AUTOMATIC CONTROL VALVE
E 2001
SPECIAL VERSIONS

SAINT-GOBAIN PAM ITALIA SPA Via E. Romagnoli, 6 - 20146 Milano (MI) Fax +39 02 – 42 43 405

INDEX

1 INTRODUCTION

1.1 Field of application

The ACV E2001 is regulation valve actuated by diaphragm under way flow. It is able to regulate automatically one or more hydraulic parameters which pressure, flow rate or level at prefixed value. On a single valve it's possible to have also two or more functions.
The ACV E2001 is constituted by the main valve and a specific pilot circuit for every function.
It works by a membrane that creates with the cover an internal control chamber, the variations of the volume chamber modifies the position of the retainer and regulates the demanded parameter.
The pilot circuit incorporates the centralized multifunction control unit "TUP-93" that includes in a single block the filter, the control of closing and opening speed and the control of reaction speed of valve.

1.2 Range

The ACV E2001 is available with PN 10-16-25 bar and DN 50-700 mm.
The main models are as follows:
- E2115-00: pressure reducing valve;
- E2116-00: pressure sustaining/relief valve;
- E2114-00: rate of flow controller valve;
- E2110-14: float controlled on/off valve;
- E2110-10: float controlled modulating valve (constant level);
- E2127-01: one way flow on/off altitude valve;
- E2127-37: one way flow modulating altitude valve;
- E2117-00: excess flow valve;
- E2118-05: hydraulic check valve;
- E2116-52: pressure relief valve with anticipated opening (until DN 200);
- E2113-12/06: electrically operated on/off valve;
- E2113-40/50: electrically operated step by step valve;
- E2113-46/21: start pump controller valve;
- E2115-02: pressure reducing valve and pressure sustaining valve;
- E2114-02: rate of flow controller and pressure reducing valve;
- E2115-04: pressure reducing valve with electrical remote control;
- E2113-04: pressure reducing and hydraulic check valve;
- E2114-08: rate of flow controller and sustaining pressure valve;
- E2116-03: sustaining pressure and hydraulic check valve;
- E2110-44: float controlled on/off and rate of flow controller valve;
- E2110-13: float controlled modulating and sustaining pressure valve.

Also the ECO2001 range is available, the main functions are:
- 2 level pressure reduction and stabilizatation;
- 2 stage flow rate limitation;
- sectioning with timed electrical control;
- 2 level pressure overflow discharge;
- 2 stage storage tank level control.

On all basic models it is possible to combine other function or add optional ones, install inductive signal devices, analogue 4-20 mA apposition transducers or electronic linear positioning devices. Our pre-sales technical service will identify the optimum configuration.

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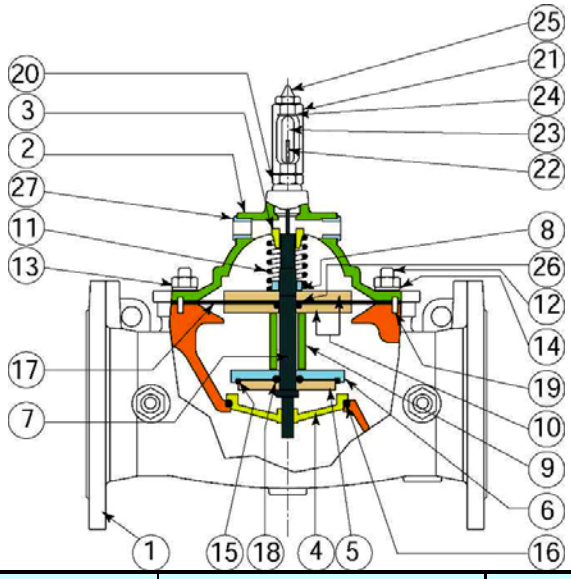
2 TECHNICAL FEATURES

