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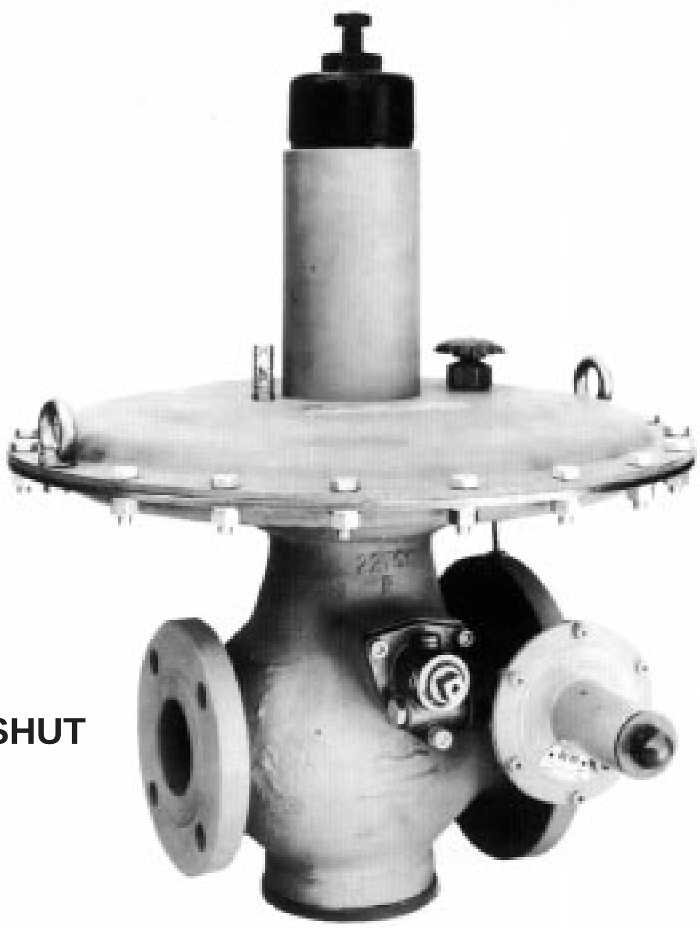
MN/ SERIES

PRESSURE REGULATORS

- FAIL-TO-OPEN REGULATOR
- BALANCED VALVE
- PROMPT RESPONSE
- PRECISION CONTROL



- HIGH FLOW COEFFICIENT
- WIDE PRESSURE-REGULATION RANGE
- FULL SEAL AT ZERO FLOW
- OPTIONAL MINIMUM AND/OR MAXIMUM PRESSURE SLAM-SHUT VALVE
- EASY SERVICING WITHOUT REMOVING UNIT FROM LINE

MN/ SERIES REGULATORS

Their technical and operational features make the **MN/Series** spring-loaded regulators the choice of preference in those applications requiring sudden changes in capacity or where gas shut-off is solenoid-controlled as with domestic or industrial burners. These regulators can be employed with natural, manufactured, propane, other gases and air so long as these are duly filtered and do not contain high percentages of benzol.

SPECIFICATIONS

The MN regulators are spring-controlled and feature plain seat and balanced valve. They are designed for easy servicing. You no longer have to take them off the line: simply remove bottom (T, Fig. 1) to check or replace seat and seals. All versions can be supplied complete with integral slam-shut valve.

BALANCING SYSTEMS:

- Diaphragm-controlled - MN/... and MBN/... versions.
- Piston-controlled - MN/...-AP, MBN/...-AP, MN/...-APA MBN/...-APA, MN/...-PST, MBN/...-PST versions.

AVAILABLE DIAMETERS

DN 25 - DN 40 - DN 50 - DN 65 - DN 80 - DN 100 - DN 150

IMPULSE CONNECTION

- For DN 25 to 65 - impulse connection incorporated in the outlet flange (see regulator installation instructions).
- For DN 80 to 150 - impulse connection fitted externally, downstream of regulator.

