

Figure 5

The meaning of the symbols given on the rating plate is explained here below:

Regulator	Regulator model
Cg	Flow rate coefficient (if any)
S.n.	Serial number
PS	Maximum pressure allowable
DN	Regulator nominal diameter
Flanges	Type of flanges

T	Allowed operating temperature
Wh	Possible calibration pressure range
Wa	Specific calibration pressure range for the inserted spring
Date	Final testing date
bpe	Inlet pressure range
Pemax	Maximum inlet pressure
AC	Accuracy class
SG	Lock-up pressure class
Fluid	Type of fluid allowed

In detail, attention shall focus on the following features:

- Maximum pressure allowable PS.

Please note that the pressure reduction unit has two main chambers (body and head) having different values for the maximum pressure allowable.

- Design temperature T (the minimum and maximum value are given).
- The class of the inlet and outlet connections.

Moreover, the user shall verify that the materials used and the surface treatments possibly applied are compatible with the forecast destination of use.

Considering the geometrical features of the regulator, during design stresses due to traffic, wind, or seismic events were not taken into consideration. As a consequence, the user shall take all suitable precautions to limit the effect of such events on the assembly, when the occurrence of the same is forecast.

3.0 COMMISSIONING

3.1 PRESSURIZATION

After installation, verify that the connections to the line are properly performed and that any relief and discharge points present on the plant are closed.

Before performing the commissioning of the regulator, it is necessary to verify that the air used during the tests in the factory has been emptied from the hood upper chamber.

After such checks, proceed as follows:

- Slowly open the on/off valve placed upstream of the regulator in order to assure a small gas flow rate passing through the relief valve positioned downstream of the regulator. The regulator, which just before pressurization is in opening position due only to the weight of the moving equipment, tends to close itself, because there is an initial feeding of gas from the seat (4) taking the part downstream and, consequently, the chamber (5) under pressure.
- Once this first step is completed, it is possible to slowly open the inlet valve (8), which feeds gas into the chamber (3). In this way, balance among the forces acting on the moving equipment is reached and when such balance is exceeded the obturator opens letting the gas flow downstream. Balance is restored by means of the sensing line connecting the chamber (5) with the downstream piping.
- This process continues until the wished calibration value is reached downstream. At this point, the inlet valve and the relief valve positioned downstream of the regulator close and, therefore, it is possible to begin to open the downstream valve.

  Any correction to the calibration can be performed by feeding gas into the static chamber through the valve (8) to increase the calibration value or discharging it through the valve (10) to reduce the calibration value (see figure 6).

  During commissioning, it is necessary to check on the pressure gauge positioned downstream of the regulator that the pressure increases slowly. Pressure shall stabilize on the calibration value or a slightly higher value, even if the upstream pressure value increases. If the downstream pressure does not stabilize on the

wished value, it is necessary to interrupt the commissioning closing the on/off valve positioned upstream of the regulator.

If, for any anomaly whatsoever, the pressure reduction unit remains in opening position and the pressure of the chamber (5) increases beyond the preset value, there is a system protecting the diaphragm (2) that allows it to lean on its stroke end seat avoiding its breaking. The diaphragm (2) assembly and the stem (6) can, in fact, slide with reference to one another to the closing position winning over the pre-loading force of the spring (7) when there is a given overpressure value in the chamber (5). A similar diaphragm stroke end system acts also in the opposite direction; therefore, the diaphragm is protected also when there is pressure in the chamber (3) and the chamber (5) is discharged.

The chamber (3) and the chamber (5) are protected against any overpressure, each by means of an adjustable relief valve (valve VF/SI) (see figure 6); these valves are already installed in the factory.
However, the user shall verify that the installation is such that the maximum allowable pressure of each regulator part is never exceeded.