2.1 Materials and coatings

2.1.1 Upgraded Version

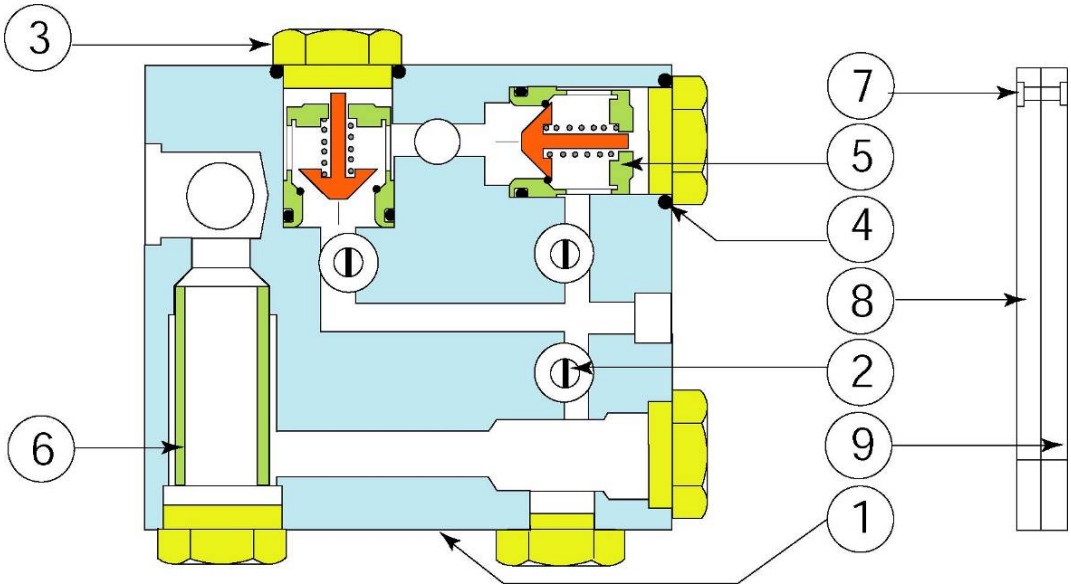
2.1.1.a Main basic valve E 2001



Ref.	Description	Material	Coating
01	Body	Ductile iron	Epoxy minimum thickness 300 microns*
02	Cover	Ductile iron	Epoxy minimum thickness 300 microns*
03	Cover bearing	Bronze	-
04	Seat	Stainless steel AISI 316	-
05	Quad retainer plate	Stainless steel AISI 316	-
06	Quad retainer DN 50 – 200	Stainless steel AISI 316	-
	Quad retainer DN 250 -700	Ductile iron	Epoxy minimum thickness 300 microns*
07	Stem	Stainless steel A2	-
08	Stem nuts	Stainless steel A2	-
09	Spacer	Stainless steel A2	-
10	Diaphragm washers DN 50 -100	Stainless steel AISI 316	-
	Diaphragm washers DN 125 - 700	Steel S235 JR	Epoxy minimum thickness 300 microns*
11	Spring DN 50 - 200	Stainless steel AISI 302	-
	Spring DN 250 - 700	Steel C70	-
12	Stud	Stainless steel AISI 316	-
13	Nuts	Stainless steel AISI 316	-
14	Washer	Stainless steel AISI 316	-
15	Quad-ring	NBR	-
16	Seat O-ring	VITON	-
17	Diaphragm	NBR	-
18-24-26	O-ring	EPDM	-
19	Centring taper pin	Stainless steel A2	-
20-21	Base and body position indicator	Brass Ni-plated	-
22	Position indicator stem	Stainless steel A2	-
23	Position indicator	Glass	-
25	Manual venting cock	Brass Ni-plated	-
27	Reduction + O-Ring	Stainless steel AISI316/Viton	-

(*) Excluded Areas: flange bolting holes - local thickness: minimum of 150 microns

2.1.1.b TUP-93



Ref.	Description	Material
1	Body	Stainless steel AISI 303
2	Cock	Stainless steel AISI 303
3	Plug	Stainless steel AISI 303
4	O-ring	EPDM
5	Non-return valve (WrC)	POM
6	Screen	Stainless steel AISI 316
7	Rivet	Brass
8	Bottom label	Polycarbonate makrolon
9	Top label	Polycarbonate makrolon

2.1.1.c Pilot circuit

Description	Material
Pilot circuit unit control TUP	Stainless steel AISI303
Pilot circuit fittings	Stainless steel AISI316
Pipes	Stainless steel AISI316L
Pilot circuit cocks	Stainless steel AISI316
Pilot control valve	Copper alloy, details are given in the specific TDS which describes the control pilot-circuit
Filter screen	Stainless steel AISI316L

