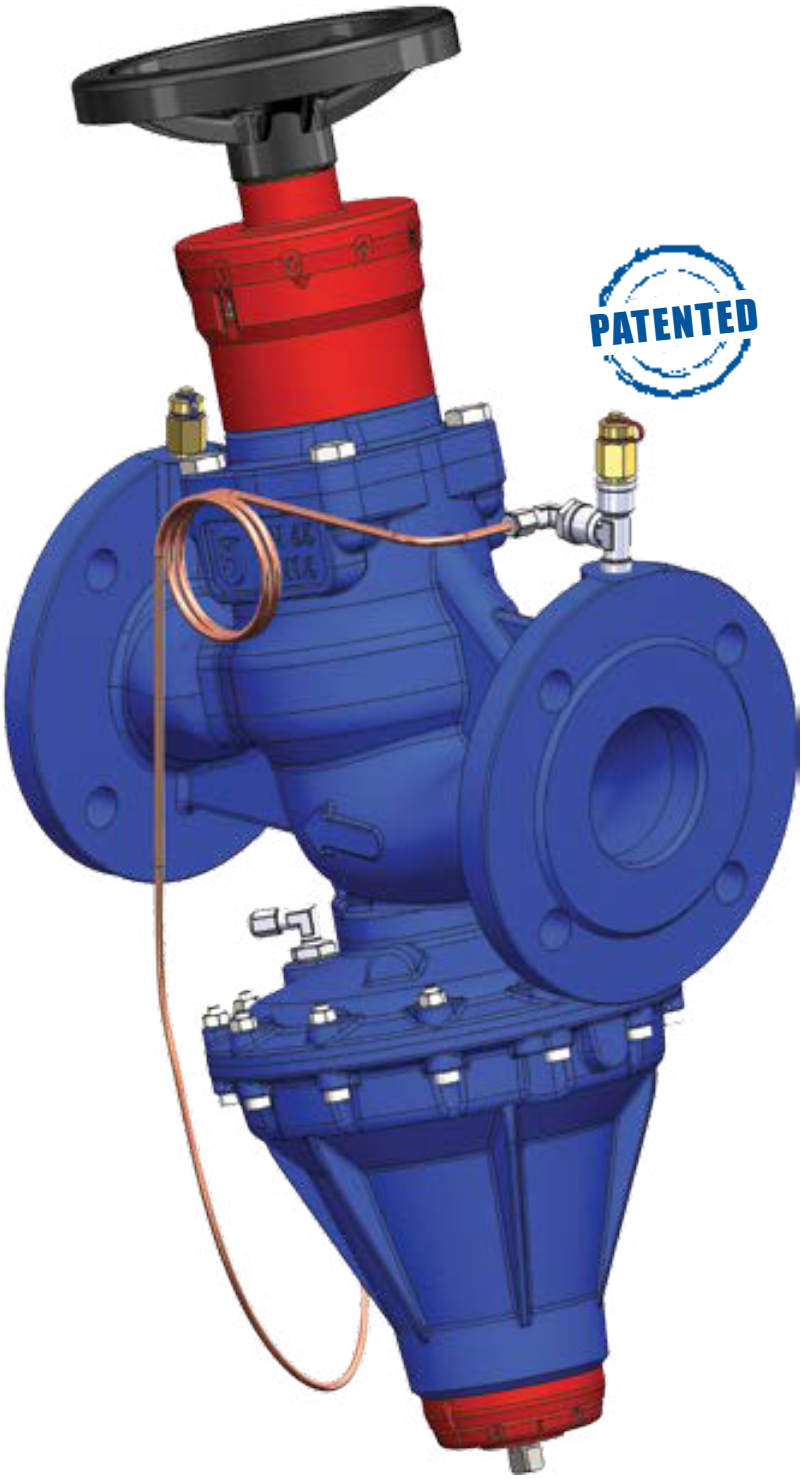
Differential Pressure Control Valve (DPCV)



