



PRESSURE REGULATOR

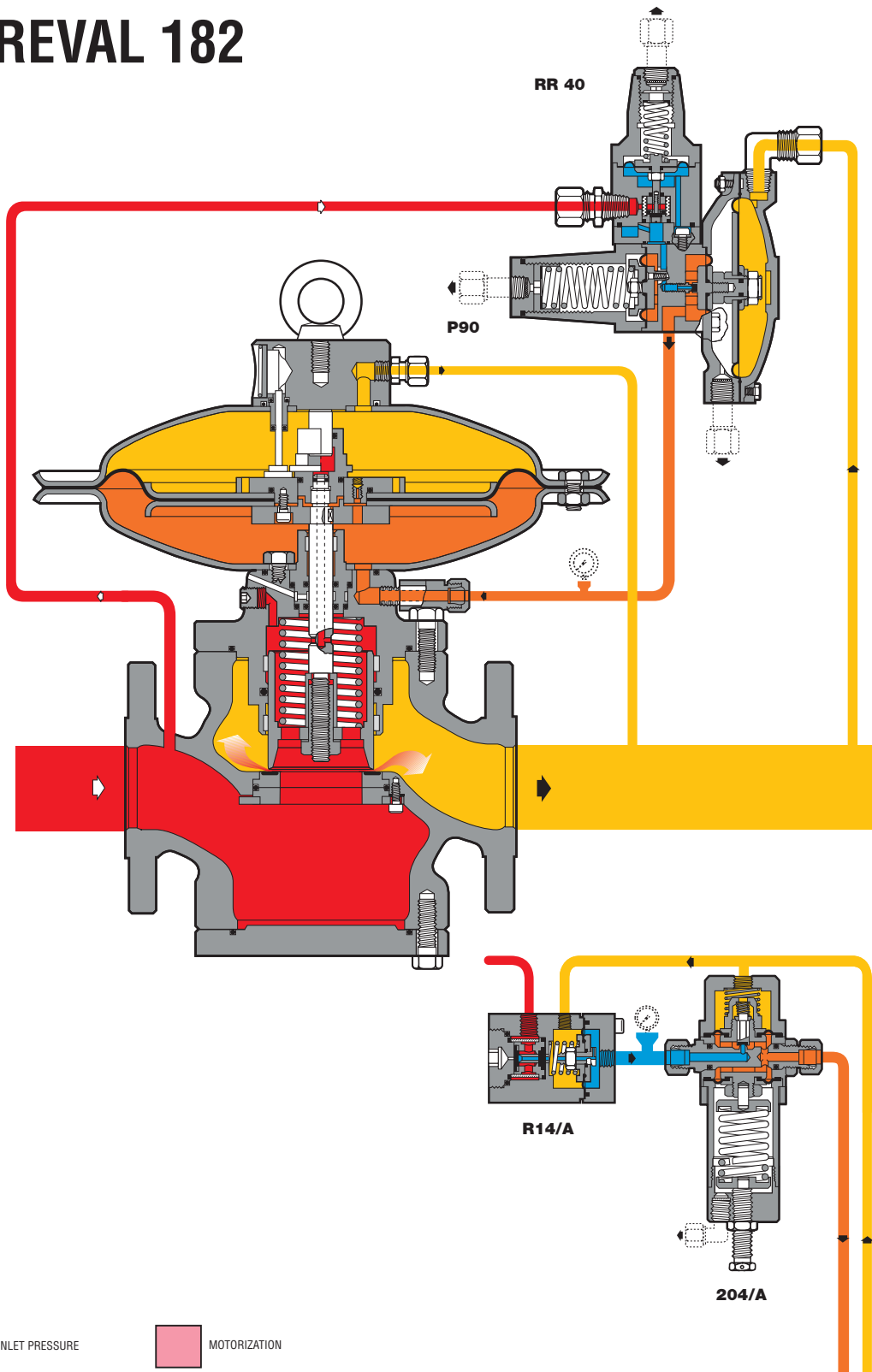
REVAL 182







TECHNICAL MANUAL MT043

INSTALLATION, COMMISSIONING AND MAINTENANCE INSTRUCTIONS

REVAL 182



- | | |
|---|--|
|  INLET PRESSURE |  MOTORIZATION |
|  OUTLET PRESSURE |  PILOT FEED |

DECLARATION OF CONFORMITY

The **PIETRO FIORENTINI SPA** with registered office in Milan (Italy) – via Rosellini, 1, declares under its sole responsibility that the apparatus series Reval 182 bearing the CE marking showed in this manual are designed, manufactured, tested and inspected in accordance with the provisions of Pressure Equipment Directive 97/23/EC (PED).

Following conformity assessment procedure has been carried out:

- EC type-examination (module B) by DVGW (ID n° 0085) – report **02/133/4301/855 issued 30th April 2002**. In this report all versions are classified as safety accessories according to clause 2.1.3 of art. 1 of PED.
- Production quality assurance (module D) by BUREAU VERITAS (ID n° 0062) – Attestation d'Approbation du Système Qualité N° **CE-PED-D-FIO001-02-ITA Rev. A issued 15th May 2002**.

Further it declares that the classification of the performances characteristics has been verified by DVGW according to the procedures given by European standard EN 334 and/or by standard DIN 3381. The classification is detailed in the aforesaid DVGW report.

Arcugnano 25/9/2002

The Pietro Fiorentini SpA

PRECAUTIONS

GENERAL PRECAUTIONS

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

PRECAUTIONS FOR THE OPERATORS

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

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

HANDLING

The handling of the apparatus and of its components must only be carried out after ensuring that the lifting gear is adequate for the **loads to lift** (lifting capacity and functionality). The apparatus must be handled using the **lifting points** provided on the apparatus itself.

Motorised means must only be used by the persons in charge of them.

PACKING

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

INSTALLATION

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

COMMISSIONING

Commissioning must be carried out by adequately trained personnel.

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

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

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

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

CONFORMITY TO DIRECTIVE 97/23/EC (PED)

Pressure regulators series Reval 182 are classified as fail close regulator according to the standard EN 334 therefore they are categorized as **safety accessory** according to directive 97/23/EC (PED).

The incorporated safety device monitor PM/182 (as well as the in-line monitor REVAL 182) being classified as fail close regulators according to the standard EN 334 is categorized as **safety accessory** according PED, therefore it can be used both as pressure accessory and **safety accessory** to PED. The regulator Reval 182 when incorporating slam shut valve SB/82 or VB/93 with pressure switches for overpressure is categorized as **safety accessory** according to PED, therefore it can be used both as pressure accessory and **safety accessory** to PED.

Conformity with Directive 97/23/EC and CE marking of pressure regulator and relevant accessory require installation in the system with minimum requirements according to EN 12286.

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1.0 INTRODUCTION

The scope of this manual is to provide essential information for the commissioning, disassembly, re-assembly and maintenance of the REVAL 182 regulator.

At the same time we consider it appropriate to provide a brief illustration of the main features of the regulator and its accessories.

1.1 MAIN SPECIFICATIONS

The REVAL 182 pressure regulator is a regulator for medium and low pressures.

The REVAL 182 is a fail closed type regulator and therefore closed in event of:

- rupture of the main diaphragm;
- rupture of the pilot diaphragm;
- no feed in the pilot circuit.

The main specifications of this regulator are:

- Design pressure: up to 18.9 bar
- Working temperature range: -10°C to +60 °C (higher or lower temperatures on request);
- Ambient temperature: -20 °C to +60 °C;
- Inlet pressure range bpe: 0.5 to 16 bar
- Regulating range possible Wh: 0.006 to 12 bar (depending on the pilot installed);
- Minimum differential pressure: 0.1 bar;
- Precision class RG: up to 2.5;
- Closing pressure class SG: up to 5.

1.2 OPERATION

1.2.1 REGULATOR WITH PILOT P...+RR40 (fig. 1)

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 Pa 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.

----- Connections to be made by the customer

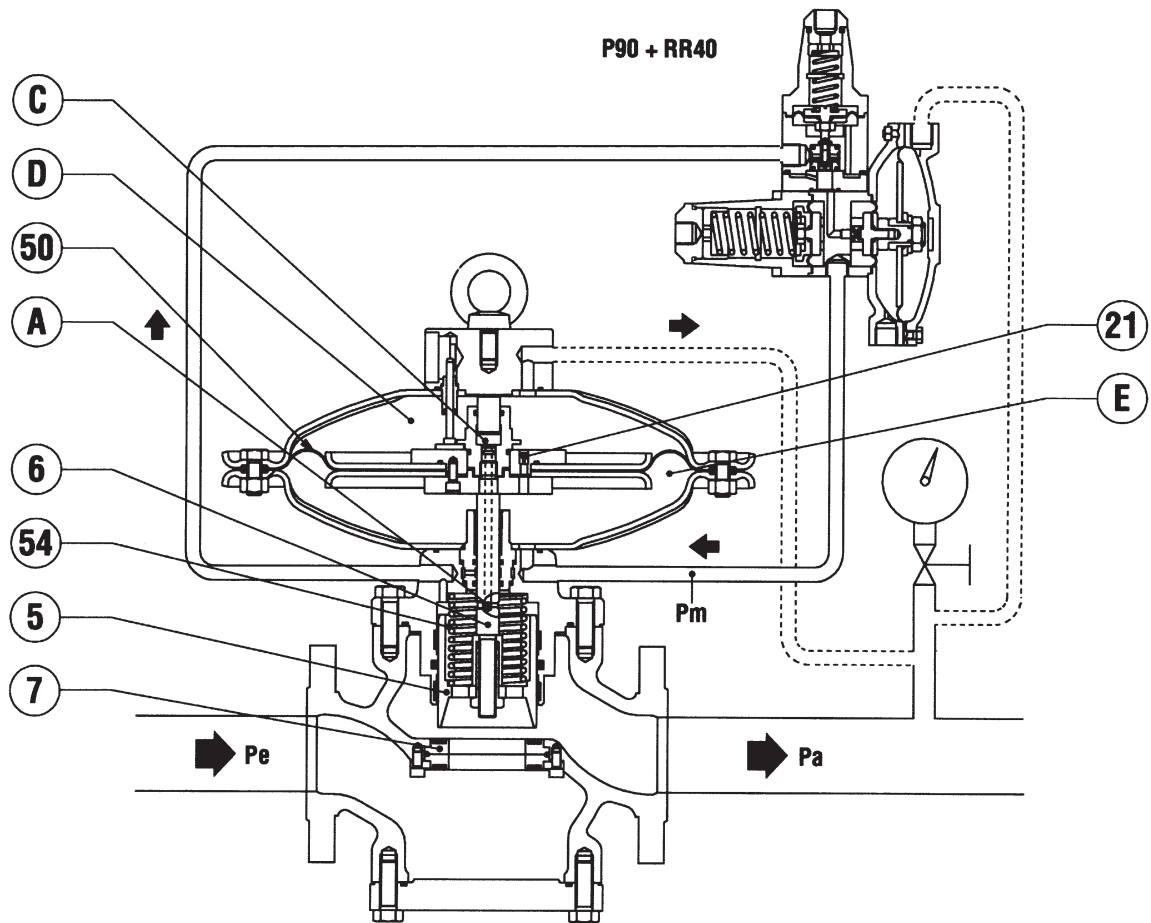


Fig. 1

The motorisation pressure is obtained by drawing gas from the regulator at the upstream pressure.

The gas is filtered through the incorporated filter 28 and is subjected to initial decompression in the adjustable pre-regulator RR40 (fig. 2) composed essentially of an obturator 31, a spring 40 and a diaphragm 25 to a value, P_{ep} , which depends on the pressure set-point of the regulator. P_{ep} is adjusted by turning the ring 10 (clockwise to increase, anticlockwise to reduce), and its value can be read on the pressure gauge fitted directly on the body. The pressure, P_{ep} , then passes from the chamber G through the hole F in the P90 incorporated pilot which adjusts it by means of the obturator 17 until the inlet value, P_m , in the head of the regulator.

The regulation of P_m is obtained by the comparison of the force exerted by the setting spring 71 of the pilot and the action of the regulated pressure, P_a , acting in the chamber B on the diaphragm 23.

The set-point can be changed by turning the adjustment ring 11; clockwise rotation increases P_m and therefore the regulated pressure, P_a ; the opposite occurs when the ring is turned anticlockwise. If, for example, the downstream pressure, P_a , 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 value, P_m , increases and, by acting in the chamber E under the diaphragm 50 (fig. 1), 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. Vice versa, when

the regulated pressure begins to increase, the force it exerts on the diaphragm 23 of the pilot moves the mobile assembly 16 displacing the obturator 17 towards the closed position. The pressure, P_m , 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, P_m , is such as to maintain the downstream pressure value, P_a , around the set-point.

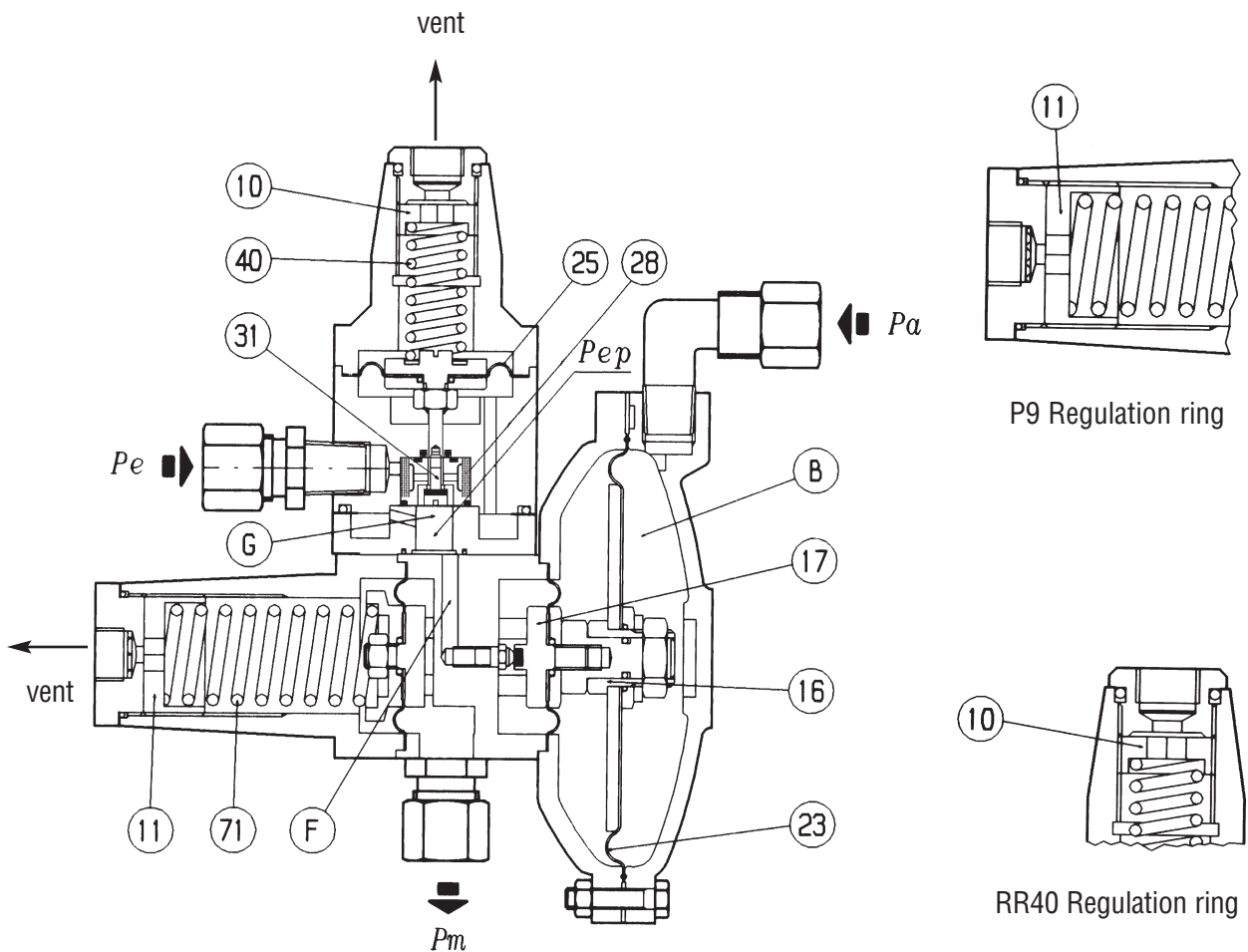


Fig. 2

1.2.2 REGULATOR WITH PILOT 204/A+R14/A (fig. 3)

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 (fig. 3). 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 P_a in the chamber D and the weight of the mobile assembly.
- upwards: the thrust deriving from the motorisation pressure P_m in the chamber E, supplied by the pilot.

The motorisation pressure is obtained by drawing gas from 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 (fig. 4) composed essentially of an obturator 5, a spring 12 and a diaphragm 10 to a value, P_{ep} , which depends on the pressure set-point of the regulator. The pressure, P_{ep} , then passes from the chamber G into in the 204/A pilot which adjusts it by means of the obturator 17 until the inlet value, P_m , in the head of the regulator. The regulation of P_m is obtained by the comparison of the force exerted by the setting spring 22 of the pilot and the action of the regulated pressure, P_a , acting in the chamber B on the diaphragm 16.

----- Connections to be made by the customer

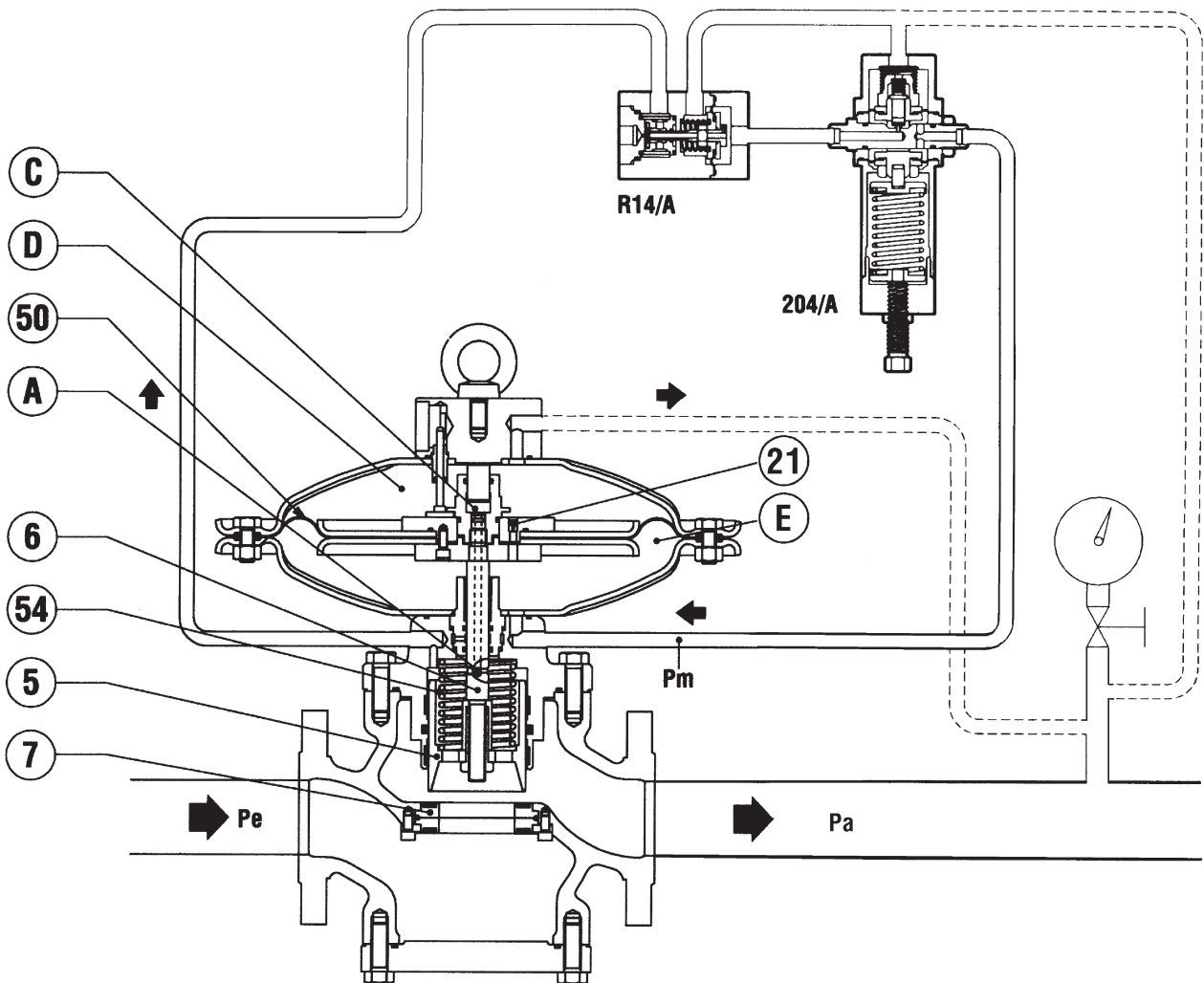


Fig. 3

The set-point can be changed by turning the adjustment screw 10; clockwise rotation increases P_m and therefore the regulated pressure, P_a ; the opposite occurs when the ring is turned anticlockwise. If, for example, the downstream pressure, P_a , 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 15 of the pilot, which is displaced to increase the opening of the obturator 17. As a result, the motorisation pressure value, P_m , increases and, by acting in the chamber E under the diaphragm 50 (fig. 3), 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.

Vice versa, when the regulated pressure begins to increase, the force it exerts on the diaphragm 16 of the pilot moves the mobile assembly 15 displacing the obturator 17 towards the closed position. The pressure P_m 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 P_m is such as to maintain the downstream pressure value P_a around the set-point.

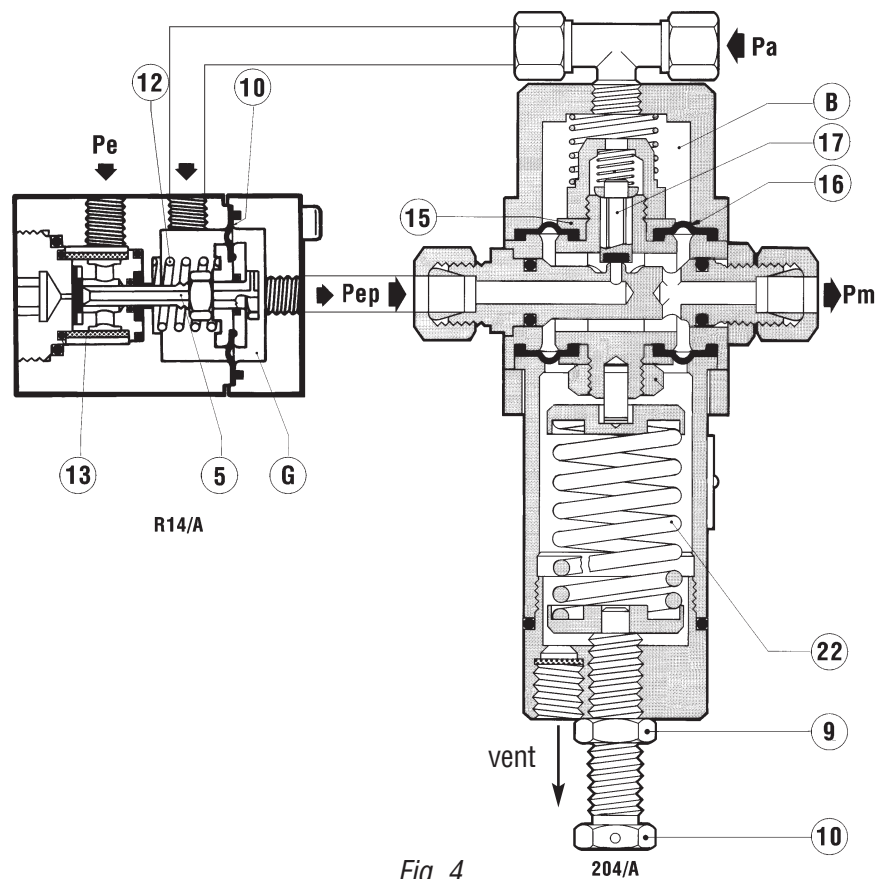


Fig. 4

1.3 SETTING SPRINGS

The REVAL 182 regulator uses the P90, P92 and 204/A pilots. The regulation range of the different pilots is given in the tables below.

Tab. 1 RR40 Setting springs pre-regulator								
	Code	Colour	De	Lo	d	i	it	Setting range in bar
1	2700338	WHITE	15	40	1.3	8.5	10.75	0.11 ÷ 0.22
2	2700375	YELLOW			1.5	6.5	8.75	0.22 ÷ 0.58
3	2700464	ORANGE			1.7	8.5	10.5	0.5 ÷ 0.86
4	2700510	RED		35	2	5.25	7.25	0.85 ÷ 2
5	2700745	GREEN			2.5	5.5	7.25	1.95 ÷ 4.7
6	2700980	BLACK			3	6	8	4.6 ÷ 8.2

N.B.: Sett-point pre-regulator: $P_{ep} = P_a + (0.15 \div 0.2)$ bar

Tab. 2 Pilots P90-92 setting springs								
P90 PILOT								
	Code	Colour	De	Lo	d	i	it	Setting range in mbar
1	2700400	WHITE	25	55	1.5	7	9	6 ÷ 15
2	2700545	YELLOW			2	7.5	9.5	14 ÷ 50
3	2700790	ORANGE			2.5	8	10	49 ÷ 120
4	2701010	RED			3	6.5	8.5	110 ÷ 270
P92 PILOT								
1	2701010	RED	25	55	3	7	8.5	260 ÷ 660
2	2701225	GREEN			3.5	6	8	650 ÷ 1110

Tab. 3 Pilot 204/A setting springs								
	Code	Colour	De	Lo	d	i	it	Setting range in mbar
1	2701260	WHITE	35	60	3.5	5.50	7.50	300 ÷ 1200
2	2701530	YELLOW			4	5.00	7.00	700 ÷ 2800
3	2702070	ORANGE			5	5.00	7.00	1500 ÷ 7000
4	2702450	RED			6	5.00	7.00	4000 ÷ 12000

De = external diameter **d** = wire diameter **i** = active coils **Lo** = Spring length **it** = total coils

2.0 INSTALLATION

2.1 GENERAL

Pressure regulator does not require any supplementary upstream safety accessory for protection against overpressure compared with its design pressure PS, when upstream reducing station is sized for a max downstream incidental pressure $MIPd \leq 1,1 PS$.