FLANGES

- Standard versions: ANSI 150 RF.
- On request: PN 16 UNI 2240 or PN 40 UNI 2242.
- Inlet flange diameter as per regulator diameter (DN).
- Outlet flange diameter greater than inlet flange diameter (see table of dimensions).

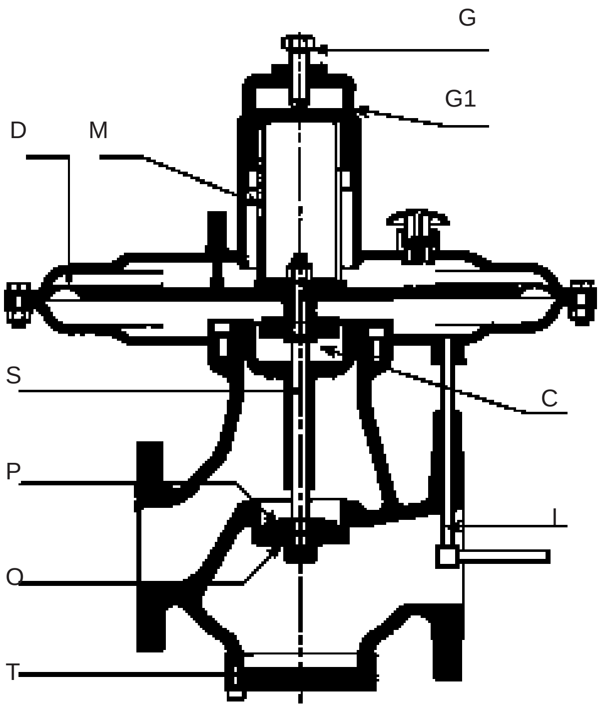


FIG. 1 **MN/** Series regulators

OPERATION

(fig. 1)

The movements of diaphragm (D) are relayed via stem (S) to valve (O). The outlet pressure acts on diaphragm (D) via impulse connection (I), thus generating a force that is countered by spring (M). The pressure exerted by the gas on the diaphragm works to close the valve while the spring's pressure works to open it (fail-to-open).
When no gas is flowing, the spring opens the valve fully; when overpressure occurs, the regulator closes. Full sealing is ensured by pad (P), which is integral with valve (O).
When the contrasting actions of the spring and outlet pressure coincide, the mobile diaphragm-stem-valve assembly remains motionless, and outlet pressure matches spring set point.
An increase in capacity demand will cause a decrease in outlet pressure. This means that the spring's action will prevail over outlet pressure's action, and the valve will open until set point pressure is again reached at outlet. The opposite occurs whenever outlet pressure increases.
Precision-perfect balancing of valve (O) is assured under all operating conditions by the inlet pressure which operates in the balancing chamber (C).

COMMISSIONING

Regulator commissioning should be carried out as set out below. In all cases, during commissioning, shut-off valves should be opened with extreme care and very slowly so as to avoid strong gas flows which could damage the equipment fitted downstream of the regulator.
Proceed as follows:

a) Depending on the characteristics of the system, take all steps in order to allow a small amount of gas to flow through. To do this properly, open bleed tap fitted downstream of regulator or, alternatively, when this is not possible, slightly open the outlet shut-off valve.

b) Slightly and very slowly open the inlet shut-off valve.

c) Reset the slam-shut valve (when fitted).

d) Wait for outlet pressure to stabilize, then open fully and very slowly first the inlet valve and then the outlet valve.

SETTING

Setting is to be done with regulator in operation. Slightly open the inlet shut-off valve and the bleed tap on regulator's outlet side.
Turn registers (G or G1) clockwise to increase pressure and anticlockwise to decrease it. The G1 and G registers are intended for rough and fine settings, respectively.
Regulators are factory-set at the value shown on the data plate, and are fitted with a spring (M) for the indicated set-point range. Pressure ranges markedly differing from the original may require a different spring (M).

MBN/ SERIES REGULATORS WITH INTEGRAL SLAM-SHUT VALVE

The MN/Series regulators can be fitted with an integral slam-shut valve. Mechanically independent of the regulator, it rapidly shuts off gas flow should outlet pressure reach its trip-point because of malfunction. The presence of the slam-shut valve in no way alters the features and operation described heretofore.