Technical Data and Installation Instructions

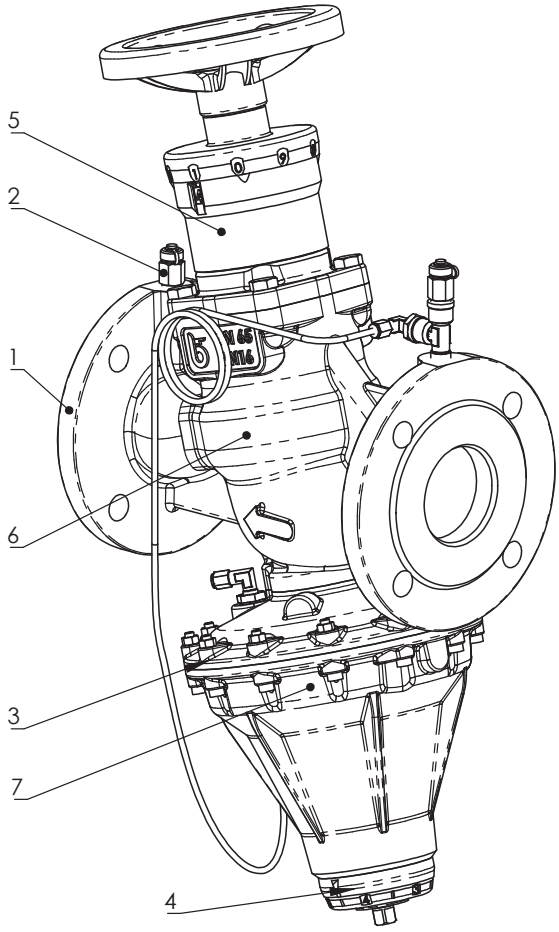
Dimensions in mm

This data sheet is designed as a guide and should not be regarded as wholly accurate in every detail. We reserve the right to amend the specification of any product without notice.

ART241 Differential Pressure Control Valve (DPCV)

The modulating valves ART 241 balance and control the differential pressure (DPCV) automatically and proportionally.
The valve balances the flow in the main network or in the single risers and branches of a heating/conditioning system, controls and keeps the differential pressure over the load at a stable value, reducing the risk of noisiness and wear of the thermostatic control valves. Moreover, correcting the imbalances of the supply between the user units assures a better environmental comfort together with an optimization of the energy consumption.
The regulation range of the differential pressure delivered is comprised between 0.2 - 0.8 and 0.8 - 1.6 bar for DN65-100 and between 0.2 and 0.8 bar for DN125-150.
The valves perform shut-off and measuring functions.

Advantages: reduces purchasing costs, and installation and set-up times.
No need for an external energy supply.



1. Internal and external epoxy coating, high temperature resistance, environmentally-friendly water-based paint.
2. Self-sealing test points for quick connection pressure or temperature probes.
3. The large diameter membrane allows accurate measuring of the pressure
4. Differential pressure regulation screws. The associated position indicator allows easy setting of the differential pressure
5. Position indicator may be adjusted to 4 positions for easy reading.
6. The shutter with EPDM seal produces a perfect seal, when maintenance work is done on the system.
7. Safety pressure relief by-pass: limits the allowable differential pressure value across the membrane and prevents the risk of damages and breakage.

Accessories

- Electronic instrument for measuring the differential pressure, flow rate and balancing of the circuit
- Pressure gauge probe adaptor
- Fitting, adapter, compression fitting, copper capillary pipe, test plug.

CE In conformity with directive 97/23/CE PED

Construction and testing norms (correspondences):

Face-to-face: EN 558-1
Flanges: EN 1092,
Design: EN13445
Marking: EN19
Testing: 100% testing according to EN 12266

Dimensions in mm
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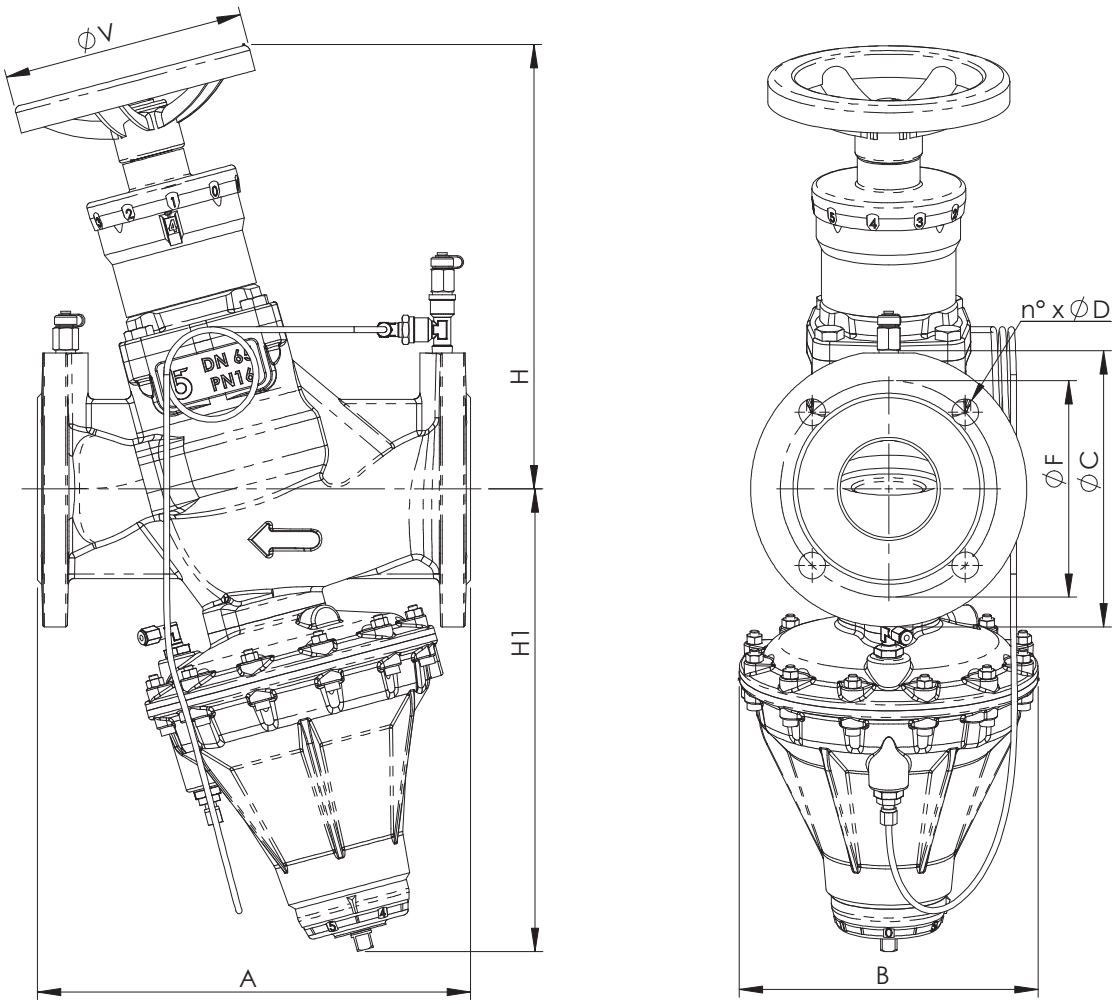
ART241 Differential Pressure Control Valve (DPCV)



