

93 / 93-1



EN Description

The pressure independent control valve (PICV) combines the functions of a differential pressure controller, regulation valve and 2 port control valve into a single body.

The EVOPICV incorporates a small diaphragm type DPCV in order to keep a constant differential pressure across an orifice and to provide a constant flow rate whilst the differential pressure is within the operating limits of the valve. Beyond these working pressures the valve acts as a fixed orifice.

Making this orifice adjustable allows the valve to be pre-set to deliver a range of flow rates. In the case of the EVOPICV valve this adjustment can be made in situ without removing any covers or actuators, the adjustment wheel is lockable by means of a combined memory stop and indicator.

The EVOPICV valve also includes 2 port temperature control by means of an oblique pattern globe valve. The plug of the globe valve is machined to give a near equi-percentage flow control characteristic. Due to the fact that the differential pressure across the valve seat is constant it can be said that the authority of this control valve is very close to 1.

Due to the way the EVOPICV valve controls the flow rate, irrespective of differential pressure branch and sub mains, balancing valves are not required. The flow rate is maintained at the terminal unit regardless of system conditions making the valve ideal for systems with inverter driven pumps.

Valves of the 93-1 series have not the pressure ports: this is the only difference to 93 series.

EN Valve features

The 93 series PICV valve offers the following functions:

- Good valve authority to maintain temperature control and power output from the terminal unit using the complete stroke of the valve.
- Maximum design flow limitation: once set, the 93 valve maintains design flow regardless of pressure changes in the system.
- it can easily be set up once installed, using the external setting ring.
- Measure by means of specific meter of the differential pressure across the valve: in this way user can verify if the start-up pressure has been reached and overpassed. **Not available on 93-1.**

| ΔP max. | Close off pressure * | Temperature | Working pressure max. | Stroke | Rangeability | Leakage | Accuracy 0 ÷ 1 bar** |
|-----------------|----------------------|--------------|-----------------------|--------|-------------------------|-------------------------|----------------------|
| 600 kPa / 6 bar | 600 kPa / 6 bar | -10 ÷ 120 °C | 2500 kPa / 25 bar | 6 mm | 50÷100 IEC 60534-2-3 | Class IV IEC 60534-4 | ± 5% |

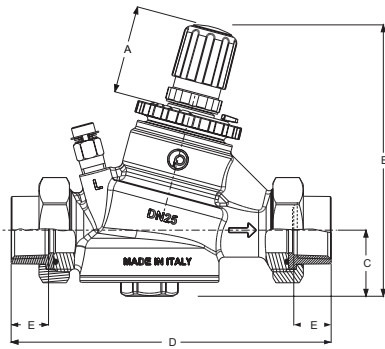
| | 93L 3/4" | 93H 3/4" | 93L 1" | 93H 1" | 93L 1 1/4" | 93H 1 1/4" |
|-----------------------|-------------------------------|-------------------------------|-----------------------------|-----------------------------|---------------------------------|---------------------------------|
| | 93L1 3/4" | 93H1 3/4" | 93L1 1" | 93H1 1" | 93L1 1 1/4" | 93H1 1 1/4" |
| Flow rate max. | 2200 l/h 0,611 l/s | 2700 l/h 0,750 l/s | 2200 l/h 0,611 l/s | 2700 l/h 0,750 l/s | 2700 l/h 0,750 l/s | 3000 l/h 0,833 l/s |
| Start-up max. | 25 kPa 0,25 bar | 30 kPa 0,30 bar | 25 kPa 0,25 bar | 30 kPa 0,30 bar | 30 kPa 0,30 bar | 35 kPa 0,35 bar |
| Connections | Rc 3/4" union F EN 10226-1 | Rc 3/4" union F EN 10226-1 | Rc 1" union F EN 10226-1 | Rc 1" union F EN 10226-1 | Rc 1 1/4" union F EN 10226-1 | Rc 1 1/4" union F EN 10226-1 |

* Closed by actuator

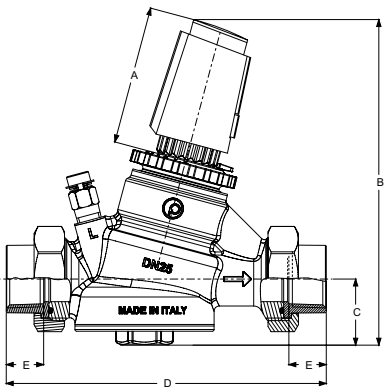
** at 100%. For other presetting and differential pressure, refer to "Flow setting accuracy" on the PICV manual.