OPERATION

(fig. 2)

The slam-shut comprises valve (O1) with pad (P1), pilot OS/66 and key-activated reset assembly. Valve (O1) is controlled by cam on shaft (A), which rotates causing the valve to open. The alignment of balls (S1 and S2), which is maintained by spring (M5) and shaft A's machined relief, prevents shaft rotation and keeps valve open.
The control pressure (outlet pressure) acting on diaphragm (D1) is opposed by the load of maximum pressure spring (M2) and overcomes the action of minimum pressure spring (M3). The system is now balanced and the pilot reset, i.e. lever (L) is aligned with the relief of lever (L1) and the balls (S3), held in their seat by bush (B), keep stem (H) in reset position.
Any change in outlet pressure beyond admissible value will alter this balance and cause lever (L) to move. Thus lever (L1), no longer held in place, releases balls (S3), causing stem (H) to move ball (S2) under thrust of spring (M4) and release shaft (A). This allows valve (O1) to close under the force of spring (M1).

RESETTING

The slam-shut valve incorporates a by-pass for easy resetting even in case of high inlet pressure.
Proceed as follows:

a) Remove cap (R), screw it to stem (H) and pull outwards.

b) While keeping stem (H) pulled out, use the appropriate wrench to turn shaft (A) anticlockwise. Wait until inlet pressure has flowed downstream.

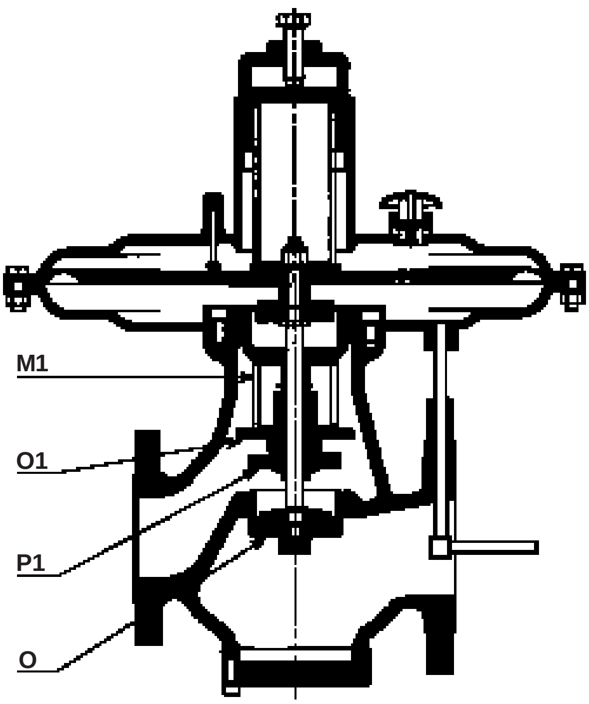
c) Complete rotation of shaft (A) until balls (S2 and S1) are felt to be properly and fully engaged, and then release shaft, checking that the slam-shut valve remains open.

d) Wait till outlet pressure stabilizes before releasing stem (H) and remounting cap (R) in its original position.

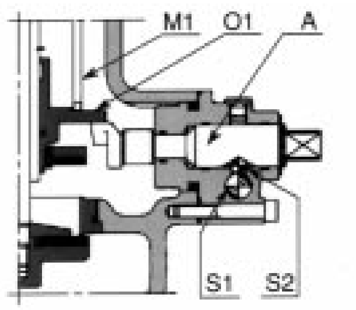
CAUTION: If these steps are carried out too rapidly, pressure peaks can occur that can trip the valve. If this happens, repeat steps with greater care.