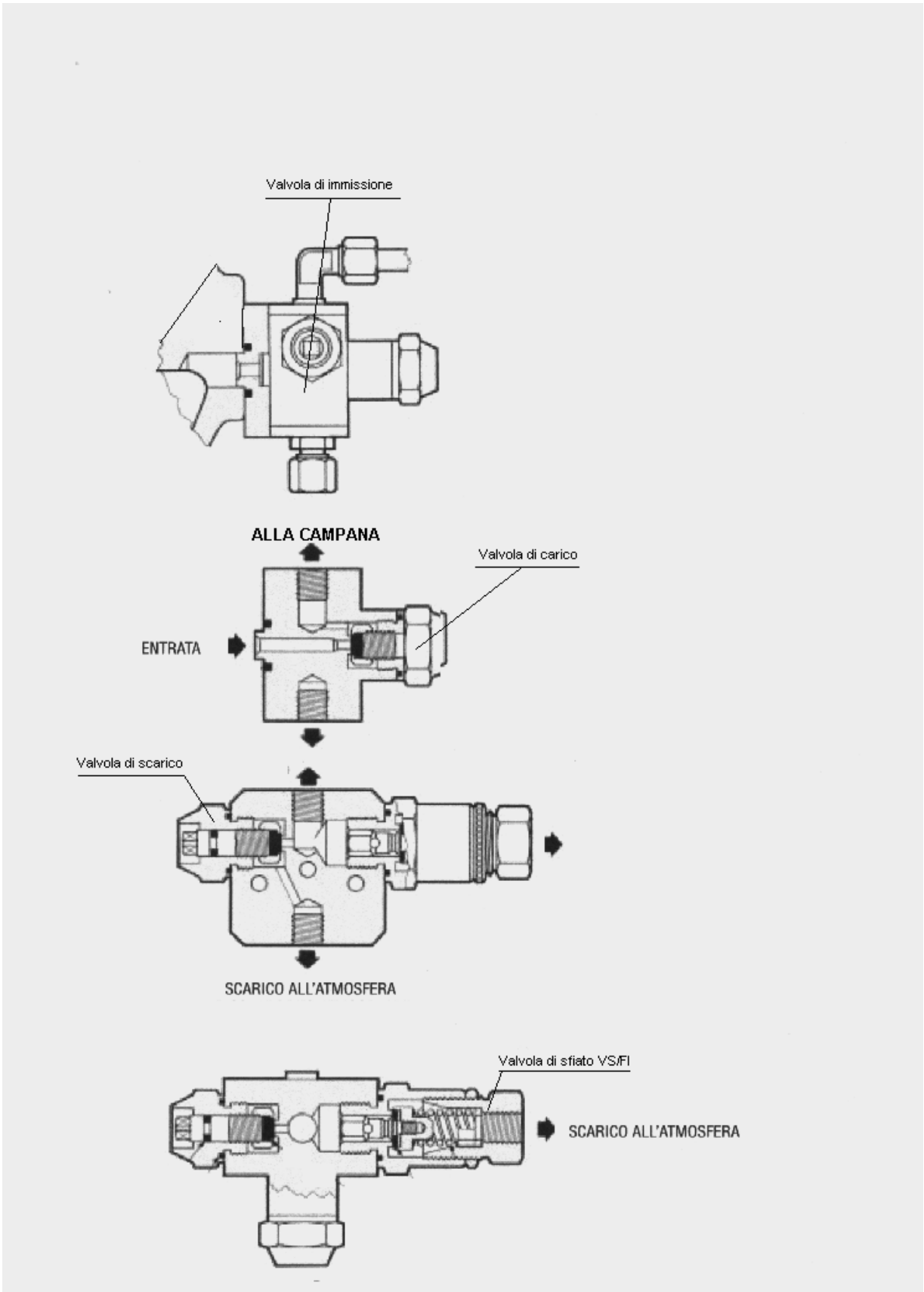

Valvola di immissione
ALLA CAMPANA
Valvola di carico
ENTRATA
Valvola di scarico
SCARICO ALL'ATMOSFERA
Valvola di sfiato VS/FI
SCARICO ALL'ATMOSFERA

Figure 6

3.2 EXTERNAL TIGHTNESS CHECK

The tightness test of the regulator connections to the plant has to be carried out according to the procedures in force in the place installation.
External tightness is assured when, by applying a foamy substance on the element under pressure, not any bubbles are formed.