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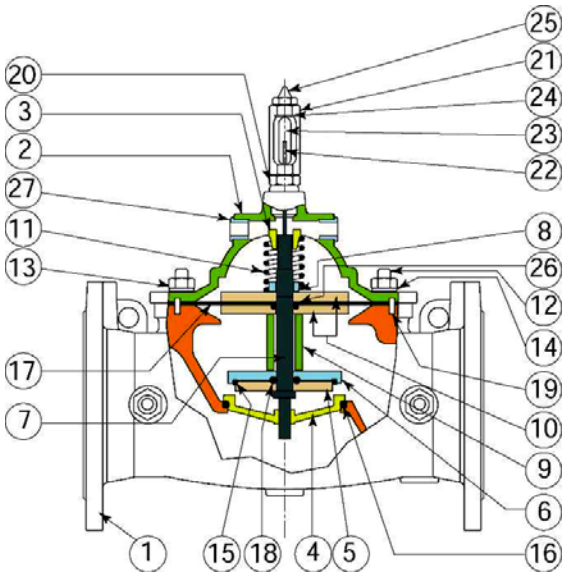
2.1.2 Reinforced Version

2.1.2.a Main basic valve E 2001



Ref.	Description	Material	Coating
01	Body	Ductile iron	Epoxy minimum thickness 300 microns*
02	Cover	Ductile iron	Epoxy minimum thickness 300 microns*
03	Cover bearing	Bronze	-
04	Seat	Stainless steel AISI 316	-
05	Quad retainer plate	Stainless steel AISI 316L	-
06	Quad retainer DN 50 – 200	Stainless steel AISI 316	-
	Quad retainer DN 250 -700	Ductile iron	Epoxy minimum thickness 300 microns*
07	Stem	Stainless steel AISI 316	-
08	Stem nuts	Stainless steel AISI 316	-
09	Spacer	Stainless steel AISI 316	-
10	Diaphragm washers DN 50 -100	Stainless steel AISI 316	-
	Diaphragm washers DN 125 - 700	Steel S235 JR	Epoxy minimum thickness 300 microns*
11	Spring	Stainless steel AISI 302	-
12	Stud	Stainless steel AISI 316	-
13	Nuts	Stainless steel AISI 316	-
14	Washer	Stainless steel AISI 316	-
15	Quad-ring	NBR	-
16	Seat O-ring	VITON	-
17	Diaphragm	NBR	-
18-24-26	O-ring	EPDM	-
19	Centring taper pin	Stainless steel AISI 316L	-
20-21	Base and body position indicator	Stainless steel AISI 316	-
22	Position indicator stem	Stainless steel AISI 316	-
23	Position indicator	Glass	-
25	Manual venting cock	Brass Ni-plated	-
27	Reduction + O-Ring	Stainless steel AISI316/Viton	-

(*) Excluded Areas: flange bolting holes - local thickness: minimum of 150 microns

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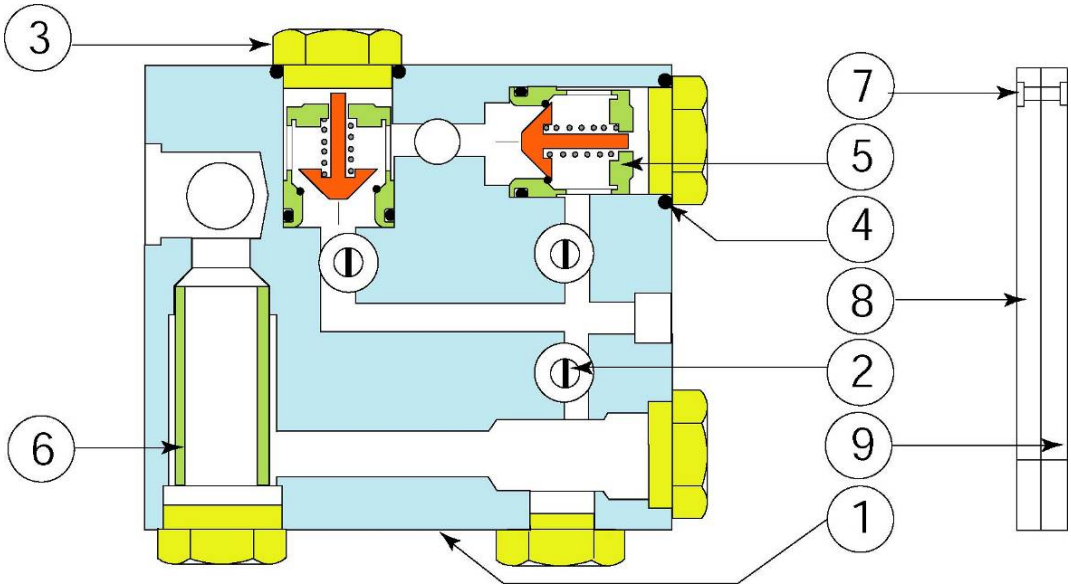
2.1.2.b TUP-93



