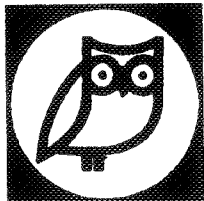


CARRARO È



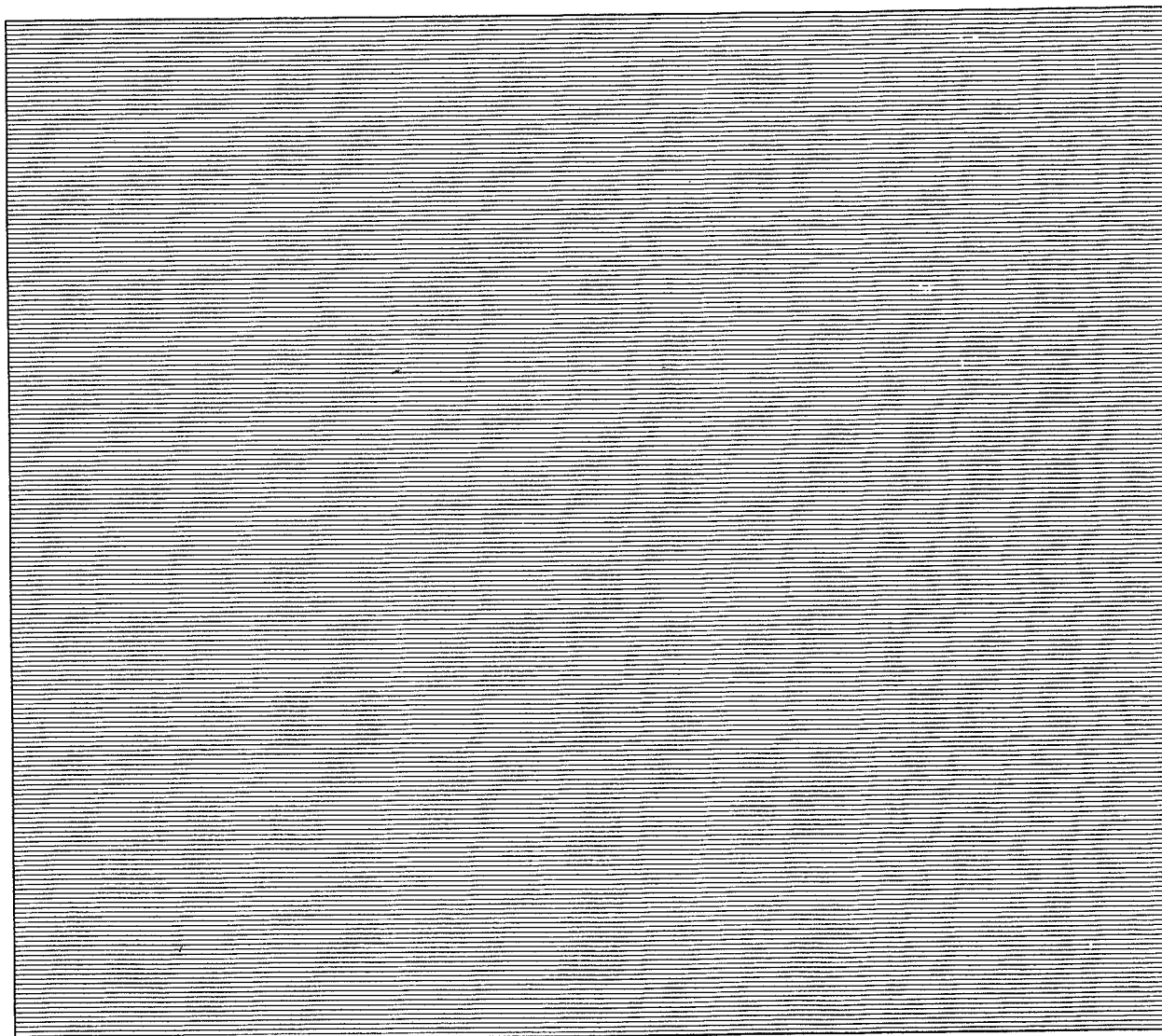
MAXOMATIC

# PILOT OPERATED CONTROL VALVES

# MAXOMATIC®

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

FOR INSTALLATION, OPERATION AND MAINTENANCE OF A STOP VALVE,  
PILOT OPERATED BY MEANS OF A SOLENOID VALVE LIKELY TO BE  
OPERATED FROM A DISTANCE; COMPLETE WITH NEEDLE VALVES FOR  
MANUAL OPERATION ON SITE - TYPE "E2" -



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The stop valve type E2 may be supplied:

- A - with drain of the pilot flow in the outlet piping - Type E2.A
- B - with drain of the pilot flow in a different conduit, or to atmosphere - Type E2.B

Both A or B versions may be supplied with the D way of the solenoid valve (see Fig.1 and Fig.2) open under tension (and closed the E way), or viceversa. We shall then have:

Tab.1

Solenoid valve	drain in outlet piping:	drain in other than outlet:
D way open under tension	E2.A.a	E2.B.a
E way open under tension	E2.A.b	E2.B.b

It is suggested to select the combination for which the solenoid valve is normally not under tension (depending upon the principal valve being normally open or normally closed).