Before installing the regulator it is necessary to ensure that:

- the regulator can be inserted in the space provided and that subsequent maintenance operations will be sufficiently practicable;
- the upstream and downstream piping is at the same level and capable of supporting the weight of the regulator;
- the inlet/outlet flanges of the piping are parallel;
- the inlet/outlet flanges of the regulator are clean and the regulator itself has not been subject to damage during transport;
- the piping upstream has been cleaned to expel residual impurities such as welding scale, sand, paint residues, water, etc.

The normally recommended set-up is:

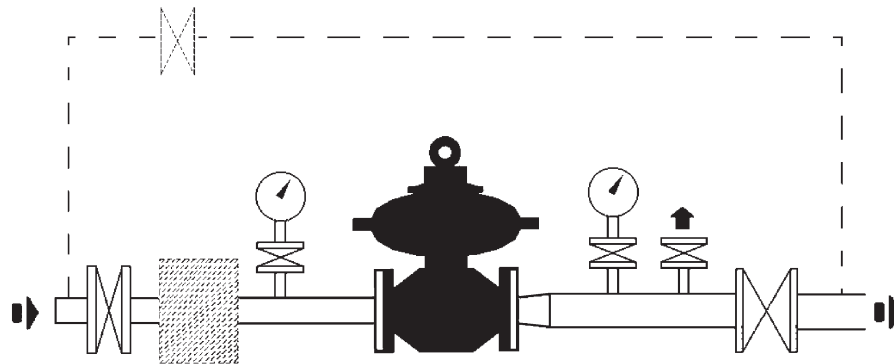


Fig. 5 (Standard regulator)

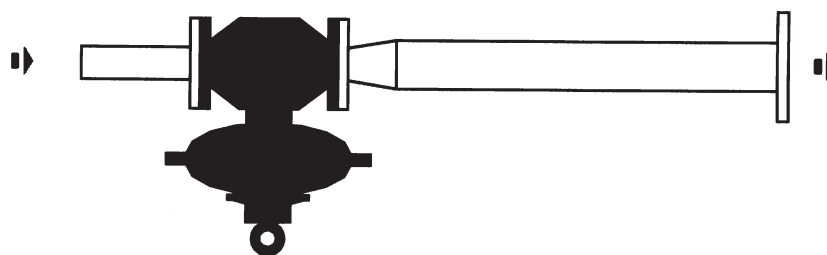
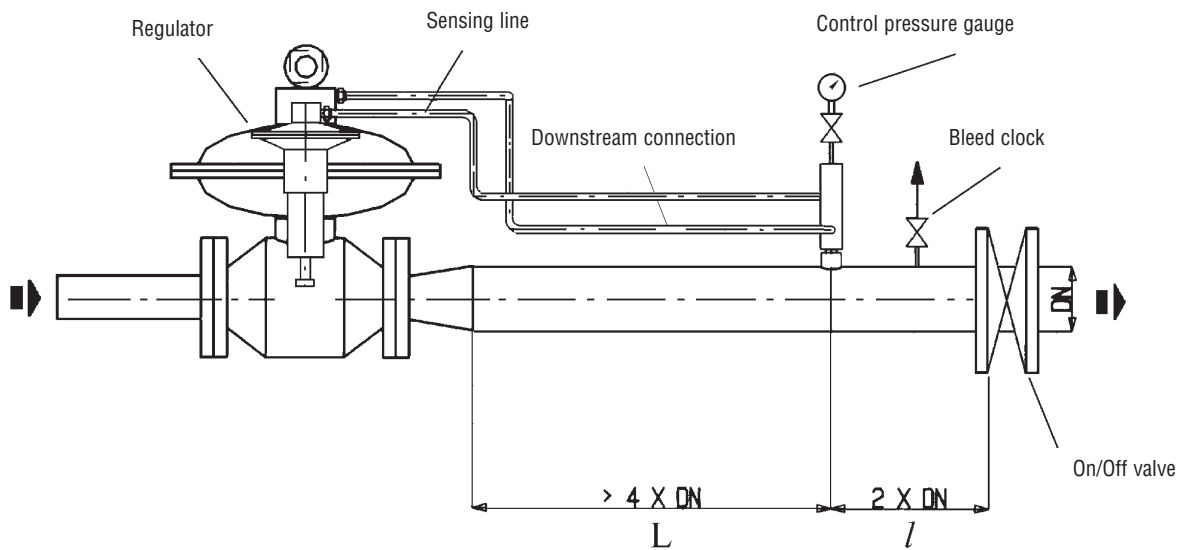


Fig. 6 (Overturned regulator)

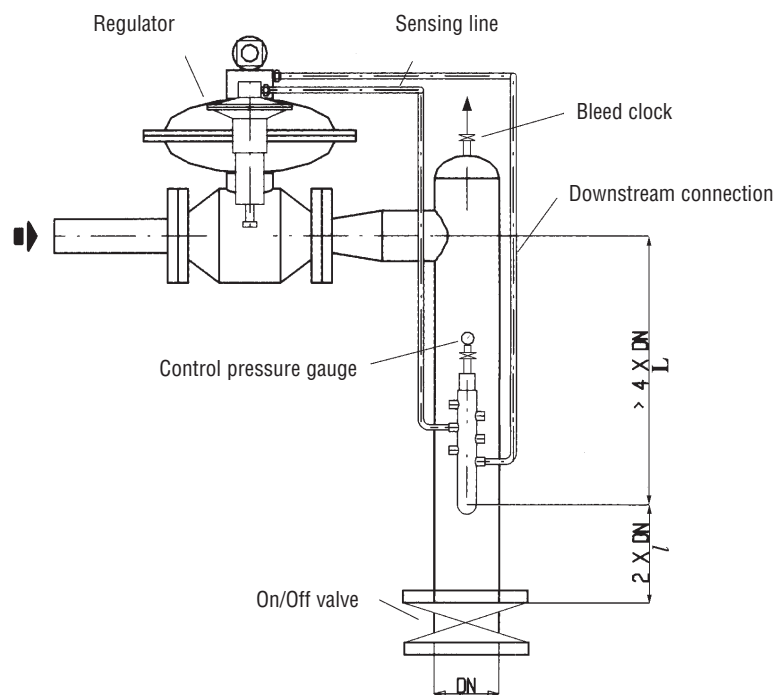
TAB. 4 CONNECTING THE APPARATUSES

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

IN-LINE INSTALLATION

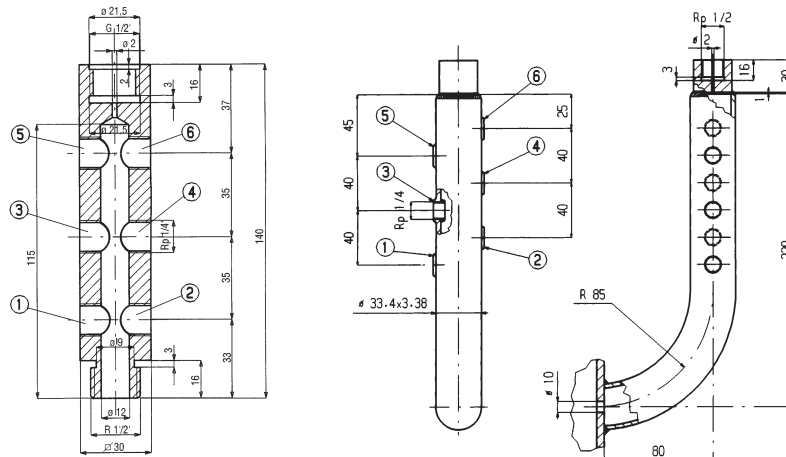


INSTALLATION AT RIGHT ANGLES



TAB. 5 DETAIL OF MULTIPLE TAKE - OFF WITH OF THE IMPULSE TAKE - OFF REFERENCE NUMBERS

- 1 and 2 Connect to regulators heads
- 3 and 4 Connect to pilots
- 5 and 6 Connect to accelerator and slam-shut



The regulator must be installed in the line with **the arrow on the body pointing in the gas flow direction**. It is indispensable for good regulation that the position of the downstream pressure take-offs and the speed of the gas at the take-off point respect the values given in tables 4 and 5 (positioning) and 6 (speed).

The pressure regulator, when installed on a reducing station, shall be installed at least according to the requirements of standard EN 12186.

All venting connections shall be connected as required by above mentioned standard.

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

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

NB. WE RECOMMEND NOT TO PUT ON/OFF VALVES ON THE IMPULSE TAKE-OFFS

TAB. 6

The speed of the gas must not exceed the following values in the piping downstream from the regulator:

$$V_{max} = 30 \text{ m/s for } P_a > 5 \text{ bar}$$

$$V_{max} = 25 \text{ m/s for } 0,5 < P_a < 5 \text{ bar}$$

$$V_{max} = 15 \text{ m/s for } P_a < 0,5 \text{ bar}$$

3.0 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 intervention of the slam-shut valve 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 valve available are all based on the same operating principle which is illustrated below with reference to the valve VS/AM 55 (fig. 7).

It is based on the contrast between the thrust on the diaphragm 24 deriving from the pressure of the gas to be controlled 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 quantity 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.

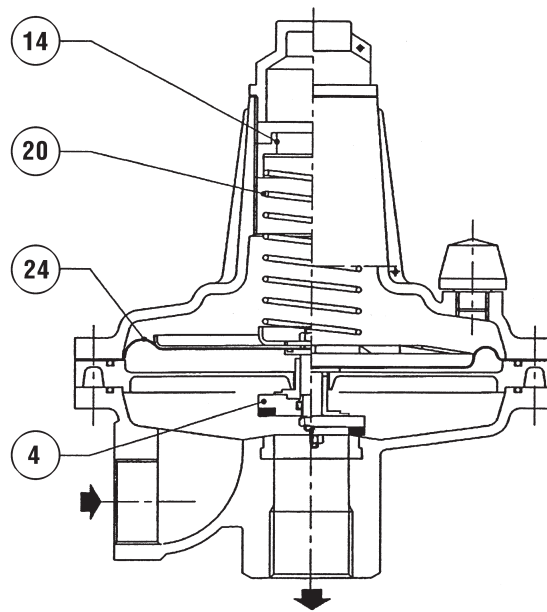


Fig. 7

3.1.1 DIRECT INSTALLATION IN THE LINE (FIG. 8)

When the relief valve is fitted directly in the line, that is without inserting an on-off valve, proceed as follows:

- 1) Ensure that the downstream on-off valve V2 and the bleed cock 6 are closed.
- 2) Increase the pressure in the downstream section up to the value envisaged for intervention in one of the following ways:
 - if the spring fitted on the pilot permits it (see tables 1-2-3), increase the setting of the pilot itself until the desired value is obtained;
 - connect a controlled auxiliary pressure to the cock 6 and stabilize it at the desired value;
- 3) Check the intervention of the relief valve and adjust it if necessary by turning the adjustment ring 14 appropriately (clockwise to increase and anticlockwise to decrease).

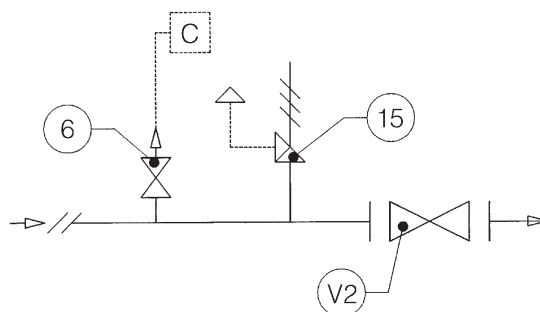


Fig. 8

3.1.2 INSTALLATION WITH ON/OFF VALVE (FIG. 9)

- 1) Close the on-off valve 16.
- 2) Connect a controlled auxiliary pressure to the nipple 17 and increase it slowly up to the value envisaged for intervention.
- 3) Check the intervention of the relief valve and adjust if necessary by turning the adjustment ring 14 appropriately (clockwise to increase and anticlockwise to decrease).

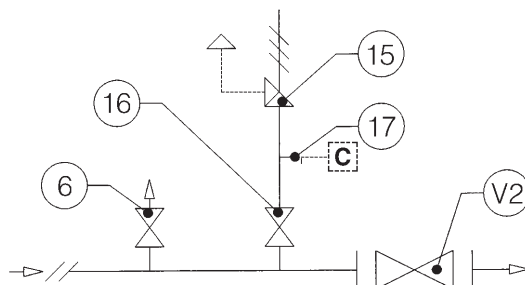


Fig. 9

3.2 ACCELERATOR

An accelerator (fig. 10) is installed on the PM/182 incorporated monitor and on the REVAL 182 regulator (use as in-line monitor) to speed up their intervention in the event of failure of the active regulator (recommended when used safety accessory according to Directive 97/23/EC "PED").

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 ring 1, clockwise to increase the value, anticlockwise to reduce it. Two models are available:

1. V/25 range of intervention W_{ho} : 15 ÷ 600 mbar;
2. M/A range of intervention starting from 550 mbar.

Accelerator V/25

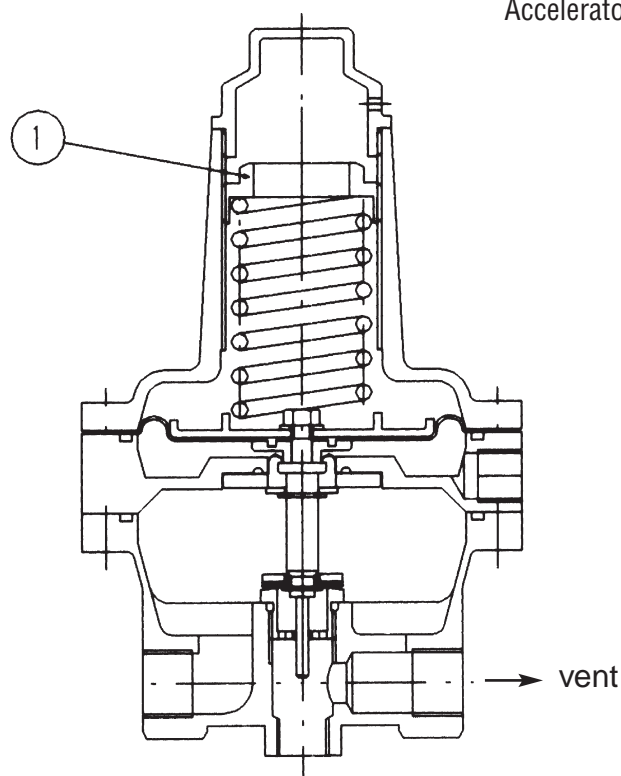


Fig. 10

4.0 MODULARITY

The modular-type design of REVAL 182 series regulators means that it is also possible to feature the emergency monitor regulator PM/182 or the slam-shut incorporated with the body itself even after the installation of the regulator without any modifications.

4.1 INCORPORATED SLAM-SHUT VALVE

When closing the slam shut incorporated into pressure regulator to be considered as safety accessory according to Directive PED, cuts off the feeding of gas both to pressure regulator and to its pilot.

4.2 INCORPORATED SB/82 SLAM-SHUT VALVE

This is a device (fig. 11) 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 REVAL 182 regulator, it is possible to have the SB/82 slam-shut incorporated both with the service regulator and on the one functioning as in-line monitor.

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): $\pm 1\%$ of the pressure set-point for pressure increases; $\pm 5\%$ for pressure drops;
- manual resetting with internal by-pass operated by the resetting lever.

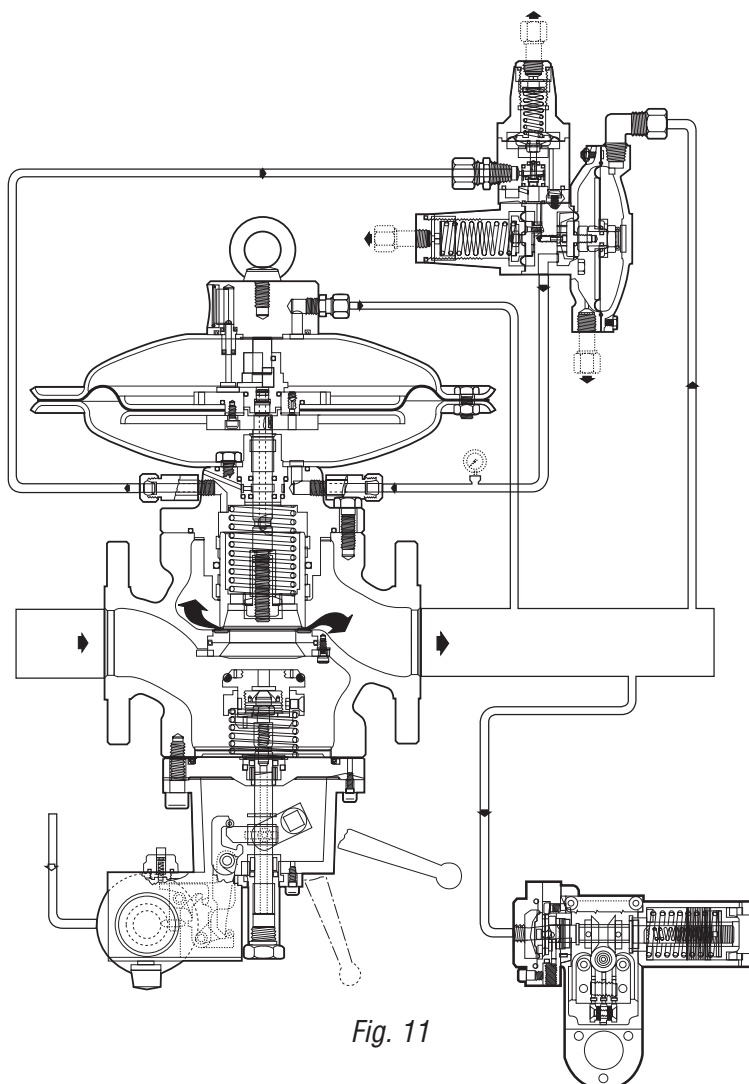


Fig. 11

4.2.1 SB/82 SLAM-SHUT OPERATION

The SB/82 slam-shut device (see fig. 11/A) consists of an obturator A, a releasing lever system, a control head B and a resetting system which is controlled manually by the lever C. The pressure in the circuit to control acts on the diaphragm in the control head B. This diaphragm, which is integral with a control rod D, receives a counter force by means of the minimum pressure springs 17 and the maximum pressure springs 11, set at the preset values .

The translation movement of this rod provokes the displacement of the lever L which controls the release of the entire mobile system and frees the obturator which is closed by the action of the spring 48.

To reset the device, operate the lever C. This opens an internal by-pass in the first part of its stroke. This leads to the filling of the downstream zone and balances the pressure on the obturator. Then, complete resetting of the entire mobile system is obtained in the second part of the stroke of the lever C. Releasing can also be carried out manually by means of the button 101.

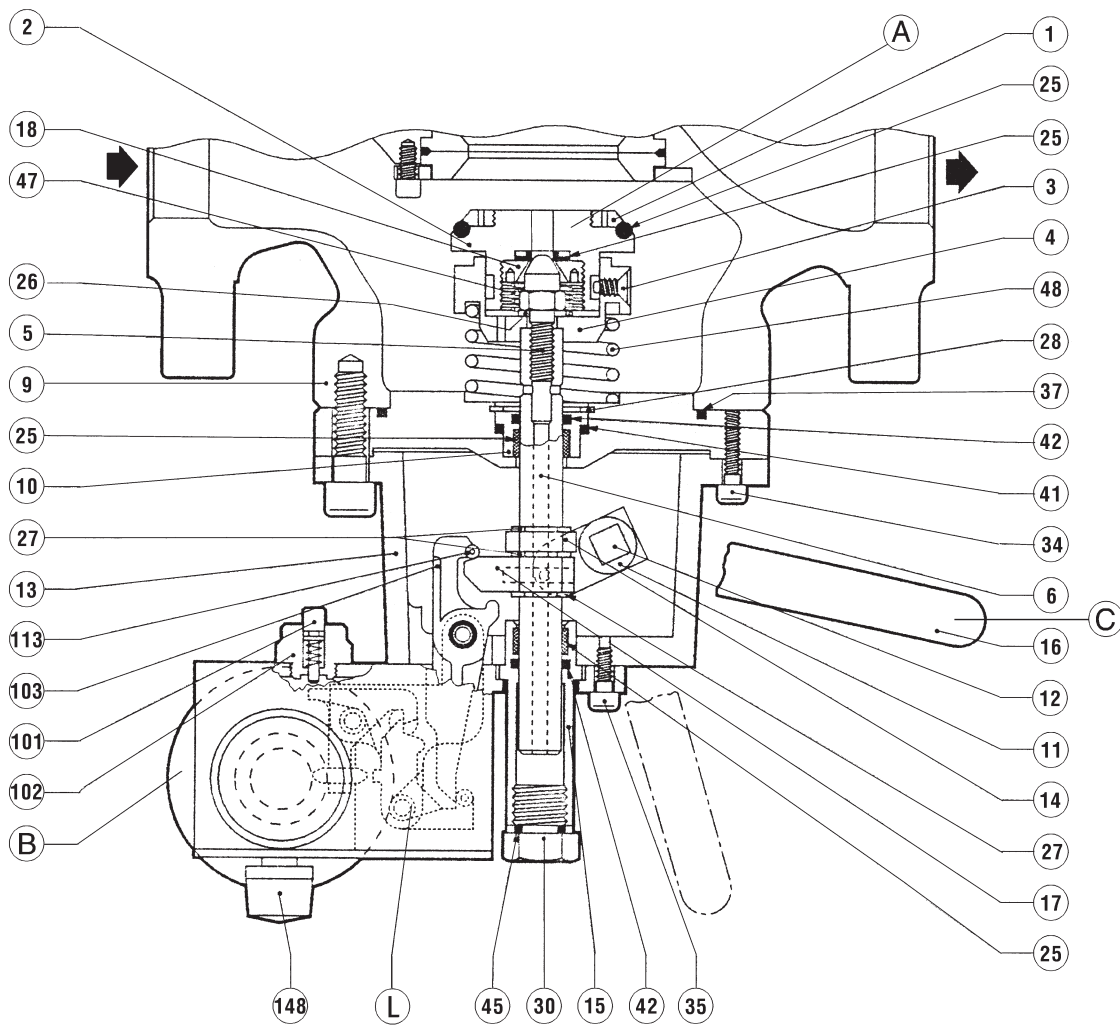
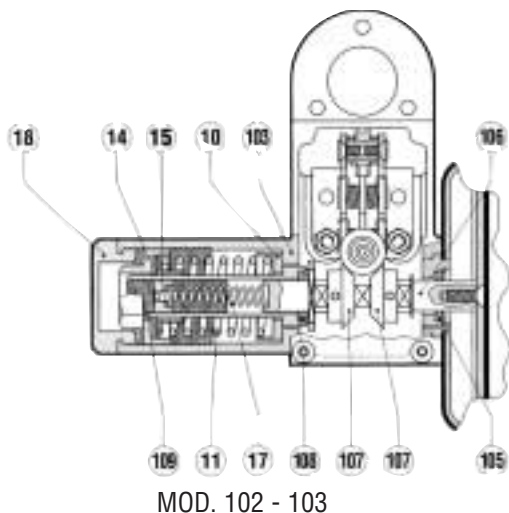


Fig. 11/A

CONTROL DEVICE



CONTROL HEADS

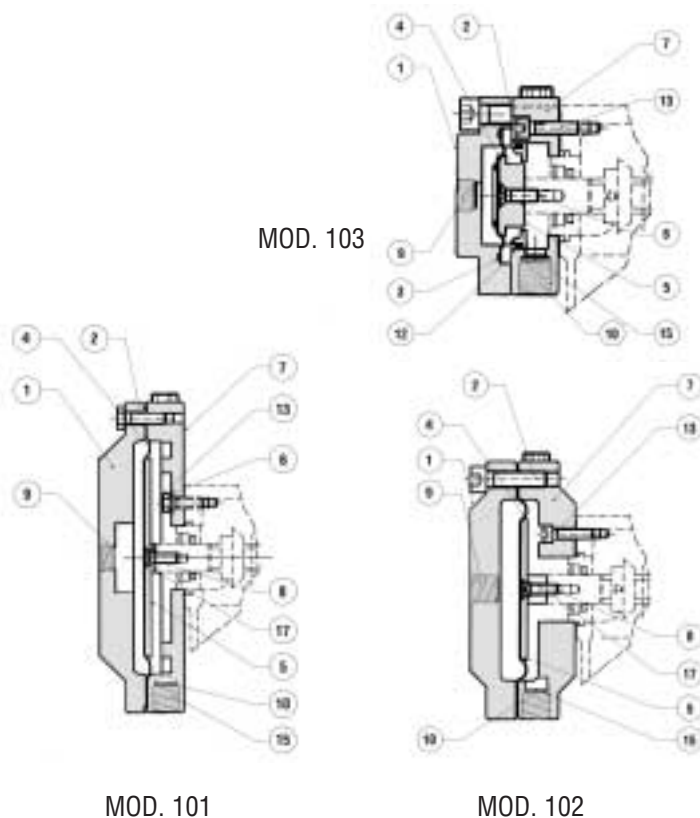


Fig. 11/B

4.2.2 TAB. 7 SB/82 SETTING SPRINGS

Characteristics spring								SETTING RANGE in mbar					
								101		102		103	
Code	Colour	De	Lo	d	i	it	max	min	max	min	max	min	
1	2700680	BROWN	35	60	2.3	6	8	20 ÷ 50					
2	2700830	RED-BLA			2.5	5.5	7.5	40 ÷ 80					
3	2700920	WHI-YEL			2.7	5.5	7.5	60 ÷ 110					
4	2701040	WHI-ORA			3	5.5	7.5	70 ÷ 150					
5	2701260	WHITE			3.5	5.5	7.5	100 ÷ 260		200 ÷ 500			
6	2701530	YELLOW			4	5	7	220 ÷ 500		450 ÷ 1100		2000 ÷ 5000	
7	2701790	YEL-BLA			4.5	4.5	6.5	450 ÷ 1000		700 ÷ 1700		4000 ÷ 8500	
8	2702070	ORANGE			3.5	5	7			900 ÷ 2000		5000 ÷ 10500	
9	2702280	WHI-RED			5.5	4.50	6.50			1500 ÷ 3000		7000 ÷ 15000	
10	2701450	RED			6	5.00	7.00			2200 ÷ 3500			
11	2702650	GREEN			6.5	6.00	7.00			3300 ÷ 5000			

12	2700275	WHITE	10	40	1	12	14		10 ÷ 25				
13	2700314	YELLOW			1.3	13	15		20 ÷ 60		40 ÷ 100		200 ÷ 500
14	2700345	ORANGE			1.5	11	13		40 ÷ 120		70 ÷ 200		400 ÷ 1200
15	2700450	RED			1.7	11	13		80 ÷ 180		150 ÷ 300		800 ÷ 2000
16	2700495	GREEN			2	11	13		130 ÷ 240		250 ÷ 450		1400 ÷ 2700
17	2700635	BLACK			2.3	10	12		210 ÷ 264		400 ÷ 700		2300 ÷ 4000

De = external diameter d = wire diameter i = active coils Lo = spring length it = total coils

4.3 INCORPORATED SLAM-SHUT VB/93

This is a device (fig. 12) which immediately blocks the gas flow if, following some kind of failure, the downstream pressure reaches the set-point for its intervention or if it is operated manually.

