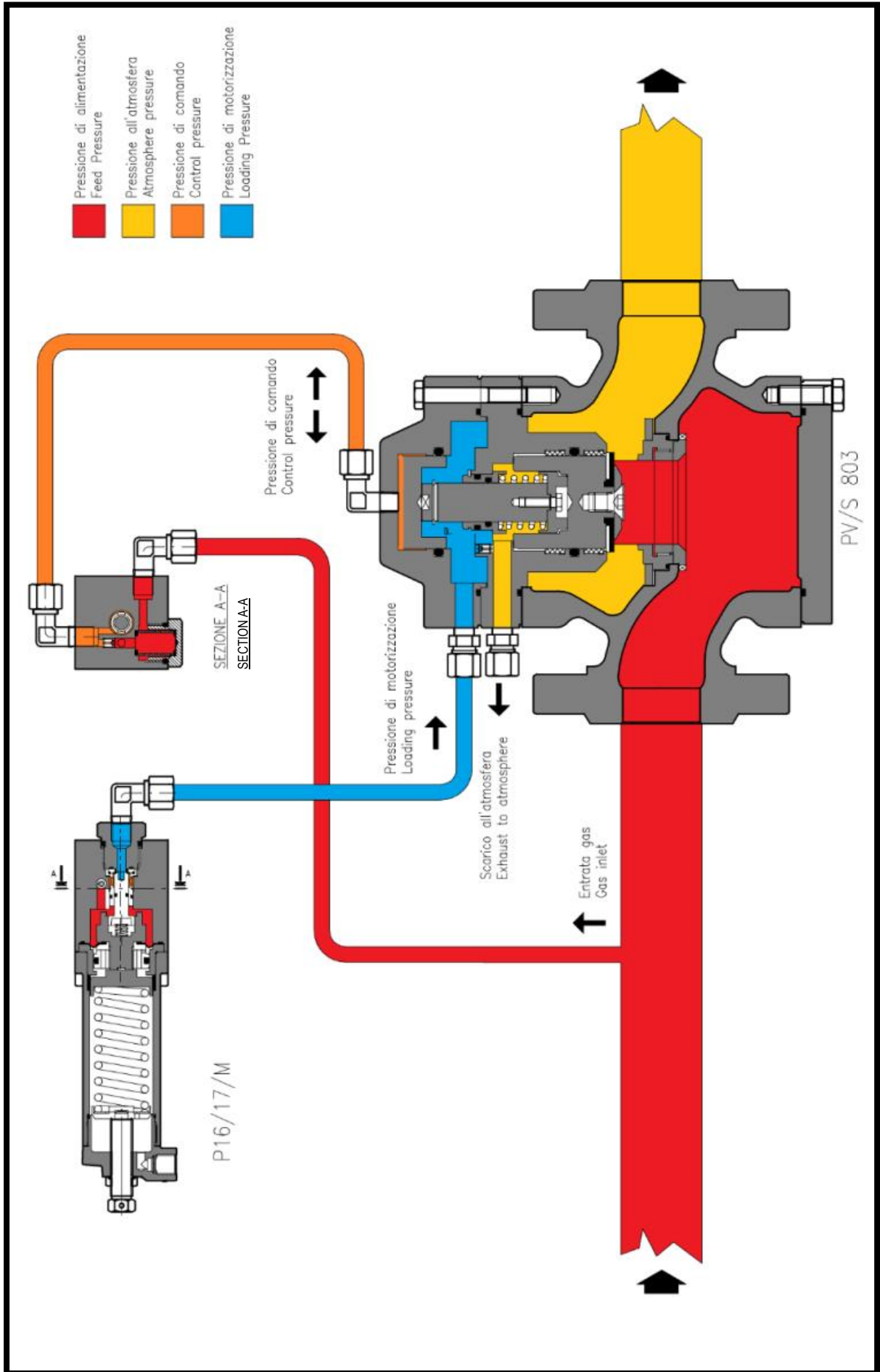


# SAFETY VALVE PV/S 803



## TECHNICAL

INSTRUCTIONS FOR INSTALLATION,  
COMMISSIONING AND  
MAINTENANCE



## WARNINGS

### GENERAL WARNINGS

The equipment described in this manual is a device subject to pressure installed in pressurized systems.

The equipment in question is normally installed in systems which transport flammable gases (for example natural gas).

### WARNINGS FOR OPERATORS

Before installation, commissioning or maintenance, operators must:

- take note of the safety regulations applicable to the installation in which they must work;
- obtain the necessary permits to operate when required;
- acquire the necessary personal protective equipment (helmet, goggles, etc.);
- ensure that the area in which they operate is equipped with the required collective protection and the necessary safety information.

### PACKAGING

The packaging for transporting the equipment and related spare parts have been specifically designed and manufactured in order to prevent damage during normal transportation, storage and handling activities. Therefore the equipment and spare parts must be kept in their respective original packaging until their installation in the final site. On opening the packaging, the condition of the materials contained within should be checked. In the event of damage, report the damage to the supplier keeping the original packaging for inspection.

### HANDLING

The equipment and its components must be handled after ensuring that the lifting means are adequate for the loads to be lifted (lifting capacity and functionality).

The equipment must be handled, when required, using the lifting points provided on the equipment itself. The use of motorized means is reserved for those in charge.

## INSTALLATION

The installation of the valve must comply with the regulations (laws or standards) in force in the place of installation.

In particular, systems for natural gas must possess characteristics in accordance with the legal requirements or regulations in force at the installation site or at least in accordance with EN 12186 or EN 12279; in particular paragraphs 6.2, 7.5.2, 7.7 and 9.3 of EN 12186 and 6.2, 7.4, 7.6 and 9.3 of EN 12279 must be adhered to. Installation in accordance with these standards minimizes the risk of a fire hazard and the formation of potentially explosive atmospheres.

The equipment is without internal pressure limiting devices. Therefore, it must be installed making sure that the operating pressure of the unit on which it is installed never exceeds the maximum permissible pressure value (PS).

The user should therefore provide, when it is deemed necessary, for the installation on all adequate pressure limiting systems. He must also set up the system with appropriate ventilation or drainage systems in order to discharge the pressure and the fluid contained in the system before carrying out any inspection and maintenance activities.

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

## COMMISSIONING

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

During the commissioning activities, personnel which are not strictly necessary must be kept at a distance and the forbidden area must be suitably marked (signs, barriers, etc.).

Make sure that the equipment settings are those requested; if necessary, reset them to the required values in accordance with the procedures indicated in this manual.

During commissioning the risks associated with any release to the atmosphere of flammable or noxious gases must be evaluated.

For installation on distribution networks for natural gas you must consider the risk of formation of explosive mixtures (gas / air) inside the pipelines.

