TERVAL/AP

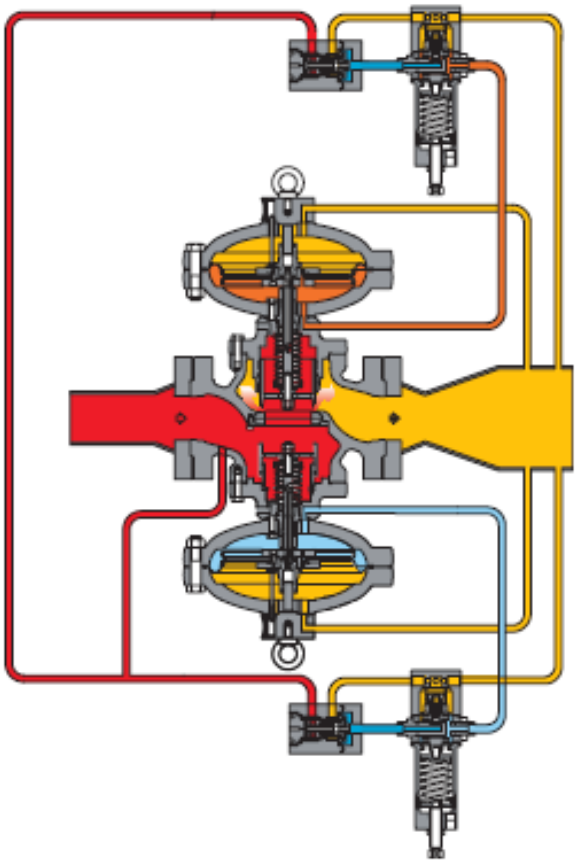
PRESSURE REGULATOR

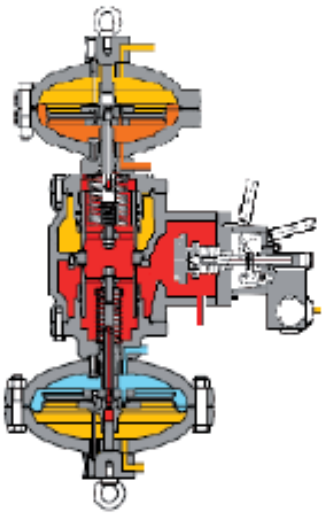
TECHNICAL MANUAL

INSTALLATION, COMMISSIONING AND MAINTENANCE INSTRUCTIONS

TM0058ENG

Pietro Fiorentini®





PRECAUTION

GENERAL PRECAUTION

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

This equipment is normally installed in transmission systems for 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 to operate when required;
- Use the necessary personal protection devices (helmet, goggles, etc.);
- Ensure that the area in which they operate is equipped with the required **collective protections** and with necessary **safety indications**.

HANDLING

The equipment and its components can be handled after ensuring that the lifting equipment is adequate for the **loads to lift** (lifting capacity and functionality). The equipment must be handled using the **lifting points** provided on the equipment itself. The use of motorised means is reserved for the personnel in charge of them.

PACKAGING

The packaging for transportation of the equipment and his spare parts are designed and manufactured to prevent damage to any part during transportation, warehousing and handling activities. Therefore the equipment and spare parts shall be kept into their original packaging until their final installation. After packaging is open, check that no damage occurred to the material inside. In the event of damage, report the damage to the supplier, keeping the original packaging for inspection.

INSTALLATION

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

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

The equipment is not equipped with internal pressure limitation devices; therefore, it has to be installed by verifying that the maximum operating pressure of the system on which it is installed does not exceed the maximum allowable pressure (PS) of the equipment.

The user should therefore provide, when it is deemed necessary, suitable pressure limitation devices.

The system has also to be provided with suitable venting or draining systems, in order to discharge the pressure and fluids contained in the plant before proceeding with any inspection and maintenance activity.

If the installation of the equipment requires the application in the field of **compression fittings**, they must be installed following their **manufacturer's instructions.** 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, the personnel which is not strictly necessary must be moved outside the restricted area, which must be properly signalled (signs, barriers, etc.).

Check that the equipment settings are those requested; if necessary, reset them to the required values in accordance with the procedures indicated in the manual. During commissioning, the risks associated with any release to the atmosphere of flammable or harmful gases must be evaluated. For installations in natural gas distribution networks, the risk of formation of explosive mixtures (gas/air) inside the piping must be evaluated.

COMPLIANCE WITH DIRECTIVE 2014/68/EU (PED)

The **TERVAL/AP** regulators are classified as **FAIL CLOSE** regulators according to standard EN 334 and are therefore defined as pressure accessories according to Directive 2014/68/EU Pressure Equipment Directive (PED).

1.0 CLASSIFICATION AND APPLICATION FIELD

The scope of this manual is to provide the essential information for the installation, commissioning, disassembly, re-assembly and maintenance of **TERVAL/AP** regulator. Furthermore, it's considered appropriate to provide a brief illustration of the main features of the regulator and of its accessories.

In Fig.1 a functional drawing of the regulator is shown.

1.1 MAIN FEATURES

The **TERVAL/AP** pressure regulator is a regulator for medium and high pressure.

The **TERVAL/AP** is a "fail close" type regulator and therefore closes in the event of:

- rupture of the main diaphragm;
- rupture of the pilot diaphragm/s;
- pilot circuit supply failure.

The main specifications of this regulator are:

- Design pressure: up to 102 bar;
- Working temperature range: -20°C + 60 °C;
- Ambient temperature: -20°C + 60 °C;
- Inlet pressure range **bpu**: 0,8 to 100 bar;
- Regulating range possible **Wd**: 0,3 ÷ 74 bar (depending on the model of pilot installed);
- Minimum differential pressure 0.5 bar;
- Precision class **AC**: up to **1** (depending on the operative conditions);
- Closing pressure class **SG**: This value varies according to the operative conditions. Final user shall consider the real value of SG while choosing the setting pressure.

1.2 OPERATION OF THE PRESSURE REGULATOR

With reference to Fig.1, here is described how the regulator works.

In the absence of pressure, the obturator **5** is maintained in the closed position by the spring **54**, and rests on the reinforced gasket **7**. The upstream pressure, even if variable, does not change this position as the obturator is completely balanced and is therefore subject to equal pressures, even if the sections are different.

The rod **6** is also between two equal pressures as the pressure upstream is also conveyed to the chamber **C** through the hole **A**.

The obturator is controlled by the diaphragm **50** on which the following forces act:

• downwards: the load of the spring **54**, the thrust deriving from the regulated pressure Pd in the chamber **D** and the weight of the mobile assembly;

• upwards: the thrust deriving from the motorisation pressure Pm in the chamber **E**, supplied by the pilot.

The motorisation pressure is obtained by drawing gas from gas the regulator at the upstream pressure. The gas is filtered through the filter **13** and is subjected to initial decompression in the pre-regulator R14/A composed essentially of an obturator **5**, a spring **12** and a diaphragm **10** to a value, Pep, which depends on the pressure set-point of the regulator.

The pressure, Pep, then passes from the chamber **G** through the hole **F** in the 204/A pilot which adjusts it by means of the obturator **17** until the inlet value, Pm, in the head of the regulator.

The regulation of Pm is obtained by the comparison of the force exerted by the setting spring **22** of the pilot and the action of the regulated pressure, Pd, acting in the chamber **B** on the diaphragm **16**.

The set-point can be changed by turningthe adjustment screw **10**; clockwise rotation increases Pm and therefore the regulated pressure Pd; the opposite occurs when the ring is turned anticlockwise.

If, for example, the downstream pressure, Pd, drops during operation (because of an increase in the requested flow rate or a drop in the upstream pressure) an imbalance occurs in the mobile assembly **16** of the pilot , which is displaced to increase the opening of the obturator **17**.

As a result, the motorisation pressure valve, Pm, increases and, by acting in the chamber **E** under the diaphragm **50**, causes the obturator **5** to move upwards and therefore an increase in the opening of the regulator until the set-point of the regulated pressure is restored. Viceversa, when the regulated pressure begins to increase, the force it exerts on the diaphragm of the pilot moves the mobile assembly **16** displacing the obturator **17**, towards the closed position.

The pressure Pm, then drops because of the transfer between the chambers **E** and **D** through the orifice **21**, and the force exerted by the spring **54** causes the downward displacement of the obturator **5**, to restore the regulated pressure to the set-point.

In normal working conditions, the obturator **17** of the pilot positions itself so that the motorisation pressure value, Pm, is such as to maintain the downstream pressure value, Pd, around the set-point.