The main characteristics of the slam-shut device are:

- design pressure: 18.9 bar for all the components;
- intervention with pressure increase and/or decrease;
- intervention accuracy (AG): $\pm 1\%$ of the pressure set-point for pressure increases, $\pm 5\%$ for pressure decreases;
- balanced obturator which permits the device to be rearmed without needing a by-pass in any operative situation;
- manual button control.

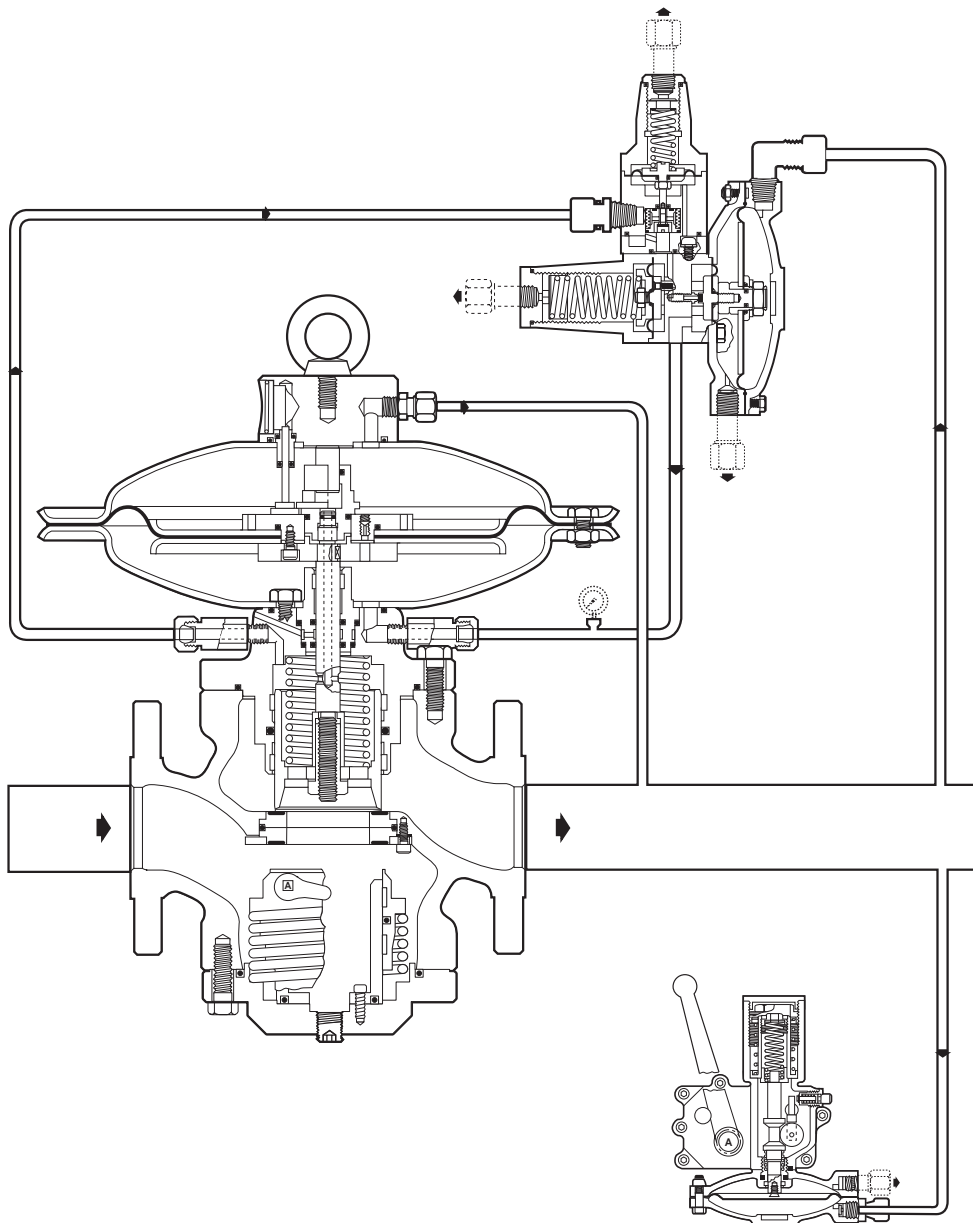


Fig. 12

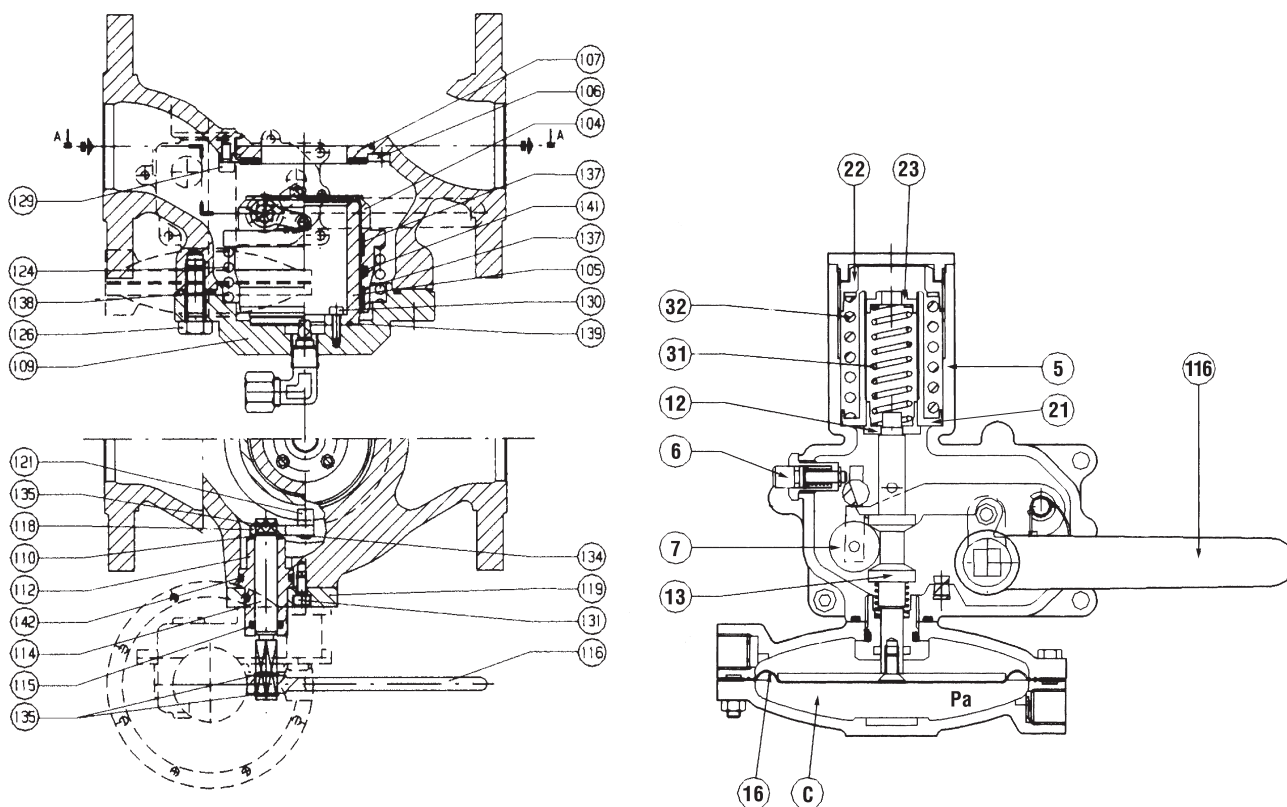


Fig. 12/A

4.3.1 VB/93 SLAM-SHUT OPERATION

The slam-shut mechanism comprises:

- a mobile obturator 104 subject to the load of the closing spring 124;
- a seal 107 already used in the Reval 182 regulators;
- a lever assembly 114, 116 and 118 whose rotation provokes movement of the obturator 104;
- a VB/31 - ../32 - ../33 pressure switch device (fig. 12/A) whose internal motion determines the open or closed position of the obturator 104.

The pressure switch device comprises a control head C in which the pressure to be controlled Pa acts on the diaphragm 16, integral with the camshaft 13.

The load of the pressure Pa on the diaphragm is countered by the springs 32 and 31 which respectively determine tripping as a result of pressure increase and decrease.

The device is set by turning the rings 22 and 23. Clockwise rotation of the rings increases the set point while anticlockwise rotation reduces it.

In the event of tripping as a result of pressure increase, when the pressure Pa exceeds the set point, the load on diaphragm 16 of the control head C increases until it overcomes the resistance of the spring 32.

This causes downward translation of the shaft 13 which, by means of the cam, shifts the feeler 7 to disengage the lever mechanism 114.

Intervention for a pressure decrease takes place as follows.

This provokes the downward displacement of the shaft 13 which shifts the feeler 7 and releases the lever mechanism 114 by means of the cam. If the pressure Pa drops below the set-point, the support of spring 21 stops its stroke on the beat of the body 31 and the spring 12 displaces the support 13 upwards and the shaft 18 as a result.

The cam then shifts the feeler 7 and causes the release of the lever mechanism 114. Intervention of the slam-shut device can also be provoked manually by means of the release button 6.

The connection between the control head C and the Pa control point can be made with the interposition of a device Push (fig. 17) which makes it easy to control the operation of the pressure control device.

4.3.2 TAB. 8 VB/93 SETTING SPRINGS

Characteristics spring								SETTING RANGE in mbar					
								VB/31		VB/32		VB/33	
Code	Colour	De	Lo	d	i	it	max	min	max	min	max	min	
1	2700565	WHITE	35	50	2.0	5.25	7.25	22 ÷ 43					
2	2700675	YELLOW			2.3	5.25	7.25	33 ÷ 60					
3	2700820	ORANGE			2.5	5.00	7.00	50 ÷ 95					
4	2700910	RED			2.7	6.00	8.00	75 ÷ 155					
5	2701035	GREEN			3.0	5.25	7.25	110 ÷ 190					
6	2701140	BLACK			3.2	4.50	6.50	160 ÷ 280					
7	2701255	BLUE			3.5	4.50	6.50	210 ÷ 360					
8	2701380	GRAY			3.7	4.25	6.25			700 ÷ 1500			
9	2701525	BROWN			4.0	4.50	6.50	310 ÷ 560		900 ÷ 2000		2000 ÷ 4100	
10	2701645	PURPLE			4.2	4.00	6.00	510 ÷ 910		1300 ÷ 2800			
11	2701785	WHI-BLA			4.5	4.50	6.50					3700 ÷ 8500	
12	2702065	SKY-BLUE			5.0	4.50	6.00	860 ÷ 1200				6200 ÷ 10500	
13	2700338	WHITE	15	40	1.3	8.75	10.75		10 ÷ 25				
14	2700377	YELLOW			1.5	8.50	10.50		20 ÷ 55				
15	2700464	ORANGE			1.7	8.50	10.50		50 ÷ 105				
16	2700513	RED			2.0	8.50	10.50		75 ÷ 145				
17	2700713	GREEN			2.3	8.50	10.50		125 ÷ 275				
18	2700750	BLACK		2.5	6.00	8.25		255 ÷ 605		150 ÷ 1550		750 ÷ 3300	
19	2700980	BLUE		3.0	6.00	8.00		505 ÷ 905		1000 ÷ 2100		2500 ÷ 4500	
20	2701180	BROWN		3.5	6.25	8.25				1800 ÷ 2700		4000 ÷ 5800	

De = external diameter **d** = wire diameter **i** = active coils **Lo** = spring length **it** = total coils

4.4 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.

When pressure regulator Reval 182 or incorporated monitor PM/182 are used as monitor, to increase response time an accelerator is installed.

Installation of accelerator is recommended for use as safety accessory according to Directive 97/23/EC (PED).

Two alternative solutions are offered for this safety device associated to Reval 182 regulators: incorporated monitor or in-line monitor.

4.4.1 PM/182 INCORPORATED MONITOR

This emergency device (fig. 13) is fixed directly on the body of the service regulator. In this way, the two pressure regulators use the same valve body but:

- they are governed by two distinct pilots and two independent servomotors;
- they work on independent valve seats.

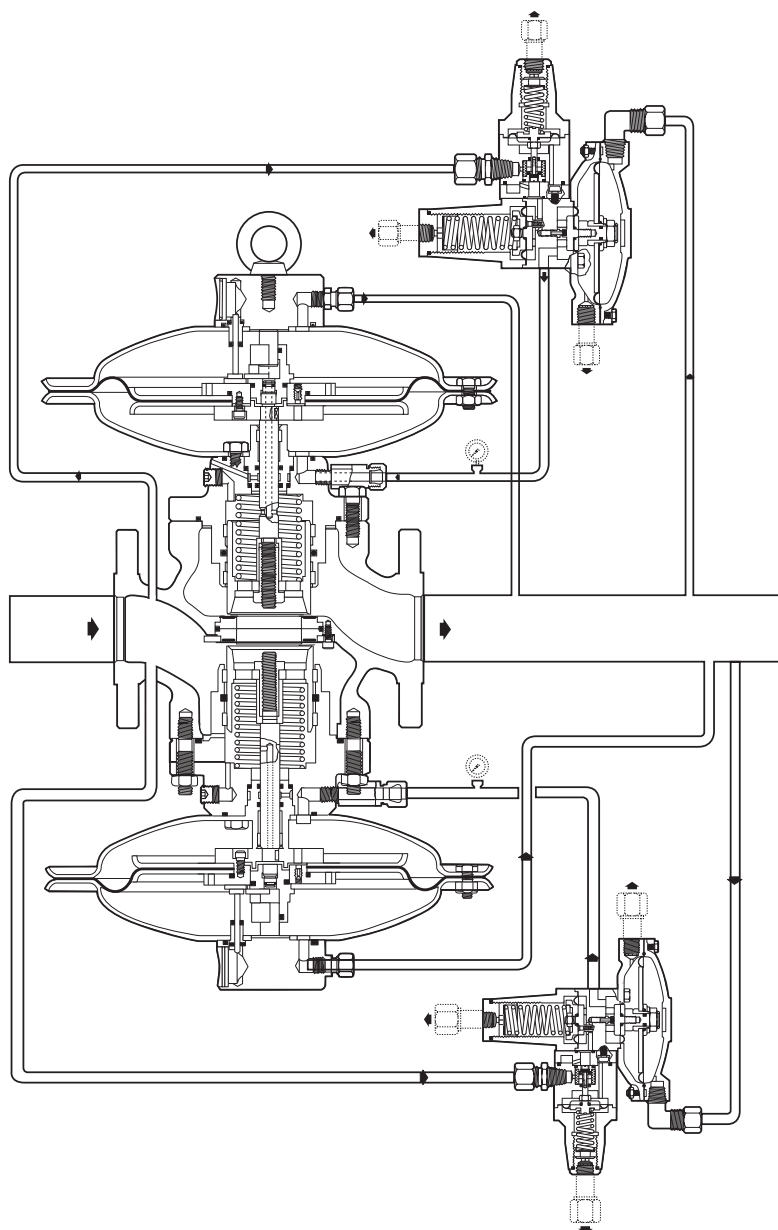


Fig. 13

4.4.2 IN-LINE MONITOR

With this kind of application, the emergency regulator is installed upstream from the service one (fig. 14).

----- Connections to be made by the customer Ref. No. for the connections

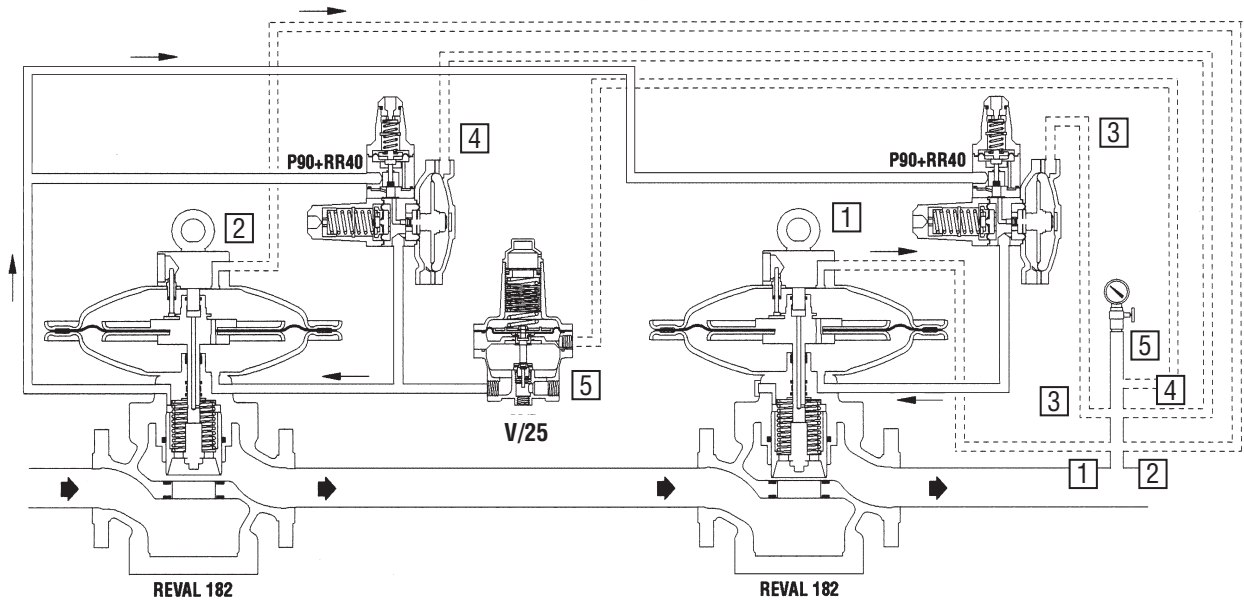


Fig. 14

----- Connections to be made by the customer Ref. No. for the connections

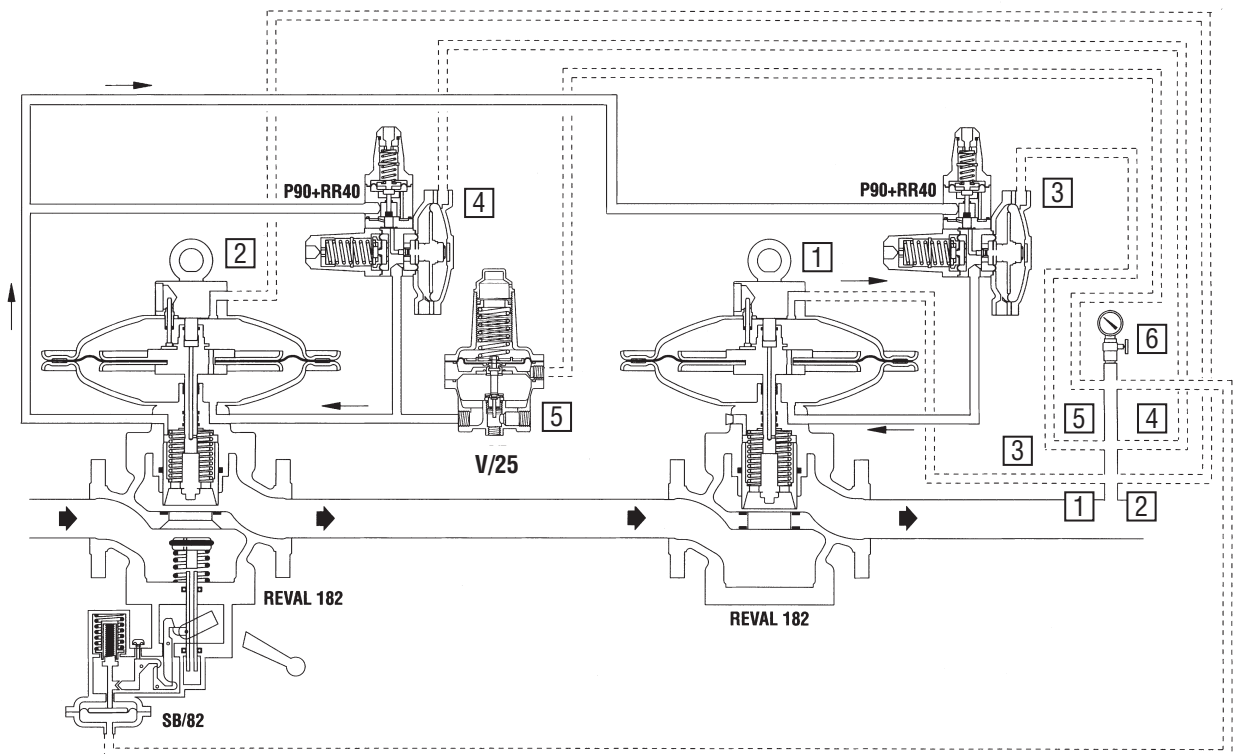


Fig. 14/A



5.0 START UP

5.1 GENERAL



After installation, check that the inlet/output on-off valves, any by-pass and the bleed cock are closed. Before starting up, checking is recommended to ascertain that the conditions of use are in conformity with the specifications of the equipment. These specifications are recalled with the symbols on the plate fitted on every component.



APPARATUS SPECIFICATION PLATES

 Pietro Fiorentini		ID n. 0062	 
REGULATOR:	REVAL 182	T:	/
S.n.:	/	PS:	/ bar
		Pamax:	/ bar
DN:	Flange: /	AC:	/
Wh:	/ bar	bpe:	/ bar
Wd:	/ bar	SG:	/
Wa:	/ bar	Fluido:	/
		Cg:	/

 Pietro Fiorentini			
Pre-regulator:	R14/A	PS:	/ bar
S.n.:	/	Pamax:	/ bar
Pa:	/	Wh:	/ bar
T:	/	Wd:	/ bar
			

 Pietro Fiorentini		ID n. 0062	 
REGULATOR:	... PM/182	T:	/
S.n.:	/	PS:	/ bar
		Pamax:	/ bar
DN:	Flange: /	AC:	/
Wh:	/ bar	bpe:	/ bar
Wd:	/ bar	SG:	/
Wa:	/ bar	Fluido:	/
		Cg:	/

 Pietro Fiorentini			
Pilot:	204/A	PS:	/ bar
S.n.:	/	Pamax:	/ bar
Pa:	/	Wh:	/ bar
T:	/	Wd:	/ bar
			

 Pietro Fiorentini			
Type:	DB/182	PS:	/ bar
S.n.:	/	T:	/

 Pietro Fiorentini			
Accelerator:	MVA	PS:	/ bar
S.n.:	/	Pamax:	/ bar
Wh:	/	Wd:	/ bar
T:	/		
			

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

CE = According to Directive PED

P_{max} = maximum inlet operating pressure of the apparatus

b_{pe} = range of variability of the inlet pressure of the pressure regulator in normal operating conditions

PS = maximum pressure which can be supported by the structure of the body of the apparatus in safety conditions

W_a = range of setting of the pressure regulator/pilot/pre-regulator which can be obtained using the parts and the setting spring fitted at the moment of testing (without changing any components of the apparatus, that is). In piloted regulators, the pilot is considered as a separate apparatus with its own setting range **W_a**

W_h = range of setting of the pressure regulator/pilot/pre-regulator which can be obtained using the setting springs indicated in the associated tables and also by changing some other part of the apparatus (reinforced gasket, diaphragms etc.). In piloted regulators, the pilot is considered as a separate apparatus with its own setting range **W_h**

Q_{maxP_{emin}} = maximum flow rate with minimum pressure at the pressure regulator inlet

Q_{maxP_{max}} = maximum flow rate with maximum pressure at the pressure regulator inlet

C_g = experimental coefficient of critical flow

AC = regulation class

SG = closing pressure class

AG = intervention accuracy

W_{ao} = range of intervention for the over pressure of slam-shut, relief and safety valves and accelerators which can be obtained using the setting spring fitted at the moment of testing. In the piloted safety valves, the pilot is considered as a separate apparatus with its own setting range **W_{ao}**

W_{ho} = range of intervention for the over pressure of slam-shut, relief and safety valves and accelerators which can be obtained using the setting springs indicated in the tables. In piloted safety valves, the pilot is considered as a separate apparatus with its own setting range **W_{ho}**

W_{au} = range of intervention for pressure decrease of slam-shut pressure which can be obtained using the setting spring fitted at the moment of testing

W_{hu} = range of intervention for pressure decrease of slam-shut pressure which can be obtained using the setting springs indicated in the tables.

5.2 GAS INPUT, CONTROL OF EXTERNAL TIGHTNESS AND SETTING

The apparatus pressurization operation must be carried out very slowly. To protect the apparatus from damage, the following operations **must never be carried out**:

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

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

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

The regulator and any other apparatuses (slam-shut, monitor) are normally supplied already set for the desired set-point. It is possible for various reasons (e.g., vibration during transport) for the settings to be changed while remaining within the values permitted by the springs used.

We therefore recommend checking the settings using the procedures illustrated below.

Tables 9 and 10 give the recommended set-points for the apparatuses in the various installation arrangements. The figures in these tables can be useful both when checking existing set-points and for modifying them should this become necessary later.