## COMPLIANCE WITH DIRECTIVE 97/23 / EC (PED)

The **PVS 803** valve is classified as a pressure accessory according to Directive 97/23/EC (PED).

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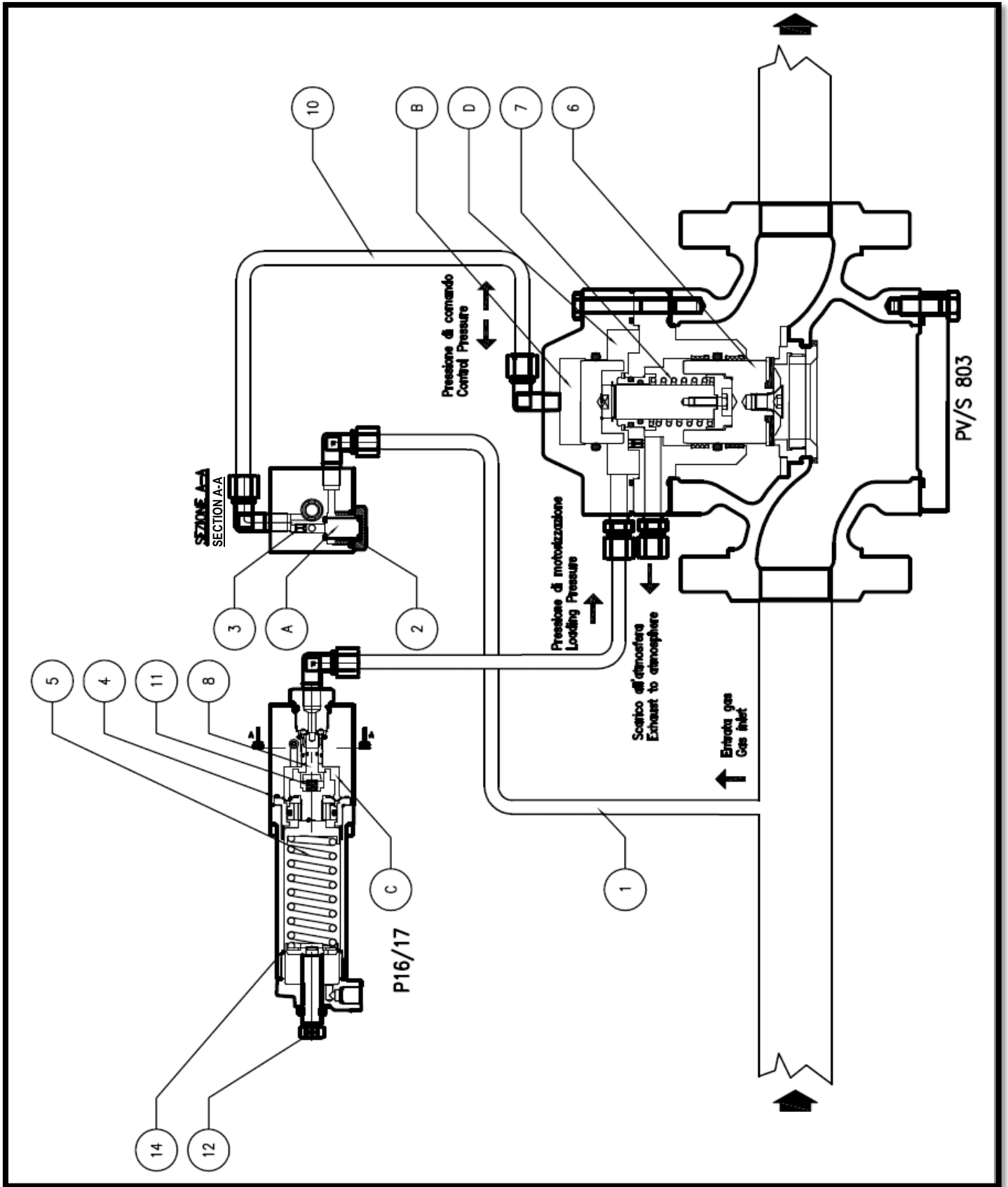


Figure 1

# 1.0 INTRODUCTION

The purpose of this manual is to provide essential information for the installation, commissioning, disassembly, re-assembly and maintenance of the safety valves model **PVS 803**. It is also considered appropriate to provide a brief illustration of the main features of the valves. In figure 1 a functional diagram of the valve is shown.

## 1.1 MAIN FEATURES

The **PVS 803** valves are safety devices suitable for use with previously filtered, non-aggressive gaseous fluids. Such valves may be installed either on ducts or on pressure vessels. The main features of these valves are:

- Body in top-entry execution suitable for flanged coupling;
- Soft insert on the seat for a better seal

## 1.2 CONTROL OF THE VALVE

The PVS 803 valve is a piloted valve therefore the opening and closing operations of the valve are controlled by a pilot device:

- Pilot P16/M cut-out range 1.5 to 40 bar
- Pilot P17/M cut-out range 41-74 bar

## 1.3 DESCRIPTION OF OPERATION

Refer to figure 1.  
 Under normal conditions the feed pressure, that is, the inlet pressure of the valve, arrives via the connecting tube (1) and the filter (2) to the chamber (C) of the pilot and, through the nozzle (3), to the main chamber (B) of the valve.  
 On the membrane (4) of the pilot, the feed pressure acts from one side, and the load of the adjustment spring (5) acts from the other; on the main valve shutter (6) the feed pressure in the chamber (B) and the position spring (7) act from one side; from the other side the same feed pressure but applied on a lower section. Therefore, unlike what takes place in traditional spring-loaded safety valves, when the feed pressure comes close to the calibration pressure, the valve ensures a perfect seal even at values which are very close to the cut-out ones.  
 As long as the feed pressure remains lower than the calibration value, the action of the spring (5) prevails over that of the fluid pressures on the membrane (4) and the pilot shutter (8) keeps the passage of the control pressure closed, corresponding in this condition to the atmospheric pressure.  
 When on the other hand the feed pressure reaches the calibration value, the pilot shutter (8) opens, allowing the fluid contained in the chambers (B) to move towards the chamber (D) and then to the atmosphere through the orifice (13). This flow causes an increase in the loading pressure in the chamber (D) (which therefore will no longer be the atmospheric pressure) and a decrease in the control pressure in the chamber (B) due to the pressure drop on the pilot orifice (3). The resulting imbalance of the forces in play allows the shutter (G) of the valve to open up to such a value so to allow the discharge of excess feed pressure.