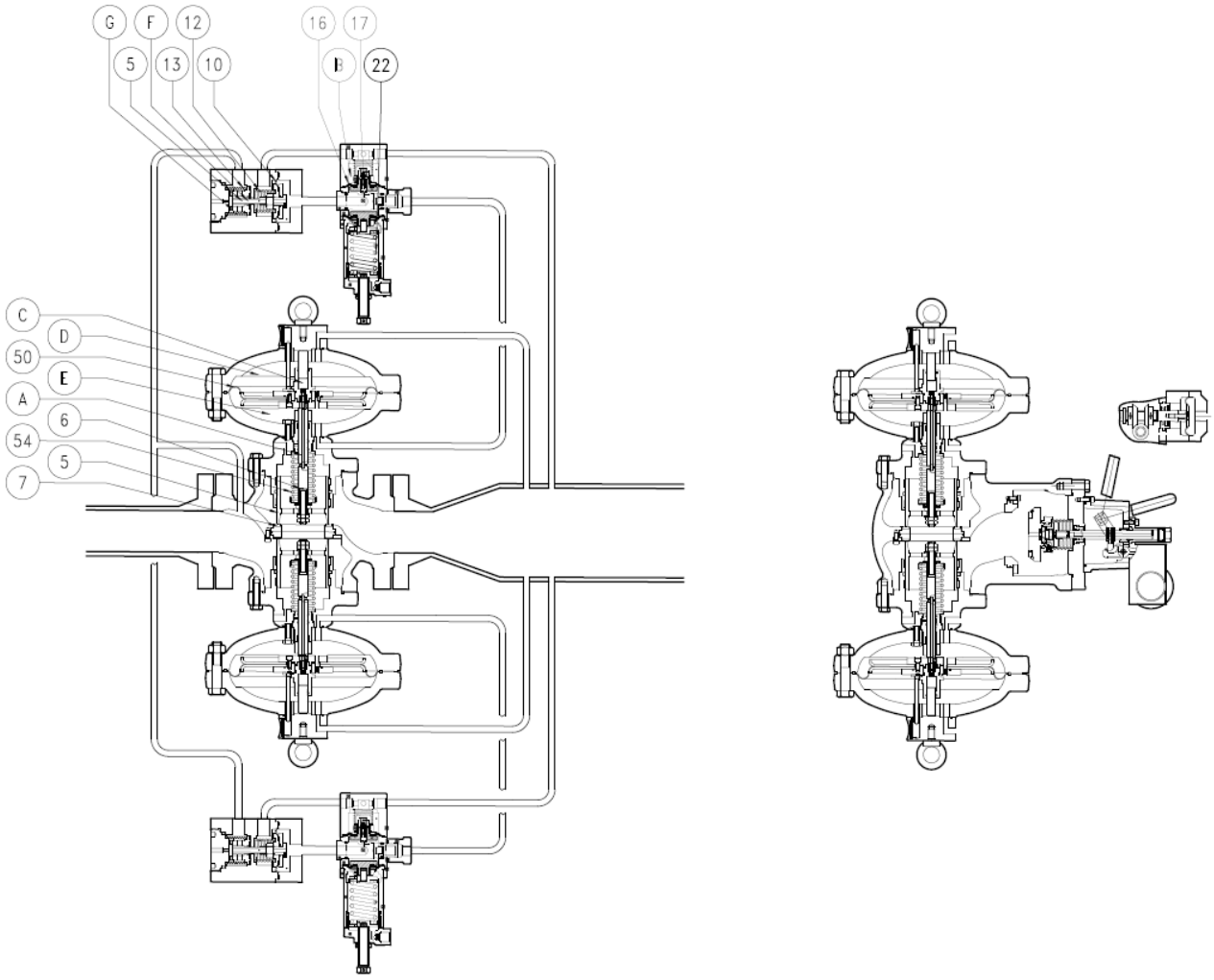


Fig.1

1.3 PILOTS

Pressure Regulators **TERVAL/AP** use following type of pilots:

204/. setting range **Wd**: from 0.3 to 43 bar

205/. setting range **Wd**: from 20 to 60 bar

207/. setting range **Wd**: from 41 to 74 bar

Pilots may be adjusted manually or remotely as shown in table 1:

Table 1: Pilot adjusting instructions	
Pilot type…/A	Manual setting
Pilot type…/D	Electric remote setting control
Pilot type…/CS	Setting increased by remote pneumatic signal
Pilot type…/FIO	Smart unit for remote setting, monitoring flow limitation and indirect flow measurement.

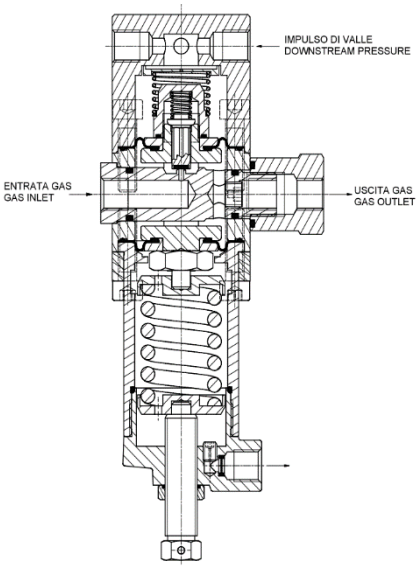


Fig.2
Pilots 204/A -205/A

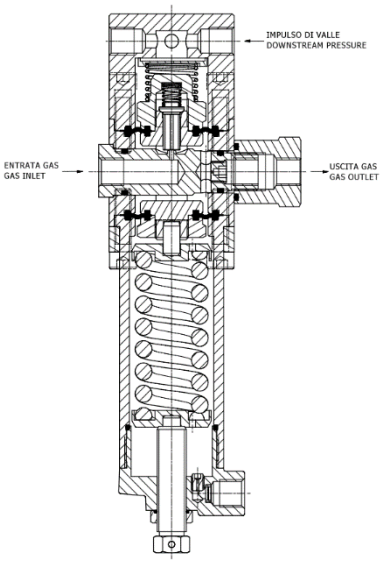


Fig.3
Pilot 207/A

1.4 R14/A PRE-REGULATOR

Pilots series 200 are equipped with pre-regulator **R14/A**

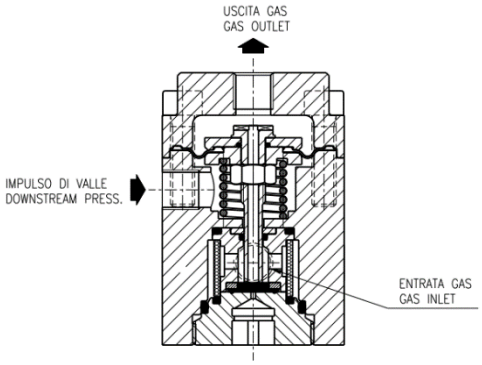


Fig.4

Pre-regulator R14/A

2.0 INSTALLATION

2.1 GENERAL

If the upstream reducing station is sized for a maximum incidental downstream pressure MIPd≤1,1×PS, the regulator **TERVAL/AP** does not require any supplementary upstream safety accessory for the protection against overpressure.

Before installing the regulator it is necessary to ensure that:

- the regulator can be installed in the space provided and that subsequent maintenance operations will be sufficiently practicable;

- the upstream and downstream pipes are aligned 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 has not been damaged during transportation;

- the piping upstream has been cleaned to remove residual impurities such as welding slags, sand, paint residues, water, etc.

The normally recommended set-up is:

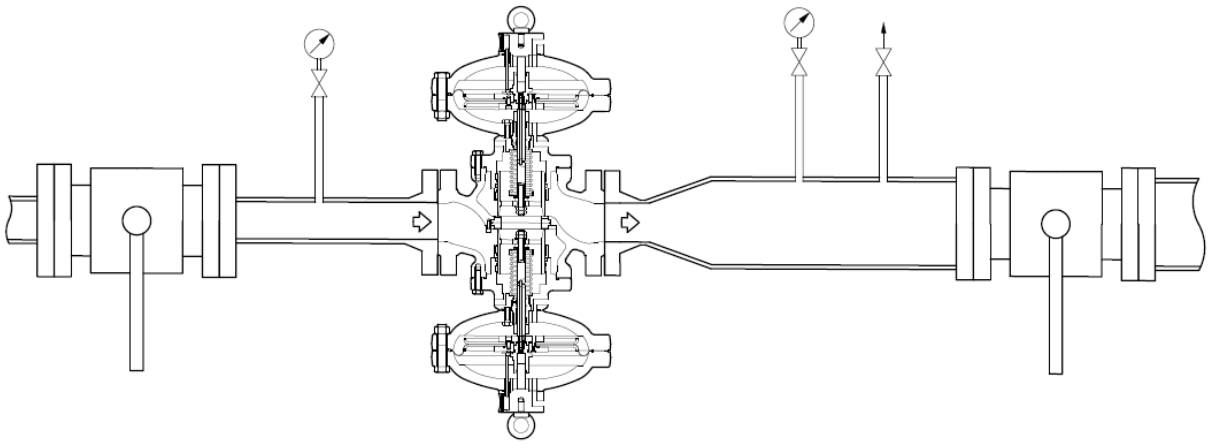


Fig.5

2.2 CONNECTING THE EQUIPMENTES

The connections between the equipment and the main piping must be made using stainless steel pipe with minimum internal diameter of 8 mm.