In installations consisting of two lines, we suggest commissioning one line at a time, starting from the one with the lower set-point, known as the “reserve” line. **The set-points of the apparatuses in this line will obviously deviate from those specified in the tables 9 and 10.**

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 REVAL 182 WITH PILOT P90+RR4 (FIG.15)

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

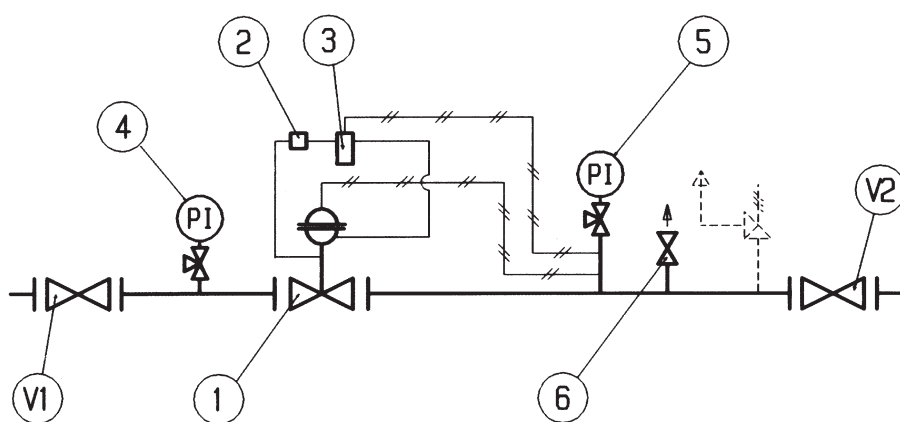


Fig. 15

Proceed as follows:

- 1) Partially open the bleed cock 6.
- 2) Very slowly open the inlet on/off valve V1.
- 3) Check on the pressure gauge of the pre-regulator 2 that its pressure set-point is within the recommended range of values $P_{ep}=P_a+(0.15\div 0.2)$ bar.
- 4) Check on the pressure gauge 5 that the pressure does not exceed the maximum value permitted by the setting spring fitted in the pilot 3. If necessary, suspend the operation by closing V1 and completely reducing the load on the spring by turning the ring 11 anticlockwise. Then slowly reopen the valve V1.
- 5) If necessary, adjust the setting by turning the ring 11 appropriately.
- 6) Close the bleed cock 6 and check that the downstream pressure, after increasing, settles at a value slightly higher to that of closure of the pilot/regulator assembly. If it does not, remedy the causes of the internal leakage.
- 7) Using a foaming agent, check the tightness of all the joints between the on/off valves V1 and V2.
- 8) 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 choked so as not to exceed the maximum flow rate value of the installation.
- 9) If pumping occurs in normal working conditions, you are advised to reduce the setting of the pre-regulator RR40 by turning the ring 10 anticlockwise without, however, dropping below the minimum recommended value. If, on the other hand, there is an excessive reduction in the regulated pressure with the increase of the flow rate, you should increase the setting of the pre-regulator by turning the ring clockwise.

5.4 COMMISSIONING THE REGULATOR WITH INCORPORATED VB/93 SLAM-SHUT (FIG. 16)

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

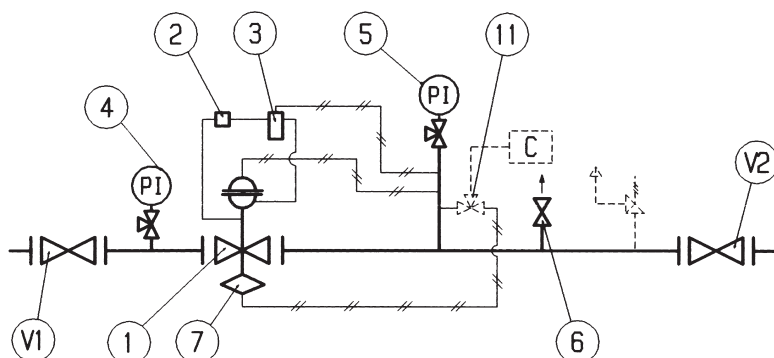


Fig. 16

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

A) For slam-shuts connected to the downstream piping by a three-way deviator push valve 11, proceed as follows (Fig. 17):

- connect a controlled auxiliary pressure to C;
 - stabilise this pressure at the set-point established for the regulator;
 - insert the reference pin 2 in the notch, pressing the knob 1 completely;
 - reset the slam-shut device by means of the provided bushing;
 - keep the knob 1 pressed:
-) for safety devices which intervene for maximum pressure: slowly increase the auxiliary pressure and check the intervention value. If necessary, increase the intervention value by turning the adjustment ring 22 clockwise, or anticlockwise to reduce the intervention value.
 -) for safety devices for pressure increase and reduction: slowly increase the auxiliary pressure and record the intervention value. Restore the pressure to the set-point established for the regulator, and carry out the slam-shut reset operation. Check intervention for pressure reduction by slowly reducing the auxiliary pressure. If necessary increase the intervention values for pressure increase or decrease by respectively turning the rings 22 or 23 clockwise and vice versa to reduce the intervention values.
- check proper operation by repeating the operations at least 2-3 times.

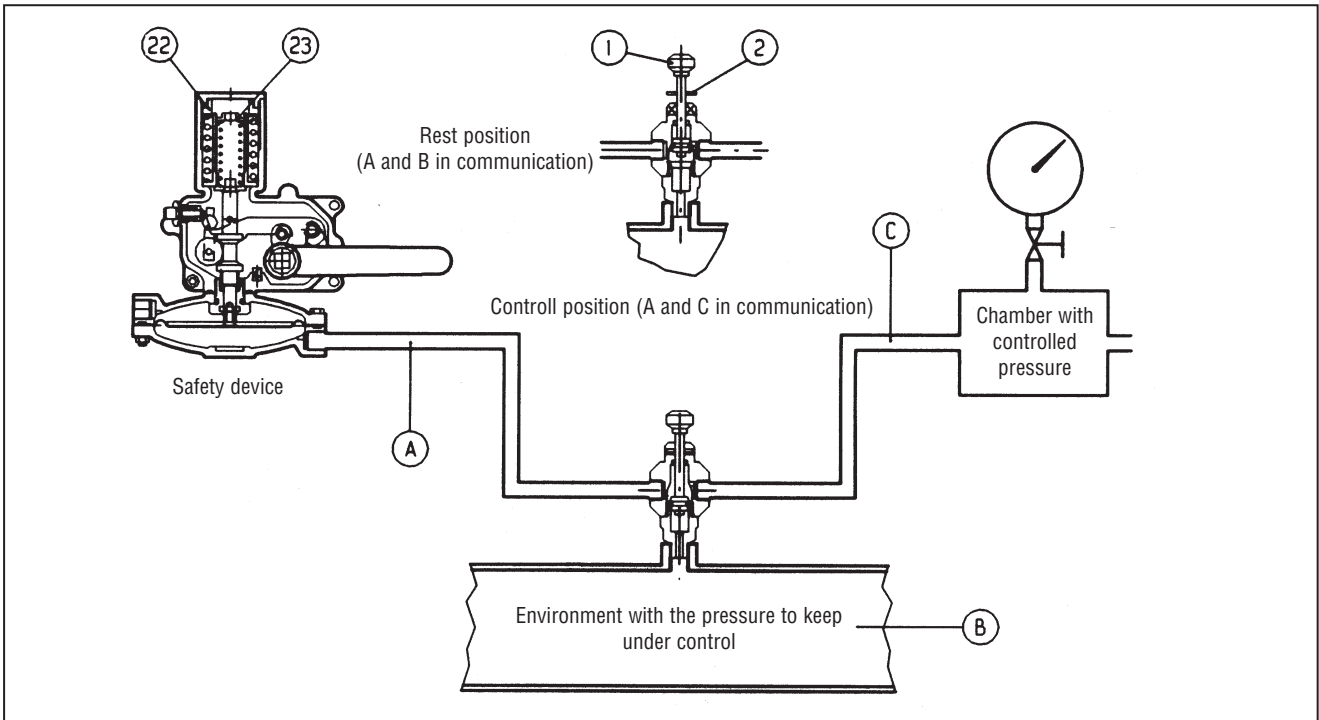


Fig. 17

B) On devices without the "push" valve (fig. 18) we recommend separately connecting the control head to a controlled auxiliary pressure and repeat the operations described above.

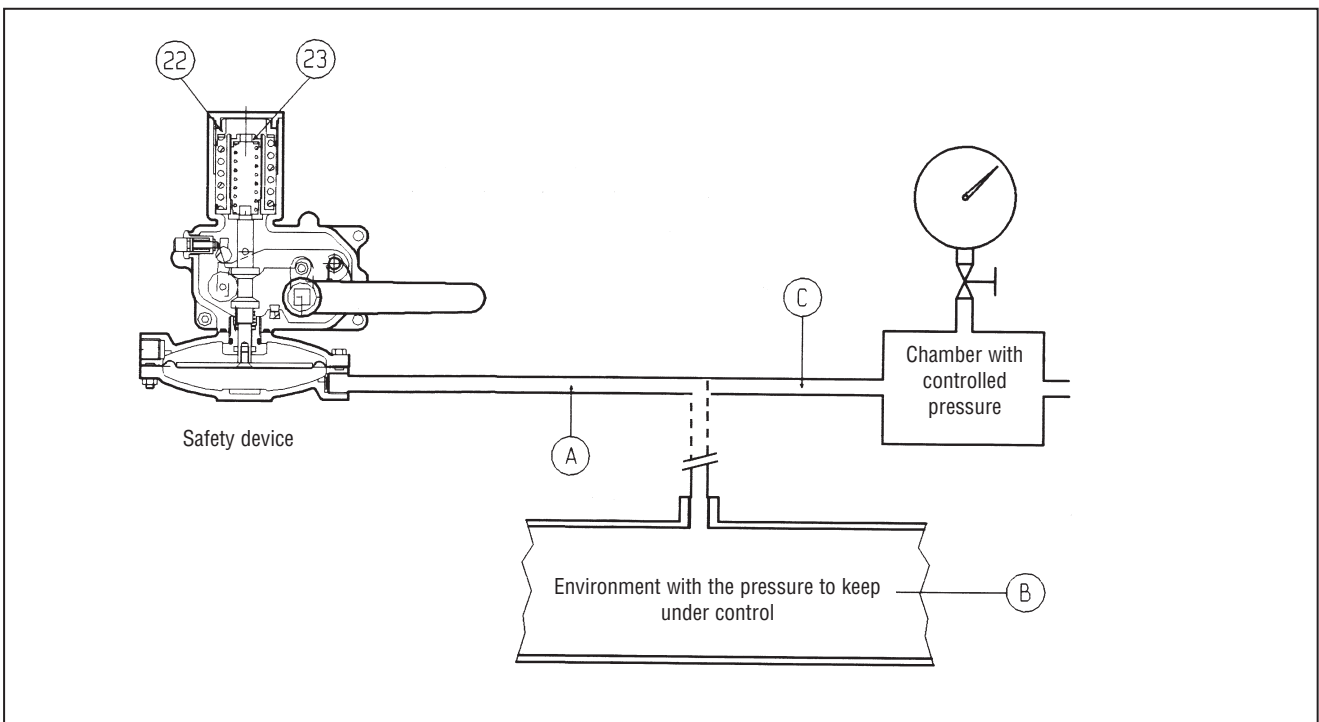


Fig. 18

ATTENTION

At the end of the operation, reconnect the control head to the downstream pressure take-off.

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

At the end of the slam-shut check, proceed as follows:

- 1) Check that the slam-shut is in the closed position.
- 2) Very slowly open the inlet on/off valve V1.
- 3) Very slowly open the slam-shut by turning the provided lever.
- 4) Open the downstream bleed cock 6.
- 5) Check on the pressure gauge of the pre-regulator 2 that its pressure set-point is within the recommended range of values $P_{ep}=P_a+(0.15\div 0.2)$ bar.
- 6) Check on the pressure gauge 5 that the pressure does not exceed the maximum value permitted by the setting spring fitted in the pilot 3. If necessary, suspend the operation by closing V1 and completely reducing the load on the spring by turning the ring 11 anticlockwise. Then slowly reopen the valve V1.
- 7) If necessary, adjust the by setting appropriately turning the ring 11.
- 8) Close the bleed cock 6 and check that the downstream pressure, after a period of increase, stabilizes and at a value slightly higher than that of closure of the pilot/regulator combination. Otherwise eliminate the causes of the internal leakage.
- 9) Using a foam substance, check the tightness of all the joints between the on-off valves V1 and V2.
- 10) Very slowly open the downstream on-off valve V2 to obtain the complete filling of the pipe. If at the beginning of this operation the pressure in the pipe is much lower than the set point, the opening of this valve should be choked so as not to go beyond the maximum flow rate value for the installation.
- 11) If pumping occurs in normal working conditions, you are advised to reduce the setting of the pre-regulator RR40 by turning the ring 10 anticlockwise without, however, dropping below the minimum recommended value. If, on the other hand, there is an excessive reduction in the regulated pressure with the increase of the flow rate, you should increase the setting of the pre-regulator by turning the ring clockwise.
- 12) It is recommended to check that the flow of the line stops when the slam-shut is tripped manually.

Settings of in-line apparatuses consisting of Reval 182 Regulator + Slam-shut + Relief valve				
TAB. 9:	Regulator set-point (Pas) mbar	Set-point RELIEF VALVE	Set-point SLAM-SHUT Max	Set-point SLAM-SHUT Min
	6<Pas≤12	20 mbar	25 mbar	Slam-shut not available
	12<Pas≤15			
	15<Pas≤19	Pas x 1.5		10 mbar
	19<Pas≤24		Pas + 20 mbar	
	24<Pas≤30	Pas x 1.4		Pas -10 mbar
	30<Pas≤60		Pas + 30 mbar	
	60<Pas≤80	Pas x 1.25		Pas -20 mbar
	80<Pas≤110		Pas + 40 mbar	Pas -40 mbar
	110<Pas≤200			
	200<Pas≤500		Pas + 100 mbar	Pas -60 mbar
	500<Pas≤800	Pas x 1.15	Pas + 150 mbar	Pas -100 mbar
	800<Pas≤1000		Pas + 300 mbar	Pas -200 mbar
	1000<Pas≤2500		Pas + 500 mbar	Pas -300 mbar
	2500<Pas≤5000		Pas + 1000 mbar	
	5000<Pas≤6000	Pas x 1.1		Pas -700 mbar
	6000<Pas≤12000		Pas + 1500 mbar	5,8 bar

5.5 COMMISSIONING THE REGULATOR WITH INCORPORATED PM/182 MONITOR AND ACCELERATING VALVE (FIG. 19)

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

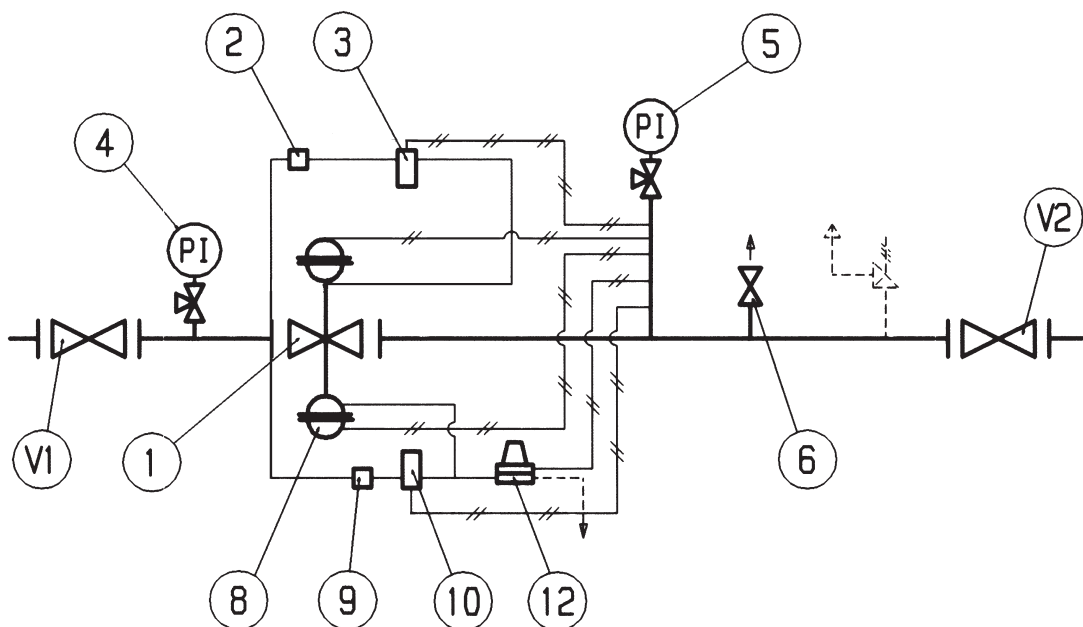


Fig. 19

- 1) Partially open the bleed cock 6.
- 2) Very slowly open the inlet on/off valve V1.
- 3) Check on the pressure gauge of the pre-regulator 2 and 9 that their pressure set-point is within the recommended range of values $P_{ep} = P_a + (0.15 \div 0.2)$ bar.
- 4) Completely increase the set-point of the pilot 3 of the main regulator by turning the ring 11 clockwise (fig. 2);
- 5) Completely increase the setting of the accelerating valve by turning the internal adjustment ring 1 (fig. 10) clockwise;
- 6) Adjust the setting of the monitor pilot 10 to the intervention value established for the accelerating valve 12;
- 7) Reduce the setting of the accelerating valve 12 until, using a foaming agent, gas is seen to be released from the provided vent;
- 8) 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;
- 9) Adjust the setting of the monitor pilot 10 to the set-point;
- 10) Reduce the setting of the pilot 3 to the selected working value for the service regulator;
- 11) Check that the PM/182 monitor is fully open by controlling the position of the indicator through the window;
- 12) Close the bleed cock 6 and 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;
- 13) Using a foaming agent, check the tightness of all the joints between the on/off valves V1 and V2.
- 14) 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 choked so as not to exceed the maximum flow rate value of the installation.

5.6 COMMISSIONING THE REGULATOR PLUS REVAL 182 IN-LINE MONITOR WITH VB/93 SLAM-SHUT VALVE (FIG. 20)

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

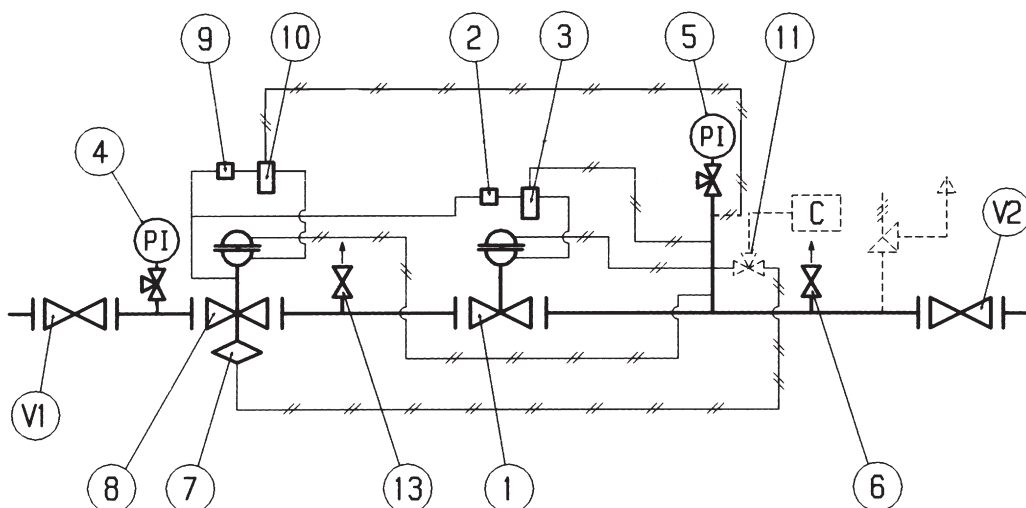


Fig. 20

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

A) For slam-shuts connected to the downstream piping by a three-way deviator push valve 11, proceed as follows (fig. 17):

- connect a controlled auxiliary pressure to C;
- stabilise this pressure at the set-point established for the regulator;
- insert a reference pin 2 in the notch, pressing the knob 1 completely;
- reset the slam-shut device by means of the provided lever;
- keep the knob 1 pressed and:
 -) For safety devices which intervene for maximum pressure: slowly increase the auxiliary pressure and check the intervention value. If necessary, increase the intervention value by turning the adjustment ring 22 clockwise, or anticlockwise to reduce the intervention value.
 -) For safety devices which intervene for pressure increase and reduction: slowly increase the auxiliary pressure and record the intervention value. Restore the pressure to the set-point established for the regulator, and carry out the slam-shut reset operation.

Check intervention for pressure reduction by slowly reducing the auxiliary pressure.

- B) On devices without the "push" valve (fig. 18) we recommend connecting the control head separately to a controlled auxiliary pressure and repeat the operations described above.

ATTENTION

At the end of the operation, reconnect the control head to the downstream pressure take-off.

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

At the end of the slam-shut check, proceed as follows:

- 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. In the case of safety devices for maximum pressure only, the device will stay spontaneously engaged in the open position at the end of the operations. With safety devices for pressure increases and decreases, keep the lever raised and increase the outlet pressure to the desired regulator set-point. At this point, the lever can be released and the slam-shut will stay in the open position.
- 4) Check on the pressure gauges of the pre-regulator 2 and 9 that their pressure set-point is within the recommended range of values $P_{ep} = P_a + (0.15 \div 0.2)$ bar.
- 5) Completely increase the setting of the pilot 3 by turning the ring 11 clockwise and ensure that the service regulator 1 is in the fully open position by controlling the position of the stroke indicator through the window.
- 6) Check that the setting of the pilot 10 corresponds to the selected working value for the monitor and adjust it to the desired value if necessary.
- 7) Reduce the setting of the pilot 3 to the selected working value for the service regulator.
- 8) Check that the REVAL 182 monitor is fully open by controlling the position of the stroke indicator through the window.
- 9) Close the bleed cock 6 and check that the downstream pressure, after increasing, settles at a slightly higher value than that of closure of the pilot/monitor assembly. If it does not, remedy the causes of the internal leakage.
- 10) Using a foaming agent, check the tightness of all the joints between the on/off valves V1 and V2.
- 11) 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 choked so as not to exceed the maximum flow rate value of the installation.
- 12) It is recommended to check that when you operate the slam-shut manually, the flow in the line stops.

TAB. 10: Settings of in-line apparatuses consisting of Reval 182 + Regulator + Monitor + Slam-shut + Relief valve							
Set-point Regualtor (Pas) mbar	Set-point MONITOR	Set-point ACCELERATOR	Set-point RELIEF VALVE	Set-point SLAM-SHUT Max	Set-point SLAM-SHUT Min		
6<Pas≤12	↑	↑	28 mbar	30 mbar	Slam-shut not available		
12<Pas≤15							
15<Pas≤19							
19<Pas≤24	Pas + 5 mbar	Pas + 11 mbar	Pas x 1.8	Pas + 20 mbar	10 mbar		
24<Pas≤30	↓	↓	Pas x 1.55	↓	↑		
30<Pas≤60			Pas x 1.4			Pas + 30 mbar	Pas -10 mbar
60<Pas≤80							
80<Pas≤110	↑	↑		Pas + 40 mbar	Pas -20 mbar		
110<Pas≤200	Pas x 1.15	↓	↑	Pas x 1.41	Pas -40 mbar		
200<Pas≤500	↓			Pas x 1.25 mbar	Pas x 1.46	Pas -60 mbar	
500<Pas≤800				Pas x 1.15	Pas x 1.4	Pas -100 mbar	
800<Pas≤1000	↓	↓	↓	↓	Pas -200 mbar		
1000<Pas≤2500	↑	↑	↑	Pas x 1.3	↑		
2500<Pas≤5000	↓	↓	Pas x 1.16	↓	Pas -300 mbar		
5000<Pas≤6000			Pas x 1.1		Pas x 1.25	Pas -700 mbar	
5000<Pas≤12000					Pas x 1.09	5.8 bar	

6.0 TROUBLE-SHOOTING

The problems of various kinds which could arise over time are highlighted below.

They derive from phenomena associated with the conditions of the gas as well, of course, as the natural ageing and wear of the materials.

It must be remembered that all operations on the apparatuses must be carried out by highly qualified personnel with appropriate knowledge of the subject. Tampering with the apparatuses by unsuitable personnel relieves us from all responsibility of any kind.

You must therefore train your maintenance personnel or avail yourself of the service centres officially authorised by us.

6.1 TAB. 11 REVAL 182 REGULATOR (FIG. 21, 22 and 23)

PROBLEM	POSSIBLE CAUSES	APPARATUS	REMEDY
Operating anomalies	Unsuitable feed Worn diaphragm [25] Spring [72] yielded or off level	RR40 PRE-REGULATOR (Fig. 23)	Change the spring [72] setting Replace Replace
	Friction in diaphragm holder packet Worn diaphragm [25] Spring [71] yielded or off level Bleed hole blocked	P PILOT... (Fig. 23)	Centre the packet hole movement and staff Replace diaphragm [25] Replace Clean
	Obturator guide ring [35] worn Friction between the obturator and obturator guide Reinforced gasket [7] off level or worn Friction on balancing rot Spring yielded or off level Service regulator and monitor set-points too close	REGULATOR (Fig. 21-22)	Replace Check the guide rings [35] [36] Replace Replace ring [36] Replace spring Distance the two set-points
Tightness failure Q=0	Obturator [30] damaged Ruptured diaphragm [25]	RR40 PRE-REGULATOR (Fig. 23)	Replace Replace diaphragm
	Obturator [17] damaged	P PILOT... (Fig. 23)	Replace
Tightness failure Q=0	Reinforced gasket [7] damaged Dirt between the reinforced gasket and the obturator Diaphragm fixed incorrectly Downstream sensing line dirty Occlusion of pressure chamber vent nozzle Obturator guide ring [35] damaged	REGULATOR (Fig. 21-22)	Replace Clean and check gas filtering Fix Clean Clean Replace

6.1 TAB. 11 REGULATOR (FIG. 21-22-23)

PROBLEM	POSSIBLE CAUSES	APPARATUS	REMEDY	
Pressure increase with Q>0	Diaphragm [25] ruptured	RR40 PREREGULATOR (Fig. 23)	Replace	
	Obturator [30] damaged	PILOT P... (Fig. 23)	Replace	
	Obturator [30] stuck in the open position		Control and clean if necessary	
	Diaphragm [23] ruptured		Replace	
	Vent hole clogged		Clean	
	Reinforced gasket [7] damaged	Dirt between the reinforced gasket and the obturator	REGULATOR (Fig. 21-22)	Replace
		Obturator blocked		Clean and check gas filtering
		Diaphragm fixed incorrectly		Clean and check movement
		Downstream sensing line dirty		Fix
		Occlusion of pressure chamber vent nozzle		Clean
		Obturator guide ring [35] damaged		Clean
		O-ring [93] damaged		Replace
		Replace		
	Pressure drop	Feed too low	RR40 PREREGULATOR (Fig. 23)	Change set-point
Filter cartridge [28] dirty		Replace		
Occlusion by dirt		Check cartridge [28] filtering level		
Diaphragm [25] ruptured		Replace		
Reinforced gasket [30] inflated		Replace		
Diaphragm [25] ruptured		PILOT P... (Fig. 23)	Replace	
			Reinforced gasket [17] swollen	Replace
			Pilot feed line broken	Repair
			Motorisation line to the regulator broken	Repair
Obturator blocked		REGULATOR (Fig. 21-22)	Clean and check movement	
			Diaphragm [50] ruptured	Replace
			Guide ring [36] damaged	Replace
			Breakage or leakage from vent nozzle calibrated hole screw	Repair
			No pressure upstream	Check cleanliness of line filter cartridges

6.2 TAB. 12 VB/93 SLAM-SHUT (FIG. 26)

PROBLEM	POSSIBLE CAUSES	REMEDY
Slam-shut obturator does not close	Diaphragm [16] in metering device broken	Change diaphragm
Leakage from slam-shut obturator	Seal [107] deteriorated	Change seal
	Seat of obturator [104] eroded or fitted	Change the seal
	Ring [93] damaged	Replace
	Ring [141] damaged	Replace
Incorrect intervention pressure	Wrong max. and/or min. spring setting	Make the setting again by means of the rings
	Friction in the lever mechanism	Change the box containing the whole assembly
Resetting not possible	Persistence of the cause of the increase or decrease of the downstream pressure	Decrease or increase the downstream pressure
	Lever mechanism broken or cracked	Change the standard box containing whole assembly

6.3 TAB. 13 SB/82 SLAM-SHUT (FIG. 27)

PROBLEM	POSSIBLE CAUSES	REMEDY
Slam-shut obturator does not close	Control head diaphragm [4] broken	Change diaphragm
Leakage from slam-shut obturator	Seal of the obturator [40] deteriorated	Change seal
	Seat of obturator [104] eroded or fitted	Change the seat
	Seal by-pass [19] deteriorated	Change seal
Incorrect intervention pressure	Wrong max. and/or min. spring setting	Make the setting again by means of the rings
	Friction in lever mechanism	Change the box containing the whole assembly
Resetting not possible	Persistence of the causes of the increase or decrease of the downstream pressure	Decrease or increase the downstream pressure
	Lever mechanism broken or cracked	Change the standard box containing the assembly outside the regulator

N.B. If the slam-shut has intervened, close the inlet and outlet valve (**V1** and **V2**) on the line and discharge the pressure before carrying out any operation.
Eliminate the causes which gave rise to intervention before reactivating it.