The device is designed in such a way that any breakage to one of the main constituent parts of the valve or the pilot device leads to the opening of the valve itself; in fact:

A - the breakage of the connecting tubes (1) and (10) or of the related connections which cause the emptying of the chamber (B), and then to the opening of the shutter (6)

B - the breaking of the spring (7) does not cause major operating variations, since it only serves to hold the shutter (6) in the closed position when commissioning the valve

C - the breaking of the spring (5) causes the opening of the shutter-pilot (8), and then the emptying of the chamber (B) and the consequent opening of the shutter (6)

D - the breaking of the membrane (4) does not affect the operation of the valve, since the pilot o-ring (14) on the pilot spring support serves as a "safety membrane".

The adjustment of the calibration value is done using the pilot screw (12) and by using different springs according to the predetermined calibration value.

The spring (11) allows the overtravel of the spring-membrane assembly without loading the shutter-pilot (8) on the seal seat.

## 1.4 VALVE SIZING

The PVS 803 valve is sized using the given formula:

$$Q_m = p_0 C A K_{dr} \sqrt{\frac{M}{Z T_0}}$$

Where:

- Q<sub>m</sub> = maximum flow rate to discharge in kg/h
- K<sub>d</sub> = discharge coefficient
- K<sub>dr</sub> = declassified discharge coefficient (0,9K<sub>d</sub>)
- C = expansion coefficient
- p<sub>0</sub> = calibration pressure plus 10% in absolute bars
- A = minimum passage area in mm<sup>2</sup> (see table 1)
- M = molecular weight of fluid in kg/kmol
- Z = compressibility factor of the fluid under discharge conditions (= 1 if unknown)
- T<sub>0</sub> = temperature of fluid at valve inlet in Kelvin degrees

$$C = 3.948 \sqrt{k \left( \frac{2}{k+1} \right)^{\frac{k+1}{k-1}}}$$

k = isentropic equation coefficient

Table 1

Size	1"	2"	3"	4"	6"
Area mm <sup>2</sup>	490	1960	4300	7850	16970

Table2: Molecular mass and coefficient of expansion.

	Molecular mass M	Coefficient of expansion
Relative density	28,97	0,685
Carbon dioxide	44,01	0,668
Hydrogen	2,02	0,686
Methane	16,04	0,669
Natural gas*	18,04	0,669
Nitrogen	28,02	0,685
Oxygen	32,00	0,685
Propane	44,09	0,635

\* Average value

## 2.0 INSTALLATION

### 2.1 GENERAL WARNINGS

Before installation, commissioning or maintenance, operators must:

- Take note of the safety regulations applicable to the installation in which they must work;
- Obtain the necessary permits to operate when required;
- Acquire the necessary personal protective equipment (helmet, goggles, etc.);
- Ensure that the area in which they operate is equipped with the required collective protection and the necessary safety information.

The equipment and its components must be handled after ensuring that the lifting means are adequate for the loads to be lifted (lifting capacity and functionality). The equipment must be handled using the lifting points provided on the equipment itself.

The use of motorized means is reserved for those in charge.

If the installation of the equipment or its accessories requires the application of compression fittings, these must be installed following the instructions of the manufacturer of the fittings themselves. The choice of fittings must be compatible with the use specified for the equipment and with the specifications of the system when provided.

Commissioning must be carried out by properly trained personnel: during commissioning activities, personnel who are not strictly necessary must be kept at a distance and the forbidden area must be suitably marked (signs, barriers, etc.).

### 2.2 GENERAL REQUIREMENTS

The valve must be installed in compliance with the regulations (laws or standards) in force in the place of installation.

In particular, systems for natural gas must possess features in accordance with the legal requirements or regulations in force at the installation site or at least in accordance with EN 12186 or EN 12279 (please note that installation in compliance with these regulations minimizes the risk of fire hazard).

The valve must be installed making sure that the operating pressure of the unit on which it is installed never exceeds the maximum permissible pressure value (PS).

The user must also set up the system with appropriate ventilation or drainage systems in order to discharge the pressure and the fluid contained in the system before carrying out any inspection and maintenance activities.

The pilot of the valve is sealed after being adjusted to the required cut-off value; the sealing is done in three points:

- On the adjusting screw
- On the screw securing the pilot to the support bracket

- On the screw securing the pilot support bracket to the valve cover

## 2.3 SPECIAL REQUIREMENTS

Before installing the valve, you must ensure that:

- The valve can be inserted in the space provided and is sufficiently accessible for subsequent maintenance operations Table 2 shows the dimensions and weights;
- In the case of installation with horizontal flow direction, the upstream and downstream piping is at the same level as the input and output connections;
- The upstream piping (and downstream only if installed with horizontal flow direction) can bear the weight of the valve;
- The inlet / outlet flanges of the piping are parallel to the valve sealing surfaces;
- The inside of the valve is clean and the valve itself has not been damaged during transport;
- The upstream piping has been cleaned in order to expel residual impurities such as welding slag, sand, paint residues, water, etc ...;

Install the valve taking into consideration that the direction of flow is mandatory and is indicated with an arrow on the body of the valve itself.

The valve may be mounted either with a vertical or horizontal flow direction. For installation refer to figures 4 and 5.

Any valves located upstream of the PVS 803 should be full bore, so as not to limit the discharge capacity.

Connect the sensing line of the pilot by means of compression fittings, according to the installation specifications.

Provide for an end on the valve exhaust pipe to protect from water and nesting.

The connections to the input and output pipes are done using standard flanges whose sizes and types are indicated on the nameplate (see section 2.4); the choices of connecting screws and seals must be made by the installer considering this information and the conditions of use at the installation site.

**ATTENTION:** if you require an excess cut-out pressure of less than 10%, it is recommended that the pilot sensing line be connected to a point where the pressure is static.

The valve is designed to operate at atmospheric back- pressure. Please pay attention in ensuring compliance with the valve design conditions during the sizing of the line downstream of the valve itself.

In case of installation in areas with explosive atmosphere, it is recommended to connect the vents of the valve and the pilot in special discharge lines, taking care not to create back pressure in the exhaust line itself, in any possible operating condition.

NOTE: the correct sizing of the discharge line downstream of the valve is the responsibility of the system designer.

**2.4 CONDITIONS OF USE**

It is recommended to check, before commissioning, that the conditions of use conform to the features of the device.  
 These specifications are recalled on the nameplates with which each valve is provided (figure 3).