Materials

	Component	Material
1	Body	EN GJL250
2	Bonnet	EN GJL250
3	Spring housing	Aluminium
4	Stems	CuZn40Pb2
5	Seat seal	EPDM
6	Membrane	EPDM reinforced
7	Spring	AISI 302
8	O Ring	EPDM
9	Handwheel	Carbon steel, epoxy coated

Dimensions (mm)

DN		65	80	100	125	150
A	EN 558-1/1	290	310	350	400	480
H		305	316	326	367	381
H1		310	400	414	436	460
B		200	242	242	242	242
V		200	200	200	200	200
C		185	200	220	250	285
F	EN1092 PN16	145	160	180	210	240
n x D		4 x 18	8 x 18	8 x 18	8 x 18	8 x 22

Weight (kg)

kg		24,2	30,6	36,1	51	80

Dimensions in mm

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ART241 Differential Pressure Control Valve (DPCV)

Maximum pressure

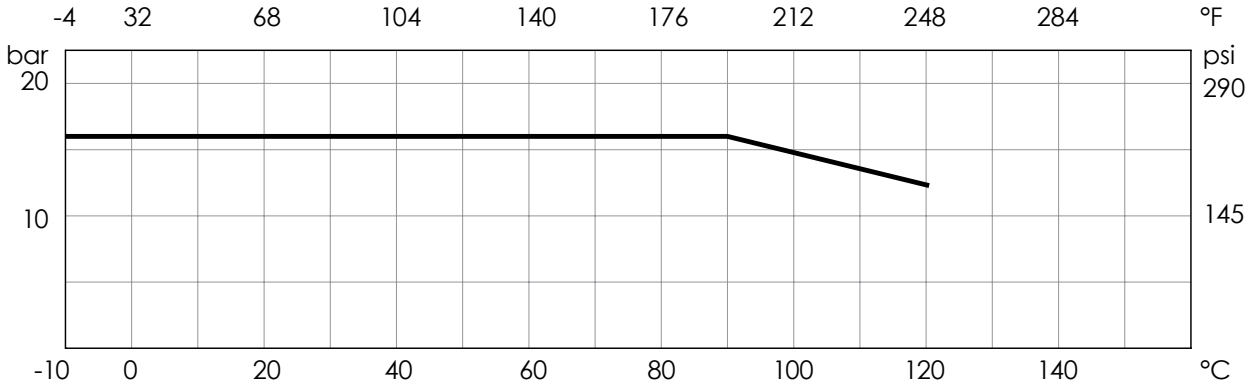
Fluids	
Water, water-glycol mix (MAX 50% glycol)	16 bar

Temperature

Temperature	min °C	Max °C
	-10	120

NB: *the maximum working pressure decreases while temperature increases, please refer to "pressure/temperature" chart*

Pressure/temperature chart



Kv chart (m^3/h per 1 bar)