In the event of operating problems when personnel qualified for a specific operation are not available, call the service centre nearest you. For further information contact our SATRI service at our Arcugnano (Vicenza) works.

7.0 MAINTENANCE

7.1 GENERAL


Periodical inspection and maintenance shall be carried out according to the regulations in force (kind and frequencies). Before carrying out any operation it is important to ascertain that the regulator has been cut off both upstream 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 out at intervals which, if not established by regulations in force, depend on:

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

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

- a set of recommended spares is available. The spares must be original **Fiorentini**  ones, bearing in mind that the more important ones such as diaphragms are marked.
- A set of wrenches is available as specified in tables 14 and 15.

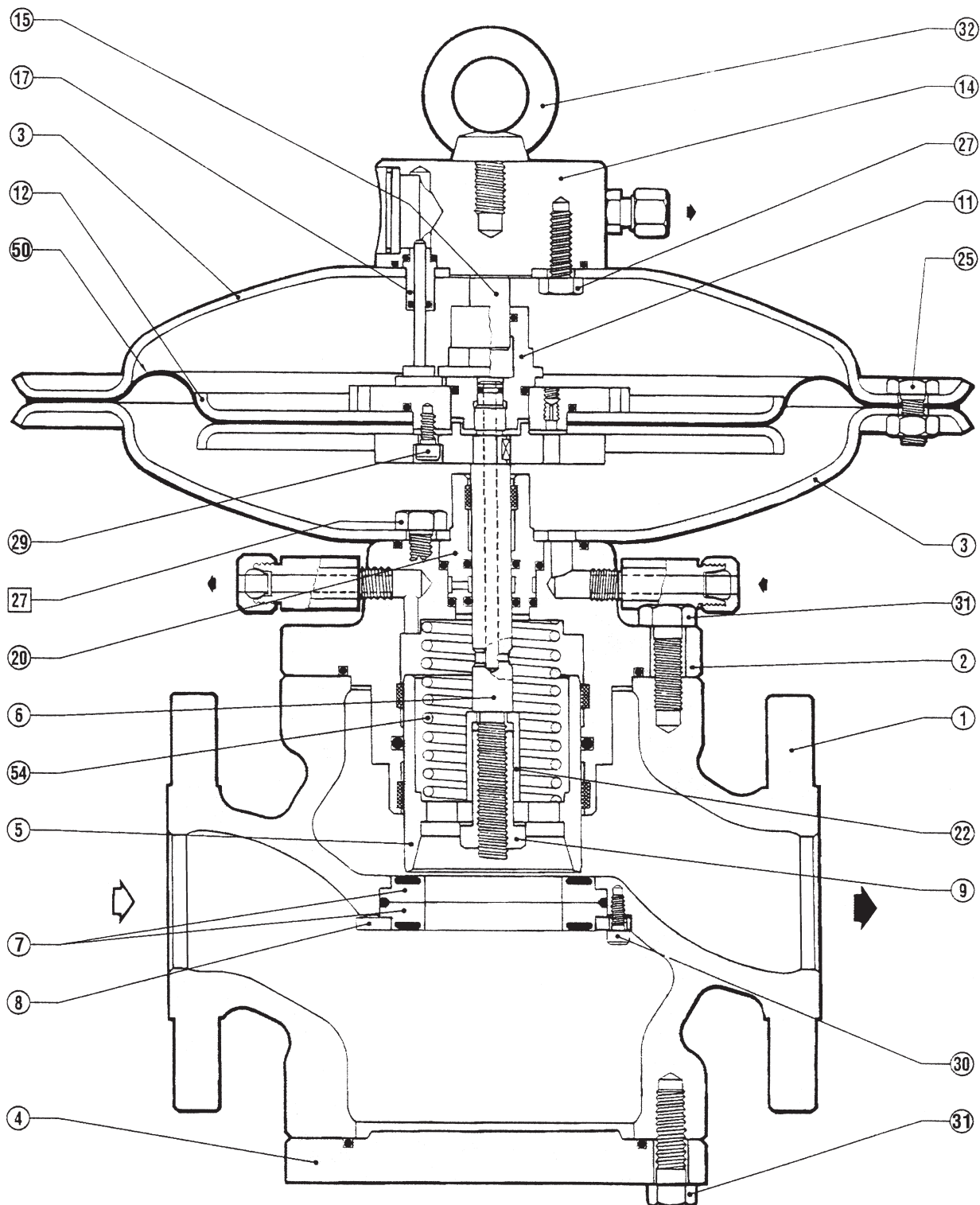
For a proper maintenance the recommended spare parts are unequivocally identified by labels indicating:

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

N.B. The use of non-original spare parts relieves us of all responsibilities.

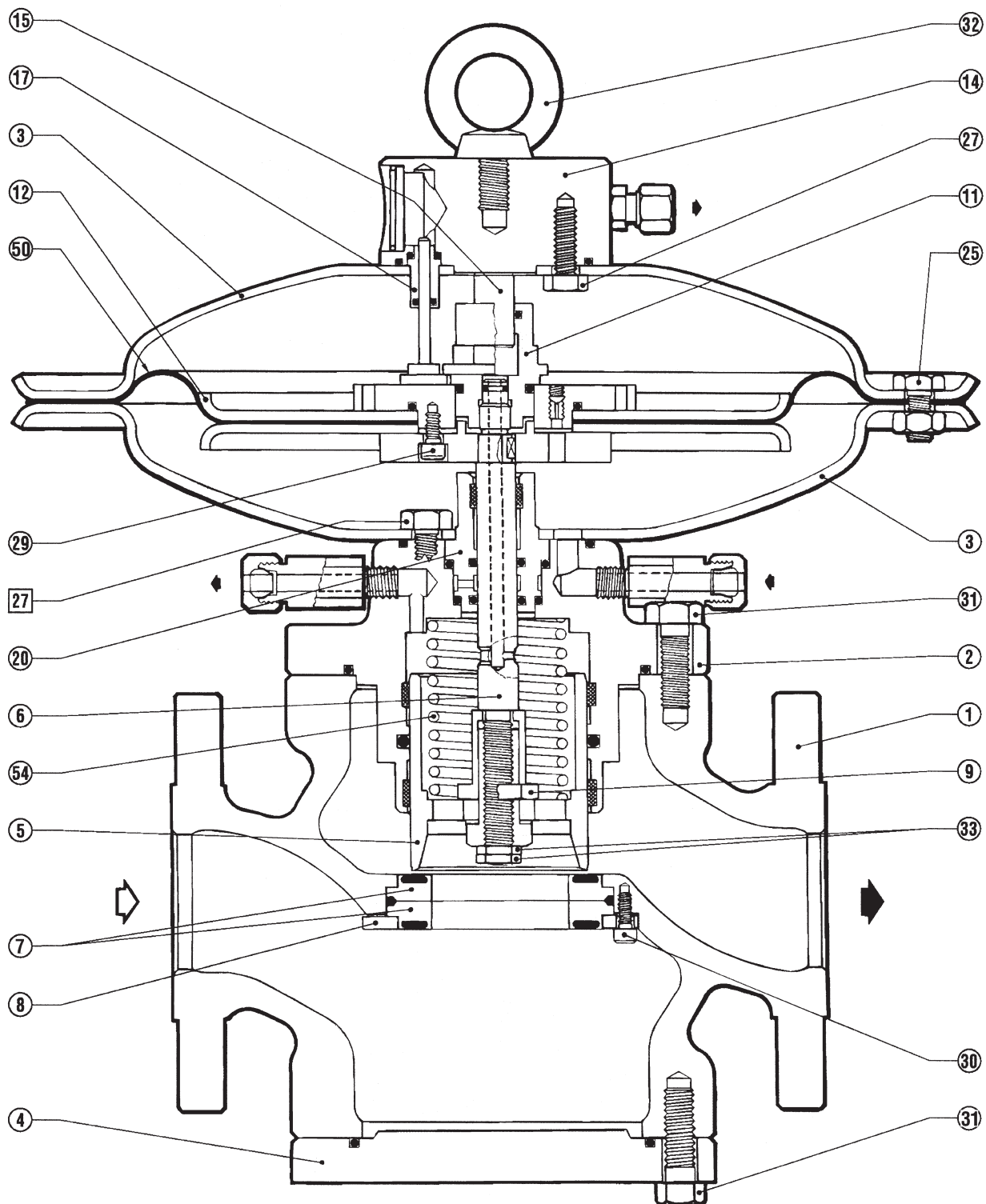
In the maintenance is carried out by your own authorized personnel, we recommend putting reference markings, before the disassembly, on those parts which could have directional or reciprocal positioning problems when reassembling. Finally, we would remind you that O-Rings and sliding mechanical components (rods, etc.) must be lubricated, before the re-assembly, with a fine **layer** of silicone grease. Before recommissioning of equipment after maintenance, external tightness shall be verified at a proper pressure value. If equipment is used as safety accessory to PED, internal **sealing** shall be verified at appropriate pressure **to assure the internal sealing at the maximum expected operating pressure**. Both verifications are essential to **assure safe use at foreseen operating conditions; they have, anyhow, to comply with the national regulations in force.**

7.2 REVAL 182 REGULATOR MAINTENANCE PROCEDURE



DN 1" ÷ 2

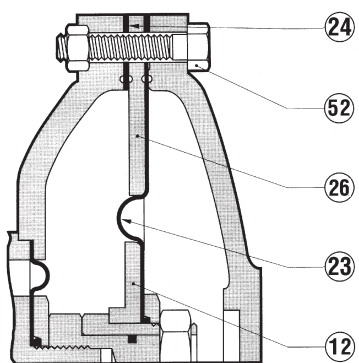
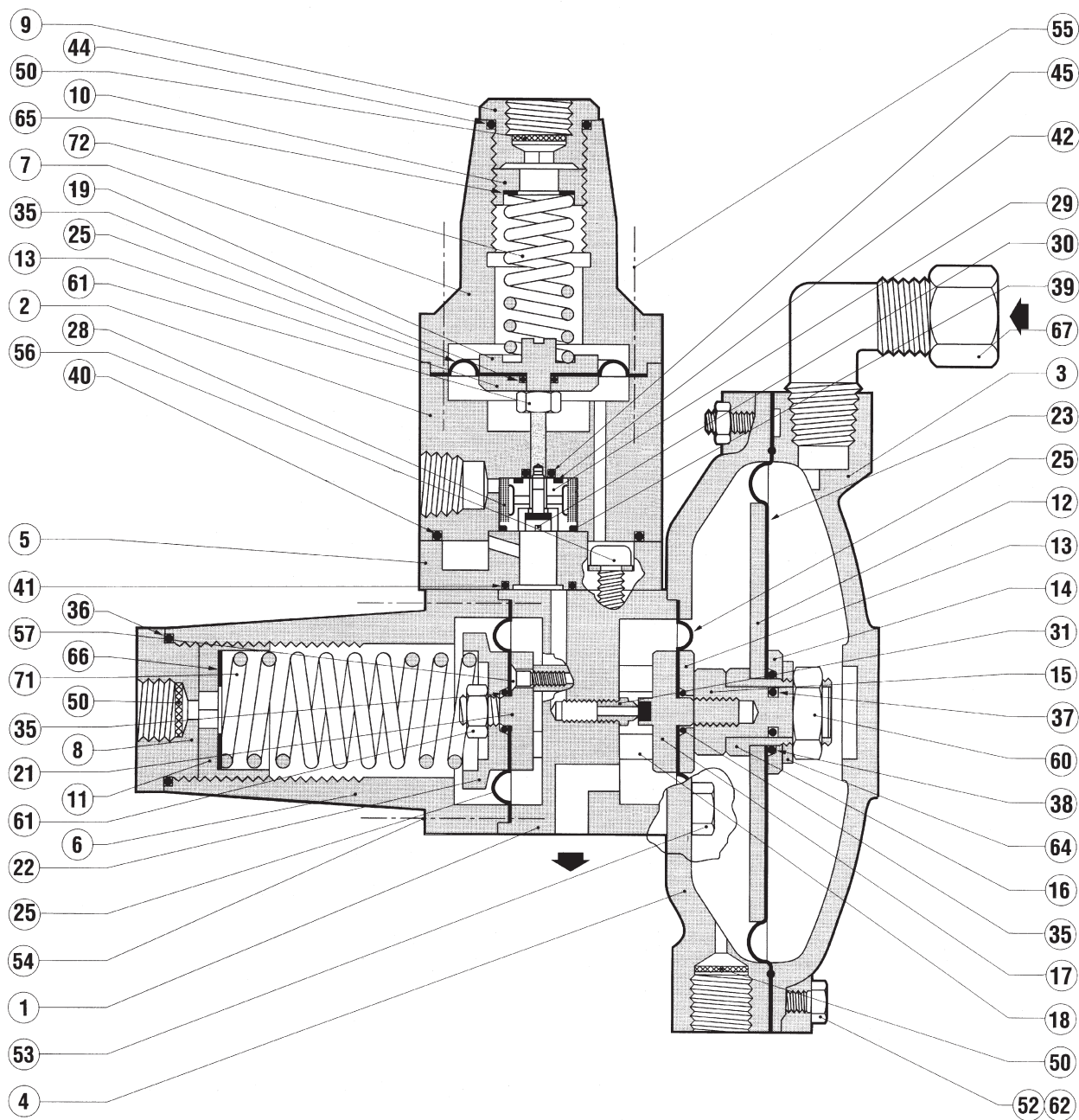
Fig. 21



Version DN 2" 1/2 ÷ 8"

Fig. 22

VERSION P90



Version P92

Fig. 23

Procedure for disassembling, completely changing the spare parts, and reassembling of REVAL 182 pressure regulator with P90 + RR40 pilot (PREVENTATIVE PROGRAMMED MAINTENANCE)

PRELIMINARY OPERATIONS

- A. Put the regulator into conditions of safety;
 - B. Ensure that the upstream and downstream pressures are 0.
-

INITIAL OPERATIONS

- 1) Disconnect all the feed and sensing line connectors from the pilot and regulator by unscrewing the taper seal fittings.
- 2) Slacken the fixing nut of the bracket supporting the pilot on the regulator.
- 3) Remove the P90+RR40 pilot assembly from the regulator.

DISASSEMBLY

(The positions refer to fig. 21)

- 4) Slacken the fixing screws, pos. (25).
- 5) Remove the top cover, pos. (3), using appropriate means and turning the eyebolt, pos. (32).
- 6) Slacken the fixing screws, pos. (27).
- 7) Separate the top cover, pos. (3), from the top flange, pos. (14).
- 8) Remove the stroke indicator rod guide, pos. (14), from the top flange, pos. (17).
- 9) Keeping the diaphragm-holder assembly fixed with a wrench, unscrew and remove the balancing rod guide, pos. (11).
- 10) Separate the balancing piston, pos. (15), from the balancing guide rod, pos. (11).
- 11) Remove the diaphragm holder assembly.
- 12) Slacken the diaphragm-holder assembly fixing screws, pos. (29).
- 13) Separate the protection discs, pos. (12), from the diaphragm, pos. (50).
- 14) Slacken the fixing screws, pos. (27).
- 15) Separate the bottom cover, pos. (3), from the obturator guide, pos. (2).
- 16) Remove the guide rod, pos. (20).
- 17) Control and clean all the disassembled metal parts.
- 18) **Replace all the parts from the spare parts kit.**

**REASSEMBLING THE REGULATOR
SERVOMOTOR UNIT**

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:

- 19) Reassemble the guide rod, pos. (20).
- 20) Reassemble the bottom cover, pos. (3), on the obturator guide, pos. (2), remembering to align the downstream sensing line hole properly.
- 21) Reassemble and fix the screws, pos. (27).
- 22) Reassemble and fix the screws of the diaphragm-holder assembly, remember to align the hole for the transfer nozzle.
- 23) Reassemble the diaphragm-holder assembly on the head.
- 24) Reassemble the balancing piston, pos. (15), on the balancing guide rod, pos. (11).
- 25) Screw and fix the balancing guide rod, pos. (11), to the rod, keeping the diaphragm-holder fixed.
- 26) Reassemble the stroke indicator rod guide, pos. (14), onto the top flange (17).
- 27) Reassemble the top cover, pos. (3) and the top flange, pos. (14), and fix the screws, pos. (27).
- 28) Reassemble the stroke indicator rod, pos. (18), (preferably not above the transfer holes).
- 29) 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.
- 30) Reassemble and fix the screws, pos. (25), with a torque of 3.5 kg.m.

DISASSEMBLING THE REGULATOR REGULATION UNIT

- 31) Slacken the fixing screws, pos. (31).
- 32) Remove the regulation unit from the main body, pos. (1).
- 33) Completely slacken the spring, pos. (54), unscrewing the lock nut, pos. (9).
- 34) Remove the obturator, pos. (5), the spacer, pos. (22) and the spring, pos. (54), from the obturator, pos. (2).
- 33)* Slacken the lock nuts, pos. (33), of the obturator, pos. (5), of the rod, pos. (6), and remove the obturator, pos. (5), from the obturator guide, pos. (2).
- 34)* Completely slacken the spring, pos. (54), by unscrewing the lock nut, pos. (9).
- 35) Slacken the fixing screws, pos. (31), on the bottom blind flange, pos. (4).
- 36) Remove the bottom blind flange, pos. (4).
- 37) Slacken the fixing screws, pos. (30), of the lock ring, pos. (8), of the reinforced gaskets, pos. (7).
- 38) Remove the lock ring, pos. (8), and the reinforced gaskets, pos. (7).
- 39) Check and clean the inside of the regulator body.
- 40) Carefully control the condition of the obturator seat, pos. (5).
- 41) Replace all the parts from the spare parts kit.**

* Only for Version DN 2" 1/2 ÷ 8" (fig. 22).

REASSEMBLING THE REGULATOR REGULATION UNIT

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:

- 42) Reassemble the reinforced gaskets, pos. (7), the lock ring, pos. (8), and fix the screws of the ring itself, pos. (30).
- 43) Reassemble the bottom blind flange, pos. (4), and fix the screws, pos. (31).
- 44) Reassemble the spring, pos. (54), the spacer, pos. (22) and the obturator, pos. (5), on the rod, pos. (6), and fully screw in the lock nut, pos. (9).
- 44)* Reassemble the spring, pos. (54) and screw the lock nut, pos. (9), fully in. Fix the obturator, pos. (5), to the rod, pos. (6), and block the nuts, pos. (33).
- 45) Reassemble the regulation unit on the main body, and fix the screws, pos. (31).

* Only for Version DN 2" 1/2 ÷ 8" (fig. 22).

DISASSEMBLING THE P90 PILOT (The positions refer to fig. 23)

- 46) Remove the pilot plug, pos. (8).
- 47) Slacken the adjustment ring, pos. (11), by turning it anticlockwise until it comes off the sleeve, pos. (6).
- 48) Remove the clutch plate, pos. (66), and the spring, pos. (71), from the sleeve, pos. (6).
- 49) Slacken the screws, pos. (54), and remove the sleeve, pos. (6), and the pilot bracket, from the pilot body, pos. (1).
- 50) Unscrew the lock nut, pos. (61), and remove the protection disc, pos. (22), the O-ring, pos. (35), and the bottom diaphragm, pos. (25) from the diaphragm support, pos. (21).
- 51) Slacken the screws, pos. (52), and remove the pilot cover, pos. (3).
- 52) Remove the diaphragm assembly from the support cover, pos. (4).
- 53) Disassemble the sensing diaphragm.
- 54) Unscrew the top diaphragm support, pos. (15), and remove it along with the disc, pos. (13), the O-ring, pos. (35), and the top diaphragm, pos. (25).
- 55) Slacken the screws, pos. (57), and remove the pilot obturator, pos. (17), from the mobile assembly.
- 56) Clean and carefully check the state of the valve seat, pos. (31).
- 57) **Replace all the parts from the spare parts kit.**

REASSEMBLING THE P90 PILOT

- 58) Screw in the screws, pos. (57) , and fix the pilot obturator, pos. (17) , to the mobile assembly.
- 59) Reassemble the top diaphragm, pos. (25) , the O-ring, pos. (35) , and the disc, pos. (13) , and fix the diaphragm support, pos. (15) .
- 60) Reassemble the diaphragm support and fit it back on the support cover, pos. (4) .
- 61) Reassemble the pilot cover, pos. (3) , and fix the screws, pos. (52) .
- 62) Reassemble the bottom diaphragm, pos. (25) , the O-ring, pos. (35) , and the protection disc, pos. (22) , on the diaphragm support, pos. (21) , and fix the whole assembly by means of the lock nut, pos. (61) .
- 63) Reassemble the sleeve, pos. (6) , and the bracket, on the pilot body, pos. (1) , and fix the screws, pos. (54) .

DISASSEMBLY OF THE RR40 PRE-REGULATOR

- 64) Remove the pre-regulator plug, pos. (9) . Turn the regulation ring, pos. (10) anticlockwise until it comes off the sleeve, pos. (7) .
- 65) Remove the clutch disc, pos. (65) , and the spring, pos. (72) , from the sleeve.
- 66) Slacken the screws, pos. (55) , and remove the sleeve, pos. (7) , the pre-regulator body, pos. (2) , the filter pos. (28) and the valve seat, pos. (29) .
- 67) Slacken the screws, pos. (56) , and remove the intermediate flange, pos. (5) .
- 68) Slacken the obturator, pos. (30) .
- 69) Disassemble the diaphragm assembly by operating on the diaphragm support and on the nut of the shaft.
- 70) Clean and carefully check the state of the valve seat, pos. (29) .
- 71) Replace all the parts from the spare parts kit.**

REASSEMBLING THE RR40 PRE-REGULATOR

- 72) Reassemble the diaphragm assembly.
- 73) Refit the diaphragm assembly and the valve seat, pos. (29) , on the pre-regulator body, pos. (2) , and fix the obturator, pos. (30) .
- 74) Reassemble the intermediate flange, pos. (5) , and fix the screws, pos. (56) .
- 75) Reassemble the bushing, pos. (28) , the pre-regulator body, pos. (2) , the sleeve, pos. (7) , and the screws, pos. (55) .

7.3 PM/182 MONITOR MAINTENANCE PROCEDURE

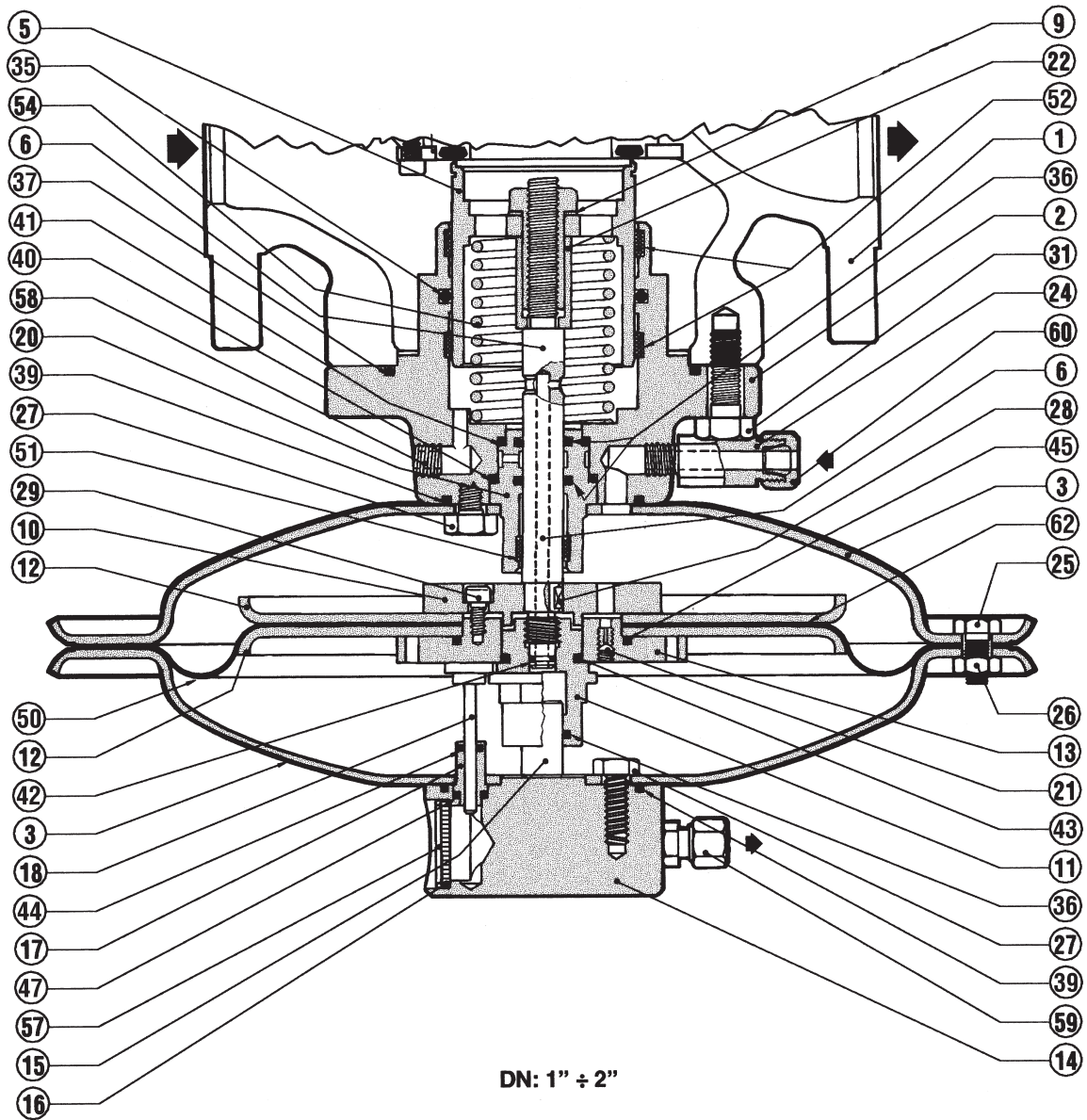
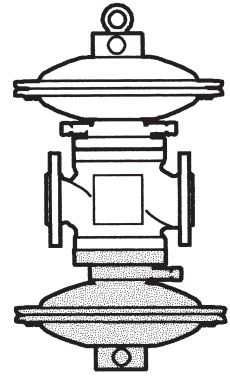


Fig. 24

- 1) Disconnect the connection pipes between the regulator and monitor and the respective pilot units, and between the latter and the downstream pressure take-offs.
- 2) Remove the screws (88) which secure the reduction assembly (90) of the monitor to the body, making sure that the weight of the reduction assembly itself can be sustained. When removing the assembly from the body, the maximum care must be taken so as to avoid denting the sealing edge of the obturator (5).
- 3) Lay the reduction assembly on one side.
- 4) With a sharp blow, slacken the lock nut (9) and unscrew it completely to unload the spring (54); then remove the obturator (5) with the spacer (22) from the obturator guide (2).
- 5) Remove the screws (25) and the nuts (26) from the control head (2).
- 6) Raise the top cover (3) with the flange (14) and the indicator rod guide (17). To separate the three parts, unscrew the screws (27).
- 7) Separate the parts (11) and (13) making use of the flat faces on the piston guide (11) and the holes on the disc (13).
- 8) Raise the assembly composed of the diaphragm (50) and the discs (10), (12) and (13); disassemble the diaphragm (50) by removing the screws (23).
- 9) Remove the stem (6) from the side of the cover.
- 10) Disassemble the bottom cover (3) by removing the screws (27), and remove the stem guide (20).