**COMPOSITION AND OPERATION OF THE ASSEMBLY**

The assembly composition is schematically shown in Fig.1 and Fig.2, which list the essential components of principal valve and pilot module. The latter includes the solenoid operated 3way valve (7) for the on-off operation at a distance, and the needle valves (9) and (10) for the manual operation on site. Fig.1 shows the version A assembly with pilot flow drained into the outlet of the valve.

This version may be used when in any case there is a minimum difference of 0,7 bar between the inlet pressure P1 and the outlet pressure P2. When the Maxomatic valve is installed along a line under pressure, and the difference between P1 and P2 is only due to the pressure loss created by the same Maxomatic valve, it becomes necessary to find out a different drain way (Fig.2), where there is a P4 pressure, lower than P1 at least 0,7 bar.

Keep in mind that the pilot module shall be draining only when the solenoid valve is operated to open the principal valve, then causing the chamber (5) to empty;

or when the manual valve (10) is opened to increase opening of the principal valve. The capacity to be drained during each operation is proportional to the chamber (5) volume, so a fraction of litre, or a maximum of some litres for the very large valves.

**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.3. The diaphragm operates at the same time as a shutter and, together with the spring, as an actuator.

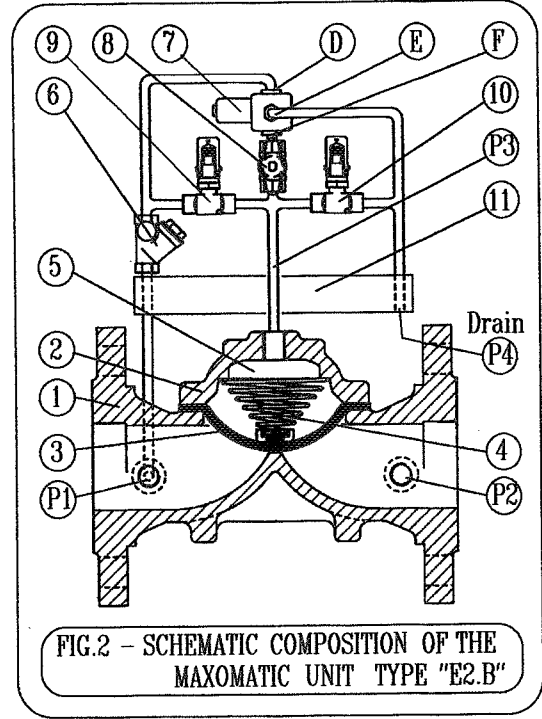
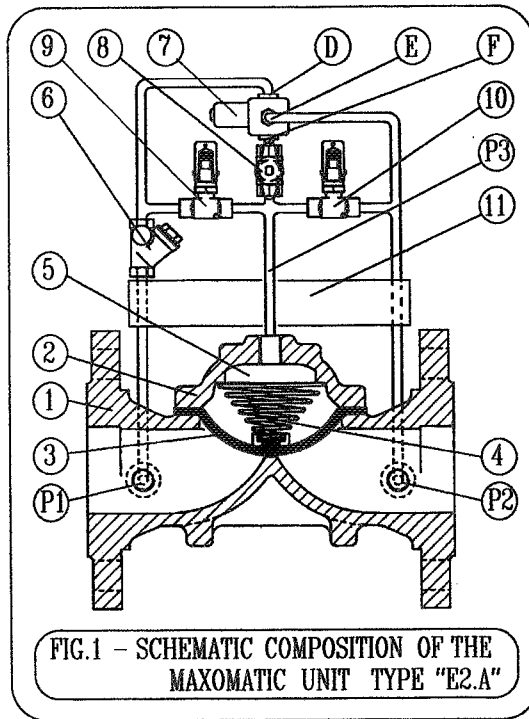
Its shaping allows it to assume any position between full closing and maximum opening, using the pressure differential between the valve inlet and outlet to set up the deformation effort.

