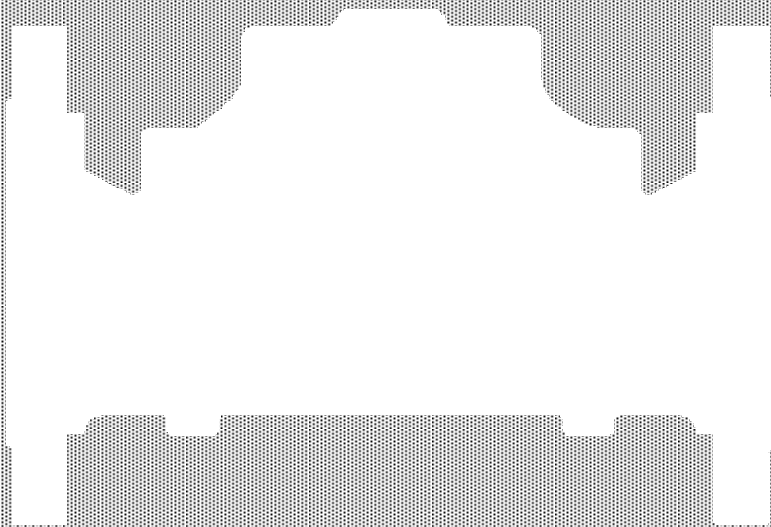




**I N S T R U C T I O N S**  
**For the installation and maintenance of MAXOMATIC type R1  
series regulator valves**





# I N S T R U C T I O N S

## For the installation and maintenance of MAXOMATIC type R1 series regulator valves

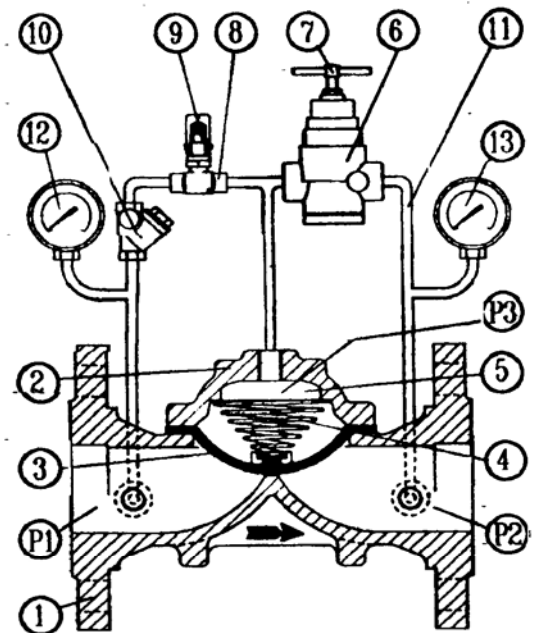
### COMPOSITION AND OPERATION OF THE UNIT

The composition of the unit is shown in Fig.1, which lists the essential components of the main valve and pilot module.

#### MAIN VALVE

The main valve consists essentially of the body (1), the cover (2), the diaphragm (3) and the spring (4). See exploded view in Fig. 2. The diaphragm acts simultaneously as a poppet and an actuator (together with the spring). Its shape enables it to assume any position between closed and maximum aperture, using the pressure difference between upstream and downstream to generate the force of deformation. The pilot system regulates flow by modulating the pressure (P3) in the chamber (5) above the diaphragm between values close to the upstream and the downstream values. A system of forces therefore acts on the diaphragm determined by:

- a) the pressure inside the top chamber acting on the entire surface of the diaphragm;
- b) the force of the conical spring, which complements the force described above; the force of the spring increases with the opening stroke of the diaphragm;
- c) the pressure of the liquid that enters the valve, or upstream pressure, acting on about half of the bottom surface of the diaphragm;
- d) the pressure of the liquid that exits the valve, or downstream pressure, acting on about half of the same surface;
- e) the dynamic forces caused by the flow of fluid deviated by the diaphragm, which are roughly proportional to the flow rate and hence the aperture of the valve;
- f) the forces with which the diaphragm opposes deformation. This system of forces is in equilibrium when the degree of aperture of the valve is exactly as needed to let through the flow rate required downstream, and thus when the controlled parameter is exactly and stably at the value corresponding to the setting of the pilot valve. If for any reason (change in flow rate required downstream or change in pressure upstream) the equilibrium of the system is broken, there will be an immediate change in the downstream pressure, which will be detected by the pilot. The pilot will then change the position of the poppet in such a way as to reduce or increase the pressure in the chamber above the diaphragm, and will thus move the diaphragm itself into the position corresponding to the new flow rate and pressure situation. This position, in turn, will correspond to a new equilibrium in the system of forces. Since the energy required by the actuator to make the adjustment is provided by the medium flowing through the valve, the pressure jump between upstream and downstream must not be less than 0.5 bar in order to ensure efficient actuation of the valve.



- 1 - Main valve body
- 2 - Main valve cover
- 3 - Main valve diaphragm
- 4 - Main valve spring
- 5 - Main valve spring chamber
- 6 - Pilot valve
- 7 - Pilot valve adjuster screw
- 8 - Adjuster valve
- 9 - Adjuster valve adjuster screw
- 10 - Filter
- 11 - Connection pipes
- 12 - Upstream pressure gauge (optional)
- 13 - Downstream pressure gauge (optional)
  
- P1 - Fluid inlet pressure (upstream)
- P2 - Fluid outlet pressure (downstream)
- P3 - Diaphragm actuation pressure