Take the following precautions during reassembly:

- the bottom cover (3) should be fixed to the obturator guide (2) in such a way that the hole of the motorization pressure passage mates with the similar hole on the obturator guide itself;
- when assembling the assembly consisting of the diaphragm (50) and the guard discs, check that the hole with the nozzle on disc (13) is aligned with the hole on disc (10); also check that the hole on nozzle (21) is free from dirt and foreign bodies;
- when assembling the assembly composed of the top cover (3) with the flange (14) and the indicator rod (18), ensure that the washer of the indicator rod is correctly fitted between the disc (13) and the piston guide (11) and that it does not obstruct the hole in disc (13); it should all be turned in such a way that the indicator port is completely visible;
- before securing the lock nut (9), check that the spring (54) is properly housed in the special centring beat on the obturator guide (2);
- take care not to fit the spacer (22) upside-down.

- 1) Slacken and remove the screws, pos. (31), and detach the motorization head from the main body.
- 2) Unscrew the eyebolts and nuts, pos. (87), and raise the flange, pos. (72).
- 3) From the sleeve, pos. (79), remove the complete grill, pos. (75), the reinforced gasket, pos. (7), and the fixing ring, pos. (98).
- 4) Detach the grill, pos. (75) from the reinforced gasket, pos. (7), slackening the screws, pos. (99).
- 5) From the sleeve, pos. (79), remove the internal basket, pos. (77).
- 6) Remove the outer basket, pos. (78), with its gaskets, pos. (73) and (80).
- 7) Remove the plating, pos. (83).
- 8) Slacken the screws, pos. (86), and remove the bottom flange of the silencer, pos. (82).

Remember that once they have been removed, the washers, pos. (88) are no longer able to guarantee tightness, and must therefore be replaced by new ones.

When reassembling the outer basket, pos. (78), ensure that the support with the smaller internal diameter is turned towards the flange, pos. (82).

7.5 VB/93 SLAM-SHUT MAINTENANCE PROCEDURE

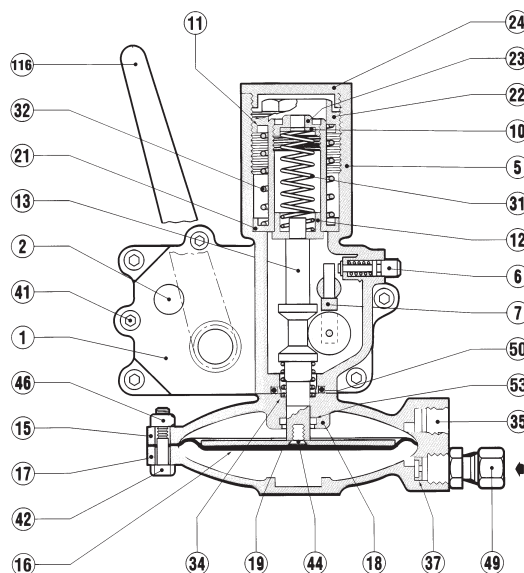
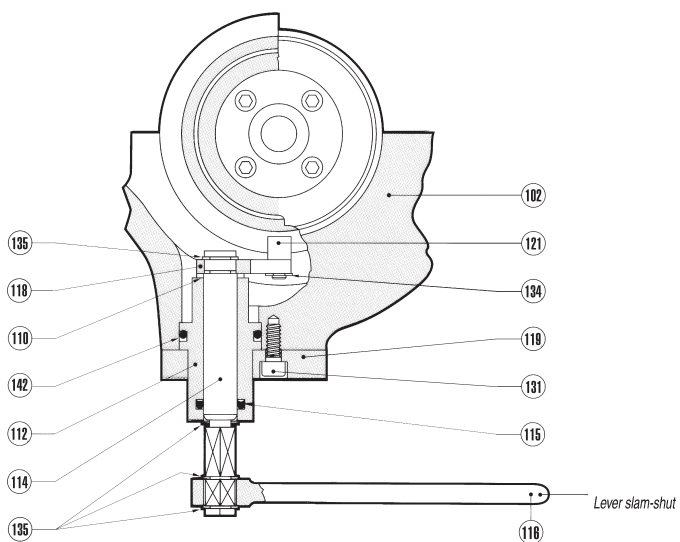
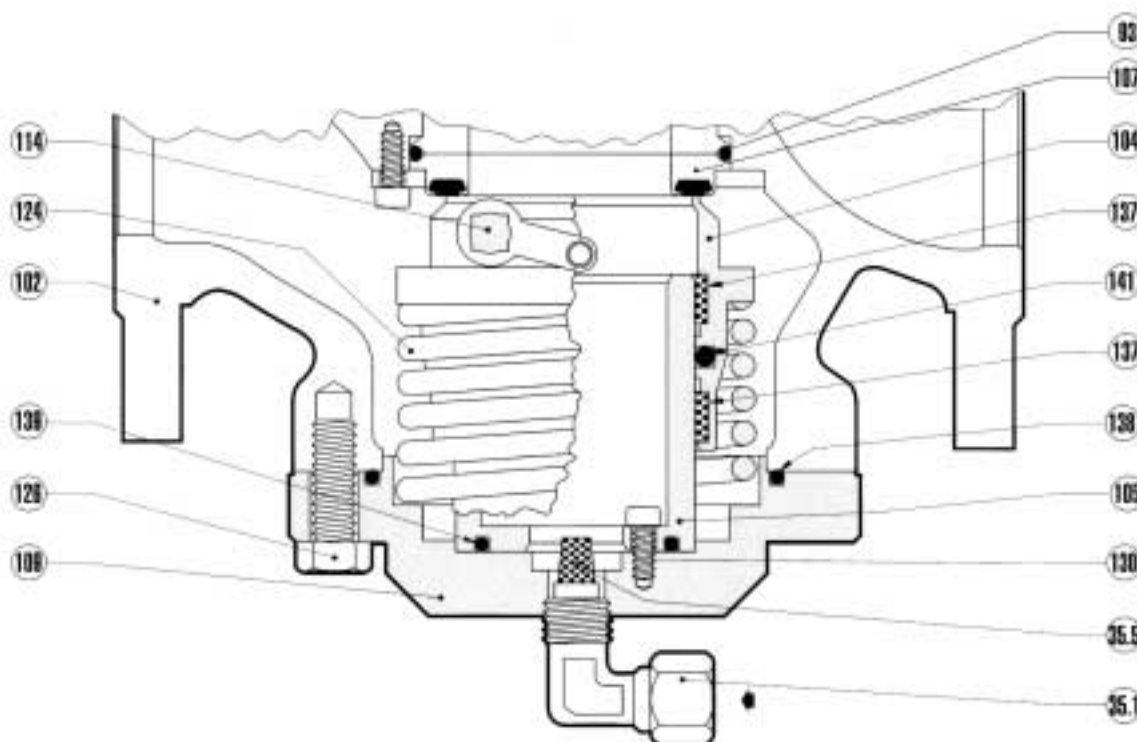
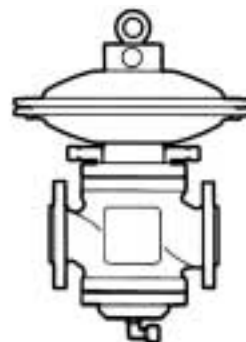


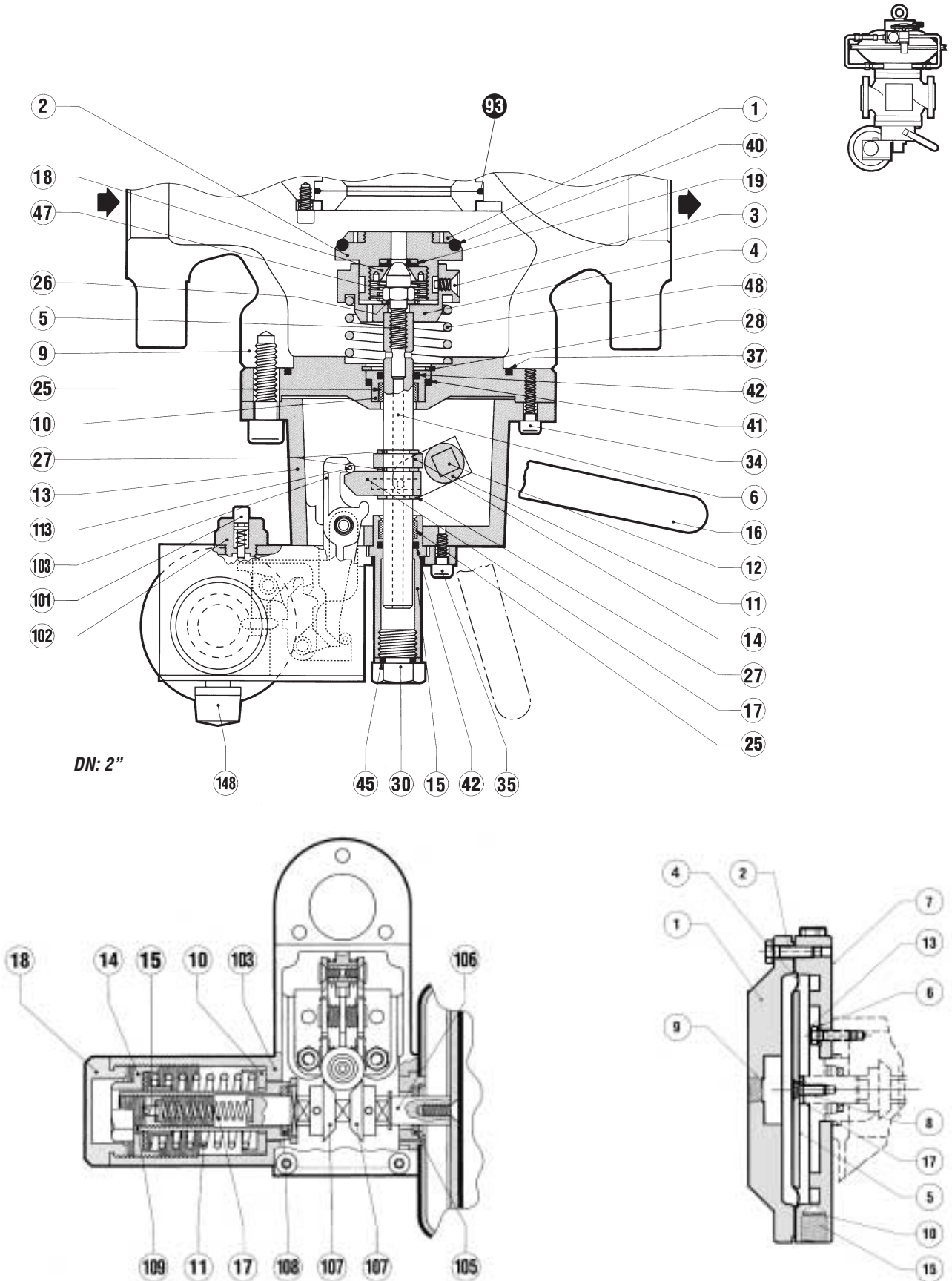
Fig. 26
54

- 1) Check that the slam-shut is in the closed position.
- 2) Disconnect the connection pipes between the elbows (35) and the pilot and between the slam-shut head and the down-line pressure take-offs.
- 3) Using a screwdriver, remove the elastic rings (135) and remove the lever (116) .
- 4) Remove the screws which retain the pressure switch device to the regulator and then remove the device itself from the guide shaft (112) .
- 5) Remove the screws (131) and the small flange (119) .
- 6) Remove the shaft guide (112) from the body; then remove the shaft (114) and lever (118) assembly.
- 7) Slacken the screws (126) so as to partially unload the spring (124) ; before completely removing them, ensure that the weight of the flange (109) , of the obturator guide (105) and of the obturator (104) can be adequately sustained. When removing this assembly, great care must be taken so as not to damage the sealing edge of the obturator.
- 8) Remove the screws (130) to separate the flange (109) from the obturator guide (105) .
- 9) Slacken the screws (42) from the pressure switch device, and remove the cover (17) .

Take the following precautions during reassembly:

- install the shaft (114) and lever (118) assembly first;
- when installing the obturator assembly into the body, keep the movement well in line to avoid denting the sealing edge, and take particular care to keep the shaft (114) completely turned anticlockwise;
- fit the small flange (119) and associated components;
- to position the pressure switch device correctly, turn the shaft as far as possible clockwise this time. Then insert the device and secure it to the bodies with the associated screws;
- fit the lever (116) onto the shaft (114) . It is important to ensure that when the slam-shut opens it is positioned horizontally and is virtually vertical when the slam-shut is closed.

7.6 SB/82 SLAM-SHUT MAINTENANCE PROCEDURE



- 1) Check that the slam-shut is in the closed position.
- 2) Disconnect the pipe between the downstream sensing line take-off and the head of the slam-shut pressure switch.
- 3) Slacken the fixing screws, pos. (36), so as to partially slacken the spring, pos. (48); before removing them completely, ensure that you can support the slam-shut device adequately.
- 4) Remove the screws and separate the slam-shut from the body, pos. (9).
- 5) Put the slam-shut on its side.
- 6) Unscrews the screws, pos. (3), and remove the obturator, pos. (2), and the spring, pos. (47).
- 7) Unscrews the ring, pos. (2), and the ring, pos. (1), from the obturator, pos. (18).
- 8) Keeping the shaft, pos. (6) firm, slacken the screw, pos. (26).
- 9) Remove the ring, pos. (4), and the spring, pos. (48).
- 10) Remove the retaining ring, pos. (28) and the shaft guide, pos. (10).
- 11) Slacken the screws, pos. (2), from the pressure switch device, and remove the cover, pos. (1).

Replace all the components included in the spare parts kit.

RE-ASSEMBLY

- 12) Fit the cover, pos. (1), and fix the screws, pos. (2) on the pressure switch device.
- 13) Put back the shaft guide, pos. (10) and fix with the retaining ring, pos. (28).
- 14) Put back the spring, pos. (48) and the ring, pos. (4), and fix the screws, pos. (26).
- 15) Put back the rings, pos. (2) and pos. (1) on the obturator, pos. (18).
- 16) Put back the spring, pos. (47) and the obturator, pos. (2), fixing the screws, pos. (3).
- 17) Put the slam-shut device back on the body, pos. (9) and fix the screws, pos. (36).
- 18) Restore the connection between the downstream sensing line take-off and the head of the slam-shut pressure switch.

8.0 FINAL OPERATIONS

- 1) Refit the P90 + RR40 pilot assembly onto the regulator.
- 2) Fix the pilot support bracket to the regulator.
- 3) Reconnect all the feed and sensing line connectors on the pilot and regulator, screwing in the taper seal fittings.














8.1 TIGHTNESS AND SETTING CONTROL

- 1) Very slowly open the on/off valve upstream from the regulator and using a foaming agent or the like, check:
 - the tightness of the outside surfaces of the regulator and of the pilot;
 - the tightness of the inside surfaces of the regulator and of the pilot;
 - the tightness of the connection fittings.
- 2) Open a bleed cock downstream from the regulator to create a small gas flow.
- 3) Reassemble the spring, pos. (65), and the clutch disc, pos. (7), onto the sleeve of the pre-regulator, pos. (72).
- 4) Turn the adjustment ring, pos. (10), clockwise until you reach the recommended set-point of the pre-regulator, $P_{ep} = P_a + (0.15 \div 0.2)$ bar, and check it on the pressure gauge, pos. (73).
- 5) Reassemble the spring, pos. (66), and the clutch disc, pos. (6), onto the pilot, pos. (71).
- 6) Turn the adjustment ring, pos. (11), clockwise until you reach the desired set-point.
- 7) Close the bleed cock to the atmosphere.

8.2 START UP

- 1) Very slowly open the downstream on/off valve and, if necessary, adjust the regulator setting by means of the adjustment ring on the pilot. Obtain the correct pressure pattern by adjusting the adjustment ring on the pre-regulator.
- 2) Reassemble the pilot plug, pos. (8), and the pre-regulator plug, pos. (9).

TAB. 14 MAINTENANCE WRENCHES FOR REVAL 182 PRESSURE REGULATORS - REVAL 182 + PM/182 WITH PILOT P90 + RR40

 (A) Combination spanner	 (B) Adjustable spanner	 (C) Compass pin wrench
 (D) Box spanner	 (E) Hexagon or allen key	 (F) Hexagonal T key
 (G) Hexagonal socket T wrench	 (H) Philips screwdriver	 (I) Flat head screwdriver
 (L) O-Ring extraction tool	 (M) Circlip pliers	 (N) Fiorentini special socket
 (O) Fiorentini special socket		














REVAL 182

Tipo/Type	DN	1"	1" 1/2	2"	2" 1/2	3"	4"	6"	8"
A	Ch.	10-16-17	10-16-17-18	10-16-17	10-16-17-18	10-16-17	10-16-17-18	10-16-17-18	10-16-17-18
		18-19-22-27	19-22-27	18-19-22-24	19-22-24	18-19-22-24	19-22-24	19-22-24	19-22-24
		30	30	27-30	27-30	27-30	27-41	27-41	27-41
B	L.	300							
C	∅	4							
D	Ch.							27-41	27-41
E	Ch.	2,5-8	2,5-8	2,5-8	2,5-8	2,5-8	2,5-8	2,5-8	2,5-8
F	Ch.	4-5-8	4-5-8	4-5-8	4-5-8	4-5-8	4-5-8	4-5-8	4-5-8
G	Ch.	8-10-17-20	8-10-17-20	8-10-17-20		10-17-19-22	10-17-19-22	10-17	10-17
L	Cod.	7999099							
I	L.	65x100	65x100	65x100	65x100	65x100	65x100	65x100	65x100

REVAL 182 + PM/182

Tipo/Type	DN	1"	1" 1/2	2"	2" 1/2	3"	4"	6"	8"
A	Ch.	10-16-17	10-16-17-18	10-16-17	10-16-17-18	10-16-17	10-16-17-18	10-16-17-18	10-16-17-18
		18-19-22-27	19-22-27	18-19-22-24	19-22-24	18-19-22-24	19-22-24	19-22-24	19-22-24
		30	30	27-30	27-30	27-30	27-41	27-41	27-41
B	L.	300							
C	∅	4							
D	Ch.							27-41	27-41
E	Ch.	2,5-8	2,5-8	2,5-8	2,5-8	2,5-8	2,5-8	2,5-8	2,5-8
F	Ch.	4-5-8	4-5-8	4-5-8	4-5-8	4-5-8	4-5-8	4-5-8	4-5-8
G	Ch.	8-10-17-20	8-10-17-20	8-10-17-20	10-17-19-22	10-17-19-22	10-17-19-22	10-17	10-17
L	Cod.	7999099							
I	L.	65x100	65x100	65x100	65x100	65x100	65x100	65x100	65x100

TAB. 15 MAINTENANCE WRENCHES FOR REVAL 182 PRESSURE REGULATORS + DB/182 - REVAL 182 + SB/182 WITH PILOT P90 + RR40

 (A) Combination spanner	 (B) Adjustable spanner	 (C) Compass pin wrench
 (D) Box spanner	 (E) Hexagon or allen key	 (F) Hexagonal T key
 (G) Hexagonal socket T wrench	 (H) Philips screwdriver	 (I) Flat head screwdriver
 (L) O-Ring extraction tool	 (M) Circlip pliers	 (N) Fiorentini special socket
 (O) Fiorentini special socket		

REVAL 182 + DB/182

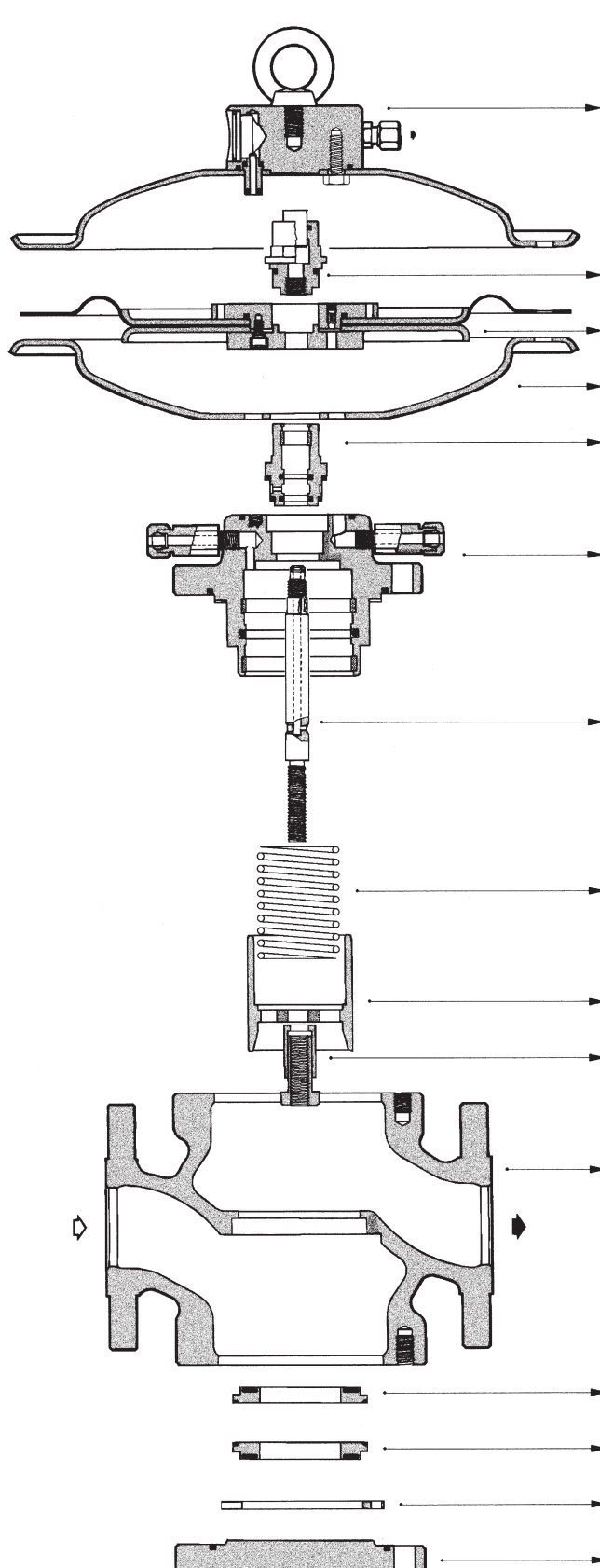
Tipo/Type	DN	1"	1" 1/2	2"	2" 1/2	3"	4"	6"	8"
A	Ch.	10-16-17	10-16-17-18	10-16-17	10-16-17-18	10-16-17	10-16-17-18	10-16-17-18	10-16-17-18
		18-19-22-24-27 30	19-22-27 30	18-19-22-24 27-30	19-22-24 27-30	18-19-22-24 27-30	19-22-24 27-41	19-22-24 27-41	19-22-24 27-41
B	L.	300							
C	∅	4							
D	Ch.							27-41	27-41
E	Ch.	2,5-8	2,5-8	2,5-8	2,5-8	2,5-8	2,5-8	2,5-8	2,5-8
F	Ch.	4-5-8	4-5-8	4-5-8	4-5-8	4-5-8	4-5-8	4-5-8	4-5-8
G	Ch.	8-10-17-20	8-10-17-20	8-10-17-20	10-17-19-22	10-17-19-22	10-17-19-22	10-17	10-17
L	Cod.	7999099							
I	L.	65x100	65x100	65x100	65x100	65x100	65x100	65x100	65x100
O	Cod.	7999031	7999032	7999033	7999034	7999035	7999036	7999037	7999038

REVAL 182 + SB/182

Tipo/Type	DN	1"	1" 1/2	2"	2" 1/2	3"	4"	6"	8"
A	Ch.	10-16-17	10-16-17-18	10-16-17	10-16-17-18	10-16-17	10-16-17-18	10-16-17-18	10-16-17-18
		18-19-22-24-27 30	19-22-24-27 30	18-19-22-24 27-30	19-22-24 27-30	18-19-22-24 27-30	19-22-24 27-41	19-22-24 27-41	19-22-24 27-41
B	L.	300							
C	∅	4							
D	Ch.	24	24	24	24	24	24	24-27-41	24-27-41
E	Ch.	2,5-8	2,5-8	2,5-8	2,5-8	2,5-8	2,5-8	2,5-8	2,5-8
F	Ch.	4-5-8	4-5-8	4-5-8	4-5-8	4-5-8	4-5-8	4-5-8	4-5-8
G	Ch.	8-10-17-20	8-10-17-20	8-10-17-20	10-17-19-22	10-17-19-22	10-17-19-22	10-17	10-17
L	Cod.	7999099							
I	L.	65x100	65x100	65x100	65x100	65x100	65x100	65x100	65x100
M	∅	19-60							
V	Cod.	7999019							

