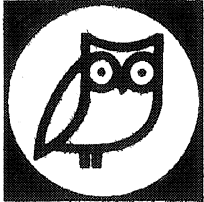


CARRARO È



MAXOMATIC

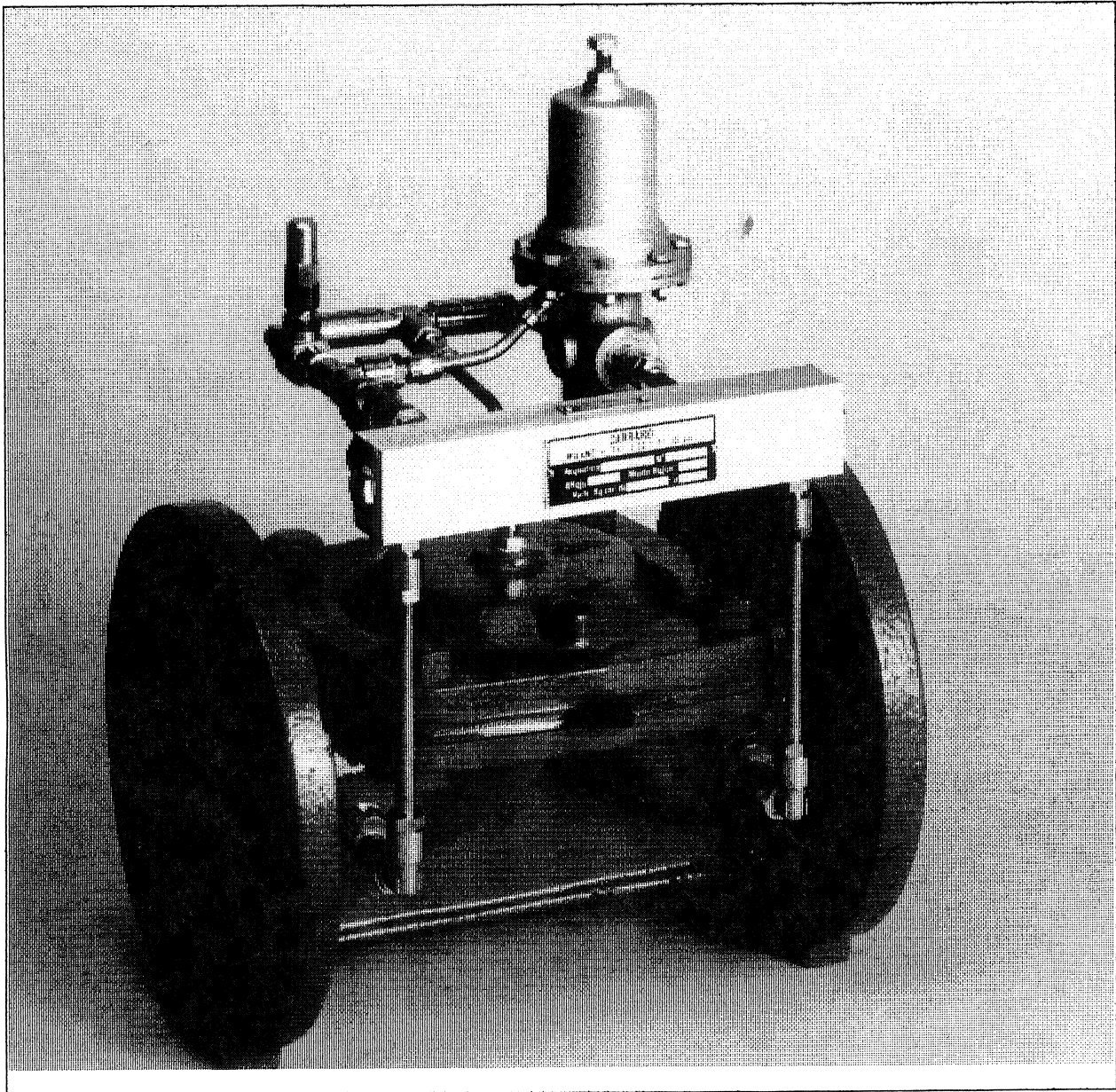
PILOT OPERATED CONTROL

VALVOLA

MAXOMATIC®

## INSTRUCTION

FOR INSTALLATION OPERATION AND MAINTENANCE OF AN  
UPSTREAM PRESSURE REGULATING UNIT FOR LIQUIDS,  
SERIES MAXOMATIC - TYPE S2 -



**CARRARO S.R.L.**

VALVOLE E STRUMENTAZIONE  
20090 SEGRATE (MI) - VIA ENRICO FERMI 22  
TEL. (02) 2133.441 - 2131.523 - 2133.367  
TELEX: 321142 - TELEFAX (02) 2133.377

### UNIT COMPOSITION AND OPERATION

The unit composition is shown in Fig.1 where the essential parts of the main valve and the pilot assembly are listed.