IN-LINE INSTALLATION

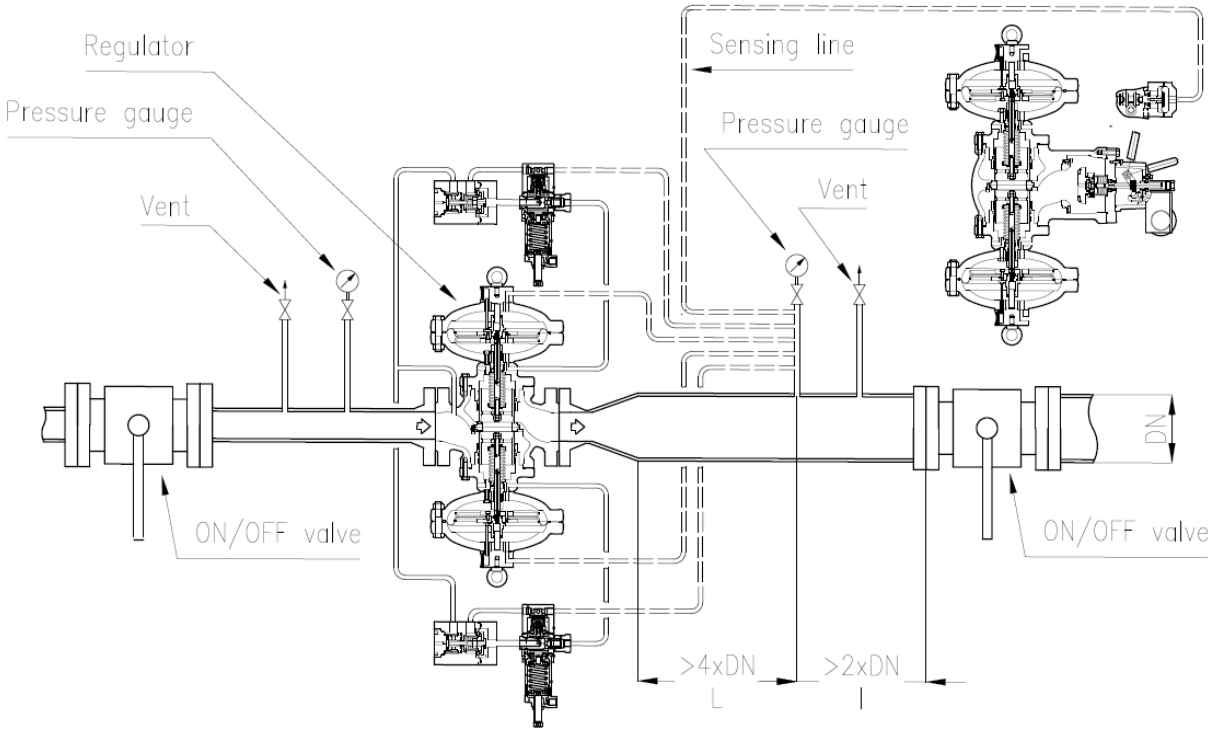


Fig. 6

The installation of a multiple plug on a plant has its aim in taking from a single point all the pressure impulse signals that go to the different regulators, safety devices and to their accessories.

It is essential for good regulation that the position of the downstream pressure take-offs and the speed of the gas at the take-off point are according to the values given in Fig.8 and Fig.9 (positioning) and tab.2 (speed).

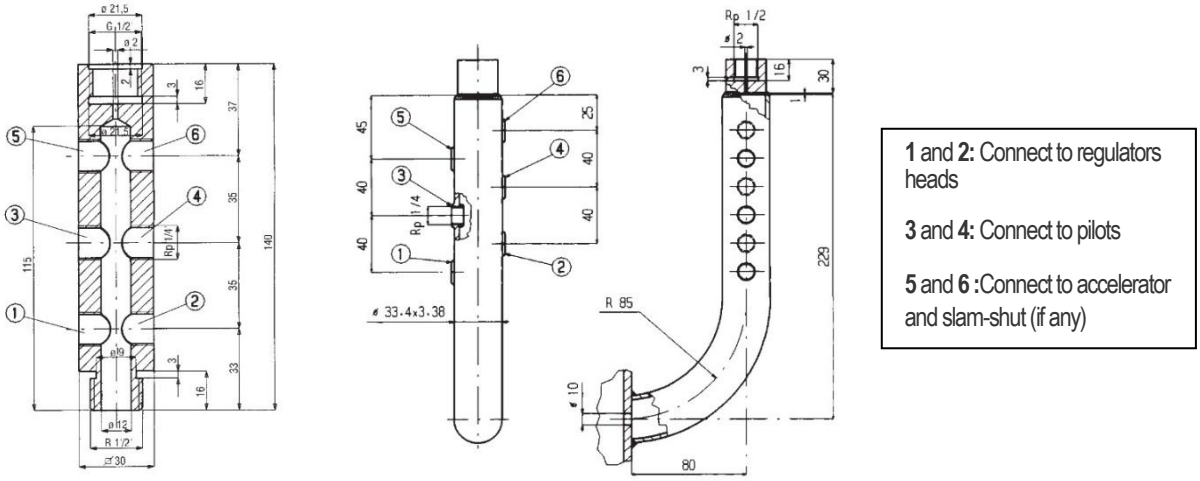


Fig.7 Detail of multiple Take-off

The speed of the gas must not exceed the following values in the piping downstream from the regulator:	
Pd > 5 bar	**Vmax = 30 m/s**
0,5 < Pd ≤ 5 bar	**Vmax = 25 m/s**

Tab.2

When the regulator is used in gas pressure reduction stations it must be installed at least according to the requirements envisaged in EN 12186 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

In order to prevent the accumulation of impurities and condensate in the lines of the pressure take-off, the following procedures are recommended:

a) the piping must slope down towards the downstream connectors with a slope of about 5-10%;

b) the connectors must be welded on the top of the piping and there must be no burrs or inward protrusions in the hole in the piping.

3.0 IN LINE ACCESSORIES

3.1 RELIEF VALVE

The relief valve is a safety device which releases a certain quantity of gas to the exterior when the pressure at the control point exceeds the set-point as a result of short-lasting events such as, for example, the very fast closing of the on/off valves and/or overheating of the gas with zero flow rate demand. The release of the gas to the exterior can, for example, delay or block the intervention of the slam-shut valves for transitory reasons deriving from damage to the regulator.

Obviously the quantity of gas released depends on the extent of the overpressure with respect to the set-point.

The different models of relief valves available are all based on the same operating principle which is illustrated below with reference to the valve **VS/AM 65** (Fig. 8).

It is based on the contrast between the thrust on the diaphragm **24** deriving from the pressure of the gas to control and the thrust from the setting spring **20**. The weight of the mobile assembly, the static thrust and the residual dynamic thrust on the obturator **4** also contribute to this contrast. When the thrust deriving from the pressure of the gas exceeds that of the setting spring, the obturator **4** is raised and a certain quality of gas is released as a result.

As soon as the pressure drops below the set-point, the obturator returns to the closed position.

Proceed as indicated below to control and adjust intervention of the relief valve.

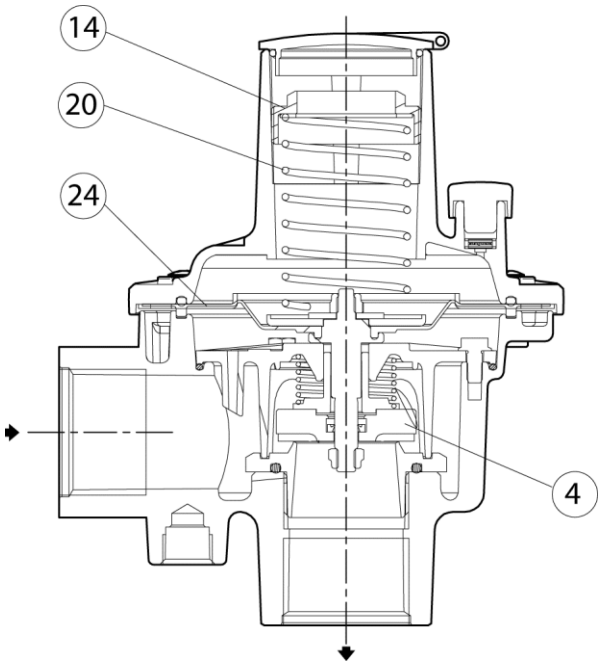


Fig.8

3.1.1 DIRECT INSTALLATION IN THE LINE

When the relief valves fitted directly in the line that is, without the interposition of an on/off valve, we recommend proceeding as follows:

1) Ensure that the downstream on/off valve **V2** and the bled cock **6** are closed;
2) Increase the pressure in the downstream pipe until the envisaged intervention value in one of the following ways:
   - If allowed by the spring installed on the pilot (see Wds range on label of pilot), increase the setting of the same pilot until the desired value is reached;
   - Connect a controlled auxiliary pressure to the cock 6 and stabilize it at the desired value;.
3) Check intervention of the relief valve and ad just it if necessary by turning the internal adjustment ring **14** appropriately (clockwise to increase the set-point, anticlockwise to reduce it)

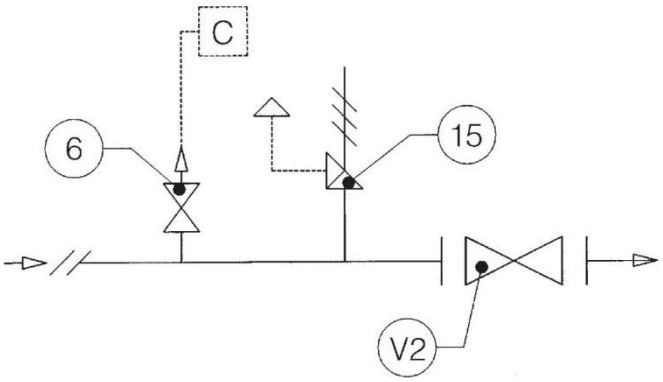


Fig.9

3.1.2 INSTALLATION WITH ON-OFF VALVE

1) Close the on/off valve **16**;
2) connect a controlled auxiliary pressure to the take-off **17** and increase it slowly up to the intervention value;
3) check the intervention of the relief valve and adjust it if necessary by turning the internal adjustment ring **14** appropriately (clockwise to increase the set-point, anticlockwise to reduce it).