SETTING

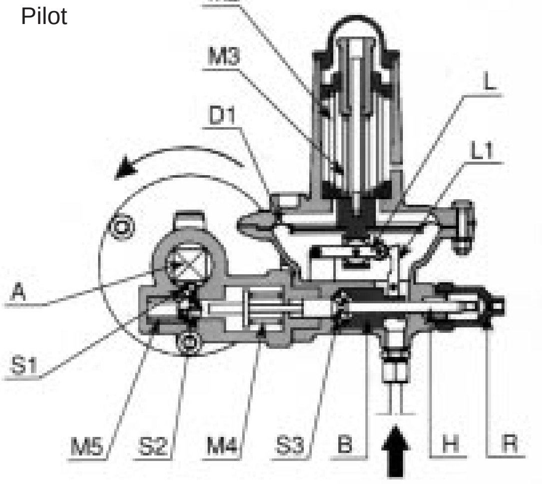
The maximum and minimum pressure trip values are independently set by springs M2 and M3, respectively. To set for maximum pressure only, remove spring (M3).



Detail of reset assembly



OS/66 Pilot



Downstream of regulator

FIG. 2 **MBN/** regulator with integral slam-shut valve

SELECTING THE REGULATOR

Selection should be based on maximum capacity demanded by working conditions. A good rule of thumb, especially for ON-OFF uses, is always to factor in a 10% increase over the actual demand value.

MN/Series regulator outlet flanges are larger than the inlet flanges so as to facilitate gas expansion and to prevent having to use expansion cones, as is often required. It is to be recalled here that the gas flow rate in the section fitted with the control connection must be less than 40 m/sec so as to prevent excessive turbulence determining poor regulator performance.
In some models, the impulse connection is incorporated in the outlet flange. Maximum capacity in these models is limited by speed of gas flow. Capacity in these cases can be calculated as a function of actual outlet pressure as shown in the chart in Fig. 3.
The outlet pressure-capacity chart can be used for quickly checking that capacity demand falls within regulator operating range. If capacity demand is greater than regulator operating range, an expansion cone will have to be fitted and the control connection shifted beyond the cone (see Fig. 6).

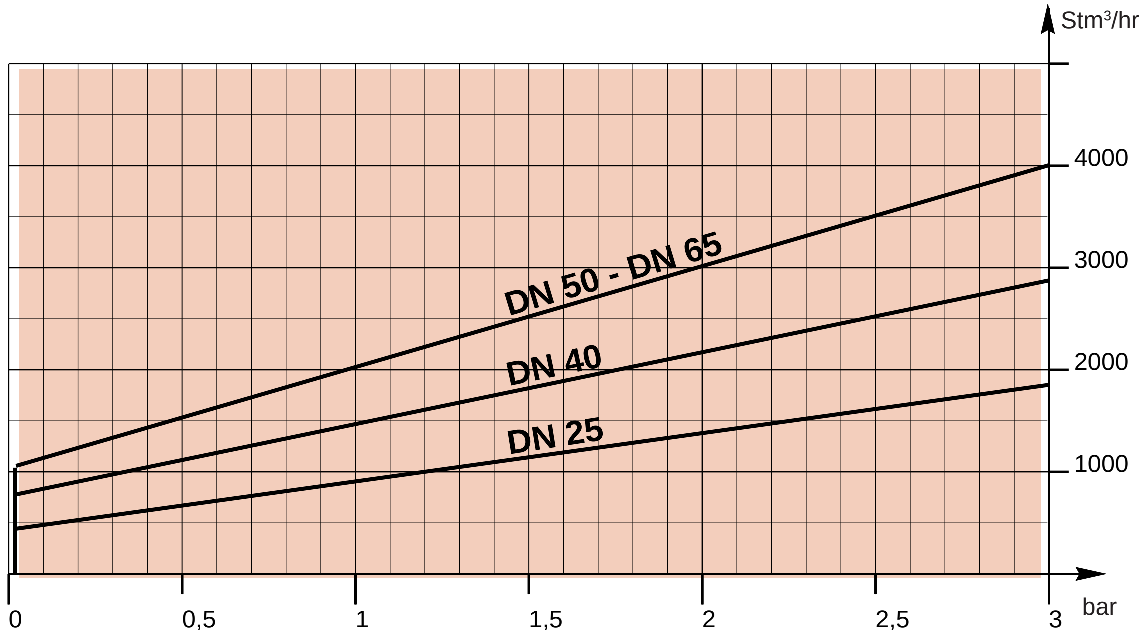


FIG. 3 Outlet pressure-capacity chart applicable to models with in-built impulse connection.