Ref.	Description	Material
1	Body	Stainless steel AISI 303
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3	Plug	Stainless steel AISI 303
4	O-ring	EPDM
5	Non-return valve (WrC)	POM
6	Screen	Stainless steel AISI 316
7	Rivet	Brass
8	Bottom label	Polycarbonate makrolon
9	Top label	Polycarbonate makrolon

2.1.2.c Pilot circuit

Description	Material
Pilot circuit unit control TUP	Stainless steel AISI303
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Pipes	Stainless steel AISI316L
Pilot circuit cocks	Stainless steel AISI316
Pilot control valve	Copper alloy, details are given in the specific TDS which describes the control pilot-circuit
Filter screen	Stainless steel AISI316L

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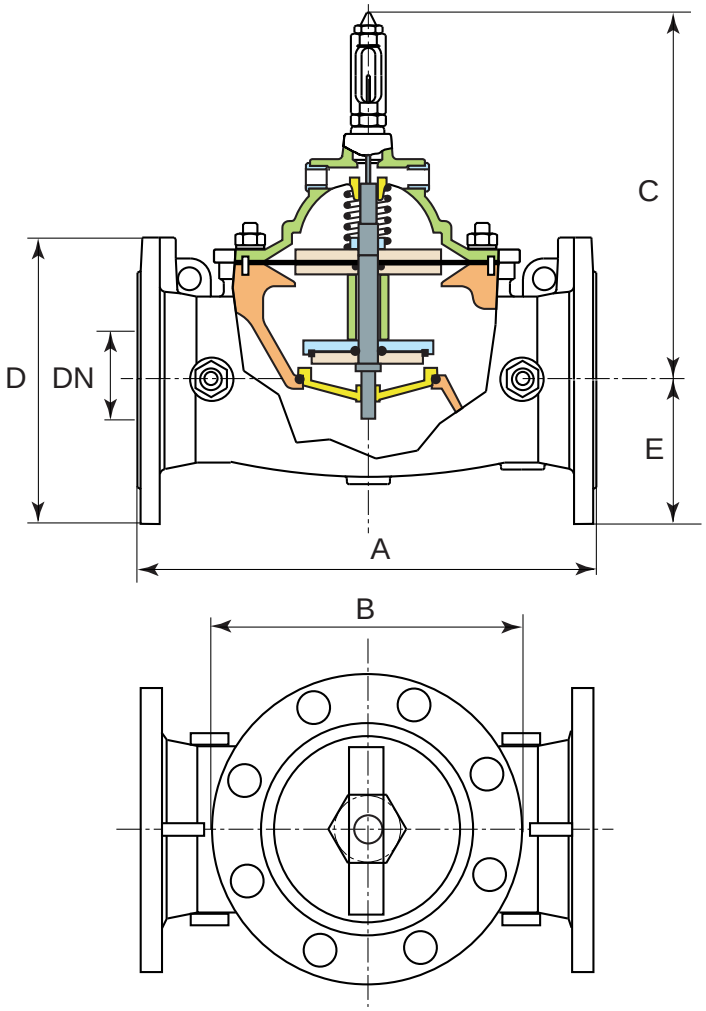
2.2 Overall dimensions and weights