Position	Kv				
	DN 65	DN 80	DN 100	DN 125	DN 150
0,0	0,0	0,0	0,0	0	0,0
0,5	0,9	4,7	6,3	1,6	1,9
1,0	2,4	7,4	8,8	3,1	3,7
1,5	3,4	10,0	12,1	4,5	5,0
2,0	5,3	12,5	17,7	5,7	5,9
2,5	7,4	14,9	22,8	6,6	7,6
3,0	10,0	20,8	27,0	7,3	9,8
3,5	13,5	27,8	32,4	7,7	14,4
4,0	16,0	34,1	42,8	8,4	20,6
4,5	18,4	40,7	52,2	9,8	28,8
5,0	23,2	46,3	58,5	12,6	38,3
5,5	28,7	50,6	63,6	18,8	48,2
6,0	32,5	54,3	68,7	30,6	58,3
6,5	36,4	57,8	74,7	41,0	69,8
7,0	40,8	61,4	79,9	49,0	82,1
7,5	42,8	64,9	83,6	55,8	94,4
8,0	44,1	66,7	87,1	63,0	106,7
8,5	46,2	67,7	90,6	72,2	119,2
9,0	47,6	68,4	94,1	83,0	131,9
9,5	-	68,9	97,3	93,1	143,4
10,0	-	69,3	99,7	103,0	154,1
10,5	-	69,7	101,5	112,6	161,6
11,0	-	70,0	102,8	119,5	166,9
11,5	-	-	103,8	123,9	170,3
12,0	-	-	104,4	127,0	172,5
12,5	-	-	104,9	129,3	174,8
13,0	-	-	105,3	131,5	177,0
13,5	-	-	105,4	133,9	184,5
14,0	-	-	105,5	136,0	182,1
14,5	-	-	-	137,5	187,4
15,0	-	-	-	138,5	190,0
15,5	-	-	-	139,0	190,2
16,0	-	-	-	139,0	190,5
17,0	-	-	-	-	190,8
18,0	-	-	-	-	191,0
19,0	-	-	-	-	191,0

Dimensions in mm

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Working range

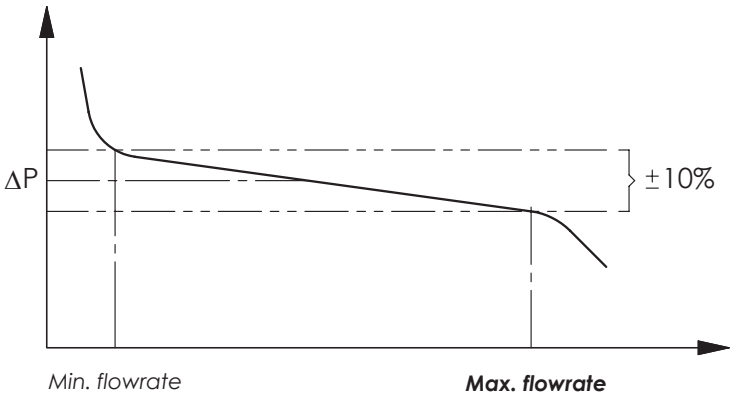
Refer also to "Instructions and Recommendations": Regulation of the differential pressure

CODE	DN	Differential pressure ΔP (mbar)									
		200	300	400	500	600	800	1000	1200	1400	1600
		Flow rate l/s									
ART241LP65	65	*0,277*	*0,277*	*0,416*	*0,416*	*0,416*	*0,416*				
		11,111	***16,666***	***18,055***	***18,055***	***20,833***	***20,833***				
ART241HP65	65						*0,555*	*0,555*	*0,555*	*0,833*	*0,833*
							20,833	***20,833***	***20,833***	***20,833***	***20,833***
ART241LP80	80	*0,333*	*0,416*	*0,416*	*0,416*	*0,416*	*0,416*				
		16,666	***19,444***	***23,611***	***23,611***	***23,611***	***23,611***				
ART241HP80	80						*0,833*	*0,833*	*0,833*	*0,833*	*1,111*
							27,777	***27,777***	***27,777***	***27,777***	***27,777***
ART241LP100	100	*0,416*	*0,555*	*0,555*	*0,555*	*0,555*	*0,833*				
		27,777	***33,333***	***33,333***	***33,333***	***33,333***	***33,333***				
ART241HP100	100						*0,833*	*0,833*	*0,833*	*1,111*	*1,111*
							38,888	***38,888***	***38,888***	***41,666***	***41,666***
ART241LP125	125	*0,833*	*1,111*	*1,111*	*1,111*	*1,388*	*1,388*				
		30,555	***38,888***	***38,888***	***41,666***	***47,222***	***47,222***				
ART241LP150	150	*1,111*	*1,388*	*1,388*	*1,388*	*1,388*	*1,944*				
		33,333	***44,444***	***44,444***	***55,555***	***63,888***	***63,888***				

ATTENTION:

Minimum flow rate: indicated in italics

Maximum flow rate: indicated in italics, bold type



Dimensions in mm

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Regulation of the differential pressure

A) To regulate the differential pressure, turn the command screw (X): turn clockwise to increase the differential pressure, and to stabilize it up to the required value, as indicated in the working range chart. Refer to the digital position indicator as shown in the table below to set the required differential pressure value.