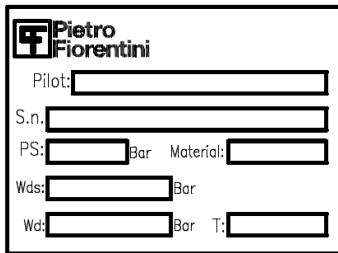
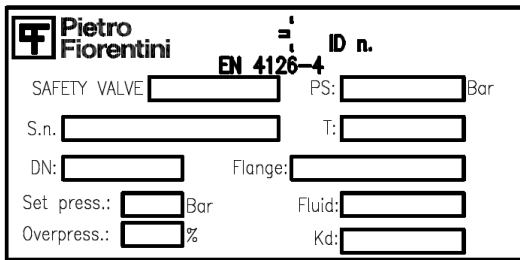


Figure 3



The meaning of the symbols shown on the nameplate is shown below:

Safety valve	the valve model
PS	maximum allowable pressure
S. n.	serial number
T	permitted service temperature
DN	nominal diameter of the valve
Flange	flanging type
Set press.	Calibration value
Fluid	Fluid
Overpress.	Overpressure
Kdr	declassified discharge coefficient
Pilot	pilot type
Material	material of the pilot body
Wds	total cut-out pressure range
Wd	specific cut-out pressure range of the inserted spring

In particular, it draws attention to the following features:

- Maximum allowable pressure PS
- Design temperature T (the minimum and maximum value are shown)
- The class of the input and output connections

Moreover the user must verify that the materials used and the surface treatments which may have been applied are compatible with the intended use.

Given the geometric features of the valve, in the design phase certain stresses from traffic, wind or earthquakes were not considered; Therefore, the user must take appropriate precautions to reduce the effects of these events on the devices when they can be expected.



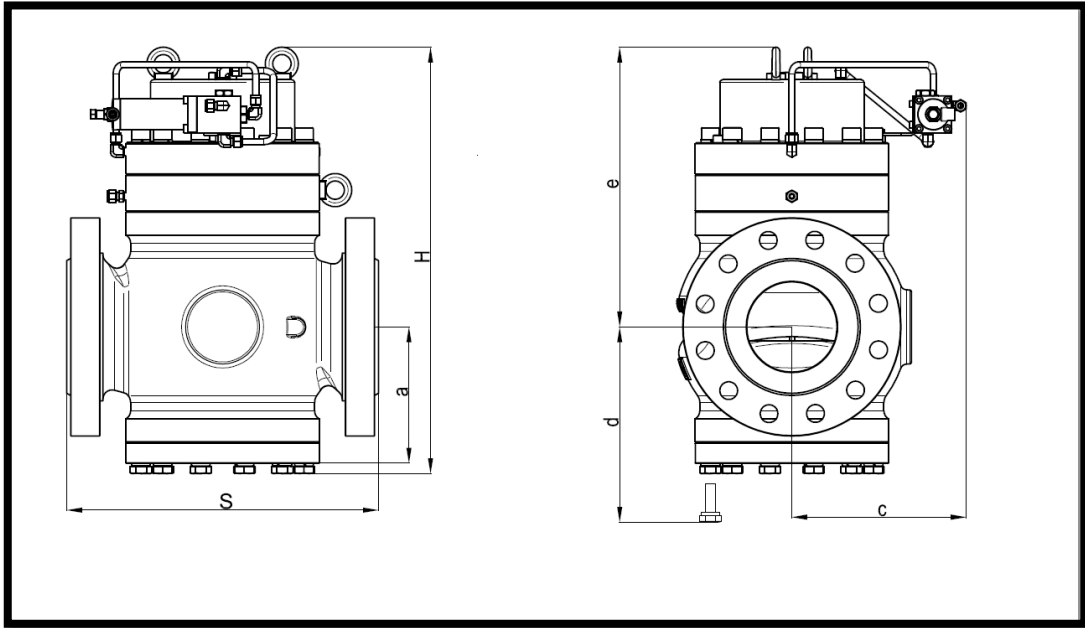


Table 2

Note: the sizes and weights for S150 are also valid for the PN16 version.  
Overall dimensions [mm]

		DN				
		1"	2"	3"	4"	6"
S	ANSI 150	183	254	298	352	451
	ANSI 300	197.4	267	317	368	473
	ANSI 600	210	286	336	394	508
a		78.5	108	132	168	222
c		195	211	229	250	286
d		115	158	194	225	309
e		250	265	295	300	456
H		335	385	440	481	695

Weight [kg]

ANSI 150	18	34	63	110	128
ANSI 300	19	36	67	115	138
ANSI 600	20	38	71	126	160

## 3.0 COMMISSIONING

### 3.1 PRESSURIZATION

After installation, check that the connections to the line are properly executed and any vents and drains present in the system are closed. Slowly pressurize the system (or the system section) by means of the upstream process valve or other systems provided for this purpose. Make sure that the pressure is at a value lower than the setting value of the valve.

### 3.2 CONTROL OF THE OUTER SEAL

The leak test of the connections of the valve to the system should be carried out as prescribed in the installation site.

The outer seal is guaranteed when sprinkling the pressure element with a foaming agent, no bubbles form.

### 3.3 CONTROL OF THE INNER SEAL

The inner seal can be checked with the valve in the closed position, keeping the line pressure at its inlet and checking that downstream of the valve and by the pilot discharge (verifiable by the special vent fitting on the valve) there is no fluid leak.

### 3.4 COMMISSIONING (FIG. 4)

**WARNING:** During commissioning, be very careful because unlike other types of pilot operated valves, in PVS 803 the pilot's cut-out point almost coincides with that of the valve.

1. Check on the nameplate that the required cut-out value is within the specified limits (Wd value on the pilot nameplate).
2. Fully tighten the calibration adjustment screw on the pilot.

3. Ensure that the pressure upstream of the shut-off valve is below the cut-out value.
4. Open slowly and partially the shut-off valve
5. Check the tightness of all the joints put under pressure with the previous operation.
6. Increase the feed pressure until the cut-out value, slowly unscrew the screw until there is the start of the exhaust gas from the pilot (verifiable by the appropriate vent fitting on the valve).
7. With great caution continue the previous operation until the opening of the valve.
8. Reduce the feed pressure and check the reclosing of the pilot valve and their seal.

### 3.5 COMMISSIONING (FIG. 5)

1. Perform steps 1, 2, 3, 4, 5 in order, referred to in paragraph 3.4, considering that the shut-off valve is missing.
2. Connect the C way of the three-way diverter valve (push) to a chamber with controlled pressure.
3. Stabilize the test pressure in the chamber at the same value as the pressure at the inlet of the safety valve.
4. Operate the three-way valve putting in communication the chamber at a controlled pressure with the sensing line of the pilot.
5. Increase the test pressure in the controlled chamber until the cut-out value of the safety valve. Slowly unscrew the adjustment screw until there is the start of the exhaust gas from the pilot (verifiable by the appropriate vent fitting on the valve).
6. With great caution continue the previous operation until the opening of the valve.
7. Reduce the controlled pressure and check the reclosing of the valve, the pilot and their seal.
8. Restore the three-way valve position so as to connect the environment to be checked with the sensing line of the pilot.