2.2.1 Main basic valve E2001



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	DN	50	60	65	80	100	125	150	200	250	300	350	400	500	600	700
PN 10	A	230	290	290	310	350	400	480	600	730	850	980	1100	1250	1450	1650
	B	148	148	148	148	206	267	267	356	445	597	597	750	842	905	1110
	C	246	246	246	246	272	330	330	402	569	649	649	786	840	956	1080
	D	165	185	185	200	220	250	285	340	400	455	520	565	670	780	910
	E	85	95	95	100	110	125	145	170	200	230	255	285	335	390	460
Weight		20	23	23	25	36	50	61	110	225	390	485	580	820	1180	2148

	DN	50	60	65	80	100	125	150	200	250	300	350	400	500	600	700
PN 16	A	230	290	290	310	350	400	480	600	730	850	980	1100	1250	1450	1650
	B	148	148	148	148	206	267	267	356	445	597	597	750	842	905	1110
	C	246	246	246	246	272	330	330	402	569	649	649	786	840	956	1080
	D	165	185	185	200	220	250	285	340	400	455	520	580	715	840	910
	E	85	95	95	100	110	125	145	170	200	230	260	290	360	420	460
Weight		20	23	23	25	36	50	61	110	225	390	485	580	820	1180	2148

	DN	50	60	65	80	100	125	150	200	250	300	350	400	500	600	700
PN 25	A	230	290	290	310	350	400	480	600	730	850	980	1100	1250	1450	1650
	B	148	148	148	148	206	267	267	356	445	597	597	750	842	905	1110
	C	246	246	246	246	272	330	330	402	569	649	649	786	840	956	1080
	D	165	185	185	200	235	270	300	360	425	485	555	620	730	845	960
	E	85	95	95	100	120	135	150	180	215	245	280	310	365	425	485
Weight		20	23	23	25	36	50	61	110	235	410	510	610	860	1270	2186

Dimensions in mm - Weight in kg

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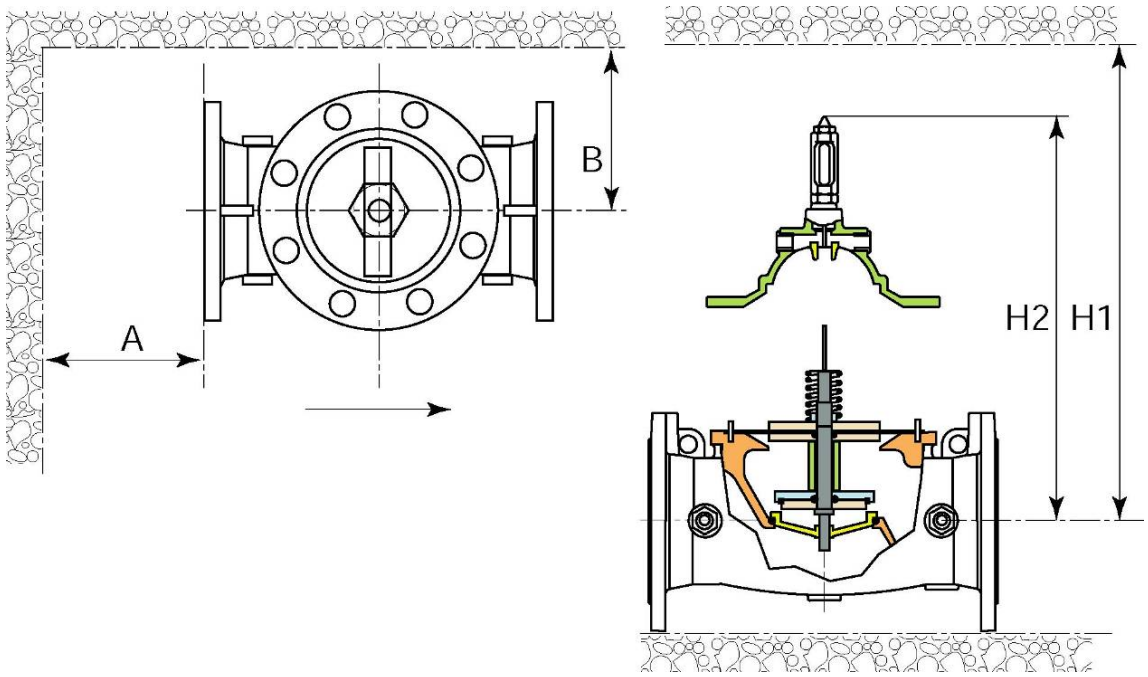
2.2.2 Pilot circuit and dimensions