9.0 WEIGHT OF THE COMPONENTS

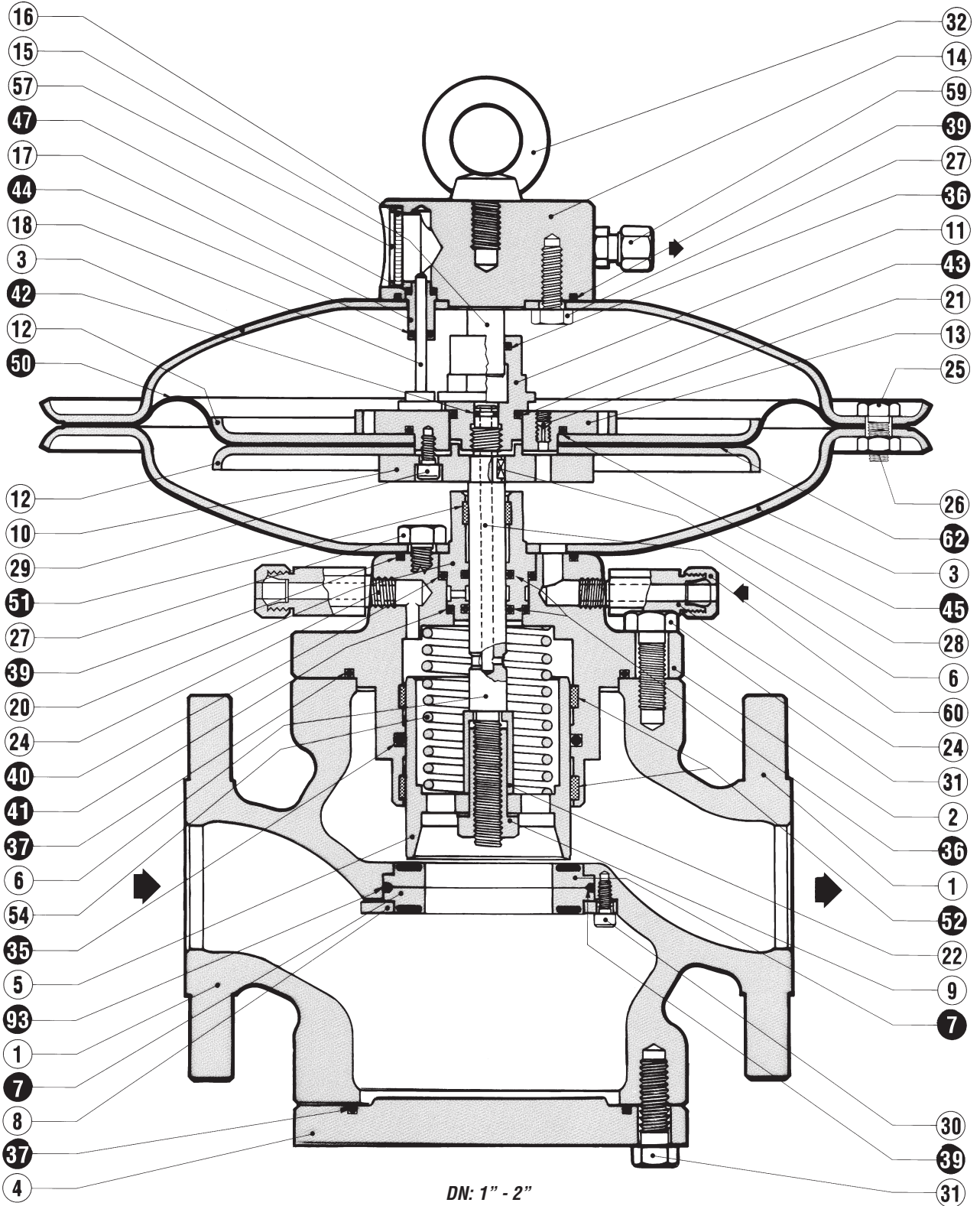
9.1 TAB. 16 WEIGHT OF THE COMPONENTS IN KG.



DN	1"	2"	2" 1/2	3"	4"	6"	8"
1	6,540	6,540	10,600	10,600	10,600	23,900	23,900
2	0,260	0,260	0,350	0,350	0,350	0,850	0,850
3	4,080	4,080	7,300	7,300	7,300	10,800	10,800
4	4,210	4,210	8,700	8,700	8,700	19	19
5	0,270	0,270	0,300	0,300	0,300	0,600	0,600
6	2,600	5,330	7,500	8,700	15,400	29,500	45
7	0,170	0,210	0,300	0,300	0,350	1,050	1,050
8	0,050	0,160	0,200	0,200	0,500	0,800	0,800
9	0,230	0,700	1,100	1,150	3,500	9,500	15
10	0,080	0,080	0,050	0,050	0,050	0,550	0,550
11	8,450	18	21,700	31	47	99,500	150
12	0,100	0,210	0,300	0,450	0,800	0,950	1,100
13	0,100	0,210	0,300	0,450	0,800	0,950	1,100
14	0,090	0,150	0,300	0,250	0,600	0,700	0,800
15	1,420	3,030	3,900	5,900	9,700	15,500	27,500

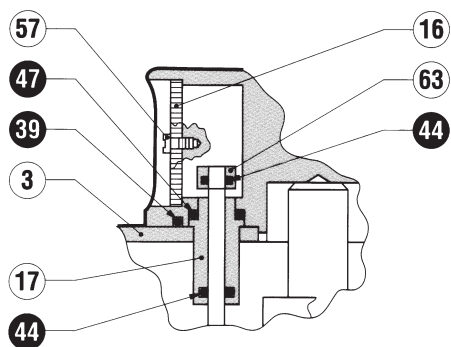
10.0 LIST OF RECOMMENDED SPARE PARTS

REVAL 182 PRESSURE REGULATOR

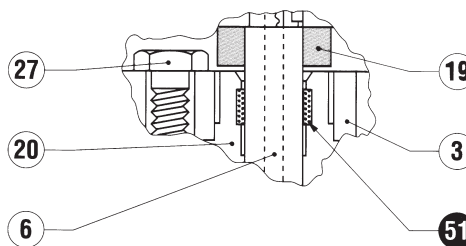


DN: 1" - 2"
Fig. A

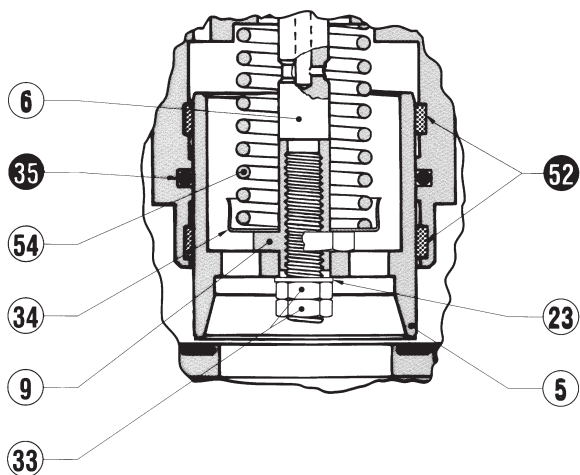
VERSIONS



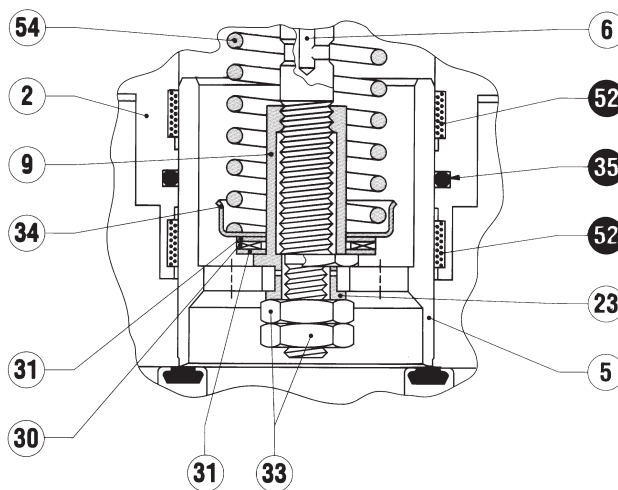
DN: 6'' - 8''



DN: 3'' - 4'' - 8''



DN: 2'' 1/2 ÷ 4''



DN: 6'' - 8''

Fig. B

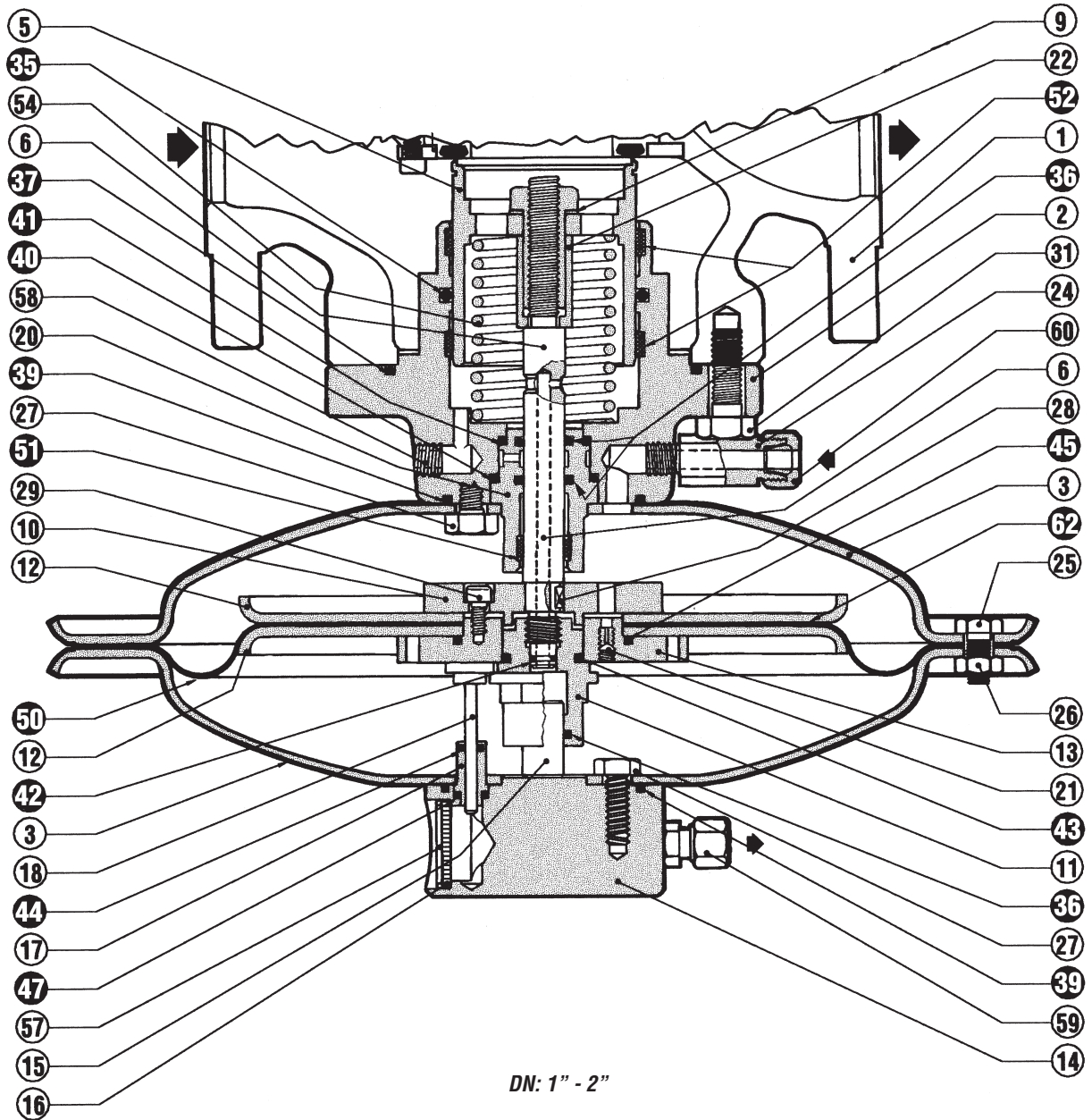
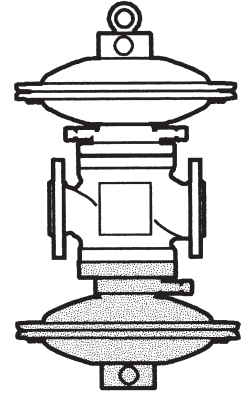
	POS.	DESCRIPTION	DN	N. OF PIECES	
				1" ÷ 4"	6" - 8"
REVAL 182	7	Reinforced gasket		2	2
	35	O. Ring		1	1
	36	O. Ring		3	3
	37	O. Ring		2	2
	39	O. Ring		2	2
	40	O. Ring		1	1
	41	O. Ring		1	1
	42	O. Ring		1	1
	43	O. Ring		1	1
	44	O. Ring		1	2
	45	O. Ring		1	1
	47	O. Ring		1	1
	50	Diaphragm		1	1
	51	Guide ring		1	1
	52	Guide ring		2	2
	62	Rubber gasket		2	2
	93	O. Ring		1	1

NB. The replacement of pos. 50 diaphragm should be assessed on the basis of its state of wear.

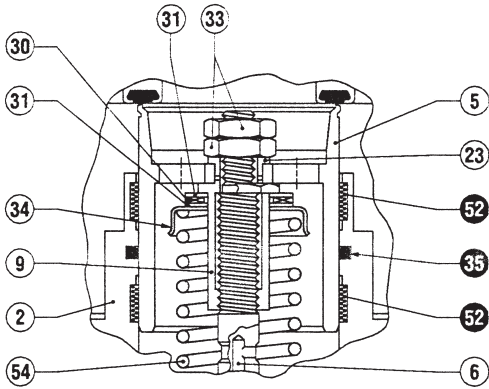
Reinforced gasket hardness

The hardness of the 65 ShA reinforced gasket can be identified from a sky blue mark.

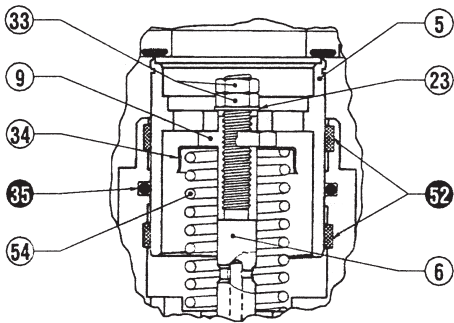
PM/182 MONITOR



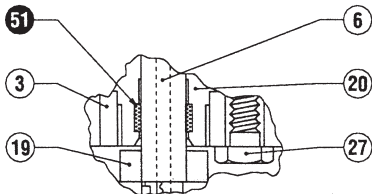
VERSIONS



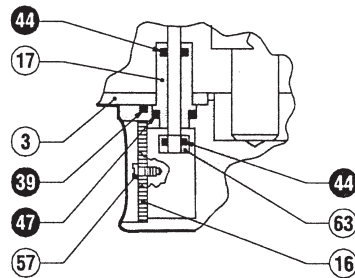
DN: 2" 1/2 ÷ 4"



DN: 6" - 8"



DN: 2" 1/2 ÷ 8"

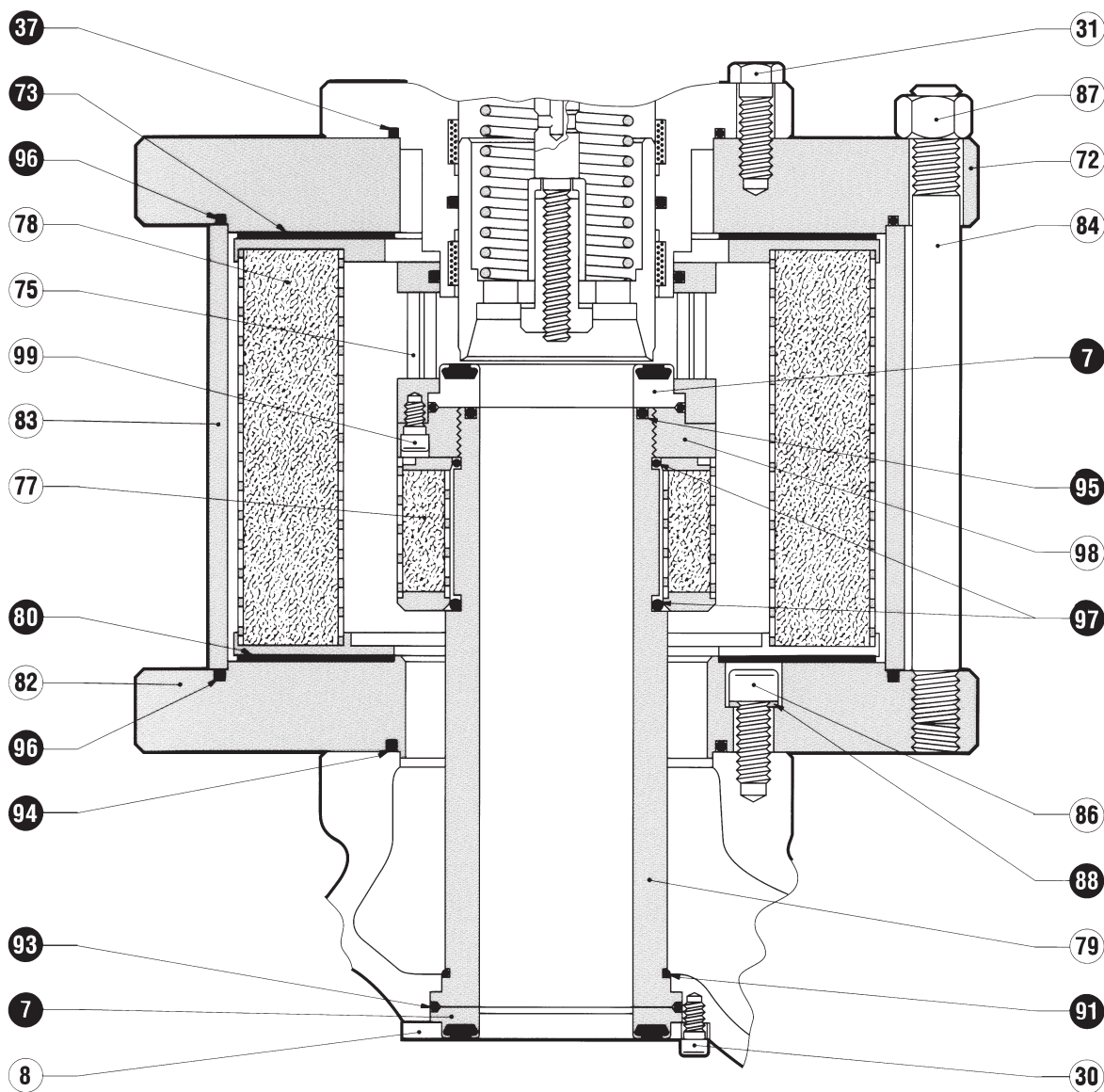
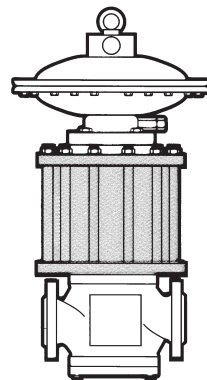


DN: 6" - 8"

POS.	DESCRIPTION	DN	N. OF PIECES	
			1" ÷ 4"	6" - 8"
35	O. Ring		1	1
36	O. Ring		3	3
39	O. Ring		2	2
40	O. Ring		1	1
41	O. Ring		1	1
42	O. Ring		1	1
43	O. Ring		1	1
44	O. Ring		1	2
45	O. Ring		1	1
47	O. Ring		1	1
50	Diaphragm		1	1
51	Guide ring		1	1
52	Guide ring		2	2
62	Rubber gasket		2	2

... + PM/182

+ DB/182 SILENCER

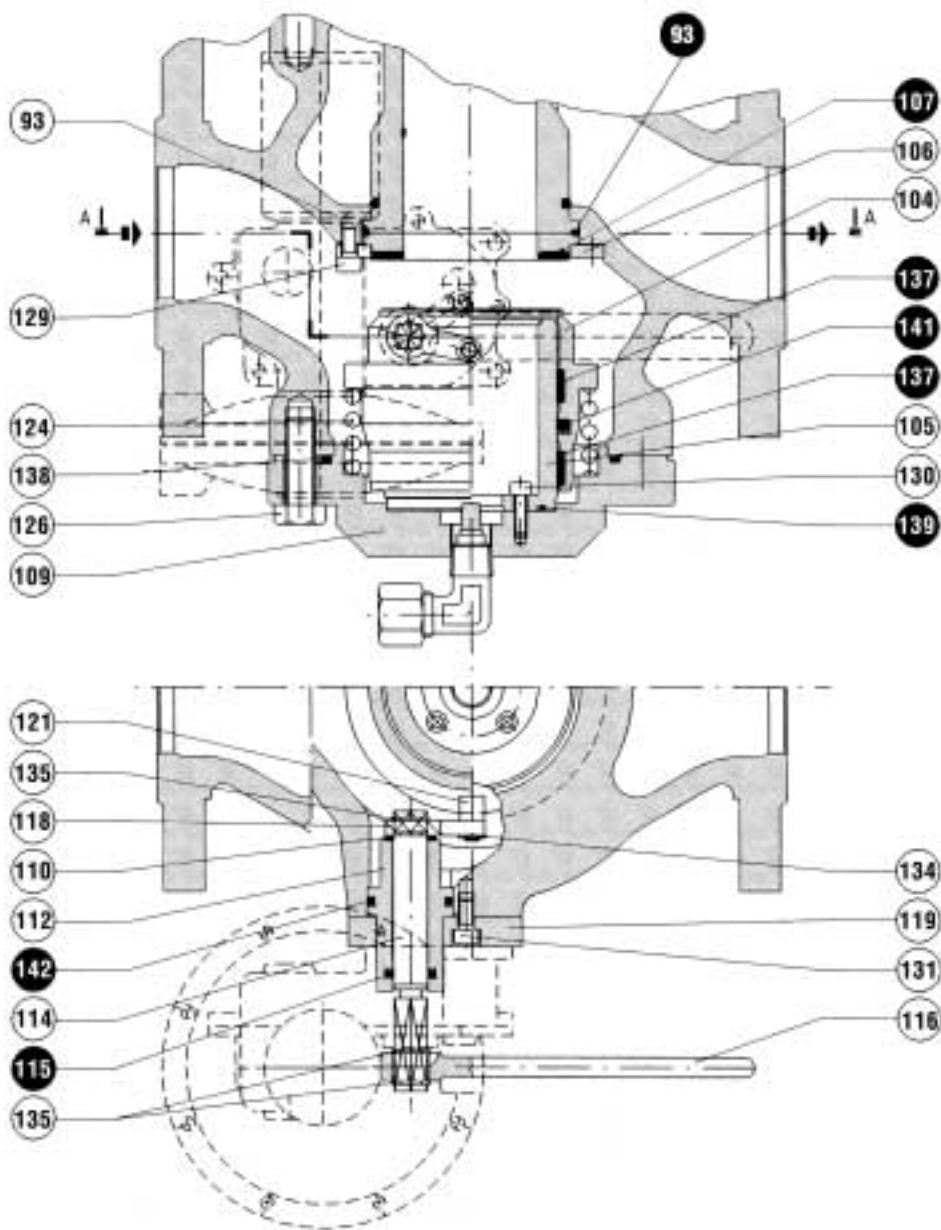
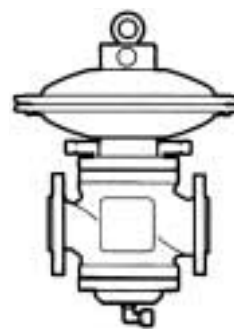


DN: 1" ÷ 8"
Fig. F

REVAL 182 + DB/182

	POS.	DESCRIPTION	DN	N. OF PIECES	
				1" ÷ 4"	6" ÷ 8"
REVAL 182 + DB/182	35	O. Ring		1	1
	36	O. Ring		3	3
	37	O. Ring		1	1
	39	O. Ring		2	2
	40	O. Ring		1	1
	41	O. Ring		1	1
	42	O. Ring		1	1
	43	O. Ring		1	1
	44	O. Ring		1	2
	45	O. Ring		1	1
	47	O. Ring		1	1
	50	Diaphragm		1	1
	51	Guide ring		1	1
	52	Guide ring		2	2
	62	Rubber gasket		1	1
	73	Gasket		2	1
	74	Gasket		2	1
	76	Reinforced gasket		1	1
	80	Rubber gasket		1	1
	81	Rubber gasket		1	1
	88	Copper		4	8 (6") 12 (8")
	93	O. Ring		1	1
	94	O. Ring		1	1
	95	O. Ring		1	1
96	O. Ring		2	2	

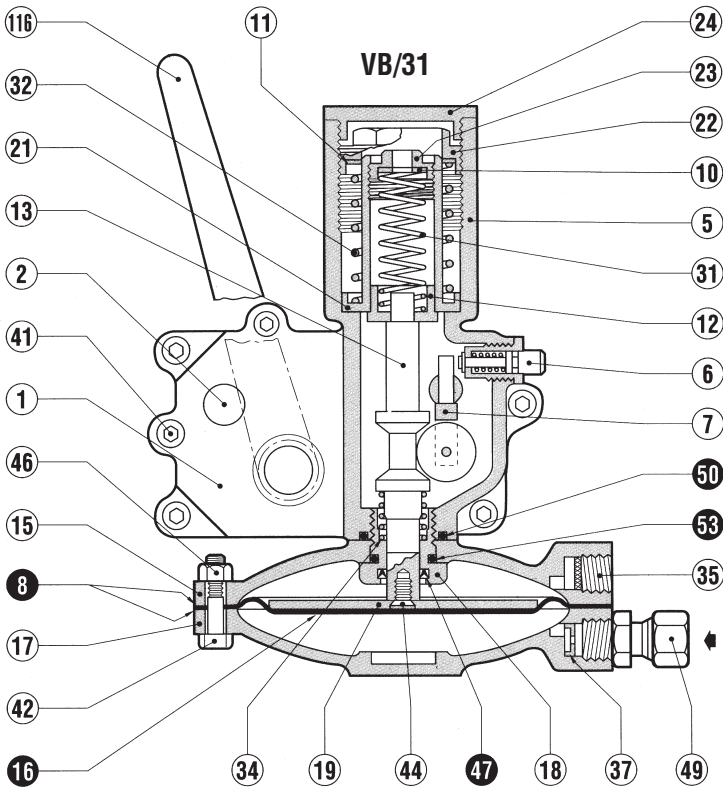
+ VB/93 SLAM-SHUT



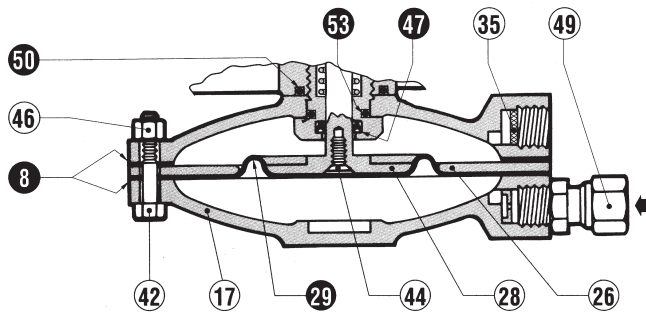
N. OF PIECES

	POS.	DESCRIPTION	N. OF PIECES
... + VB/93	107	Gasket	1
	115	Sealing U-Ring	1
	137	Guide ring	2
	139	O. Ring	1
	141	O. Ring	1
	142	O. Ring	1