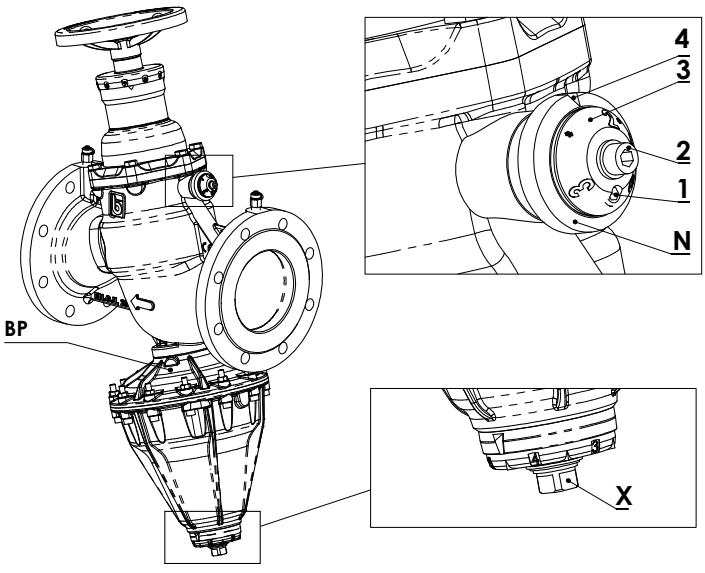
B) WARNING: for valves DN125 and DN150, to assure the correct operation, the regulation needle (N) shall be adjusted to match the value set for the position

indicator of the command screw (X).

- Loosen the socket head screw (1)
- By acting on the screw (2) turn the indicator (3), until the required value is read in correspondence of notch (4)
- Tighten socket head screw (1) to lock the position.

Note: the position indicator/differential pressure table is given to ease the set-up and cannot substitute a direct pressure measurement.

CODE	DN	Differential pressure ΔP (mbar)									
		200	300	400	500	600	800	1000	1200	1400	1600
		Position indicator									
ART241LP65	65	*0*	*1*	*1.5*	*2*	*2.3*	*2.8*				
ART241HP65	65						*0*	*0.5*	*1*	*1.5*	*2*
ART241LP80	80	*0*	*0.5*	*0.8*	*1.2*	*1.7*	3				
ART241HP80	80						*0*	*1*	*1.7*	*2.2*	*2.5*
ART241LP100	100	*0*	*1*	*1.5*	*2*	*2.7*	*3.5*				
ART241HP100	100						***0***	***1***	***2***	***2.3***	***2.5***
ART241LP125	125	*0*	*0.5*	*1*	*1.5*	*2*	*3*				
ART241LP150	150	*0*	*0.5*	*1*	*1.5*	*2*	*3*				



IMPORTANT: If the differential pressure acting on the membrane is too high, it can lead to damage the membrane itself or other components and thus compromising the valve functionality.

ART 241 is equipped with a safety pressure relief by-pass (BP, see the picture above) that limits the allowable differential pressure value across the membrane and prevents the risk of damages and breakage,

We recommend anyway to check the correctness of capillary pipes connection as well as the correctness of plant set-up (e.g. the correct position open/close of isolation valves) before plant start-up.

Dimensions in mm

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ART241 Differential Pressure Control Valve (DPCV)

Versions

Modulating differential pressure control valve

Coating: **RAL 5002** colour

ART 241 LP

Body: EN GJL 250
Seal: EPDM
Temp: -10 +120°C
Controllable differential pressure range: 0,2 – 0,8 bar

ART 241 HP (DN 65÷100)

Body: EN GJL 250
Seal: EPDM
Temp: -10 +120°C
Controllable differential pressure range: 0,8 – 1,6 bar

Project data to be supplied while ordering

- Nominal flow
- Differential pressure of the user unit **ΔP**

Attention: In order to grant that valve works properly, it is important to assure that the differential pressure ΔH user unit connection to the riser (upstream of the valve) has at least the double value of the differential pressure ΔP across the user unit **(ΔH > 2,5 x ΔP)**

Accessories

Complete kit

Tee 1/4MFF fitting, 1/4M-1/8F adapter, compression fitting 1/8M, copper capillary pipe diam. 4mm 2m length, 1/4M test plug.

Fitting and capillary kit

Compression fitting 1/8M, copper capillary pipe diam. 4mm 2m length.

Fittings, adapter and test plug kit

Tee 1/4MFF fitting, 1/4M-1/8F adapter, compression fitting 1/8M, 1/4M test plug.

Test plug

1/4M test plug.

Instrument for measurement

Electronic instrument for the measurement of the differential pressure, the flow rate and the balancing of the circuit.

Adaptor

Pressure gauge probe adaptor. 1/4" F brass body and stainless steel probe.

Dimensions in mm

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Instructions and Recommendations

The information provided here is delivered with each product, and contains "Instructions for use and maintenance".