3.3 INTERNAL TIGHTNESS CHECK

The internal tightness of the regulator can be verified by placing the same in completely closed position (zero flow rate), keeping the regulator upstream pressure in line and verifying that downstream of the regulator not any pressure increase occurs.

4.0 MAINTENANCE

4.1 GENERAL REMARKS

Inspection and maintenance interventions are strictly linked to the type of installation. Therefore, it is always advisable to carry out a preventive maintenance whose performance frequency, when not set forth by regulations, shall occur in compliance with:

- the quality of the conveyed fluid;
- the cleaning and preservation status of the piping making up the plant; in general, after the first start of the plants, more frequent maintenance interventions are required due to the uncertain cleaning status of the piping internal part.

Periodical inspections involve also the status of the external surfaces of the regulator. In detail, surface protections (usually painting) shall be restored, when deteriorated.

Before performing any intervention, make sure that the plant segment where the intervention has to be performed has been cut off both upstream and downstream, as well as that pressure has been discharged from the involved piping segment.
Moreover, make sure to have a series of suggested spare parts available. Spare parts shall be original spare parts by Pietro Fiorentini Spa.
NB. The use of not original spare parts relieves the manufacturer of any responsibility.

4.2 DISASSEMBLY

For the disassembly, not any special wrenches are required.
Before disassembly, perform reference marks on the elements making up the regulator.
Pay utmost care not to damage the gasket seats and the housing of the O-rings.

Examine the status of all rubber parts involved in assuring the tightness and replace the damaged ones or those being used for long time. Lubricate the surfaces of moving elements with a thin layer of grease as indicated under chapter 5.

Refer to the spare parts list "SR 149-a".

4.3 REASSEMBLY

Re-assemble the parts making use of the references marked on the parts during disassembly in order to allow all connections to correspond properly.

5.0 LUBRICATION

The regulators are already lubricated during assembly (with the most suitable product for the use stated in the order) for the following reasons:
1) To ease the assembly of the components
2) To improve maneuverability

3) To ease equipment preservation in case of warehouse storage

During normal operation, it is not necessary to lubricate the regulator.

When performing maintenance procedures, it is recommended to lubricate moving parts (stem, etc.) and gaskets with silicone oil.

6.0 STORAGE

The regulators do not require taking any special precautions in case of storage for an extended period of time. However, it is recommended to pay attention to the following:

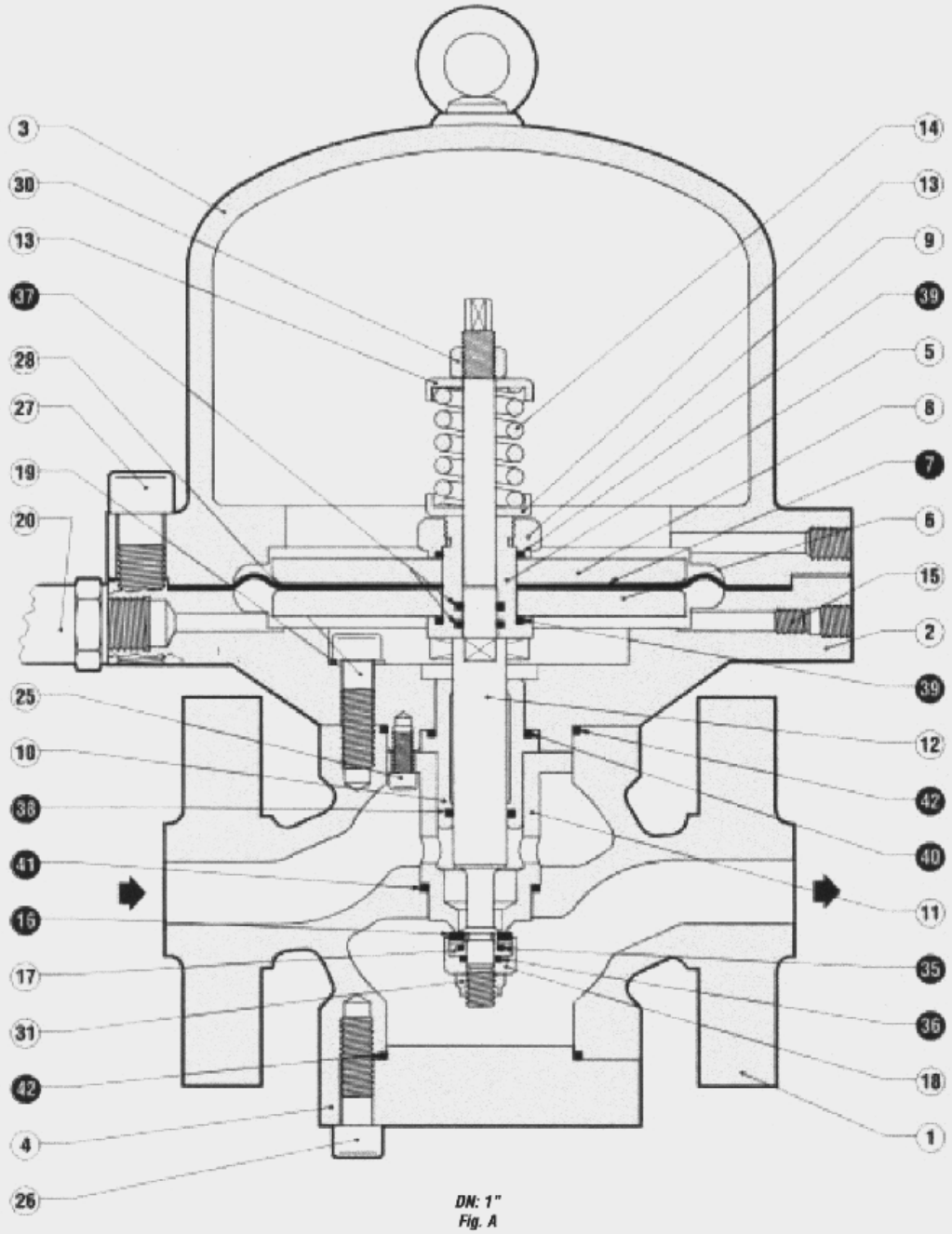
- keep the regulators in their original packages;
- keep the protections applied on the flanged connections in the factory;
- keep rubber parts away from exposure to direct sunlight in order to avoid their fast ageing;

7.0 SPARE PARTS

To identify the spare parts, refer to the spare part list "SR 149-a".

REGOLATORE DI PRESSIONE - *PRESSURE REGULATOR*
GAS-DRUCKREGELGERÄT - *DETENDEUR DE PRESSION*
REGULADOR DE PRESION - *REGULADOR DE PRESSÃO*

STAFLUX 187



DN: 1"
Fig. A

Lista delle parti di ricambio consigliate / *List of recommended spares*
Liste der empfohlenen Ersatzteile / *Liste des pièces de rechange conseillées*
Lista de repuestos aconsejados / *Lista das peças aconselhadas*