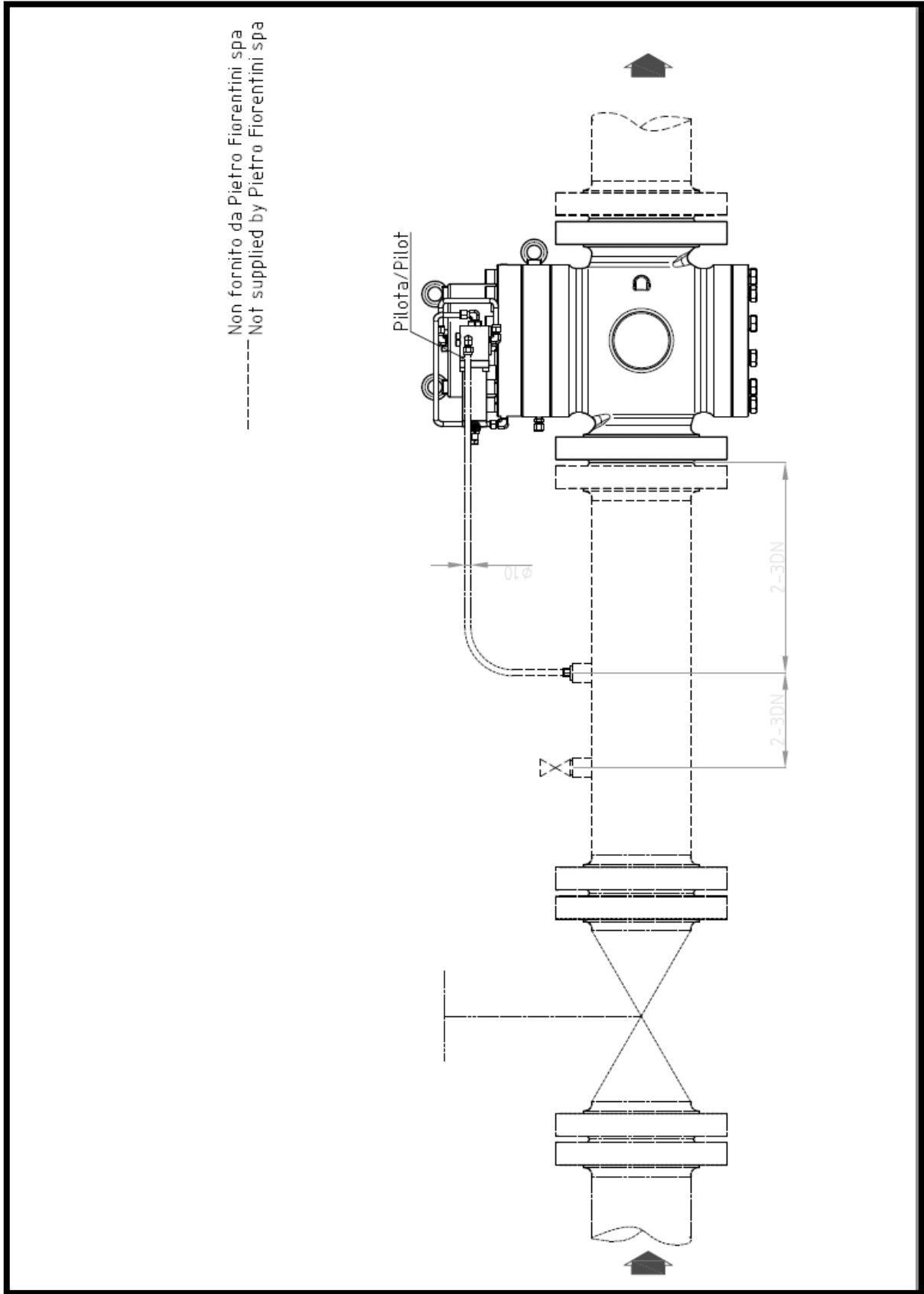


Figure 4

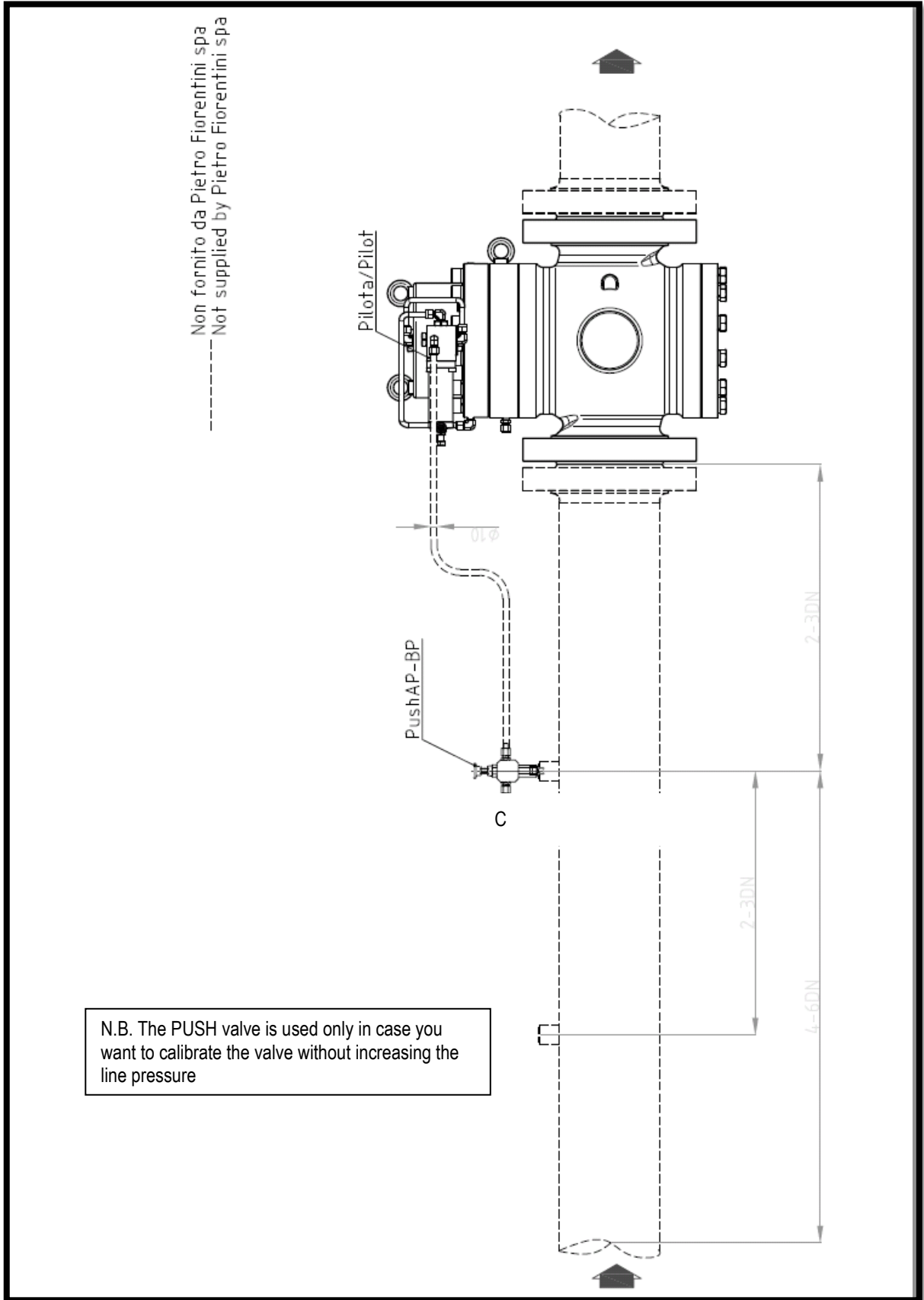


Figure 5

## 4.0 MAINTENANCE

### 4.1 GENERAL INFORMATION

The inspection and maintenance operations are closely related to the type of installation. Preventive maintenance is therefore always recommended, the intervals of which, if not established by regulations, depend on:

- The quality of the transported fluid;
- The state of cleanliness and conservation of the piping making up the system; in general, after commissioning of the plants, they require more frequent maintenance due to the precarious state of cleanliness inside the piping.

It is recommended to periodically check the cut-out value of the valve following the rules in force in the place of installation and, as necessary, to provide for a preventive maintenance of the valve and its pilot.

Regular checks will also affect the status of the external surfaces of the valve. In particular, one will have to restore the surface protection (usually paint) in case of its deterioration.

Before carrying out any work, make sure that the section of the system in which one operates has been cut off upstream and downstream and that the pressure has been discharged into the affected pipe section.

Also make sure you have a set of recommended spare parts. The spares must be original Pietro Fiorentini parts.

**N.B.** The use of non-original spare parts relieves the manufacturer of any liability.

### 4.2 DISASSEMBLY

With the exception of the OR valve seat (21), where the use of a special wrench is required, for the disassembly of all the other components special wrenches are not necessary.

Before disassembling, place the reference marks on the elements to be disassembled.

You should take particular care not to damage the sealing seats and housings of the sealing rings.

Examine the status of all the rubber parts affected by the seal and replace damaged ones or those that have been in use for a long time. Lubricate the surfaces of the moving parts with a thin layer of grease as described in Chapter 5.