#### MAIN VALVE

The main valve essentially includes the body(1), the cover(2) the diaphragm(3) and the spring(4). See the exploded view in Fig.2. The diaphragm operates at the same time as a shutter and together with the spring, as an actuator. Its shaping allows it to assume any position between full closing and maximum opening, using the pressure differential between the valve inlet and outlet to set up the deformation effort. The pilot system exerts its regulating action by modulating the pressure within the chamber(5) over the diaphragm between values close to the upstream ones and values close to the downstream ones.

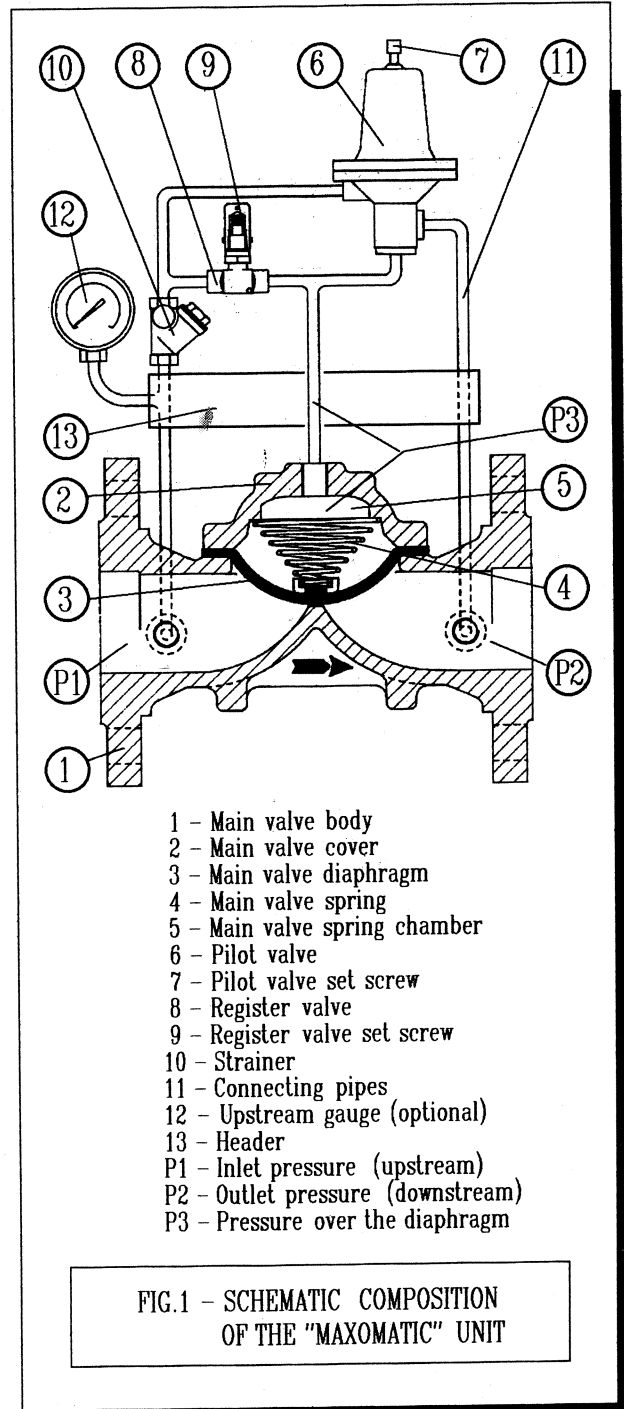
A system of forces will be acting on the diaphragm, which shall be determined by:

- a)-The pressure existing into the upper chamber and acting on all the diaphragm surface.
- b)-The cone-shaped spring force, in addition to the above; the spring force increases with the diaphragm opening.
- c)-The liquid inlet pressure, acting on about half the diaphragm surface.
- d)-The liquid outlet pressure, acting on about the other half of the diaphragm surface.
- e)-The dynamic forces due to the flow deviation, roughly proportional to the flow rate and thus to the valve opening.
- f)-The forces by which the diaphragm opposes to deformations.