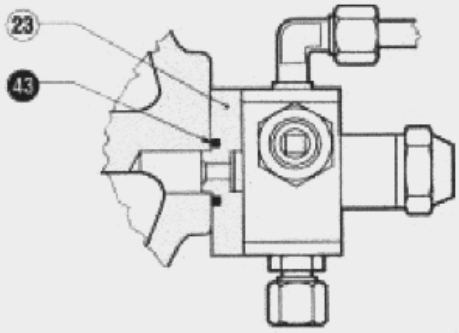


Fig. B

POS. / *ITEM* / POS. / *REP.* / POS. / *POS.*	DESCRIZIONE / *DESCRIPTION* / BESCHREIBUNG / *DESIGNATION* / DESCRIPCION / *DESCRIÇÃO*	N. PEZZI - *QTY* / MENGE - *Q.TÉ DE PIÈCES* / CANTIDAD PIEZAS - *N. PEÇAS* DN: 1"
7	Membrana / *Diaphragm* / Membrane / *Membrane* / Membrana / *Membrana*	1
16	Guarnizione armata / *Reinforced gasket* / Ventilsitzabdichtung / *Garniture du clapet armée* / Junta armada / *Guarnição armada*	1

POS. / *ITEM* / POS. / *REP.* / POS. / *POS.*	DESCRIZIONE / *DESCRIPTION* / BESCHREIBUNG / *DESIGNATION* / DESCRIPCION / *DESCRIÇÃO*	N. PEZZI - *QTY* / MENGE - *Q.TÉ DE PIÈCES* / CANTIDAD PIEZAS - *N. PEÇAS* DN: 1"
35	O. Ring	1
36	O. Ring	1
37	O. Ring	2
38	O. Ring	1
39	O. Ring	2
40	O. Ring	1
41	O. Ring	1
42	O. Ring	2
43	O. Ring	1

VALVOLA DI IMMISSIONE CAMERA PRESSURIZZATA / *PRESSURIZED CHAMBER INLET VALVE*
DRUCKKAMMER-EINLASSVENTIL / *VANNE D'ARRIVEE CHAMBRE PRESSURISEE*
VÁLVULA DE ADMISIÓN CÁMARA PRESURIZADA / *VÁLVULA DE IMISSÃO CÂMARA PRESSURIZADA*

CAMERA PRESSURIZZATA/*PRESSURIZED CHAMBER*/DRUCKKAMMER
CHAMBRE PRESSURISEE/CÁMARA PRESURIZADA/*CÂMARA PRESSURIZADA*

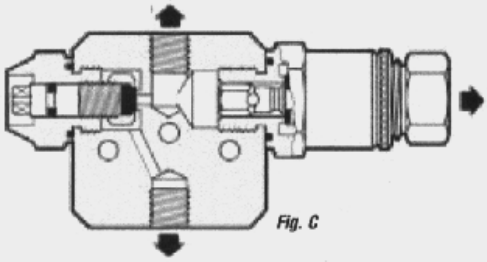


Fig. C

SCARICO ALL'ATMOSFERA
DISCHARGE TO ATMOSPHERE
ATMUNGSÖFFNUNG
EVACUATION A L'ATMOSPHERE
DESCARGA A LA ATMÓSFERA
DESCARGA ATMOSFERA

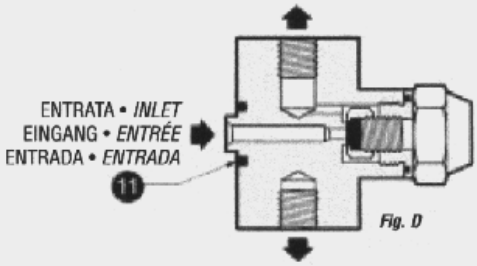


Fig. D

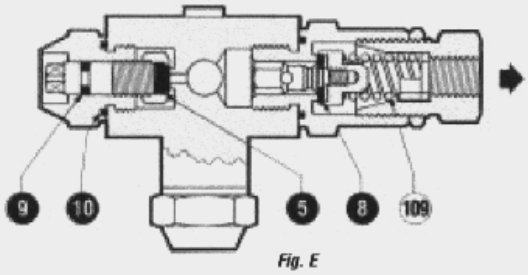


Fig. E

Lista delle parti di ricambio consigliate / *List of recommanded spares*
Liste der empfohlenen Ersatzteile / *Liste des pièces de rechange conseillées*
Lista de repuestos aconsejados / *Lista das peças aconselhadas*