CONTROL DEVICE

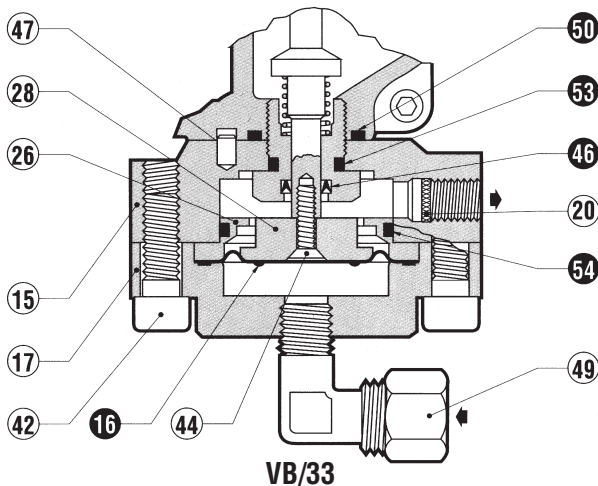


		N. OF PIECES	
POS.	DESCRIPTION		
VB/31	8	Gasket	2
	16	Diaphragm	1
	47	Sealing U	1
	50	O. Ring	1
	53	O. Ring	1



		N. OF PIECES	
POS.	DESCRIPTION		
VB/32	8	Gasket	2
	29	Diaphragm	1
	47	Sealing U	1
	50	O. Ring	1
	53	O. Ring	1

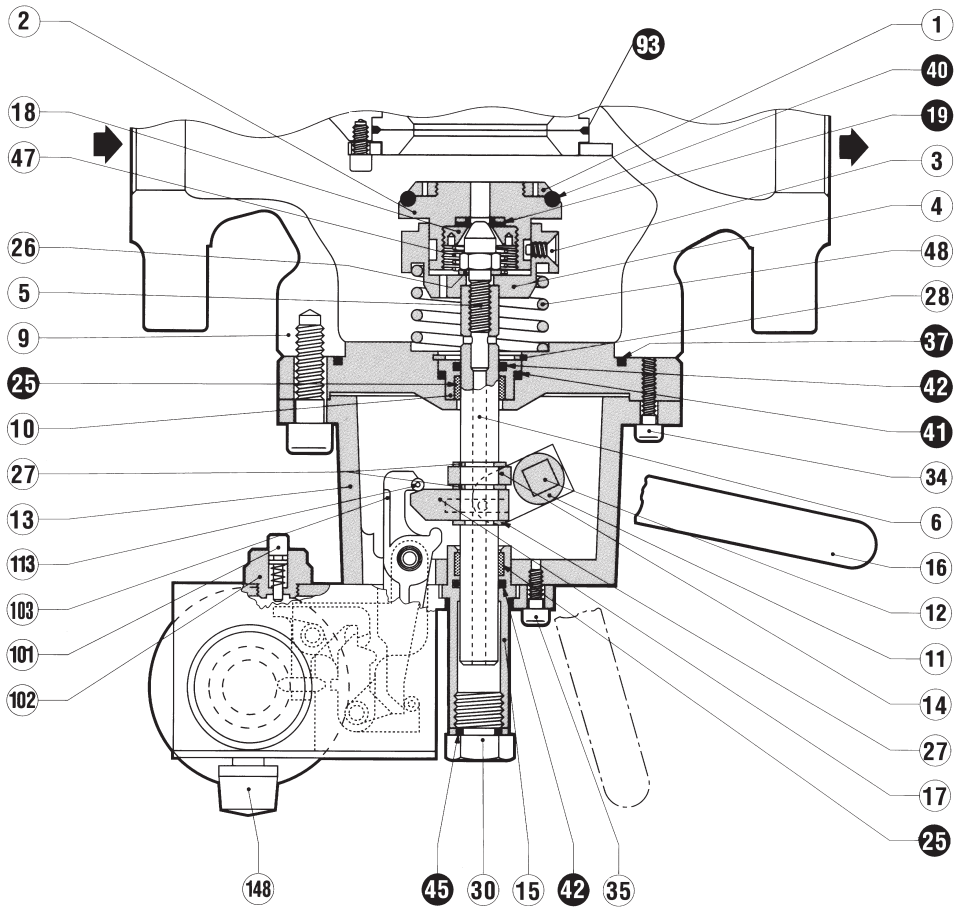
VB/32



		N. OF PIECES	
POS.	DESCRIPTION		
VB/33	16	Diaphragm	1
	46	Sealing U	1
	50	O. Ring	1
	53	O. Ring	1

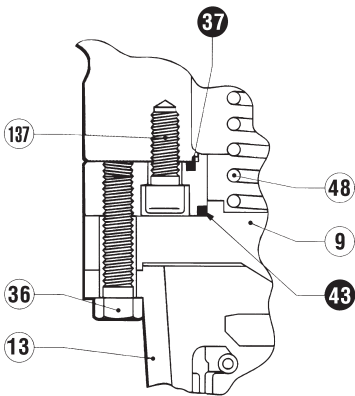
VB/33

... + SB/82 SLAM-SHUT

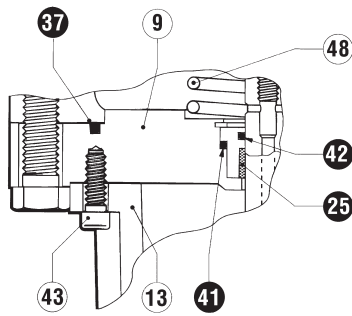


DN: 2"

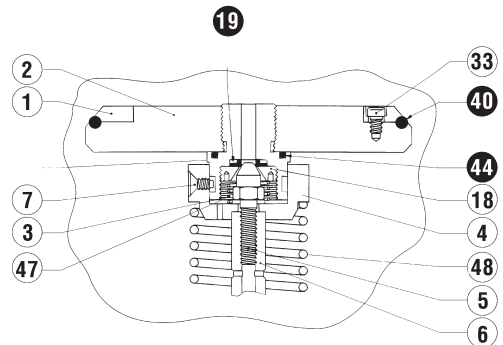
VERSIONS



DN: 1"



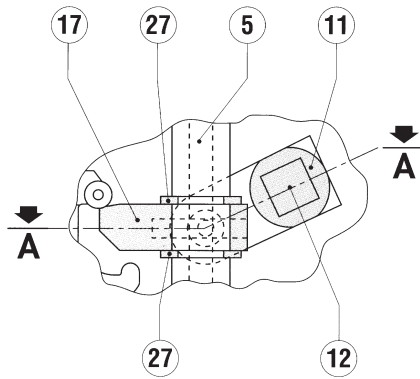
DN: 2 1/2" - 3" - 4" - 6" - 8"



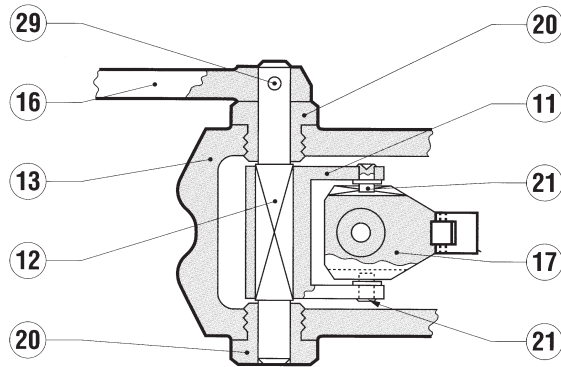
DN: 4" - 6" - 8"

VERSIONS

Sez. A. A

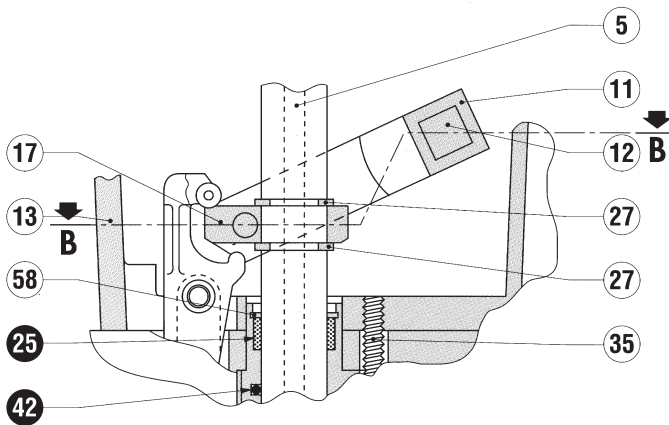


DN: 2"½ - 3" - 4"

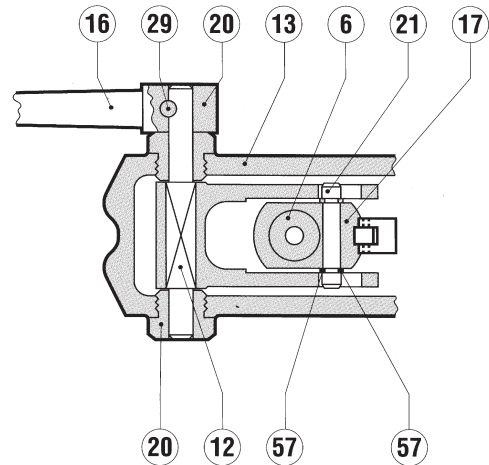


DN: 1" ÷ 4"

Sez. B. B

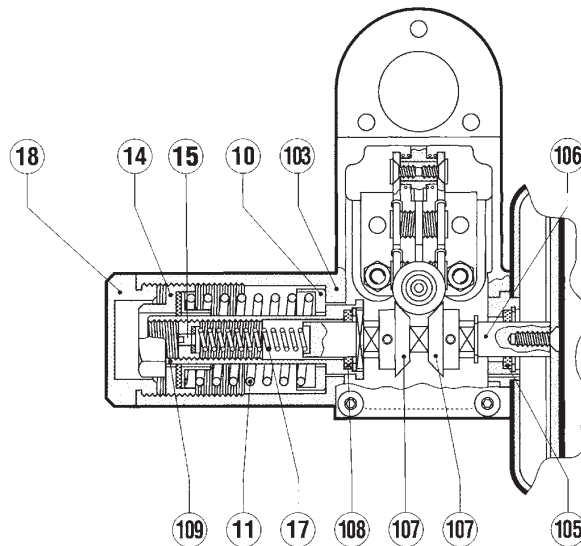


DN: 6" - 8" - 10"



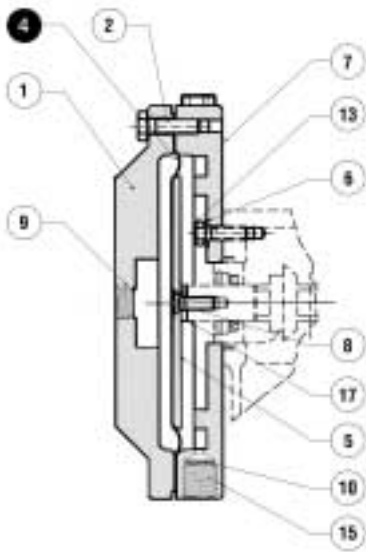
DN: 6" - 8" - 10"

CONTROL DEVICE

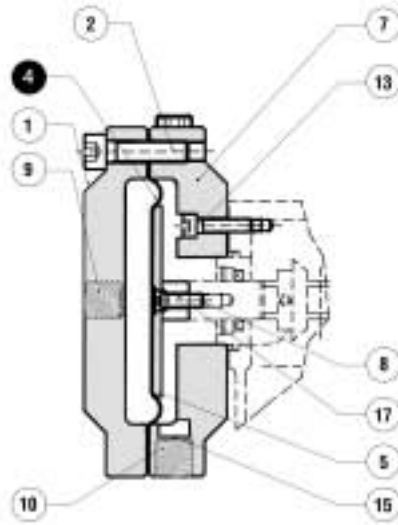


Mod.: 101 - 102 - 103

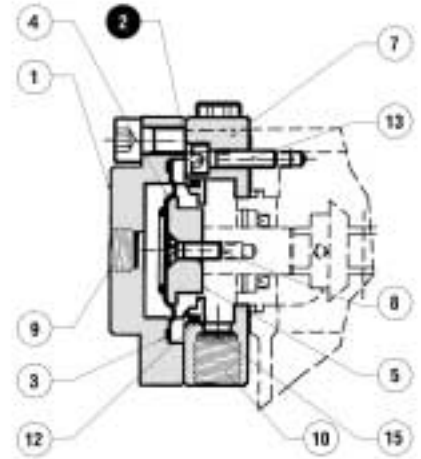
HEADS CONTROL



101



102



103

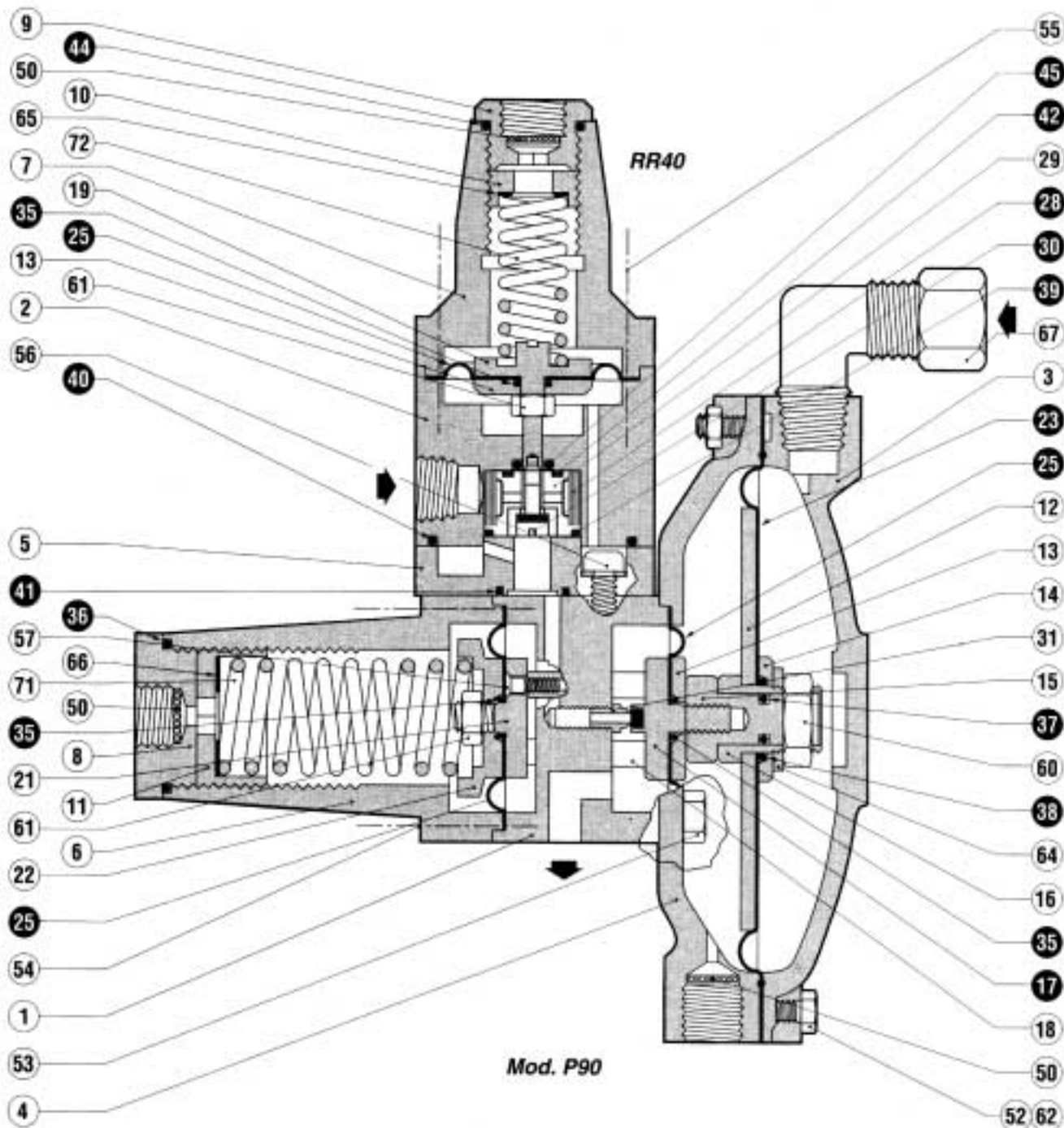
SB/82 + 101; SB/82 + 102;

		N. OF PIECES			
		DN	1"	2" - 3"	4" - 6" - 8"
POS.	DESCRIPTION				
... + SB/82	4	Diaphragm	1	1	1
	19	Reinforced gasket	1	1	1
	25	Guide ring	2	2	2
	37	O. Ring	1	1	1
	40	O. Ring	1	1	1
	41	O. Ring	1	1	1
	42	O. Ring	2	2	2
	43	O. Ring	1	-	-
	44	O. Ring	-	-	1
	45	O. Ring	1	1	1

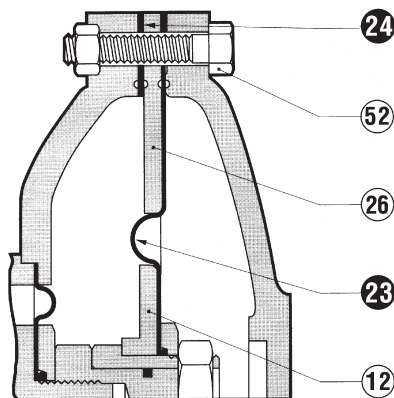
SB/82 + 103;

		N. OF PIECES			
		DN	1"	2" - 3"	4" - 6" - 8"
POS.	DESCRIPTION				
... + SB/82	2	Diaphragm	1	1	1
	19	Reinforced gasket	1	1	1
	25	Guide ring	2	2	2
	37	O. Ring	1	1	1
	40	O. Ring	1	1	1
	41	O. Ring	1	1	1
	42	O. Ring	2	2	2
	43	O. Ring	1	-	-
	44	O. Ring	-	-	1
	45	O. Ring	1	1	1

P90 - P92 Version Pilots + RR40 Pre-regulator



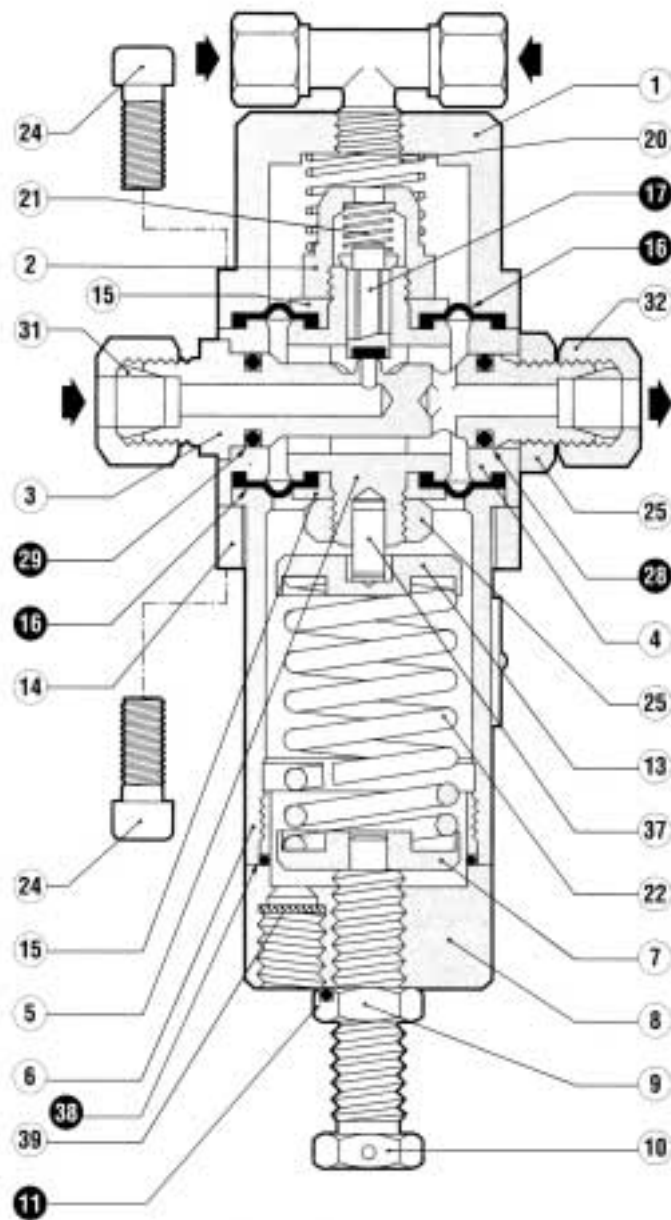
VERSION



Mod. P92

	POS.	DESCRIPTION	N. OF PIECES	
			P90	P92
PILOTS	17	Obturator	1	1
	23	Diaphragm	1	1
	24	Gasket	-	1
	25	Diaphragm	3	3
	28	Filter	1	1
	30	Obturator	1	1
	35	O. Ring	3	3
	36	O. Ring	1	1
	37	O. Ring	1	1
	38	O. Ring	1	1
	39	O. Ring	1	1
	40	O. Ring	1	1
	41	O. Ring	1	1
	42	O. Ring	1	1
	44	O. Ring	1	1
45	O. Ring	1	1	

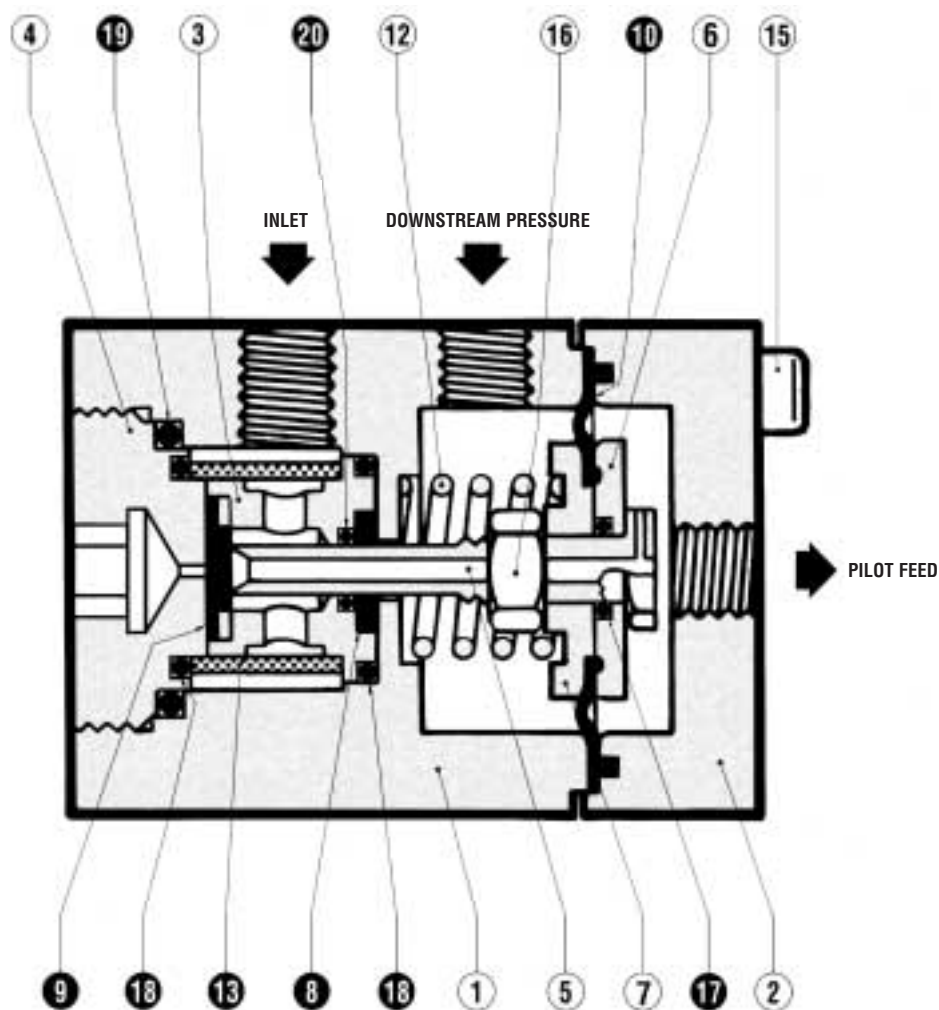
204/A PILOT



POS.	DESCRIPTION	N. OF PIECES
------	-------------	-----------------

11	O. Ring	1
16	Diaphragm	2
17	Obturator	1
28	O. Ring	1
29	O. Ring	1
38	O. Ring	1

R14/A PRE-REGULATOR



POS.	DESCRIPTION	N. OF PIECES
8	Guide ring	1
9	Reinforced gasket	1
10	Diaphragm	1
13	Filter	1
17	O. Ring	1
18	O. Ring	2
19	O. Ring	1
20	O. Ring	1

WHEN ORDERING SPARE PARTS, PLEASE SPECIFY:

FOR REGULATOR

Type of regulator

Dne (nominal input diameter)

Pe (inlet pressure)

Pa (outlet pressure)

Works no. (Serial no.)

Year of manufacture

Type of fluid used

Slam-shut (if assembled)

Type of head control

The no. of the part (position no.)

Quantity desired

FOR PILOT

Type of pilot

Pe (inlet pressure)

Operating **pressure**

Works no. (Serial no.)

Year of manufacture

Type of fluid used

The no. of the part (position no.)

Quantity desired

The data are not binding. We reserve the right to make modifications without prior notice.

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IMPAGINAZIONE E STAMPA
A CURA DI

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