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:

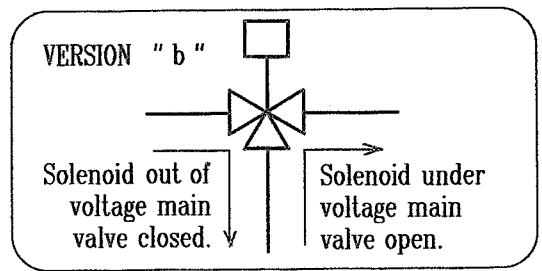
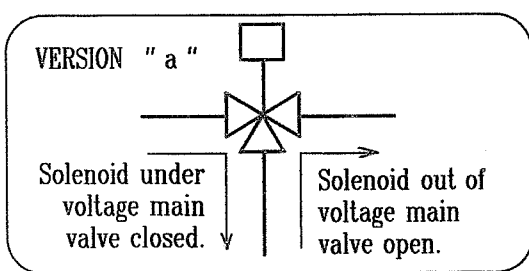
- a)- The pressure existing into the upper chamber and acting on all the diaphragm surfaces.
- b)- The cone-shaped spring force, in addition to the above; the spring force increases with the diaphragm opening.
- c)- The liquid inlet pressure, acting on about half the diaphragm surfaces.
- d)- The liquid outlet pressure, acting on about the other half of the diaphragm surfaces.
- 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 acts, in this particular type of assembly, always in an unbalanced way, causing the valve to be fully closed (when the solenoid valve (7) puts in connection (P1) with the chamber (5), or fully opened (when (7) puts (5) in connection with (P2) or (P4)); or maintaining standstill the diaphragm in a semi open position against the incompressible liquid contained in (5) by (9) and (10) valves, both shut up.



- 1 - Main valve body
- 2 - Main valve cover
- 3 - Main valve diaphragm
- 4 - Main valve spring
- 5 - Main valve spring chamber
- 6 - Strainer
- 7 - Solenoid valve

- 8 - Manual shut off valve
- 9/10 - Needle valves for manual operation
- 11 - Header
- P1 - Inlet flow pressure (upstream)
- P2 - Outlet flow pressure (downstream)
- P3 - Pressure over the diaphragm
- P4 - Drain pressure



**PILOT MODULE**

The pilot module, both in the A version and in the B version, includes the same positions from (6) to (10) of Fig.1 and Fig.2, and has the same way of operation.

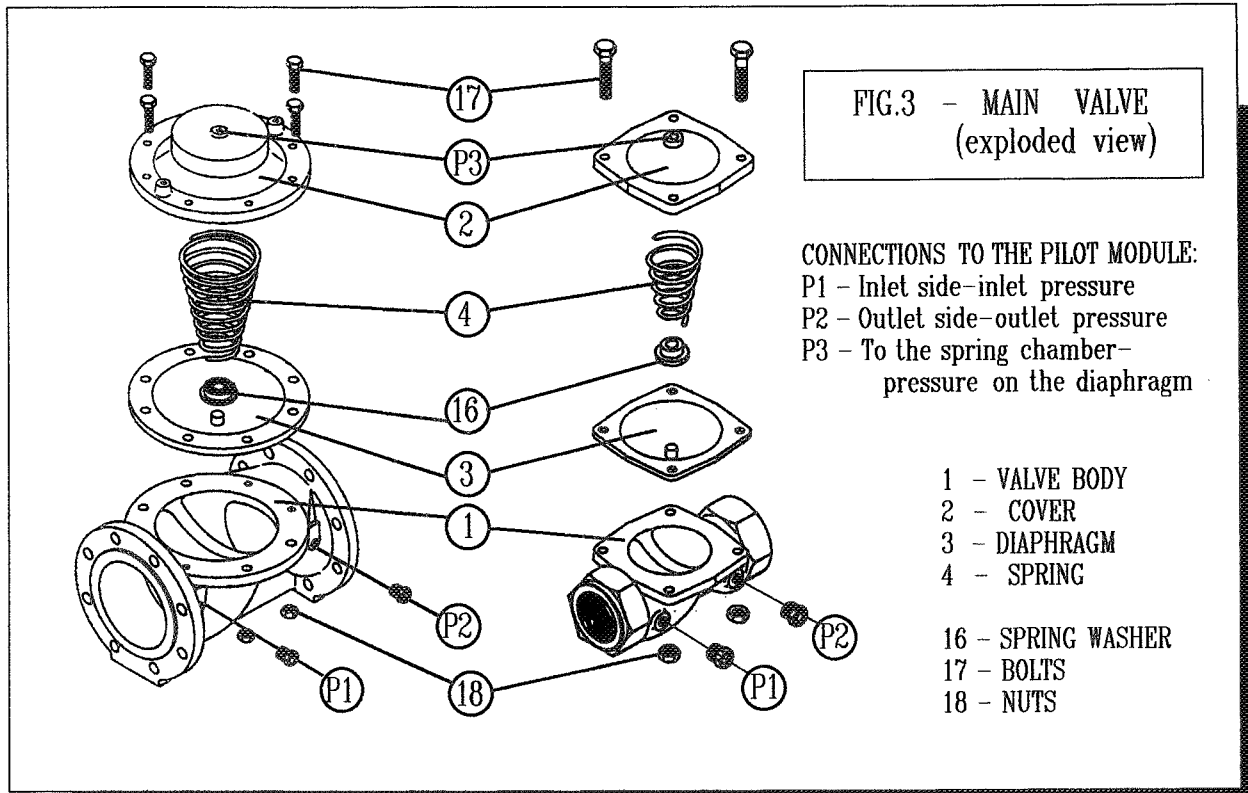
The only difference between the two versions consists, as already said, in the place where the pilot flow is drained, which is the downstream conduit for the A version, or a different drain conduit for the version B.