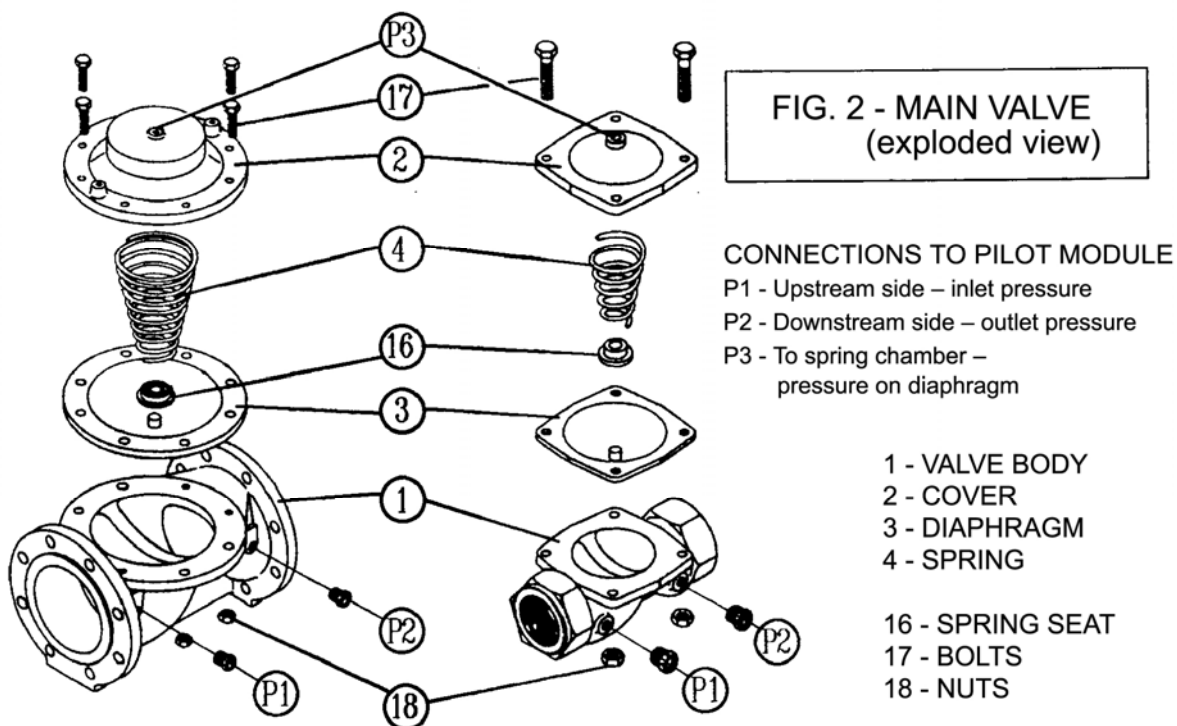
**FIG. 1 - SCHEMATIC COMPOSITION OF THE MAXOMATIC UNIT**





# I N S T R U C T I O N S

## For the installation and maintenance of MAXOMATIC type R1 series regulator valves



### PILOT MODULE

The pilot module includes positions 6 to 14 in Fig. 1. A detailed section view of the pilot valve (6) is shown in Fig.3. The other essential component is the adjuster valve (8) (also see Fig. 4). The component parts are assembled in such a way that, when a certain flow rate is required downstream, a pilot flow passes through a fixed orifice between the adjuster valve (8) and then through an adjustable orifice in the pilot (6). Between (8) and (6) a pressure P3 (mid-way between the upstream pressure P1 and the downstream pressure P2) will be generated, which will act in chamber (5) on diaphragm (3). The pilot is equipped with a spring sized in relation to the range of settings for which the valve was supplied. The valve is factory-set on the bench; it may be necessary to make a minor correction to the setting in actual operating conditions, and this can be done by means of the calibration screw (7): turning it clockwise increases the regulated pressure; turning it anticlockwise reduces it. The adjuster valve (8) serves to adjust the fixed aperture in relation to which the variable aperture of the pilot valve will determine the play of flows entering and exiting the chamber (5) and hence the speed with which the chamber itself fills and empties. The more the adjuster valve is open, the quicker the main valve will close and the slower it will open, and conversely the more the adjuster valve is closed the slower the main valve will close and the quicker it will open. It is necessary to find the right position according to the local situation (volume of chamber (5) and ratio between the upstream and downstream pressures). The valve (8) is factory-set to an average degree of aperture, in proportion to the volume of the chamber (5), but it may be appropriate to correct this setting on site. In this case, turn the plunger (9) clockwise to reduce the aperture or vice versa (see "Commissioning"). The filter (10) serves to prevent the pilot flow from drawing dirt into the adjuster valve (8), the chamber (5) and the pilot valve (6). It is possible, however, for mud or fine dust to pass through the filter mesh and accumulate in the chamber (5), which must therefore be periodically checked and kept clean.





# I N S T R U C T I O N S

## For the installation and maintenance of MAXOMATIC type R1 series regulator valves

FIG. 3 - PILOT VALVE

- A - ADJUSTER SCREW
- B - SPRING
- C - DIAPHRAGM
- D - INTERNAL SENSING LINE
- E - PLUNGER
- F - POPPET
- G - SET OF GASKETS