CALCULATING CAPACITY

The capacity of a fully open regulator is calculated by the following formulae, given the working outlet (Pv) and minimum inlet (Pm) pressures:

When **Pv** $> \frac{Pm}{2}$ use the following formula

$$Q = K \cdot Cg \cdot Pm \cdot sen \left(\frac{3417}{C1} \cdot \sqrt{\frac{Pm - Pv}{Pm}} \right)^{\circ}$$

When **Pv** $\leq \frac{Pm}{2}$ use the following formula

$$Q = K \cdot Cg \cdot Pm$$

Note: The sine argument is expressed in sexagesimal degrees.

Cg and C1 COEFFICIENTS for all versions

DN	Cg	C1
25	450	28
40	900	25
50	1100	25
65	1800	25
80	2700	25
100	4000	25
150	4500	25

Q = Capacity (Stm^3/hr)
Pm = Absolute inlet pressure (bar)
Pv = Absolute outlet pressure (bar)
Cg = Gas coefficient (see table)

C1 = Cg/Cv (see table)
K = 0.52 for natural gas, 0.31 for propane
0.27 for butane, 0.39 for nitrogen and air

If an outlet pressure within ± 5% of set-point (RG5), for capacities ranging from 10 to 100 per cent, and a closing overpressure less than or equal to 10% of the set point (SG10) are required, capacity values obtained by applying the above formulae must be reduced by about 30%.

INSTALLATION

Mount regulator on a pipe segment with horizontal axis. For proper performance, it is recommended to install a filter upstream of the regulator. Proceed as follows for proper installation:

a) Make sure unit has not been damaged in transport.

b) Clean and bleed pipes of any foreign matter (sand, welding residues, etc.).

c) Make sure pipes can bear regulator’s weight. If not, brace with adequate supports.

d) Install shut-off valves, pressure gauges and impulse connections both upstream and downstream of regulator.

e) Make sure that regulator is mounted in flow direction as shown by the arrow embossed on its body.

f) In models featuring internal impulse connection, connect the sensing line to the appropriate connection located at the centre of the outlet flange.

LINKING CONTROL CONNECTIONS

- Check that gas flow speed in the control connection fitted section of the pipe is less than 40 metres a second.
- For horizontal pipes, control connections should be linked up as shown in Fig. 6. Vertical pipes do not require any particular link-up configuration.
- In the versions with internal slam-shut valve, pilot impulse connection must be fitted downstream (Figs 4 and 5).
- In models with external impulse connection, link-up must be made downstream of regulator (Fig. 5).
- In models featuring internal impulse connection, connect the sensing line prior to regular being installed onto the line. In case of values exceeding those shown in the **“OUTLET PRESSURE- CAPACITY”** table, these models require an external impulse connection (see Fig. 5).

OUTLET PIPE CAPACITY

While the MN/Series regulators are classified as “prompt response” types, a properly sized amount of gas must be present between the regulator and the burner when ON-OFF feed control is employed. This will dampen the pressure peaks due to sudden swings in capacity.

Said amount of gas should be at least 1/1000 of capacity as expressed in Stm³/hr, especially for low-pressure utilities.