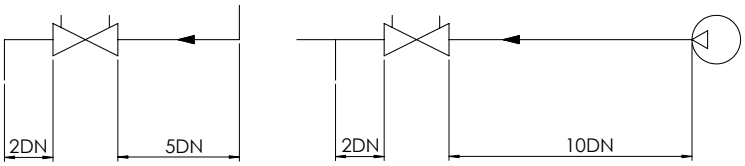
RECOMMENDATIONS

Before carrying out maintenance or dismantling the valve: ensure that the pipes, valves and fluids have cooled down, that the pressure has decreased and that the lines and pipes have been drained in case of toxic, corrosive, inflammable and caustic liquids. Temperatures above 50°C and below 0°C might cause damage to people.
Commissioning, decommissioning and maintenance interventions must be carried out by trained staff, taking account of instructions and local safety regulations.

ADVICE FOR PLANT LAYOUT

- In order to ensure that temperature and pressure limits are not exceeded, the system should be fitted with a thermostat and pressure switches.
- Observe the following minimum distances between the valve and other system components.

DISTANCE FROM	UPSTREAM	DOWNSTREAM
Pump	10 x DN	-
Bends, T-joints	5 x DN	2 x DN



- **The capillary pipe connection is shown in fig. 2.**
- In order to ensure that valve works properly, it is important to ensure that the differential pressure ΔH user unit connection to the riser (upstream of the valve) has at least twice value of the differential pressure ΔP across the user unit **(ΔH > 2,5 x ΔP)**, see fig. 1.

The differential pressure ΔH should not exceed 4 bar, if cavitation is to be avoided.

INSTALLATION AND CONNECTIONS (FIG. 1-2).

installation and connections with DPCV mounted in the return pipework (Fig 1)
- connect to the flow pipe by means of a capillary tube (supplied separately) between positions M & C1.

installation and connections with DPCV mounted in the flow pipework (Fig 2)
-connect to the return pipe by means of a capillary tube (supplied separately) between positions M & C2.

NOTE: in case of normal operation the handle must be completely open.

FIG.1

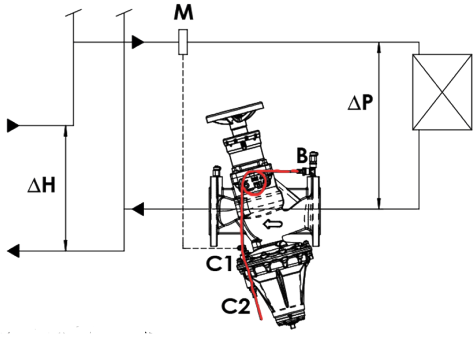


FIG.2

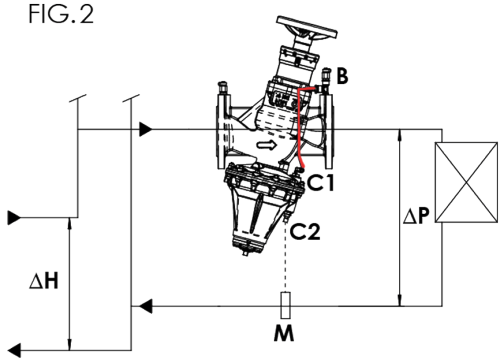


Fig 1 Return mounted DPCV C2 to Test plug B shown in red (already installed)

Fig 2 Flow mounted DPCV C1 to B shown in red (already installed)

ABOUT CAVITATION

NB: the flow must be free of cavitation.

As the liquid flows through the valve, as a result of section reduction, its velocity, and its dynamic pressure, increase, and the corresponding static pressure decreases.
If the static pressure value drops below the vapour pressure level, steam bubbles will form. These bubbles will be carried away by the fluid, and implode when the static pressure exceeds the vapour pressure again. Bubble implosion generates high temperatures and pressure shock waves locally, which will damage the valve and cause vibrations and noise.
Higher temperatures, lower static pressure and higher pressure drops across the valve usually increase the risk of cavitation.

Dimensions in mm
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STORING

- Keep the valve in a dry place, protect from damage and dirt.
- Handle with care, avoid knocks, especially on the weaker parts (hand wheel).
- Do not lift the valve by the hand wheel.
- Use suitable, sturdy packing for transport.

INSTALLATION

- Do not lift the valve by the hand wheel.
- Before installation, check that:
  - The piping is clean
  - The valve is clean and undamaged
  - The flange sealing surfaces are clean and undamaged
- The valve is unidirectional. Respect the flow direction indicated by the arrow on the body.
- Use suitable gaskets and check that they are correctly centred.
- Do not weld the flanges to the piping after installing the valve.
- Water hammers might cause damage and ruptures. Avoid inclination, twisting and misalignments of the piping which may subject the installed valve to excessive stresses. It is recommended that elastic joints be used in order to reduce such effects as much as possible.
- Tighten screws crosswise.

NB: check that the hand wheel is fully open (complete anti-clockwise rotation)

- Position indicator can be set in 4 positions for an easier reading, without changing the valve preset regulation position. (see fig.3):
  - Remove the hand wheel "V" and take the position indicator out by pushing on its lower part.
  - Set the indicator position by rotating it by 90-180-270° (fig. 3C).
  - Screw the hand wheel back on (fig. 3D), taking care to match the gear teeth on the stem and position indicator.