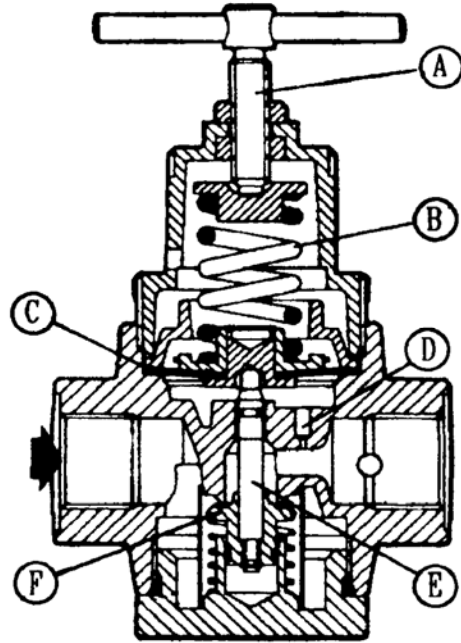
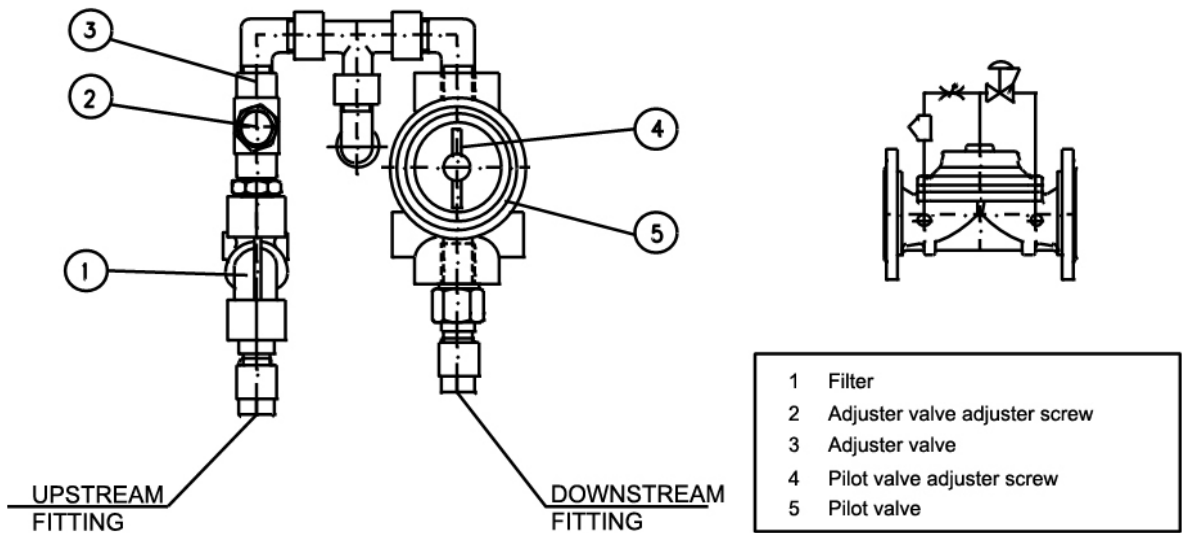


FIG. 4 - PILOT MODULE (viewed from above)