DN	50	60	65	80	100	125	150	200	250	300	350	400	500	600	700
A	300	300	300	300	300	300	300	300	400	400	400	400	400	400	400
B	300	300	300	300	350	400	400	500	550	600	600	700	800	900	1000
H_1	400	400	400	400	500	600	600	700	1000	1100	1100	1500	1600	1700	2000
H_2	372	372	372	372	409	491	491	601	849	966	966	1160	1206	1369	1553

Dimensioni in mm

- **A, B, H_1** minimum external limits of the pilot circuit
- **H_2** minimum distance to allow maintenance on the main valve

For installation in places with less space available, please consult our pre-sales technical service.

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3 APPLICABLE STANDARDS

3.1 Test

3.1.1 Hydraulic test

Every single acv valve is subjected to hydraulic final test with the purpose of verifying the accordance with the prescriptions EN 12266 and EN1074:

- Shell test (body/cover): 1,5 x PN;
- Retainer test (tightness): 1,1 x PN;
- Retainer test (tightness at minimal pressure): 0,3 bar.

3.1.2 Product test

Control of coating: test of thickness, holiday test, impact test, MIBK test.

3.2 Conformity to the standards

Plant test:

- EN 12266
- EN 1074

Flanges drilling:

- EN 1092-2
- ISO 7005-2

Flanges dimension:

- ISO 5752-1

Suitability for potable water:

- D.M. 174/04 for applicable parts (ex C.M. 102 of 02/12/1978)
- Conformity to foreign norms: KTW (Germany), WRC (U.K.), ACS (France)

3.3 Marking

On the body according to EN19:

- Nominal diameter in mm (DN);
- Nominal pressure in bar (PN);
- Type of ductile iron;
- Flow direction.

On the label according to EN19:

- Nominal diameter in mm (DN);
- Nominal pressure in bar (PN);
- Manufacturer's logo;
- Model code.

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4 VALVE SELECTION

To do the right dimensioning and operation of automatic control valve it's necessary to know the hydraulic parameters::

- Upstream pressure (with closed valve)
- Upstream pressure P1 and downstream pressure P2 of valve at maximum flow rate Q_{max}
- Upstream pressure P1 and downstream pressure P2 of valve at minimum flow rate Q_{min}

	Flow rate Q	**Upstream pressure P_1**	**Downstream pressure P_2**
Measure Unit			
Maximum flow rate			
Minimum flow rate			
Closed valve	**0**		

With these parameters it can determine the diameter of the valve, the type of pilot to use to achieve the desired control of hydraulic parameters, and the possible need to adopt an anti-cavitation plate/cylinder on the valve.
It has to be verified that the operating temperatures of fluid are between 0 and 40 ° C.

In order to make a first dimensioning, it is possible to consult the following table from which you can obtain the diameter of valve in function of the flow velocity (m/s) in the inlet section and of the type of valve operation.
In any case, for speeds higher than recommended, contact the technical pre-sales service for a suitable sizing.

DN	LOW HEADLOSS V = 2,3 m/s		ADVISABLE V = 3,4 m/s		MAX CONTINUOS V = 4,3 m/s	
mm	l/s	m3/h	l/s	m3/h	l/s	m3/h
50	4	15	7	25	8	29
65	8	28	11	40	14	50
80	12	43	17	61	22	79
100	18	65	27	97	34	122
125	28	101	42	151	53	191
150	41	148	60	216	76	274
200	72	259	107	385	135	486
250	113	407	167	601	211	760
300	162	583	240	864	304	1094
350	221	796	327	1177	413	1487
400	289	1040	427	1537	540	1944
500	451	1624	667	2401	844	3038
600	650	2340	961	3460	1215	4374
700	885	3186	1308	4710	1655	5957