This system of forces is in equilibrium when the degree of the opening is exactly that one required to let go through the capacity requested downstream, and so when the controlled parameter (the downstream pressure) is exactly on the value corresponding to the pilot valve setting.

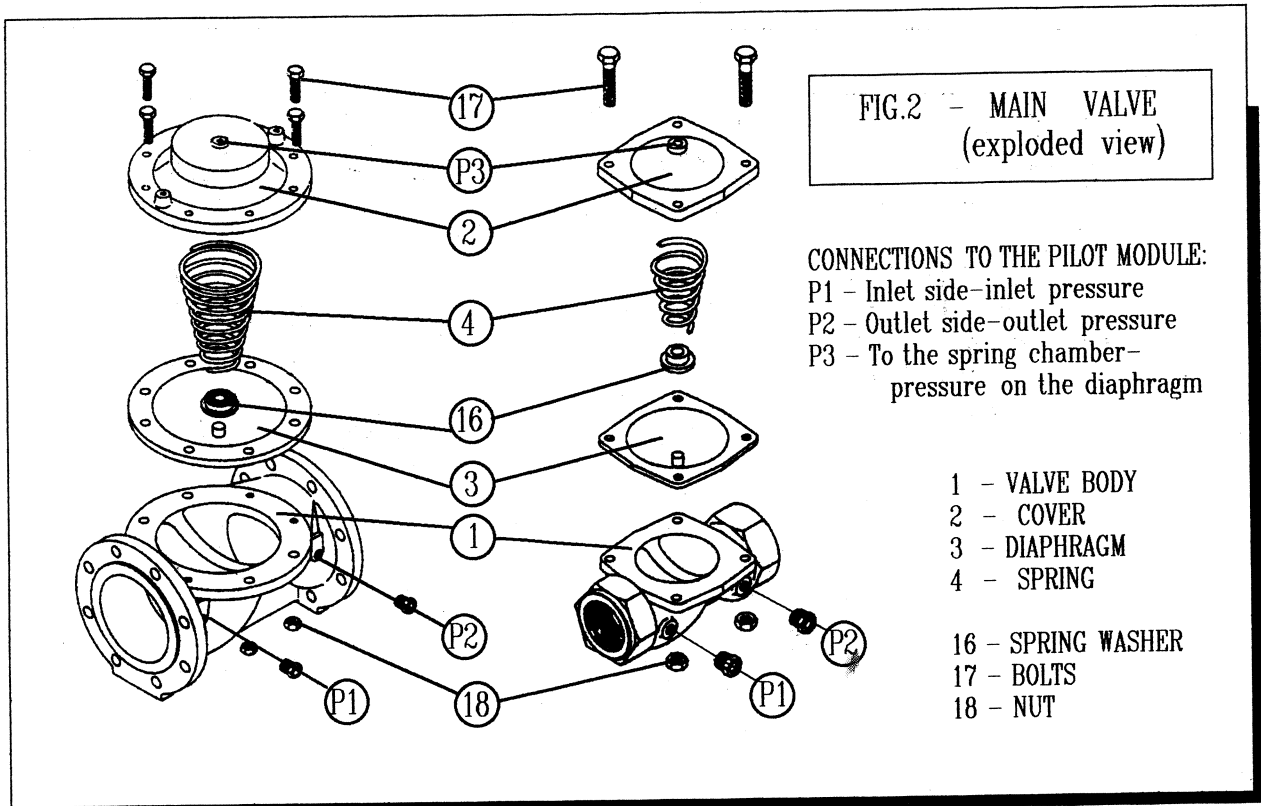
If, for any reason (change in the downstream capacity or in the upstream pressure) the equilibrium of the system is broken, immediately there will be a variation of the downstream pressure, which shall act on the pilot. This will operate increasing or reducing its own opening in such a way as to reduce or increase the pressure over the diaphragm, which will move to a new position corresponding to the new situation of capacity or pressure.

This new position shall be corresponding to a new equilibrium of the force system. As the energy necessary to the actuator to operate the valve is supplied by the medium which flows into the valve itself, the pressure differential between inlet and outlet shall be not less than 1 bar to guarantee a sure 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 set screw
- 8 - Register valve
- 9 - Register valve set screw
- 10 - Strainer
- 11 - Connecting pipes
- 12 - Upstream gauge (optional)
- 13 - Header
- P1 - Inlet pressure (upstream)
- P2 - Outlet pressure (downstream)
- P3 - Pressure over the diaphragm

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



### PILOT MODULE

The pilot module includes the items from 6 to 13 of Fig.1. The sectional view of the pilot valve (6) is shown in Fig.3. Another essential component is the register valve (8) (see also Fig.4).