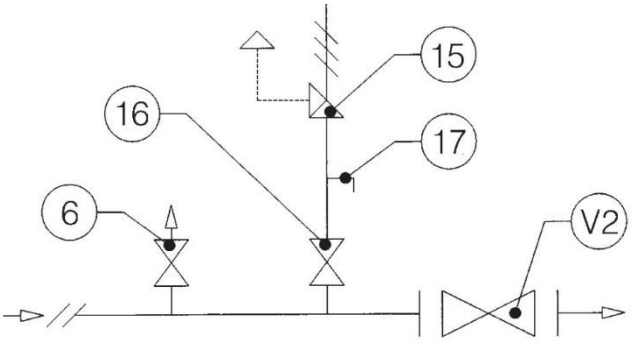


Fig.10

3.2 ACCELERATOR

An accelerator is installed on the **TERVAL/AP** regulator (use as in-line monitor) to speed up the intervention in the event of failure of the active regulator (recommended when used safety accessory according to Directive 2014/68/UE “PED”).

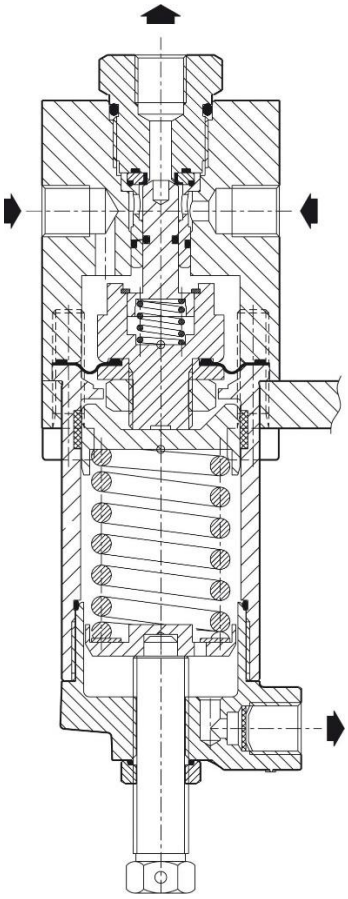


Fig.11

On the basis of a pressure signal from downstream this device discharges the gas into the monitor’s motorization chamber into the atmosphere, thereby permitting rapid intervention. The set point of the accelerator must obviously be higher than that of the monitor.

Setting is made by turning the adjustment screw **17**, clockwise to increase the value, anticlockwise to reduce it.

4.0 MODULARITY

4.1 INCORPORATED SB/82 SLAM-SHUT VALVE

This is a device which immediately blocks the gas flow if, following some kind of failure, the downstream pressure reaches the set-point for its intervention, or is operated manually.

On the **TERVAL/AP** regulator, SB/82 slam-shut incorporated on the main body.

The main characteristics of the slam-shut device are:

• intervention with pressure increase and/or decrease;

• design pressure: 100 bar for all the components;

• intervention accuracy (AG): ± 1% of the pressure set-point for pressure increases; ± 5% for pressure drops;

• manual resetting with internal by-pass operated by the resetting lever.

4.2 INCORPORATED PM/819 MONITOR

The monitor is an emergency regulator which takes over from the active regulator if for any reason the latter permits the downstream pressure to rise up to the value set for its intervention.

This emergency device is fixed directly on the body of the service regulator, but:

- it is governed by one distinct pilot;

- it is work on independent valve seat.

5.0 START UP

5.1 GENERAL

After installation, check that the inlet and outlet on/off valves, any by-pass and the bleed cock 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.16).

We recommend actuating the opening and closing valves very slowly.

APPARATUS SPECIFICATION PLATES

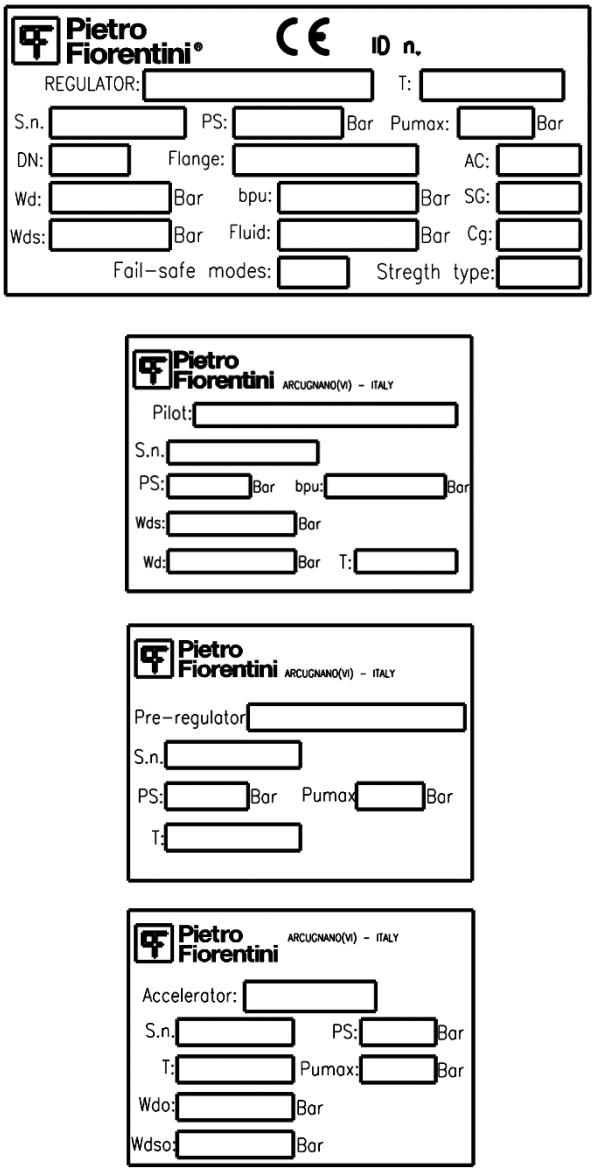


Fig.12

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

CE = According to 2014/68/UE 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.

Wds= setting range of the pressure regulator which can be obtained using the parts and the setting spring fitted at the moment of testing (that is without changing any components of the apparatus).

Wd= setting range of the pressure regulator which can be obtain using the setting springs indicated in the associated tables and also by changing some other part of the apparatus (reinforced gasket, diaphragm, etc.).

Cg = characteristics flow coefficient. **AC**= accuracy class. **SG**= closing pressure class.

Wdso= range of slam shut intervention for over pressure, which can be obtained using the setting spring fitted at the moment of testing.

Wdo= range of slam shut intervention for over pressure, which can be obtained using the setting springs indicated in the tables.

Wdsu= range of slam shut intervention for under pressure, which can be obtain using the setting spring fitted at the moment of testing.

Wdu= range of slam shut intervention for under pressure, which can be obtain using the setting springs indicated in the tables.

5.2 GAS INPUT, CONTROL OF EXTERNAL TIGHTNESS AND SETTING

The pressurization of the equipment shall be done very slowly.

To protect the equipment from damage, the following operations must never be done:

- Pressurization through a valve located downstream of the regulator.
- Depressurization through a valve located upstream of the regulator.

External tightness is guaranteed if applying a foam medium on elements under pressure, no bubble appears.

The regulator and other devices (slam-shut, monitor) are normally supplied with requested set-point already set. A little variation in original setting is possible (e.g., vibration during transport).

We recommend to check the settings using following procedures.

In installation consisting of two lines, we suggest commissioning one line at a time, starting from the one with the lowest set-point (known as “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.

5.3 COMMISSIONING THE REGULATOR TERVAL/AP

If the line is provided with a relief valve, please refer to par. 3.1 to check it.

Check and adjust intervention of the slam-shut 7 as follow:

We recommend connecting the control head separately to a controlled auxiliary pressure.

Check intervention for pressure reduction valves for pressure increase or decrease by respectively turning the rings and clockwise and vice versa to reduce the intervention values.

Check proper operation by repeating the operations at last 2-3 times.

N.B.: The intervention tests should be repeated at last every 6 months.

With reference to Fig.13, follow these steps during commissioning:

1. Partially open the bleed cock 6.
2. Very slowly open the inlet on/off valve V1.
3. Very slowly reset the slam-shut valve by actuating the provided lever.
4. Check on the pressure gauge of preregulators 2 and 9 that their pressure set-point is within the recommended range of values.
5. Completely increase the set- point of the main regulator 3 by turning the screw 10 clockwise.
6. Completely increase the setting of the accelerating valve 12 by turning the screw 10 clockwise.
7. Adjust setting of the monitor pilot 10 to the intervention value established for the accelerating valve 12.
8. Reduce the setting of the accelerating valve 12 until. Using a foaming agent, gas is seen to be released from the provided vent.
9. Reduce the setting of the pilot 10 to the selected working value for the monitor, and ensure that the valve 12 has stopped the release of the gas.
10. Adjust the setting of the pilot 10 to the set-point.
11. Reduce the setting of the pilot 3 to the selected working value for the service regulator.
12. Check that the monitor is fully open by controlling the position of the stroke indicator through the window.
13. Close the bleed cock 6and check that the downstream pressure, after increasing, settles at a value slightly higher than that of closure of the pilot/monitor assembly. If it does not, remedy the causes of the internal leakage.
14. Using a foaming agent, check the tightness of all the joints between the no/off valves V1 and V2.
15. Very slowly open the downstream on/off valve V2 until the line is completely filled. If , at the beginning of this operation, the pressure in the line is much lower than the set-point, the opening of this valve should be chocked so as not to exceed the maximum flow rate value of the installation.
16. It is recommended to check that the flow in line stops when the slam-shut is tripped manually.