In both cases we may again obtain two ways of operation:

- The valve is actuated under the control of the remotely operated solenoid valve.
- The valve is manually operated on site.

**SOLENOID OPERATION**

The valves (9) and (10) are shut up. The valve (8) is opened.



The solenoid valve in excited condition (the solenoid is under tension) may put in connection either (D) with (F), or (F) with (E).

This characteristic shall clearly be defined in the order, giving a complete specification of type (e.g. E2.A.a or E2.A.b, etc, see tab.1).

For the version "a", when the solenoid valve is under tension (excited solenoid) the upstream part of the main valve is put in connection with the chamber (5), while the drain is closed: the main valve gets closed.

When at the contrary the voltage is out the solenoid valve closes the connection from upstream and opens the drain, causing the main valve to open.

The contrary happens with version "b": with voltage out on the solenoid the main valve is closed, while it will be open when the solenoid is under tension.

It is suggested to adopt the combination for which to the normal (or more common) position (open or close) of the main valve, does correspond the condition of non excited solenoid, so that the solenoid be not under tension for most of time.

The remote actuating device (various types of switches) is not included in our supply, as it shall be selected to be fit for the installation requirements.

**HAND OPERATION ON SITE**

To switch from solenoid controlled operation to hand operation the valve (8) shall be shut up.

The solenoid valve (7) may be left in either position, as in any case the connection between upstream and downstream is closed. By closing valve (8) the chamber (5) remains shut up and the diaphragm (3) remains standstill in the position where it is. Its position may be modified acting on the needle valves (9) and (10) which are now shut up.

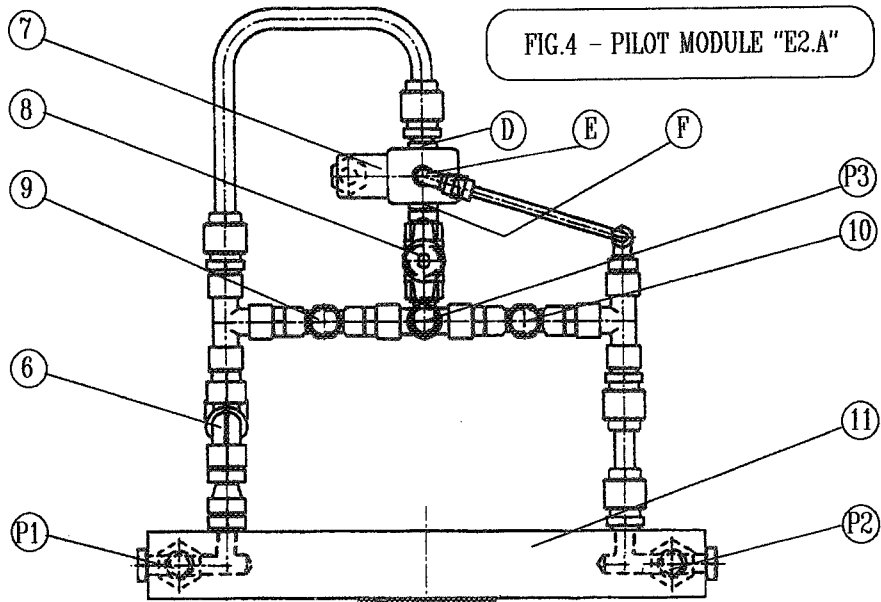
Supposing that the diaphragm is standing in the close position, by opening a little the needle valve (10) a liquid flow out of chamber (5) shall take place, due to P1 and P2 pushing under the diaphragm, which will move to open, until the needle valve (10) remains open: when it is closed the diaphragm shall again stop and stand in position.