#### 4.2.1 Disassembly and maintenance of the valve

Proceed according to the steps described below for disassembly and maintenance of the valve, with reference to the parts in the diagram in Figure 6.

1. After unscrewing its securing nut, disconnect the sensing line from the upstream pipeline



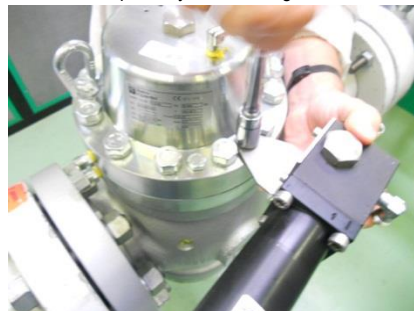
2. After unscrewing the securing nut of the connector (23), disconnect the pulse of the control pressure



3. After unscrewing the fitting nut (75), disconnect the pulse of the loading pressure



4. Remove the pilot, by unscrewing the relative fixing screw



5. Remove the eyebolts (70) and the nuts (71)



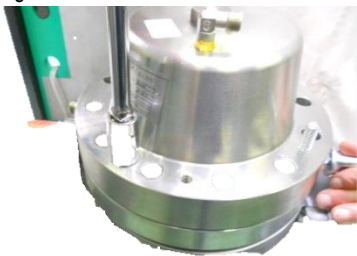
6. Loosen and remove the fixing screws (45) and their washers (29)



7. With a special lifting device, remove the lid - shutter guide unit. Warning: handle with care so that the seal support (6) does not fall on the ground. With the valve horizontally installed it will have to remain within the body. With the valve installed vertically it will have to come out together with the lid - shutter guide unit. Place the raised assembly on a suitable work bench



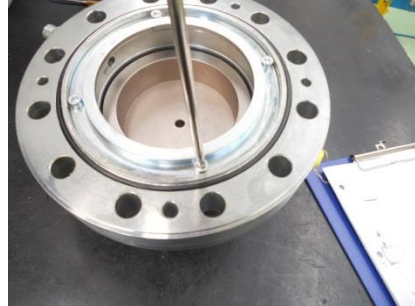
8. Unscrew and remove the fixing screws (73) of the lid to the shutter guide



9. Remove the lid (47) by resting it on the work surface as shown in the figure



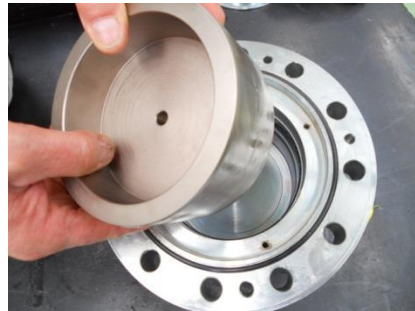
10. Unscrew and remove the screws (16) holding the piston retainer ring (40)



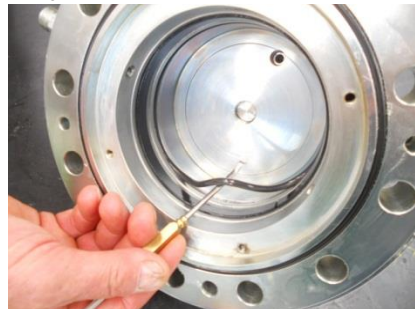
11. Remove the piston retainer ring (40) (only for DN 4 "and 6" versions)



12. Take out the piston (46)



13. Using the appropriate tool, remove and replace the OR (20)



14. Using the appropriate tool, remove and replace the OR (19)



15. Using the appropriate tool, remove and replace the DWR (38)



16. Lay the shutter guide (3) on the working surface and remove the fixing screw (43) and its washer (42)



17. Remove the spring support (44)



18. Take out the spring (22)



19. Take out the rod (39)



20. Using the appropriate tool, remove and replace the OR (20)



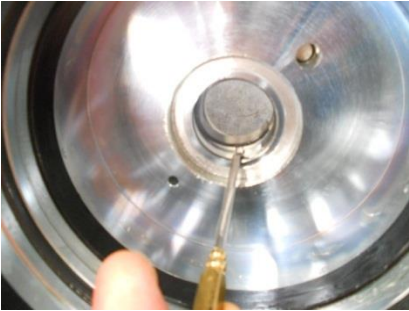
21. Using the appropriate tool, remove and replace both DWRs (18)