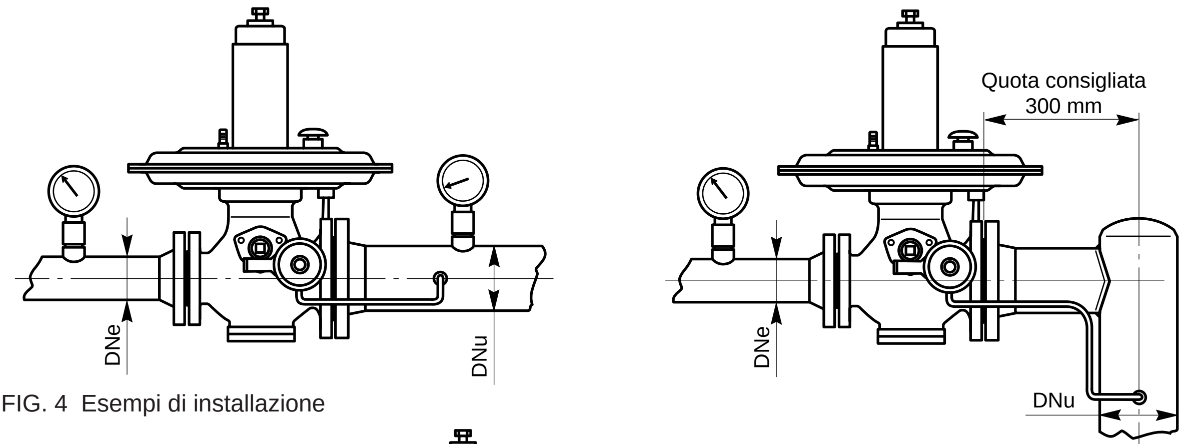


FIG. 4 Esempi di installazione

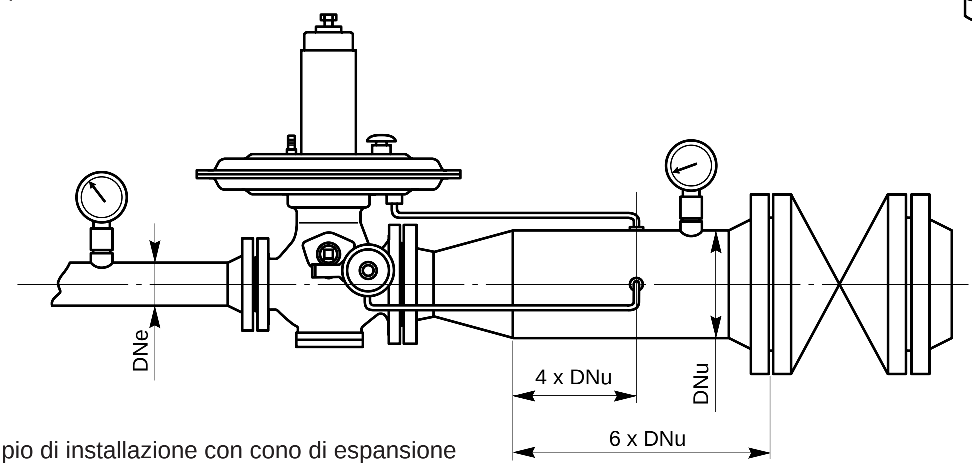


FIG. 5 Esempio di installazione con cono di espansione

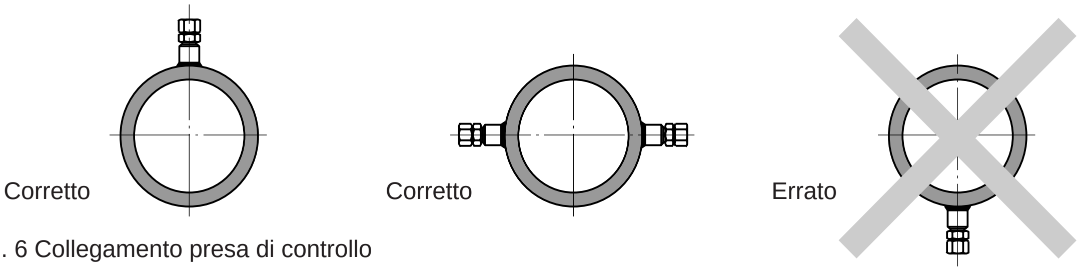
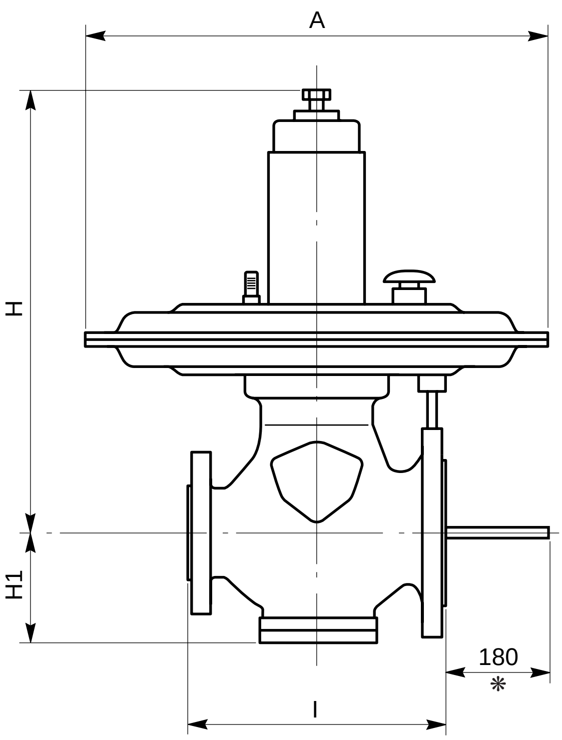
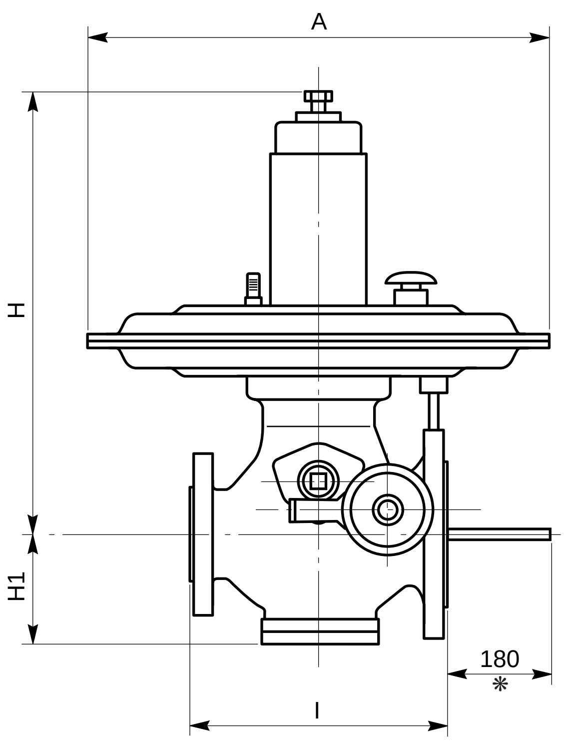


FIG. 6 Collegamento presa di controllo





MN/...
AP, APA, PST

k Only applicable to models featuring internal impulse connection (DN 25-40-50-65).

MBN/...
AP, APA, PST

OVERALL DIMENSIONS (mm)

DN inlet		25	40	50	65	80	100	150
DN outlet		65	80	100	100	150	200	150
I		184	222	254	276	298	352	451
A	MN/, MN/...-PST MBN/, MBN/..-PST	380	500	500	500	620 * / 500	620 * / 500	720
A	MN/-AP .../-APA MBN/-AP .../-APA	380	380	380	380	380	500	500
H		500	580	600	620	650	660	715
H1		95	100	120	132	145	180	204

* For outlet pressure from 20 to 80 mbar only

Note: Dimensions are not binding

TECHNICAL DATA

DESIGN PRESSURE	BODY	20 bar
	ACTUATOR	5 bar
INLET PRESSURE	MN/ MBN/	max. 5 bar
	MN/-AP-APA-PST MBN/-AP-APA-PST	max. 19 bar
OUTLET PRESSURE	MN/ MBN/	0.008 to 0.5 bar
	MN/-AP MBN/-AP	0.5 to 1 bar
	MN/-APA MBN/-APA	1 to 3 bar
WORKING TEMPERATURE		-10°C to +50°C
REGULATION PRECISION		RG 5

MATERIALS

BODY	ASTM-A 216 W CB
COVER	FE 360 UNI 5869
PLATE	FE 360 UNI 5869
STEM	AISI - 420
VALVE SEAT	AISI - 420
VALVE	OT 58 UNI 2012
DIAPHRAGM	BUNA-N e VITON
SEAL	BUNA-N e VITON