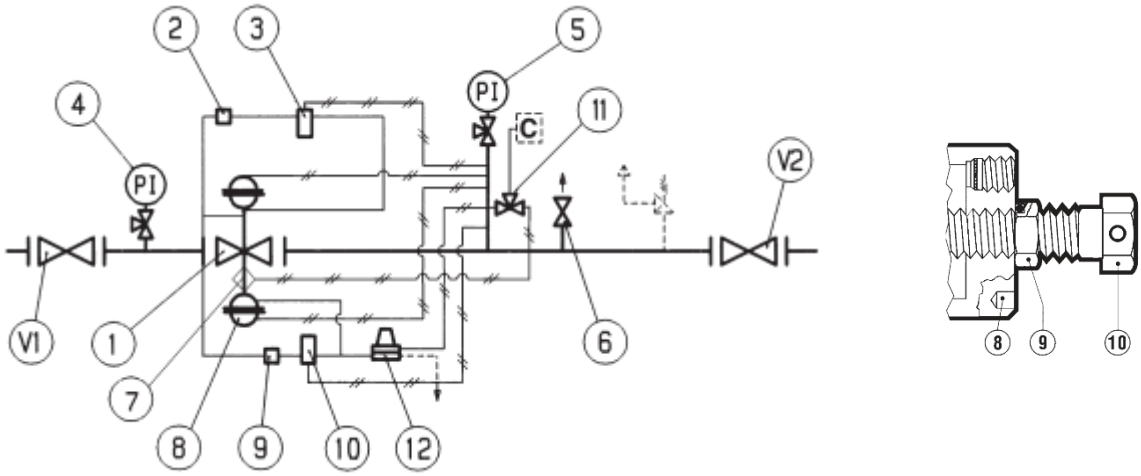


Fig.13

6.0 TROUBLE-SHOOTING

A list of main problems that could arise over time is shown below.

They derive from phenomena associated both with the gas conditions and the natural ageing and wear of the materials.

All operations on the equipment must be carried out by qualified personnel. Tampering of the equipment by unqualified personnel relieves Pietro Fiorentini from all kind of responsibilities.

You must therefore train your maintenance personnel or use the officially authorised service centres.

6.1 Control Head Tab. 3

PROBLEM	POSSIBLE CAUSE	EQUIPMENT	REMEDY
Operating anomalies	Worn Diaphragm [16]	Pre-regulator R14	Replace
	Spring [12] yielded or off level		Replace
	Friction in diaphragm holder packet		Center the packet hole movement and staff
	Worn Diaphragm [16]	Pilot 20./…	Replace
	Spring [12] yielded or off level		Replace
	Bleed hole blocked		Clean
	Obturator guide ring [48] worn	Regulator	Replace
	Friction between the obturator and obturator guide		Check the guide rings
	Reinforced gasket [7] [76] off level or worn		Replace
	Friction on balancing rod		Replace ring [36]
	Spring yielded or off level		Replace
	Service regulator and monitor set-points too close		Distance the 2 set-points
Tightness failure Q=0	Obturator damaged	Pre-regulator R14	Replace
	Rupture diaphragm [25]		Replace
	Obturator damaged	Pilot 20./…	Replace
	Reinforced gasket [7] damaged	Regulator	Replace
	Dirt between the reinforced gasket and the obturator		Clean and check gas filtering
	Diaphragm fixed incorrectly		Fix
	Downstream sensing line dirty		Clean

In the event of operating problems not mentioned in the table, please contact Pietro Fiorentini service department.

6.2 Incorporated Slam-shut Tab. 4

PROBLEM	POSSIBLE CAUSE	EQUIPMENT	REMEDY
Operating anomalies	Wrong calibartion	SB/82 Slam-shut	Repeat calibration procedure
	Friction on leverage		Clean and lubricate or in case replace the box
	Spring yielded or off level	Pressostatic device	Replace
Cannot rearm	Worng calibration	SB/82 Slam-shut	Repeat calibration procedure
	Downstream pressure not include in slam-shut setting		Regulate downstream pressure
	Friction on leverage		Replace
	Principal membrane broken	Pressostatic device	Replace
	Manual bypass button blocked		Clean and lubricate
Cannot rearm	Steam blocked	SB/82 Slam-shut	Clean and lubricate
	Friction on leverage		Clean and lubricate
	Principal membrane broken	Pressostatic device	Replace

In the event of operating problems not mentioned in the table, please contact Pietro Fiorentini service department.

6.3 DB/819 Tab. 5

PROBLEM	POSSIBLE CAUSE	EQUIPMENT	REMEDY
Noise increases	External basket broken	DB/819	Replace
Tightness failure Q=0	Tightness failure o-ring [97]	DB/819	Replace
	Tightness failure o-ring [93]		Replace
	Tightness failure o-ring [95]		Replace

In the event of operating problems not mentioned in the table, please contact Pietro Fiorentini service department.

7.0 MAINTENANCE

7.1 GENERAL

Before carrying out any operation it 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.

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 with a frequency which, if not established by regulations, depend by:

- the quality of the gas transported;
- the cleanliness and conservation of the piping upstream from the regulator: generally, 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 equipment you should check that:

- a set of recommended spares is available. The spares must be original **Pietro Fiorentini**. The most important ones (such as diaphragms) are marked by the manufacturer.
- a set of wrenches is available as specified in table 8.

For a proper maintenance the recommended spare parts are uniquely identified by labels indicating:

- the No of assembly drawing SR of the equipment for which the spare parts are suitable
- the position showed in the assembly drawing SR of the equipment

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

If the maintenance is carried out by your own authorized personnel, we recommend putting reference markings, before the disassembly, on those parts which could have directional or reciprocal positioning problems when reassembling. Finally, we would remind you that O-Rings and sliding mechanical components (rods, etc.) must be lubricated, before the re-assembly, with a fine layer of silicone grease.

7.2 TERVAL/AP REGULATOR MAINTENANCE PROCEDURE

Procedure for disassembling TERVAL/AP, completely changing the spare parts, and reassembling of regulator with 20_/A + R14/A pilot.

PRELIMINARY OPERATIONS

A. Put the regulator into conditions of safety.

B. Ensure that the upstream and downstream pressures are 0.

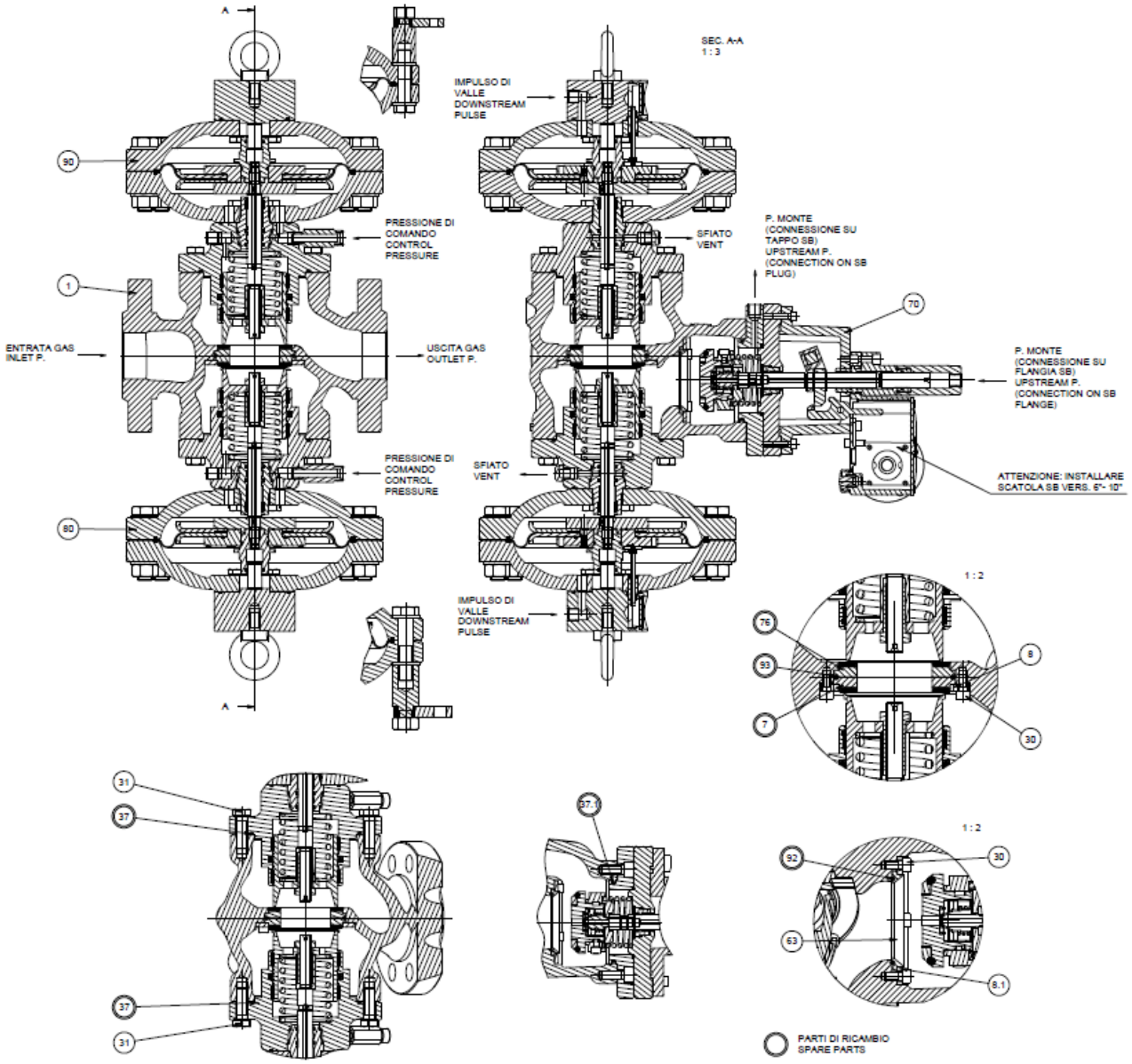


Fig.14

INITIAL OPERATIONS

1) Disconnect all the feed and sensing line connectors from the pilot and regulator by unscrewing the taper seal fittings.