These items are connected in such a way that, when a certain capacity is needed to flow through the main valve in order to maintain constant the upstream pressure, a certain pilot flow shall exist, which goes through a fixed orifice in the register valve(8) and then through a variable orifice in the pilot valve (6).

In within (8) and (6) a pressure P3 ( intermediate between the upstream pressure P1 and the downstream pressure P2) shall be determined, which acts in the chamber (5) on the diaphragm (3).

The pilot is equipped with a spring dimensioned with reference to the set range for which the valve is foreseen.

The valve is set on the test stand at the factory: in the actual field operating conditions it may be necessary to make a small setting correction, which may be done acting on the setting screw (7): the controlled pressure is increased by turning it clockwise, is lowered by turning it counterclockwise.

The register valve task is to adjust the fixed opening with reference to which the pilot valve variable opening shall determine the flow play in and out the chamber (5) and consequently the filling or emptying speed of the chamber itself.

The more the register valve is open, the more the principal valve is quick to close and slow to open, while on the contrary the more the register valve is close, the more the principal valve is slow to close and quick to open.

The right position must be found according with the actual situation on the field (chamber (5) volume and ratio between inlet and outlet pressures).

As a matter of fact the valve (8) is set at the factory at an average opening proportioned to the chamber (5) volume, but it may be necessary to correct on the field such setting, which may be done by acting on the stem (9):turning it clockwise the opening decreases or other (see "Field setting").

The strainer (10) prevents the pilot flow to convey impurities into the register valve (8), the chamber (5) and the pilot (6).

It is however possible that dust or slush may get over the filter and accumulate into the chamber (5), which shall be checked from time to time and kept clean.



FIG.3 - PILOT VALVE

- A - SET SCREW
- B - SPRING
- C - DIAPHRAGM
- D - INTAKE
- E - DISC
- F - NOZZLE
- G - GASKET SET
- H - DISC GASKET

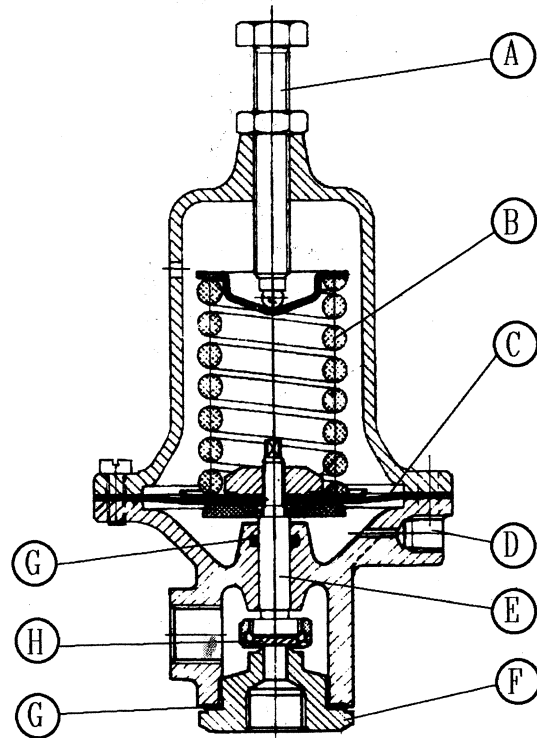
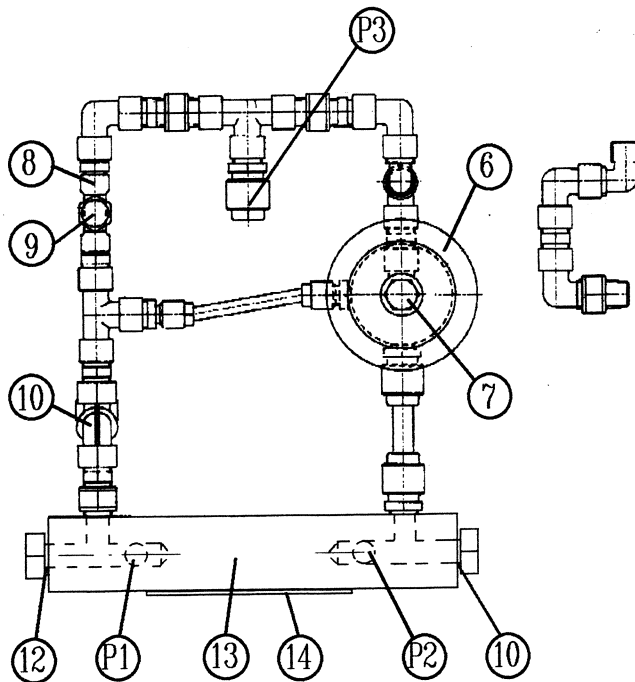