22. Turn the shutter guide and remove the OR (50)



23. Using the appropriate tool, remove and replace the DWR (41)



24. By the seal support (6), unscrew and remove the fixing screws (17)



25. Remove the locking ring (8)



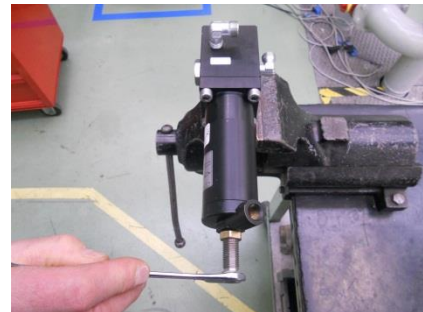
26. Remove and replace the reinforced gasket (7)



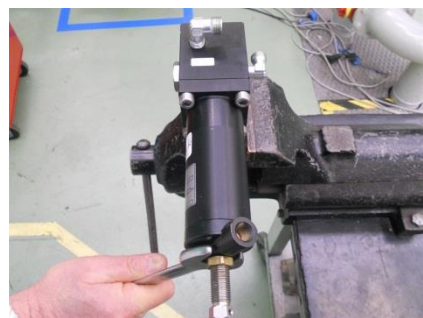
#### 4.2.2 Disassembly and maintenance of the pilot

Proceed according to the steps described below for disassembly and maintenance of the pilot, with reference to the parts in the diagram in figure 7

1. Unscrew the spring of the pilot by turning the adjusting screw (28)



2. Unscrew the cap (17)



3. Remove the cap (17), the spring (28) and the spring supports (14 and 16)





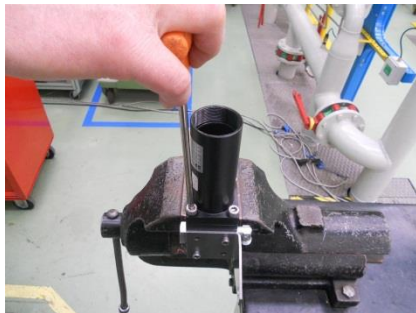
4. Remove the adjusting screw (28) of the cap (17)



5. Remove and replace the OR (46)



6. Unscrew and remove the screws (33)



7. Remove the sleeve (40)



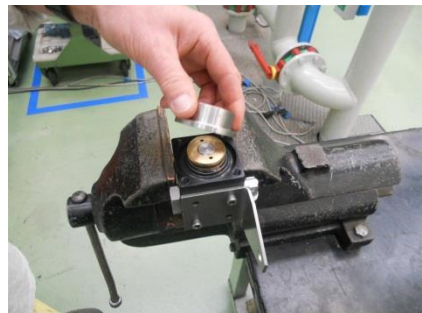
8. Remove and replace the DWR (52)



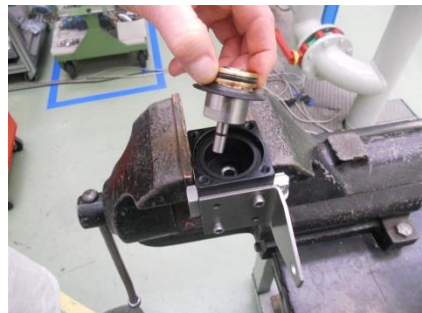
9. Remove and replace the OR (40)



10. Take out the pilot guide (21)



11. Take out the membrane unit



12. Remove and replace the OR (44)



13. Remove and replace the OR (51)



14. With the aid of a wrench and a compass key, unscrew the piston (31)



15. After removing the piston (31) and the pilot protection disk (12), remove and replace the membrane (25)



16. Unscrew and remove the pilot gasket support (1)



17. Remove and replace the OR (45)



18. Remove and replace the OR (41)



19. Take out the shutter guide (9)



20. Remove and replace the OR (44)



21. Remove and replace the reinforced gasket (7)



22. Unscrew and remove the cap (18)



23. Remove the filter (32)



24. Remove and replace the gaskets (22) and the filter (32)



25. Remove and replace the OR (50)



### 4.3 REASSEMBLY

Reassemble the parts, using the references put on the parts in the disassembly phase, to correctly match all the connections and following the procedures described in the preceding paragraphs in reverse order.

### 5.0 LUBRICATION

The valves are already lubricated during assembly (with the product most suitable for the exercise if specified in the order) for the following reasons:

1. To facilitate the fitting of components.
2. To improve functionality.
3. To facilitate preservation in case of warehouse storage

During normal operation it is not necessary to provide for lubrication of the valve.

On the occasion of maintenance operation, it is recommended to lubricate the moving parts (shutter) and seals with silicone grease.

### 6.0 STORAGE

The PVS 803 valves do not require special precautions in the event of storage for long periods; however it is important to:

- Keep the valves in the original packaging;

- Keep the protections applied in factory on the flanged connections;
- Keep the rubber parts away from exposure to direct sunlight to avoid rapid aging

## **7.0 SPARE PARTS**

For the identification of spare parts refer to the drawing SS14-103

When ordering spare parts specify:

**Type of valve**  
**Integrated accessories**  
**Serial number**  
**Year of manufacture**  
**Type of fluid used**  
**Number of article**  
**Quantity**