2) Remove the 20_/A + R14/A pilot assembly from the regulator.

3) Unscrew the connecting bolts between the **TERVAL/AP** regulator and the piping line.

4) Remove the **TERVAL/AP** regulators from the piping line.

CONTROL HEAD DISASSEMBLY (Fig.15)

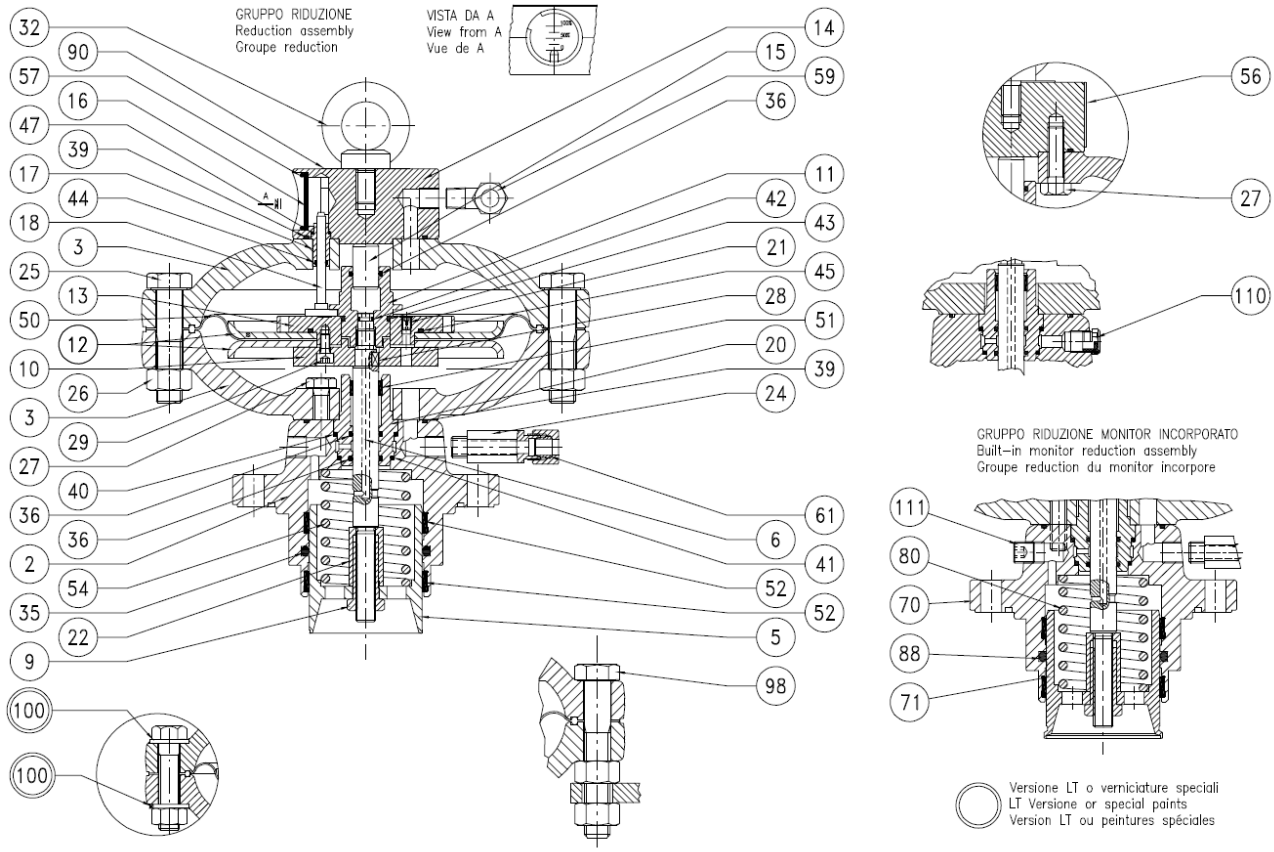


Fig.15

5) Slacken the fixing screws, pos. 25.

6) Remove the top cover, pos. 3 using appropriate means and turning the eyebolt, pos.32.

7) Slacken the fixing screws, pos. 27.

8) Separate the top cover, pos. 3 from the top flange, pos. 14.

9) Remove the stroke indicator rod guide pos. 17, from the top flange, pos. 14.

10) Keeping the diaphragm-holder assembly fixed with a wrench, unscrew and remove the balancing rod guide, pos. 11.

11) Separate the balancing piston, pos. 15, from the balancing guide rod, pos. 11.

12) Remove the diaphragm holder assembly.

13) Slacken the diaphragm-holder assembly fixing screws, pos. 29.

14) Separate the protection discs, pos. 12, from the diaphragm, pos. 50.

15) Slacken the fixing screws, pos. 27.

16) Separate the bottom cover, pos. 3 from the obturator guide, pos. 2.

17) Remove the guide rod, pos. 20.

18) Control and clean all the disassembled metal parts.

19) Replace all the parts from the spare parts kit.

REASSEMBLING THE REGULATOR SERVOMOTOR UNIT (FIG. 15)

Remember that the O-rings and the sliding mechanical parts (rods, etc.) must be lightly lubricated, before reassembly, with a fine layer of silicone grease, while static parts require grease to make them softer but mainly to hold them in their slots:

20) Reassemble the guide rod, pos. 20

21) Reassemble the bottom cover, pos. 3 on the obturator guide, pos.2, remembering to align the downstream sensing line hole properly.

22) Reassemble and fix the screws, pos. 27.

23) Reassemble and fix the screws of the diaphragm-holder assembly, remember to align the hole for the transfer nozzle.

24) Reassemble the diaphragm-holder assembly on the head.

25) Reassemble the balancing piston, pos. 15, on the balancing guide rod, pos. 11.

26) Screw and fix the balancing guide rod, pos. 11, to the rod, keeping the diaphragm-holder fixed.

27) Reassemble the stroke indicator rod guide, pos. 17, onto the top flange 14.

28) Reassemble the top cover, pos. 3, and the top flange, pos. 14, and fix the screws, pos. 27.

29) Reassemble the stroke indicator rod, pos. 18, (preferably not above the transfer holes).

30) Using appropriate means on the eyebolt, pos. 32, reassemble the top cover, pos. 3, after checking that the diaphragm is correctly positioned with respect to the bottom cover.

31) Reassemble and fix the screws, pos. 25

DISASSEMBLING THE REGULATOR REGULATION UNIT (FIG 14)

32) Slacken the fixing screws, pos. 31.

32) Remove the regulation unit from the main body, pos. 1.

(FIG 15)

33) Slacken the lock nuts, pos. 9, of the obturator, pos. 5, of the rod, pos. 6, and remove the obturator guide, pos. 5, from the obturator guide, pos. 2.

34) Completely slacken the spring, pos. 54.

(FIG 14)

35) Slacken the fixing screws, pos. 30, of the lock ring, pos. 8, of the reinforced gaskets, pos. 7.

36) Remove the lock ring, pos. 8, and the rein-forced gaskets, pos. 7 or 76.

37) Check and clean the inside of the regulator body.

38) Carefully control the condition of the obturator, pos. 5.

39) Replace all the parts from the spare parts kit.

REASSEMBLING THE REGULATOR REGULATION UNIT (FIG. 14)

Remember that the O-rings and the sliding mechanical parts (rods, etc.) must be lightly lubricated, before reassembly, with a fine layer of silicone grease, while static parts require grease to make them softer but mainly to hold them in their slots:

40) Reassemble the reinforced gaskets, pos. 7 and 76, the lock ring pos. 8, and fix the screws of the ring itself, pos. 30.

(FIG 15)

41) Reassemble the spring, pos. 54, fully in. Fix the obturator, pos. 5 to the rod pos. 6, and screw the lock nut, pos. 9.

(FIG 14)

42) Reassemble the regulation unit on the main body, and fix the screws, pos. 31.