FIG.4 - PILOT MODULE



- 6 - PILOT VALVE
  - 7 - PILOT VALVE SET SCREW
  - 8 - REGISTER VALVE
  - 9 - REGISTER VALVE SET SCREW
  - 10 - STRAINER
  - 12 - INLET PRESSURE GAUGE (optional)
  - 13 - HEADER
  - 14 - TAG
- 
- P1 - CONNECTION TO MAIN VALVE (inlet side - inlet flow pressure)
  - P2 - CONNECTION TO MAIN VALVE (outlet pressure - outlet flow press.)
  - P3 - CONNECTION TO MAIN VALVE (spring chamber - pressure on the diaphragm)



### INSTALLATION

Fig.5 shows a complete diagram for the installation of an upstream pressure regulating Maxomatic unit. Not always all the components shown in the diagram are strictly necessary.

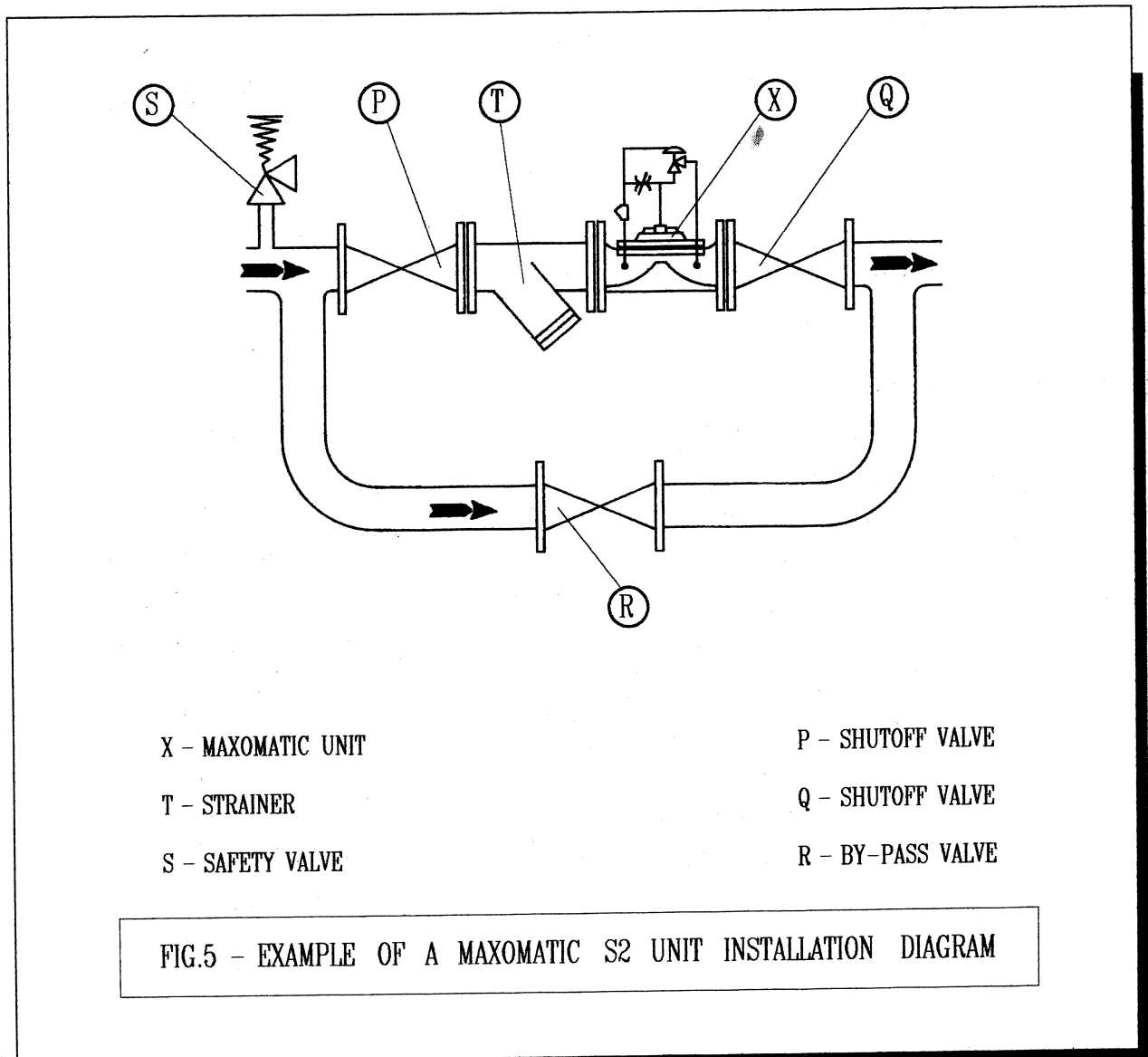
The strainer(T) is not necessarily required by the Maxomatic valve, but it may be advisable to protect downstream installations from impurities conveyed by the liquid, and in this case it may be installed before the Maxomatic in order to protect it as well.