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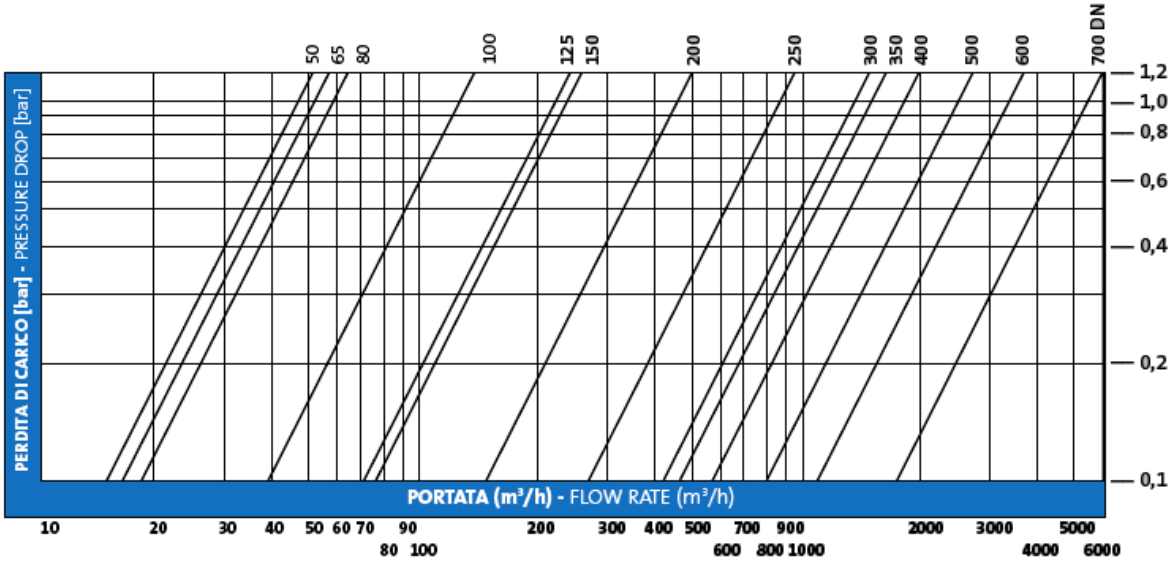
4.1 Hydraulic features

The hydraulic features can be estimated through the flow factor Kv that is the flow rate in m^3/h at 20°C that will cause a 1 bar headloss trough the fully open valve.

DN	50	65	80	100	125	150	200	250	300	350	400	500	600	700
Kv (m^3/h)	47	52	58	120	215	228	456	847	1370	1450	1767	2480	3205	5400
Lift (mm)	14	14	14	21	28	29	43	57	71	73	85	100	114	145
Chamber volume (l)	0,1	0,1	0,1	0,3	0,6	0,7	2,0	4,7	9,5	9,8	15,1	24,6	35,9	69,5

The valve headlosses can be calculated with following formula: $\Delta P = \left(Q / Kv \right)^2$

Where Q is the flow rate in m^3/h, Kv is the theoretical flow factor and ΔP are the headlosses in bar.
In alternative the valve headlosses can be calculate by the following diagram according to the flow rate and the diameter of the valve.



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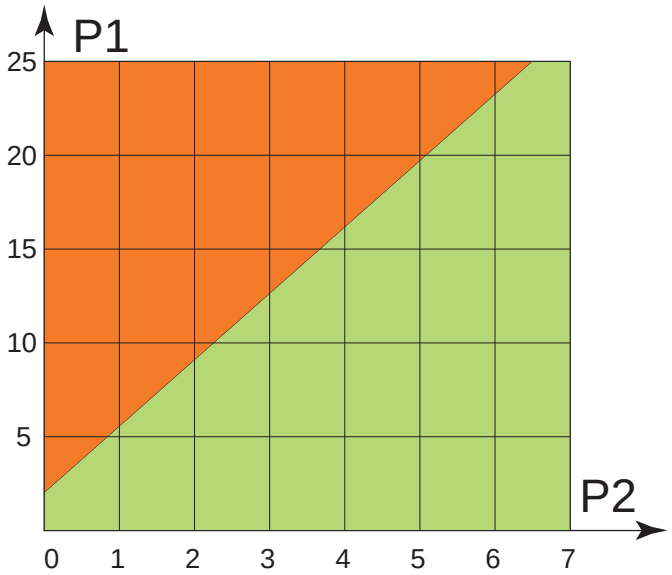
4.2 Cavitation

To avoid the cavitation risk is necessary to control the difference between inlet and outlet pressure of valve. In order to make a first control can be used the following cavitation diagram:



where:
- P1 is the maximum inlet pressure of valve
- P2 is the minimum outlet pressure of valve

Two situations are possible according to the pressure values P1 and P2:
- green area: no cavitation danger (and therefore no significant wear on the valve)
- red area: notable cavitation danger (with accelerated wear and damage to the valve).