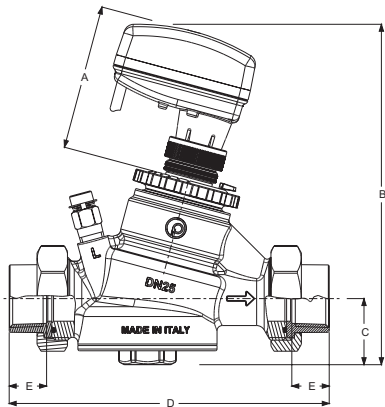
EN Dimensional data



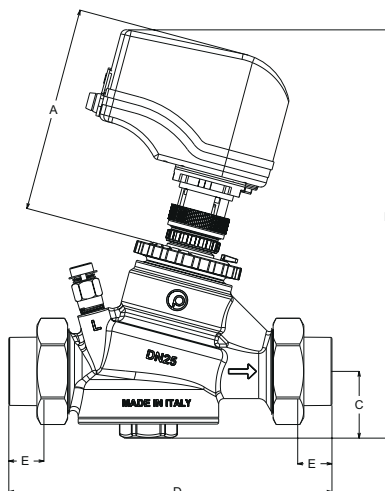
| Manual valve | | | | | | | |
|--------------|-------------------|--------|--------|--------|--------|--------|------|
| Art. | Flow rate [l/h] | A (mm) | B (mm) | C (mm) | D (mm) | E (mm) | |
| 93L 3/4" | 93L1 3/4" | 2200 | 47 | 152 | 38 | 176 | 17 |
| 93H 3/4" | 93H1 3/4" | 2700 | 47 | 152 | 38 | 176 | 17 |
| 93L 1" | 93L1 1" | 2200 | 47 | 152 | 38 | 184 | 21,5 |
| 93H 1" | 93H1 1" | 2700 | 47 | 152 | 38 | 184 | 21,5 |
| 93L 1 1/4" | 93L1 1 1/4" | 2700 | 47 | 152 | 38 | 209 | 22 |
| 93H 1 1/4" | 93H1 1 1/4" | 3000 | 47 | 152 | 38 | 209 | 22 |



| Valve with thermo-electric actuator | | | | | | | |
|-------------------------------------|-------------------|--------|--------|--------|--------|--------|------|
| Art. | Flow rate [l/h] | A (mm) | B (mm) | C (mm) | D (mm) | E (mm) | |
| 93L 3/4" | 93L1 3/4" | 2200 | 79,5 | 187 | 38 | 176 | 17 |
| 93H 3/4" | 93H1 3/4" | 2700 | 79,5 | 187 | 38 | 176 | 17 |
| 93L 1" | 93L1 1" | 2200 | 79,5 | 187 | 38 | 184 | 21,5 |
| 93H 1" | 93H1 1" | 2700 | 79,5 | 187 | 38 | 184 | 21,5 |
| 93L 1 1/4" | 93L1 1 1/4" | 2700 | 79,5 | 187 | 38 | 209 | 22 |
| 93H 1 1/4" | 93H1 1 1/4" | 3000 | 79,5 | 187 | 38 | 209 | 22 |



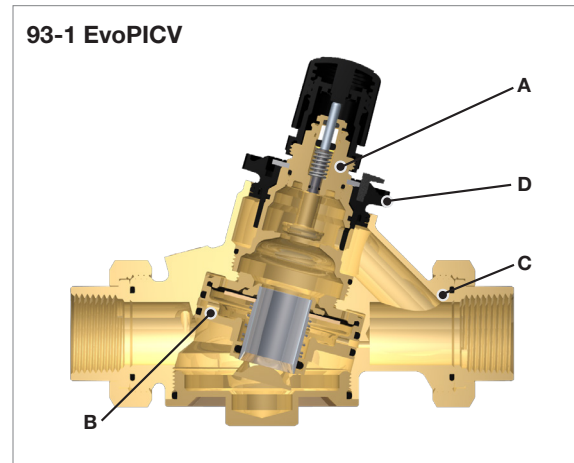
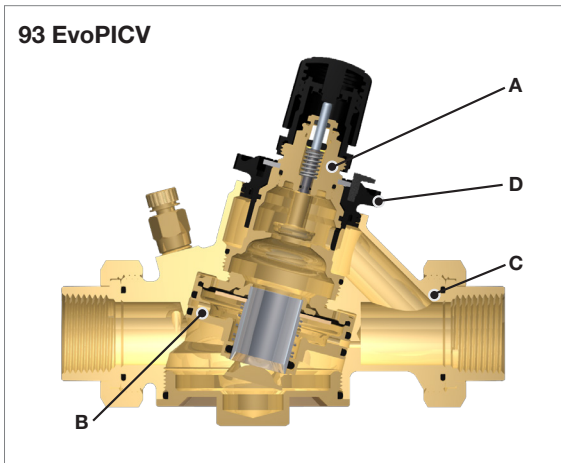
| Valve with electromotive actuator | | | | | | | |
|-----------------------------------|-------------------|--------|--------|--------|--------|--------|------|
| Art. | Flow rate [l/h] | A (mm) | B (mm) | C (mm) | D (mm) | E (mm) | |
| 93L 3/4" | 93L1 3/4" | 2200 | 83 | 196 | 38 | 176 | 17 |
| 93H 3/4" | 93H1 3/4" | 2700 | 83 | 196 | 38 | 176 | 17 |
| 93L 1" | 93L1 1" | 2200 | 83 | 196 | 38 | 184 | 21,5 |
| 93H 1" | 93H1 1" | 2700 | 83 | 196 | 38 | 184 | 21,5 |
| 93L 1 1/4" | 93L1 1 1/4" | 2700 | 83 | 196 | 38 | 209 | 22 |
| 93H 1 1/4" | 93H1 1 1/4" | 3000 | 83 | 196 | 38 | 209 | 22 |