SB/82 SLAM-SHUT DISASSEMBLY (FIG 16)

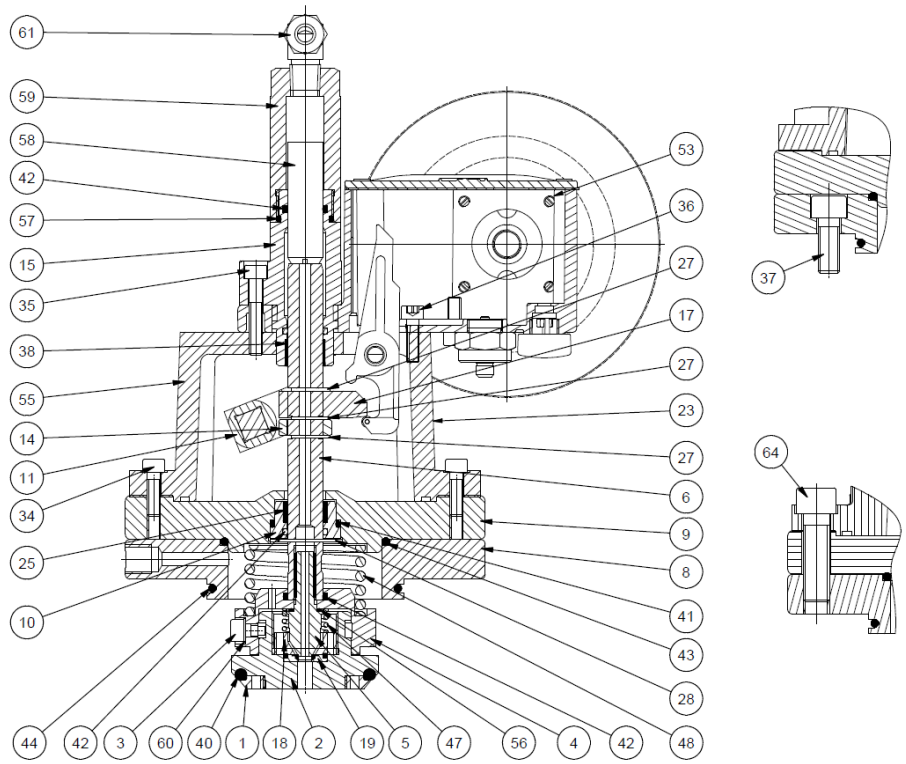


Fig. 16

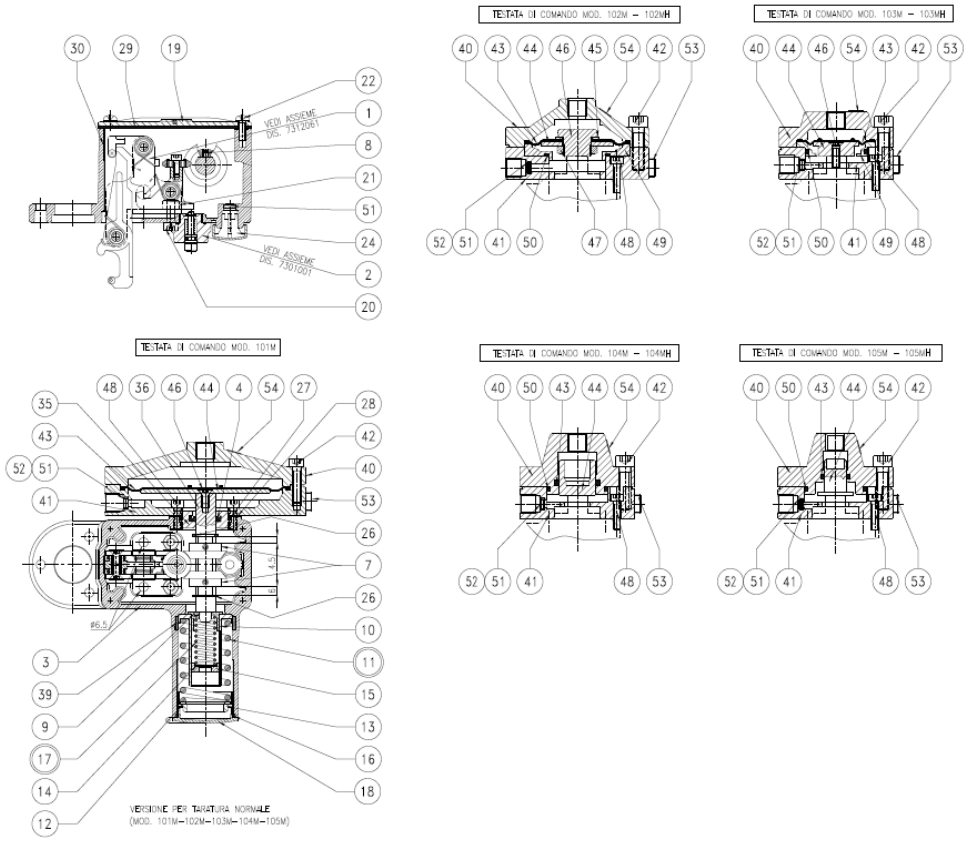


Fig. 17

43) Check that the slam-shut is in closed position.

44) Disconnect the pipe between the downstream pressure take-off and the head of the slam-shut pressure switch.

45) Slacken the fixing screws, pos. 64, so as to partially slacken the spring, pos. 48; before removing them completely, ensure that you can support the wright of the slam-shut device adequately.

46) Remove the screws and separate the slam-shut from the body.

47) Put the slam-shut on its side.

48) Remove the screw pos.37 and remove the intermediate flange pos.8

49) Unscrew the screws, pos. 3, and remove the obturator, pos. 2, and the spring, pos. 47.

50) Unscrew the ring, pos. 1, and the ring, pos.18, from the obturator, pos. 2.

51) Keeping the shaft, pos. 6 firm, slacken the screw, pos. 5.

52) Remove the ring, pos. 4, and the spring, pos.48.

53) Remove the retaining ring, pos. 28, and the shaft guide, pos. 10.

(FIG 17)

54) Slacken the screws pos. 42 form the pressure switch device, and remove the cover pos. 40.

55) Replace all the components included in the spare parts kit.

SB/82 SLAM-SHUT RE-ASSEMBLY (FIG 17)

Remembering that the o-rings and the sliding parts (rods, etc.) must be lightly lubricated with a fine layer of silicone grease before re-assembly, while static parts require grease to render them softer but, especially, to hold them in their slots:

56) Fit the cover, pos. 40, and fix the screws, pos. 42 on the pressure switch device.

(FIG 16)

57) Put back the shaft guide, pos. 10, and fix it with the retaining ring, pos. 28.

58) Put back the spring, pos. 48, and the ring, pos.4, and fix the screw, pos. 5.

59) Put back the rings, pos.1 and pos.18 on the obturator, pos. 2.

60) Put back the spring, pos. 47, and the obturator, pos. 2, fixing the screws, pos. 3.

61) Put back the intermediate flange, pos. 8, in the bod and fix it with the screws, pos. 37.

62) Put the slam-shut device back on the body and fix the screws, pos. 64.

63) Restore the connection between the downstream pressure take-off and the head of the slam-shut pressure switch.

DISASSEMBLING GROUP PILOT (Fig. 18, 19)

64) Disconnect the connectors between the pilot 20_/A and the pre-regulator R14/A, unscrewing the tapered seal connectors.