In order to avoid this phenomenon it is possible to install an anti-cavitation plate/cylinder on the valve outlet.

Example of valve dimensioning:

Q_{max} = 150 l/s; P1 = 10 bar; P2 = 6 bar
Q_{min} = 100 l/s; P1 = 15 bar; P2 = 6 bar

Consulting the table at page 10 and choosing the recommended speed it's possible to dimension a DN 250 valve. The headloss of valve completely opened can be calculate with the formula at page 11 and it results 0,41 bar.
After heaving choose of valve diameter must verify that not cavitation problems are using the diagram at page 12. In this case, being in the green area, they aren't.

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5 ISTRUCTION FOR USE

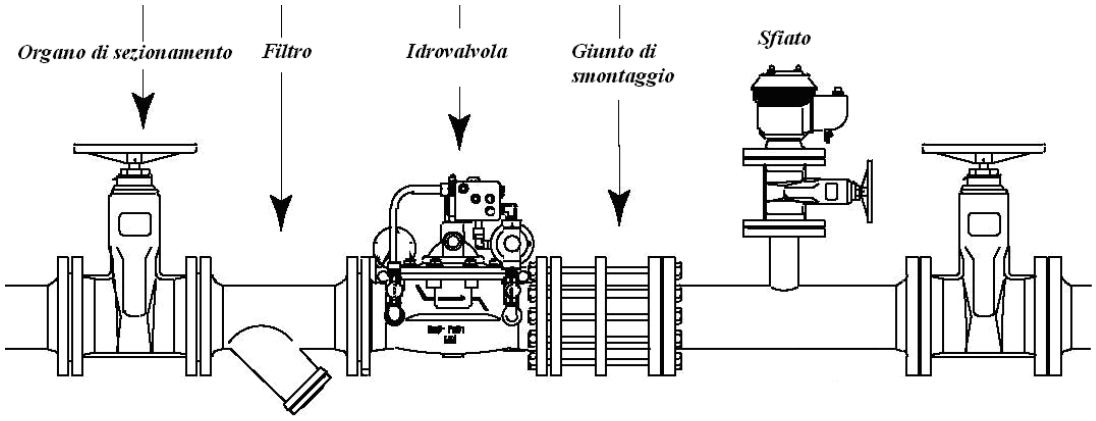
For further information please refer to the operation and maintenance manual.

5.1 Storage

The automatic control valve will have to be held (if possible) in covered places, the most possible protected from the sun, from the rain and generally from the atmospheric agents. Moreover it will have to be avoided that the seal of the same valves come to contact with powder or earth.

5.2 Installation

The valve should be installed in horizontal or vertical position respecting the flow direction indicated by the arrow on the body valve. For vertical installation of the valves with DN≥ 200 it is necessary the substitution of the standard spring with the reinforced version.
It is recommended to leave around the valve the sufficient space for the operations of calibration and maintenance (you see par 2.2.2) and to preview a dismantling joint in order to facilitate the maintenance operations.
For a corrected automatic valve installation it is advised to preview an air valve, a Y type strainer and the sectioning valves (butterfly valve or gate valve). A typical automatic control valve mounting scheme is as follows:



5.3 Regulation

The regulation of automatic control valve is actuated simply on the pilot spring, for example in the model E2115-00 to increase the downstream pressures the pilot has to be turned clockwise and to decrease the downstream pressure it has to be turned anti-clockwise.
The regulation of opening and/or closing speed of valve has to be acted directly on the control unit TUP 93.
For the correct regulation of valve, please refer to the operation and maintenance manual.

5.4 Maintenance

The automatic control valve does not require a particular maintenance. Each 6 months it is advised however to control and eventually to clean the filter on unit TUP 93.

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