MOLLA
SPRING
FEDER
RESSORT
MUELLE
MOLA
Lo= 35

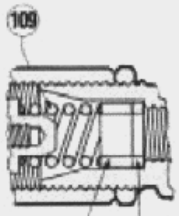


Fig. F

cod. 7535031 (B) (A) cod. 7522004

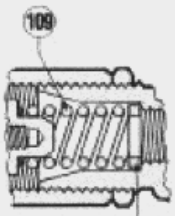


Fig. G

(A) cod. 7522004

MOLLA
SPRING
FEDER
RESSORT
MUELLE
MOLA
Lo= 40

MOLLA / *SPRING* / FEDER / *RESSORT* / MUELLE / *MOLA* (109)

CARATTERISTICHE DELLA MOLLA *SPRING CHARACTERISTICS* FEDERMERKMALE *CARACTÉRISTIQUES DU RESSORT* CARACTERISTICAS DEL MUELLE *CARACTERÍSTICAS DA MOLA*								Campo di pressione regolata in bar - Valvola di sicurezza camera pressurizzata *Outlet pressure range in bar - Pressurized chamber safety valve* Ausgangsdruckbereich in bar - Sicherheitsabsperrventil mit Druckkammer *Plage de pression regulée en bar - Vanne de sécurité chambre pressurisée* Campo de presión regulada en bar - Válvula de seguridad cámara presurizada *Campo de pressão regulada em bar - Válvula de segurança câmara pressurizada*
Pos.	**N. codice/*Code* Ident Nr/*Code* Código/*Código***	**De**	**Lo**	**d**	**i**	**it**	**Colore/*Colour* Farbe/*Couleur* Color/*Cor***	
1	2700320	15	35	1,3	5,75	7,75	Bianco/*White*/Weiss/*Blanc*/Blanco/*Branco*	1,3 ÷ 2
2	2700370			1,5	5,75	7,75	Arancio/*Orange*/Orange/*Orange*/Naranja/*Laranja*	1,9 ÷ 3,15
3	2700463			1,7	5,5	7,5	Verde/*Green*/Grün/*Vert*/Verde/*Verde*	3,1 ÷ 6,3
4	2700510		40	2	5,25	7,25	Rosso/*Red*/Rot/*Rouge*/Rojo/*Vermelho*	6,2 ÷ 12,7
5	2700750			2,5	6,25	8,25	Nero/*Black*/Schwarz/*Noir*/Negro/*Preto*	12 ÷ 19,5
6	2700985			3	6,5	8,5	Giallo/*Yellow*/Gelb/*Jaune*/Amarillo/*Amarelo*	19 ÷ 33
7	2701182			3,5	6	8	Blu/*Blue*/Dunkelblau/*Bleau*/Azul/*Azul*	32 ÷ 72

De= diametro esterno/*external diameter*
Außendurchmesser/*ø extérieur*
diámetro exterior/*ø externo*

d= diametro filo/*wire diameter*
Drahtdurchmesser/*ø fil*
ø hilo/*ø fio*

i= spire utili/*active coils*
Arbeitswindungen/*nbre uti de spires*
c. espiras útiles/*n° espiras úteis*

it= spire totali/*total coils*
Gesamtwindungen/*nbre total de spires*
c. espiras totales/*n° total das espiras*

Lo= lunghezza molla libera/ *free spring length*
Federlänge/*Longueur du ressort libre*
Largo muelle libre/*Comprimento da mola livre*