The user shall decide about the advisability of adding the shutoff valves (P) and (Q), and possibly the by-pass

valve (R): they will permit to make maintenance to the Maxomatic assembly without emptying the plant or stopping the downstream service.

The valves (P) and (Q) should possibly be of the gate type. The safety valve (S) may be advisable or even required when the upstream plants are not protected by their own safety valves.

While carrying out the installation check that the pipes are clean from impurities or welding scales; if possible blow the piping to clean the interior before installation of valves.





## FIELD SETTING

The Maxomatic unit is ready to be put in service as it is supplied.

As told while speaking of the pilot module, the pilots are set on the basis of the data specified on the order; it may be necessary to adjust such a setting, following the instructions there supplied.

It is also very important for the Maxomatic assembly good operation (main valve correct opening and closing speed, control stability) that the register valve(8) be correctly set.

If setting must be corrected turn the stem clockwise to reduce the opening or counterclockwise to increase the opening, not more than 1/8 turn each time, and checking the result any time.

Where obtained a good setting put again the cap on the register valve and seal it if necessary.

---

## MAINTENANCE

**Warning:** relieve pipe line pressure and take all the specific precautions suggested or ordered on the plant prior to starting any handling or disassembling of the valve.

### Main valve

The valve body, due to simplicity of its design, requires very little maintenance.

The internal surfaces may be checked for cleanliness or possible wear by disassembling the cover and the diaphragm.

If taking the valve off the line is not difficult, the internal may be inspected through the inlet and outlet of the valve.

If the line medium conveys sand or lime, a deposit could form in the long time in the chamber on the diaphragm. It will initially be necessary to open the valve from time to time in order to fix the appropriate interval between two inspections for cleaning.

If the operating conditions do conform with the order ones, the diaphragm will be long lasting.

To ask for replacements mention the serial number of the valve.

### Strainer

Periodically open and clean the strainer. Even in this case the period depends upon conditions existing in the plant, and shall be determined on the field as suggested above. The same may be said for the strainer installed before the main valve, when it exists.

### Register valve

As a rule this valve should not require any maintenance; it is rather unlikely that impurities or foreign matters may reach and obstruct it.

Should it happen, the controlling action of the unit tends to be slower while opening and quicker while closing, with wider deviations from the set value of the regulated pressure. In such a case open the valve removing the cap and the stem (note and mark the position of the stem before removing it, in order to restore exactly the setting of the valve when reassembling it). Clean the internals and reassemble.

### Pilot valve

What above mentioned with reference to the possible presence of impurities, also applies to the pilot.

There might be two types of consequences: obstruction of opening with interruption of the pilot flow, or prevention to the plug to close.

In the first case the main valve tends to remain close, in the second case to remain open.

Loose the setting screw (A) (see Fig.3) and open the valve. Clean the internals taking care to check that the impulse (D) be free.

Check the state of efficiency of the diaphragm (C), the gaskets (G), the disc gasket(H) and the nozzle (F). Substitute them if necessary.

### Suggested spare parts

To assure operation continuity the following spare parts should be kept in stock.

#### **For the main valve:**

- Diaphragm

#### **For the pilot valve:**

- Diaphragm
- Set of gaskets
- Plug

To ask for spare parts always mention the serial number of the unit, which is stamped on the tag fixed on the header of the pilot module (see Fig 4, item 14).