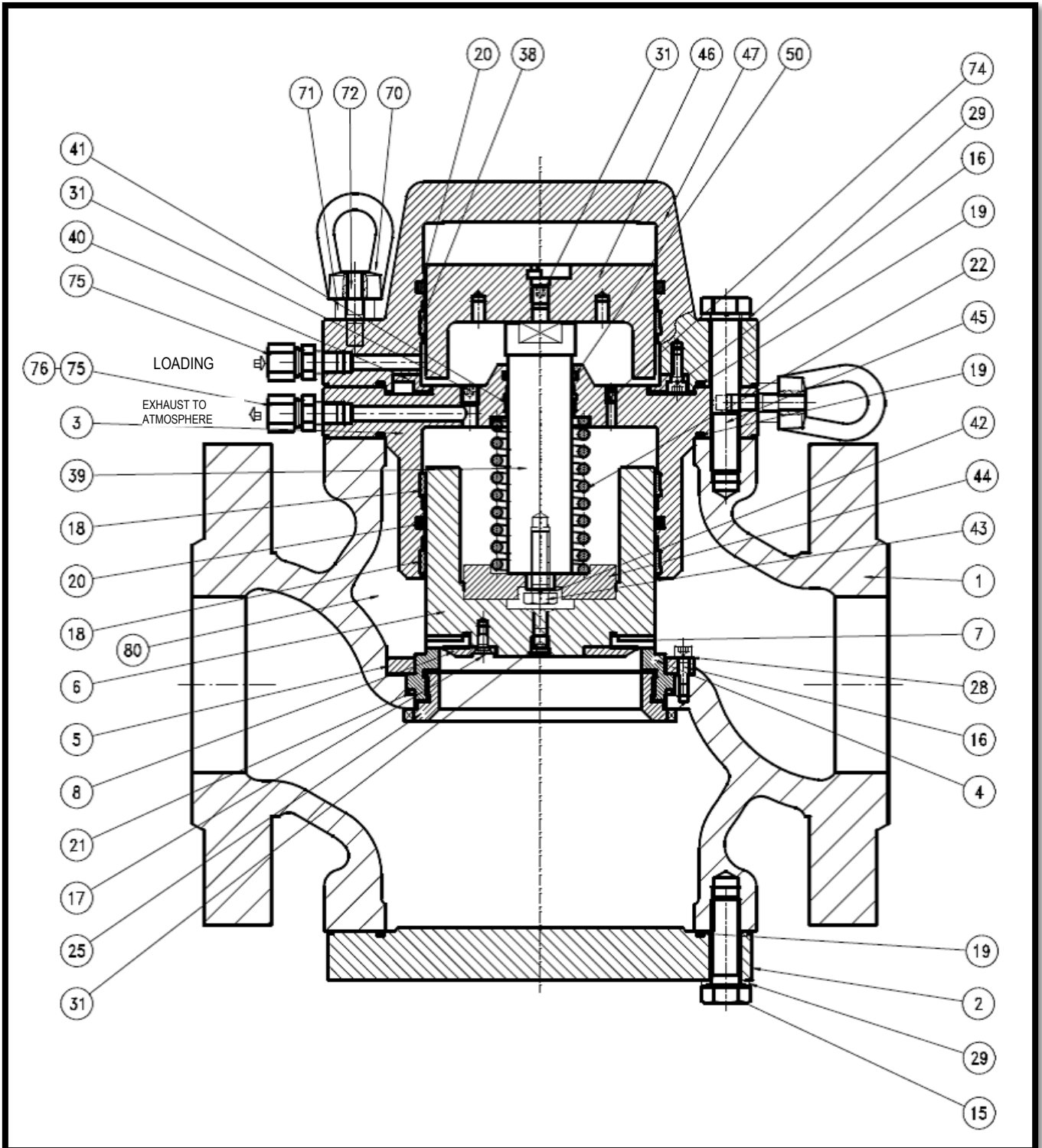


Figure 6

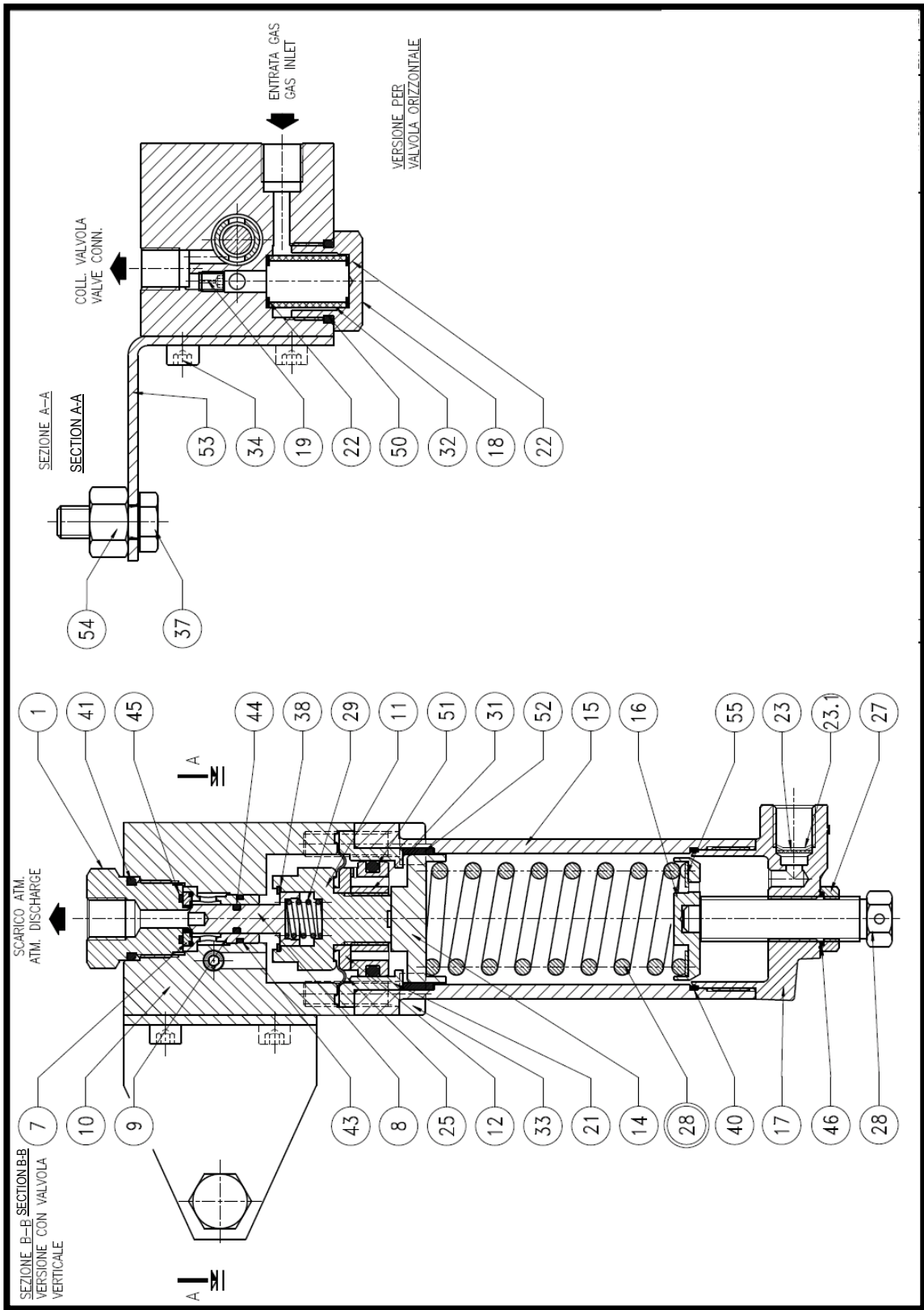


Figure 7



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