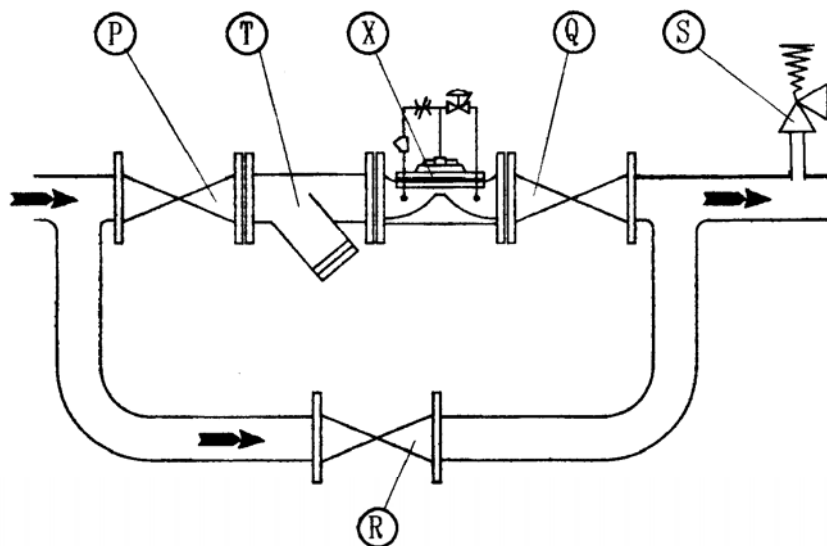


# I N S T R U C T I O N S

## For the installation and maintenance of MAXOMATIC type R1 series regulator valves

### INSTALLATION

Fig.5 shows a complete installation diagram for a Maxomatic unit for reducing and regulating the pressure of a fluid. It is not always necessary to use all the components shown in the diagram. Sometimes the Maxomatic unit is an autonomous and self-sufficient assembly, capable of fulfilling its function simply by fitting it in the pipeline. In some cases, however, operating conditions are such that the outlet of the pilot valve (which acts as a sensing line for the regulated pressure) fitted on the downstream way of the main valve is unreliable, because of the vortices generated at that point, especially at high flow rates. In this case, it is necessary to bring the connection to the downstream pipeline, in a straight run (at least 10 diameters long before the sensing line and 5 after it). The filter (T) is not strictly necessary for the Maxomatic, but can be ordered to protect the user devices against possible aggression from impurities entrained by the fluid. The user or plant engineer will then decide whether it is advisable to add the shut-off valves (P) and (Q) and by-pass valve (R): these make it possible to open or remove the Maxomatic (X) for maintenance without draining the system, and with (R), without interrupting service downstream. The safety valve (S) can be advisable, or even required by standards, if the devices supplied are not already protected by their own safety valves. When fitting, make certain that the pipes are clean and free from deposits of impurities or welding residues. If possible, blow the pipes through with compressed air before fitting the valves.



X - MAXOMATIC UNIT

P - SHUT-OFF VALVE

T - FILTER

Q - SHUT-OFF VALVE

S - SAFETY VALVE

R - SHUT-OFF VALVE

FIG. 5 EXAMPLE OF INSTALLATION LAYOUT FOR MAXOMATIC R1 UNIT





# I N S T R U C T I O N S

## For the installation and maintenance of MAXOMATIC type R1 series regulator valves

### COMMISSIONING

The Maxomatic regulator is supplied ready for use. It is factory-set to the pressure specified in the order, but may need to be adjusted, as explained previously, by turning screw (7) so that the pressure gauge downstream indicates the desired pressure (see Fig. 1). As already explained in the section on pilot module operation (read this section carefully if you have not already done so), it is very important for correct operation of the Maxomatic unit (right response speed of the main valve when opening and closing, established by the adjustment) that adjuster valve (8) is suitably positioned. If you need to correct the adjustment, turn the plunger to the right to reduce the aperture or to the left to increase it, by turning by not more than 1/8 of a turn at a time and then checking the regulating action. Establish the correct adjustment, put the cap back on and seal it if appropriate.

### MAINTENANCE

Attention: do not start any maintenance work on the valve until you have de-pressurised the circuit and taken the specific precautions for the system in question.

#### Main valve:

Because of its exceptional simplicity, the valve body generally requires minimal maintenance. The condition of the internal surfaces can be checked by removing the cover and the diaphragm. If there are no difficulties involved in removing the valve from the pipeline, the interior can also be inspected through the inlet and outlet. If the controlled fluid entrains fine dust or mud, deposits may form in the long term on the diaphragm in the chamber. By means of initial checks, establish appropriate intervals for removing the cover and cleaning the chamber. If operating conditions are as specified in the order, the diaphragm will have a long service life. When ordering replacement parts, quote the serial number of the valve.

#### Filter:

Open and clean the filter periodically. In this case too, intervals depend on plant operating conditions and must be established on site as stated above. This also applies to the line filter located before the main valve, if present.

#### Adjuster valve:

Does not normally require maintenance: it is improbable that foreign bodies or impurities will reach and obstruct it. Should this happen, however, the regulating action will tend to be slower when closing and faster when opening, with greater deviations in pressure from the controlled value. In this case, open the valve by removing the cover, but without removing the cap and without moving the plunger, so as not to alter the adjustment made during commissioning. Clean the insides and reassemble.

#### Pilot valve:

With regard to the possible presence of impurities, the same principles explained above also apply to the pilot valve. This could have two consequences: obstructing the passage and thus preventing the pilot flow, or preventing the poppet from closing. In the first case, the main valve will tend to remain closed, and in the second it might fail to close. Open by unscrewing the bottom and top covers and clean inside taking care to check that the sensing line "D" (see Fig.3) is free. Also check the condition of the diaphragm "C" and the seats on the valve body and poppet.

### RECOMMENDED REPLACEMENT PARTS:

To ensure good continuity of operation, it is advisable to keep the following replacement parts in stock:

FOR MAIN VALVE: Diaphragm

FOR PILOT VALVE: Diaphragm, set of gaskets, poppet



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VALVES AND INSTRUMENTATION

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Page 6 of 6