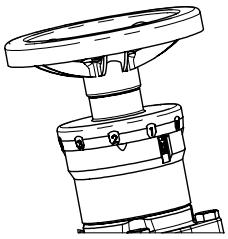

FIG.3A

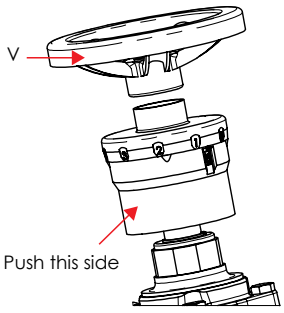

FIG.3B

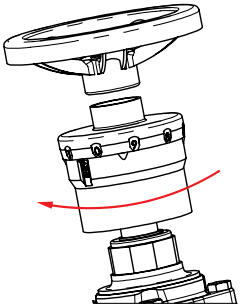

FIG.3C

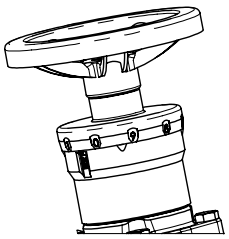

FIG.3D

COMMISSIONING

- It is advisable to flush the system clean. Keep the valve fully open when flushing.
- If a system pressure test is required, the maximum allowed pressure PS may be exceeded by up to a maximum of 24 bar. Pressure tests must be carried out at room temperature and with the valve fully open.

Dimensions in mm

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MEASURING

Pay close attention during measurement, in the case of hot media.

- Pressure test plugs are self-sealing. Unscrew the pressure test plug cap and insert the probe (fig. 4A).
- Screw the probe ring nut to the pressure test plug (fig. 4B).
- We recommend placing an isolation valve upstream of the probe.
- After measuring, unscrew and extract the probe. Screw the plug cap back on.

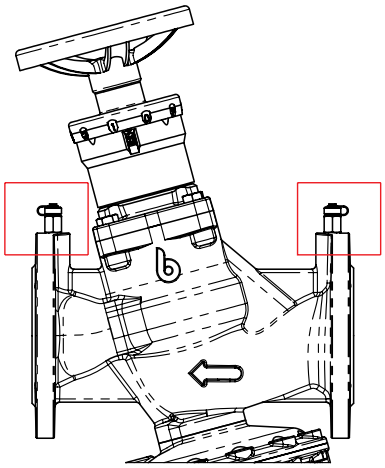


FIG. 4A

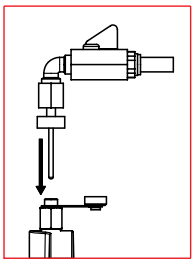
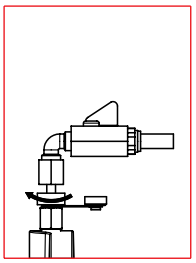


FIG. 4B



Measuring the flow rate

- Open the valve fully (complete anti-clockwise rotation).
- Screw the pressure gauge connection to the pressure plugs.
- Turn the hand wheel clockwise observing the pressure gauge connection. The gauge indicator is stable as long as the flow rate does not change.
- Stop turning as soon as the gauge indicator moves (differential pressure increasing).
- Take note of differential pressure reading on pressure gauge.
- Calculate the flow rate with the formula:

$$Q = K_V \cdot \sqrt{\Delta P}$$

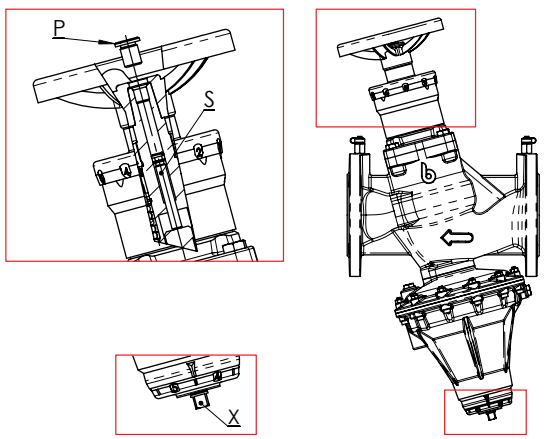
ΔP (bar)	Differential pressure reading on the pressure gauge
K_v	Coefficient of flow rate, taken from the Kv chart, in correspondence with the number of turns made, read on the hand wheel position indicator
Q (m³/h)	Coefficient of flow rate

- When the measurements have been done, put the valve in the fully open position (complete anti-clockwise rotation of the hand wheel).

REGULATION OF THE DIFFERENTIAL PRESSURE

- Open the valve fully (complete anti-clockwise rotation).
- Remove the upper cover "P", fig. 5.
- Using a screwdriver with a flat head, unscrew air vent "S" and let any air out.
- Tighten until it stops turning, and replace the cover "P".
- To regulate the differential pressure, turn the command screw "X": turn clockwise to increase the differential pressure, up to the preset value, as indicated in the operation field chart.