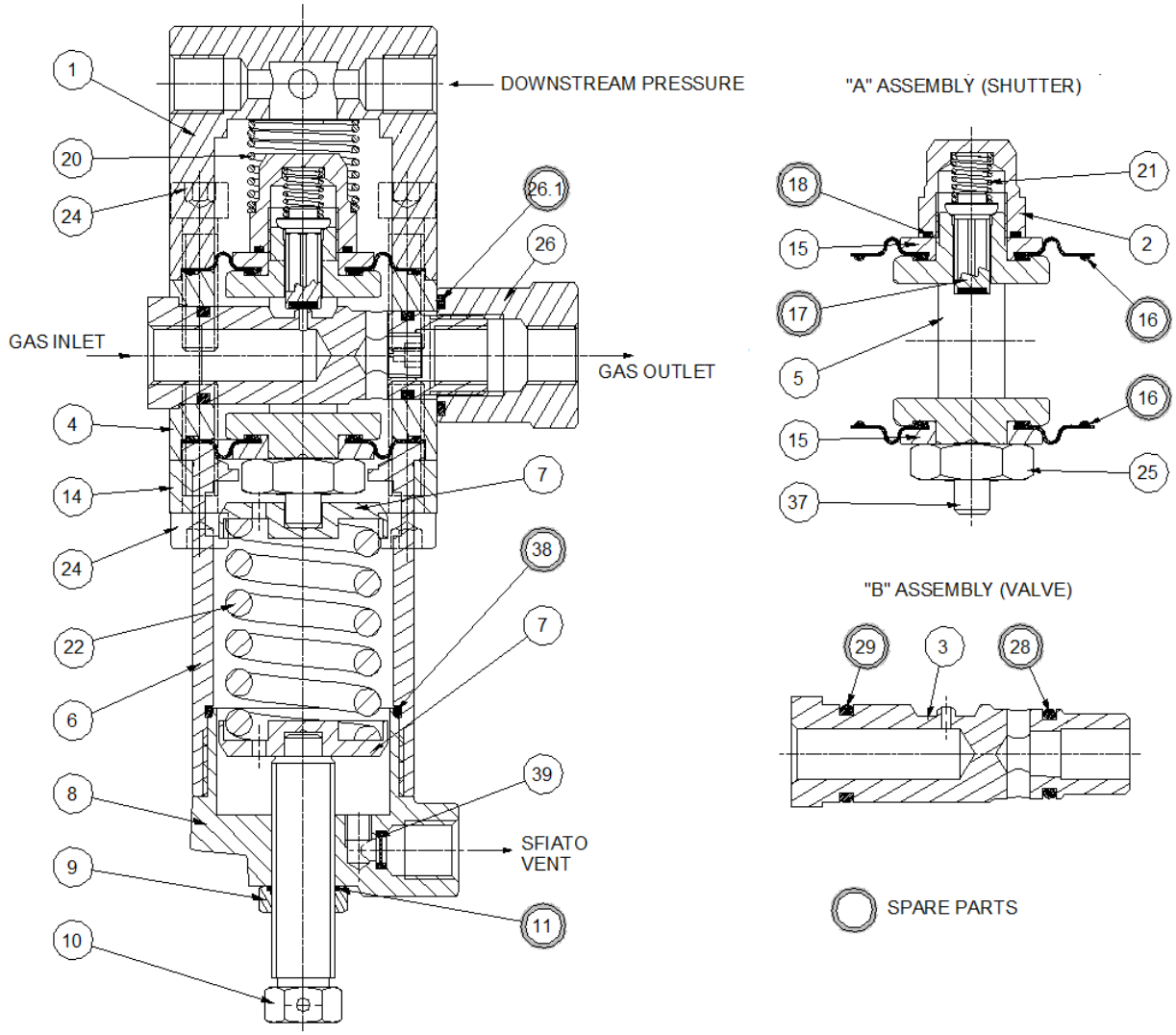


Fig.18

DISASSEMBLING THE PILOT 20_/A (Fig. 18)

65) Slacken the lock nut 9.

66) Slacken the adjustment screw 10 for its complete stroke by turning it anticlockwise.

67) Remove the pilot plug 8.

68) Remove the spring support 7, the spring 22 and the spring support 13.

69) Slacken the screw 24 and remove the sleeve 6 and the pilot bracket 14.

70) Unscrew the lock nut 25 and remove the protection disc 5 and the bottom diaphragm 16.

71) Slacken the screws 24 and remove the pilot cover 1 and the spring 20.

72) Unscrew the pilot nut 2 and remove the spring 21, the pilot obturator 17, the protection disc 15 and the top diaphragm 16.

73) Unscrew the lock nut 26 from the valve seat 3.

74) Remove the valve seat 3 from the pilot body 4, along with diaphragm support 5.

75) Clean and check that the valve seat 3 is in good condition.

76) Replace all the components that are part of the spare parts kit.

REASSEMBLING THE PILOT 20_/A (Fig. 18)

77) Reassemble the valve seat 3 on the pilot body 4, putting the diaphragm support 5 between them.

78) Insert O-ring 26.1 in the lock nut 26, and screw it on the valve seat 3.

79) Reassemble the bottom diaphragm 16, the protection disc 15 and screw the pilot lock nut 25.

80) Insert the pilot obturator 17, the spring 21, the top diaphragm and the protection disc 21.

81) Put the O-ring 18 in the nut 2, and screw it on the support 5.

82) Center the diaphragm support 5.

83) Reassemble the pilot cover 20 along with the spring 1 and secure with screws 24.

84) Reassemble the sleeve 6 and the pilot bracket 14 and secure it with screws 24

85) Position the spring support 13, the spring 22, and the spring support 7 and fix the pilot plug 8.

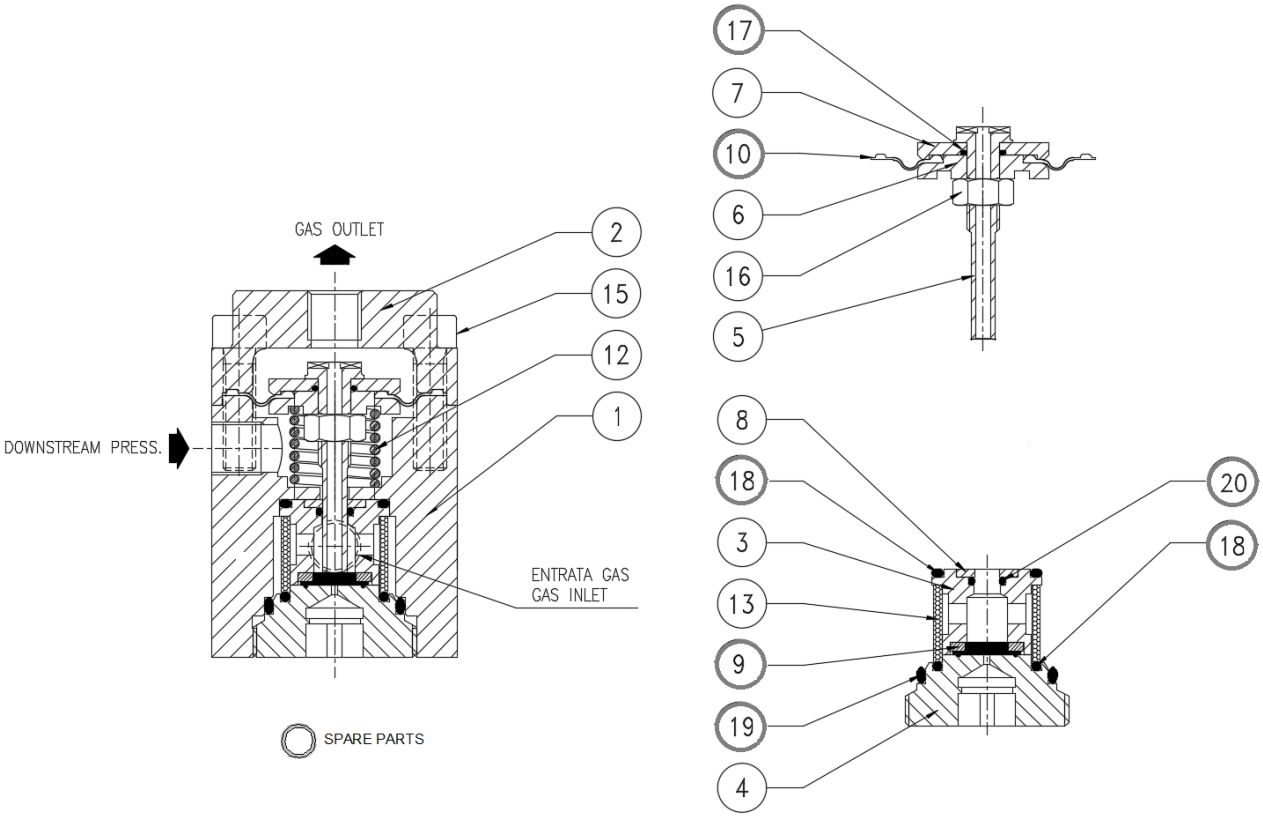


Fig. 19

DISASSEMBLING THE PRE-REGULATOR R14/A (FIG. 19)

86) From the pre-regulator body 1, remove the cover 2, slackening the screws 15.

87) Remove the diaphragm obturator assembly and the spring 12.

88) Separate the diaphragm assembly 10 and obturator 5, unscrewing the lock nut 16.

89) Unscrews the pre-regulator plug 4.

90) From the pre-regulator body 1, remove the pre-regulator plug 4, the reinforced gasket 9, the filter 13, the obturator guide 3 and the guide ring 8.

91) Clean the obturator 5 and check that it is in a good state.

92) Replace all the components that are part of the spare parts kit.

REASSEMBLING THE PRE-REGULATOR R14/A (FIG. 19)

93) Reassemble the shaft-filter guide assembly.

94) Screw in the pre-regulator plug 4.

95) Reassemble the diaphragm-obturator assembly.

96) Reassemble the spring and the diaphragm-obturator assembly and fix the cover 2, securing the screws 15.

REASSEMBLING THE PILOT ASSEMBLY

97) Reconnect the connectors between the pilot 20_/A and the pre-regulator R14/A screwing in the tapered seal connectors.

FINAL OPERATIONS

98) Reassemble the pilot 20_/A + R14/A assembly on the regulator

99) Secure the nut of the bracket holding the pilot on the regulator.

100) Reassemble the ASX 176 regulators on the piping line.

101) Reconnect all the feed and impulse connectors of the pilot and regulator, screwing in the tapered seal connectors.

Tab. 6 MAINTENANCE WRECHES FOR ASX 176/FO PRESSURE REGULATORS WITH 204/A AND R14/A

 A) Combination spanner	 B) Adjustable spanner	 C) Box spanner
 D) Hexagonal or allen key	 E) Hexagonal T key	 F) O-ring extraction tool

Type	DN	1”	2”
A	Ch.	13-17-19 24-30	13-17-19 24-30
B	L.	300	
C	Ch.	17	17
D	Ch.	10	10
E	Ch.	5-6-7	5-6-7
F	Cod.	7999099	

8.0 FINAL OPERATION

8.1 CHECKING THE TIGHTNESS AND SETTING

1) Open very slowly the on/off valve upstream from the regulator and, using a foam solution or the like, check:

• the tightness of the external surfaces of the regulator and of the pilot

• the tightness of the internal surfaces of the regulator and of the pilot

2) Open the atmosphere bleed valve downstream the regulator, to create a small gas flow.

3) Turn the pilot regulation screw until the desired set-point value is reached.

4) Close the atmosphere bleed valve.

8.2 START UP

1) Open very slowly the downstream on/off valve.

2) When the mains has been filled, check that the regulator is set properly for the flow requirements of the mains itself.

3) Block the pilot adjustment screw by means of the lock nut 9.

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MT314-E MARCH 2018