POS. / *ITEM* / POS. / *REF.* / POS. / *POS.*	DESCRIZIONE / *DESCRIPTION* / BESCHREIBUNG / *DESIGNATION* / DESCRIPCION / *DESCRIÇÃO*	N. PEZZI - *QTY* / MENGE - *Q.TÉ DE PIÈCES* / CANTIDAD PIEZAS - *N. PEÇAS*
5	Pastiglia / *Gasket* Dichtung / *Garniture* Junta / *Munta*	2
8	Pastiglia valvola sicurezza / *Safety valve reinforced gasket* Dichtungspackung Sicherheitsabsperrventil / *Garniture vanne de sécurité* Junta válvula de seguridad / *Pastilha válvula de segurança*	1
9	O. Ring	2
10	O. Ring	2
11	O. Ring	1

Per l'ordinazione precisare / *When ordering spare parts, please specify*
Notwendige Angaben bei der Bestellung von Ersatzteilen / *Pour commander des pièces de rachange, préciser*
Para cursar el pedido de las piezas de recambio, hay que indicar / *Para o pedido de peças de reposição indicar:*

- **Tipo** di regolatore / *Regulator* ***type***
  Reglertyp / ***Type*** *de détendeur*
  Tipo de regulador / ***Tipo*** *de regulador*
- **Pe** (Pressione di entrata) / ***Pe*** *(Inlet pressure)*
  Pe (Eingangsdruck) / ***Pe*** *(Pression entrée)*
  Pe (Presión de entrada) / ***Pe*** *(Pressão de entrada)*
- **Pa** (Pressione di uscita) / ***Pa*** *(Outlet pressure)*
  Pa (Ausgangsdruck) / ***Pa*** *(Pression sortie)*
  Pa (Presión de salida) / ***Pe*** *(Pressão da saída)*
- **N. di fabbrica** (Matricola) / ***Works no.*** *(Serial no.)*
  Fabrikationsnummer / ***Numéro de série*** *(Matricule)*
  N. de Fabricación (Fabricación) / ***N° de Fábrica*** *(Mátricula)*
- **Tipo di fluido** impiegato / ***Fluid type*** *used*
  Medium / ***Type de fluide*** *employé*
  Tipo de fluido empleado / ***Tipo de fluido*** *utilizado*
- **Anno costruzione** / ***Year of manufacture***
  Baujahr / ***Année de fabrication***
  Año de fabricación / ***Ano de construção***
- **Il n. del particolare** (posizione) / ***The no. of the part*** *(position no.)*
  Positionsnummer (lt. Ersatzteilliste) / ***N° de la pièce*** *(position)*
  El n. de la pieza (posición) / ***N° do particular*** *(posição)*
- **Quantità** desiderata / ***Quantity*** *desired*
  Menge / ***Quantité*** *souhaitée*
  Cantidad deseada / ***Quantidade*** *desejada*

Indirizzando a: **Pietro Fiorentini S.p.A.**
Address **Servizio Assistenza tecnica e ricambi**
Senden an **Via A. Fermi, 8/10 - I-36057 ARCUGNANO (Vicenza) - Italy**
Envoyer à **Tel. +39 0444 968521-968511 (10 linee selez. pass.) - Telefax +39 0444 960468**
Dirigirlo a **Internet: http://www.fiorentini.com**
Destinação **E-mail:service@fiorentini.com**

I ricambi vengono forniti in scatole di cartone per preservarli dagli effetti deleteri della luce. Consigliamo di conservarli lontani da fonti di calore.
Parts are packed and delivered in cardboard boxes to protect them against harmful light effects. Storage away from heat sources is recommended.
Ersatzteile werden in Kartonschachteln geliefert, um sie vor Licht zu schützen. Wir empfehlen, sie fern von Heizquellen zu lagern.
Les pièces sont fournies dans des boîtes en carton pour les protéger de la lumière. Nous conseillons de les conserver à l'abri des sources de chaleur.
Los recambios se entregan en cajas de cartón para protegerlos contra los efectos deletéreos de la luz. Aconsejamos mantenerlos alejados de las fuentes de calor.
As peças são fornecidas em caixas de papelão para conservar-las dos efeitos danosos da luz. Aconselhamos de conservar-las distante das fontes de calor.