FIG. 5



Dimensions in mm

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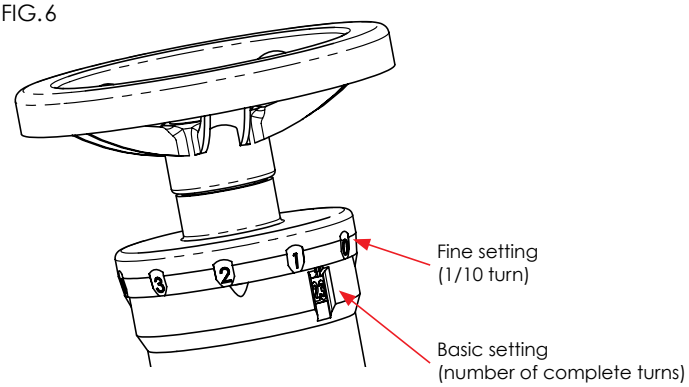
SETTING

Hand wheel mounting can be set for an easier reading, see chapter entitled "Installation".
The regulation position can be read from the digital setting scales, showing basic settings (number of complete turns) and fine setting (1/10 turn) (fig. 6). Intermediate positions can be adjusted continuously.
Position 0.0 coincides with the valve being fully closed.

FIG. 6



SCHEME

In an heating/conditioning plant, because of the distance of the pump and of the plant layout, some user units are subjected to a differential pressure higher than the designed one and so experience overflow, while, on other hand, others could not receive the design flow.
In fig. 7A is shown an example scheme; vertical rods represent pressure upstream and downstream the user units, and the rods' red part represent the differential pressure, which varies widely among the circuits (ΔP1-2 > ΔP3-4 > ΔP5-6 > ΔP7-8 > ΔP9-0).
The unbalanced differential pressure and flow affects negatively comfort (requested temperature are reached after a long time, or not reached at all, resulting in unstable temperature), control as well the energy consumption raise and wear of user unit control valve.

FIG. 7A

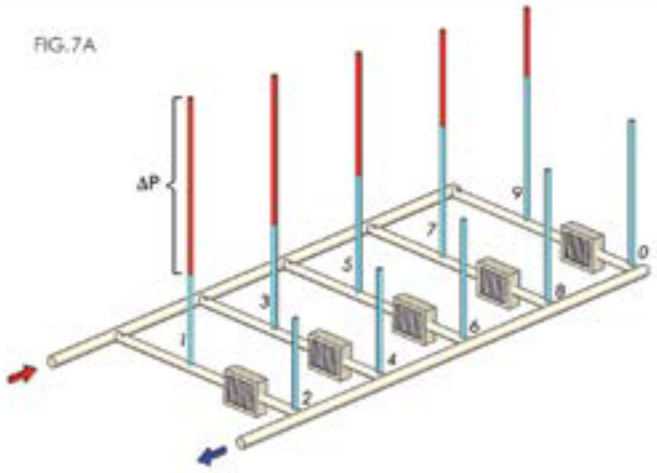
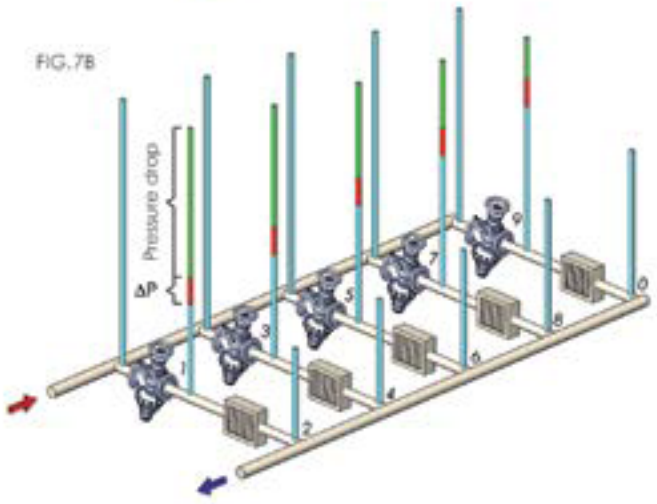


FIG. 7B



Placing a balancing valve ART 241 upstream of the user unit, it creates a pressure drop (shown in green in fig. 7B), that provides hydronic balanc and allows to keep the optimum differential pressure on the user unit control valve (in red, ΔP1-2 = ΔP3-4 = ΔP5-6 = ΔP7-8 = ΔP9-0).
A differential pressure control valve gives the further advantage to keep constant the differential pressure across the end user circuit also when modifications occur in the plant (e.g. end user circuit opening/closing, temperature variations).

Dimensions in mm
This data sheet is designed as a guide and should not be regarded as wholly accurate in every detail. We reserve the right to amend the specification of any product without notice.

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