To move it to close the needle valve (9) may be opened a little, causing some liquid at pressure P1 to flow into the chamber (5) pushing the diaphragm in closing direction.

In this way it is possible to operate the valve on site, also throttling its opening position.

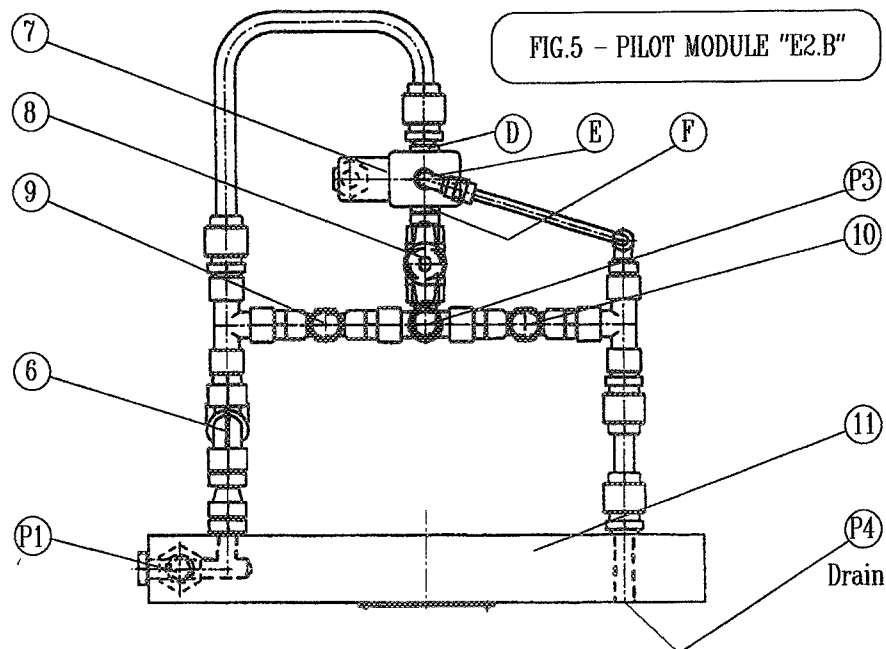
To switch again to the remote, on-off, solenoid operation, the valve (8) shall be opened.

Check that needle valves (9) and (10) be shut up.



- 6 - Strainer
- 7 - Solenoid valve
- 8 - Manual shut off valve
- 9/10 - Needle valves for manual operation
- 11 - Header

- P1 - Inlet flow pressure (upstream)
- P2 - Outlet flow pressure (downstream)
- P3 - Pressure over the diaphragm
- P4 - Drain pressure





**PILOT OPERATED CONTROL VALVES**  
**MAXOMATIC**

**INSTRUCTION FOR INSTALLATION, OPERATION AND MAINTENANCE OF A STOP VALVE, PILOT OPERATED BY MEANS OF A SOLENOID VALVE LIKELY TO BE OPERATED FROM A DISTANCE; COMPLETE WITH NEEDLE VALVES FOR MANUAL OPERATION ON SITE - TYPE "E2" -**

### INSTALLATION

The Maxomatic groups type E2 in their various versions are to be installed on the line preferably in the horizontal position.

For the versions E2.B the pilot module shall be connected to the external drain.

The solenoid shall be electrically connected with the power source and with the remote actuating switch.

Upstream the Maxomatic a strainer may be installed. It is not strictly necessary, but, would it be required for protection of some other equipment downstream it is suggested to put the Maxomatic group under protection as well.

The user shall decide about the advisability of adding shutoff valves upstream and downstream and possibly a by-pass valve, in order to make maintenance of the Maxomatic assembly without emptying the plant or stopping the downstream service.

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

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.

### Solenoid valve

Check periodically internals for cleaning. See the referring sheet, if enclosed.

### PUTTING IN SERVICE

Check operation of the remote actuating device, and the hand operation on site.

### 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 longtime in the chamber on the diaphragm. It will initially be necessary to open the valve from time

### SUGGESTED SPARE PARTS

To assure operation continuity the main part to keep in stock is the main valve diaphragm.

To ask for spare parts always mention the serial number of the unit, which is stamped on tag fixed on the pilot module.