| Valve with VM060 | | | | | | | |
|------------------|-------------------|--------|--------|--------|--------|--------|------|
| Art. | Flow rate [l/h] | A (mm) | B (mm) | C (mm) | D (mm) | E (mm) | |
| 93L 3/4" | 93L1 3/4" | 2200 | 117 | 233 | 38 | 176 | 17 |
| 93H 3/4" | 93H1 3/4" | 2700 | 117 | 233 | 38 | 176 | 17 |
| 93L 1" | 93L1 1" | 2200 | 117 | 233 | 38 | 184 | 21,5 |
| 93H 1" | 93H1 1" | 2700 | 117 | 233 | 38 | 184 | 21,5 |
| 93L 1 1/4" | 93L1 1 1/4" | 2700 | 117 | 233 | 38 | 209 | 22 |
| 93H 1 1/4" | 93H1 1 1/4" | 3000 | 117 | 233 | 38 | 209 | 22 |



EN Materials and weight



| Material list | |
|-----------------------------|--|
| Regulating valve (A) | Brass CW614N Stainless steel 18/8 |
| Diaphragm (B) | High resistance polymer - EPDM Stainless steel AISI 303 |
| Presetting (D) | High resistance polymer Brass CW614N |
| Body (C) | Corrosion resistant brass CW602N |
| Gaskets | EPDM-x |

| Art. | Weight (kg) |
|-------------------|-------------|
| 93L 3/4" | 2,30 |
| 93H 3/4" | 2,30 |
| 93L 1" | 2,40 |
| 93H 1" | 2,40 |
| 93L 1 1/4" | 2,60 |
| 93H 1 1/4" | 2,60 |

| Art. | Weight (kg) |
|--------------------|-------------|
| 93L1 3/4" | 2,30 |
| 93H1 3/4" | 2,30 |
| 93L1 1" | 2,40 |
| 93H1 1" | 2,40 |
| 93L1 1 1/4" | 2,60 |
| 93H1 1 1/4" | 2,60 |

EN Installation and maintenance EvoPICV 93 and 93-1

1. Use conditions

The valve has to be mounted with the arrow in the direction of the flow. Mounting it in the wrong direction may damage the system and the valve itself.

If flow reversal is possible, a non-return valve should be mounted.

Minimum differential pressure above which the valve begins to exercise its regulating effect:

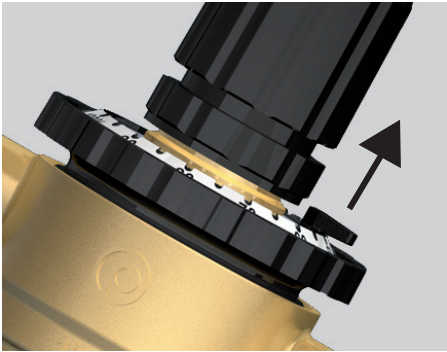
| | 93L 3/4" | 93H 3/4" | 93L 1" | 93H 1" | 93L 1 1/4" | 93H 1 1/4" |
|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| | 93L1 3/4" | 93H1 3/4" | 93L1 1" | 93H1 1" | 93L1 1 1/4" | 93H1 1 1/4" |
| ΔP Start-up | 25 kPa 0,25 bar | 30 kPa 0,30 bar | 25 kPa 0,25 bar | 30 kPa 0,30 bar | 30 kPa 0,30 bar | 35 kPa 0,35 bar |

| Medium |
|--------------------------|
| Water / Water+glycol 30% |

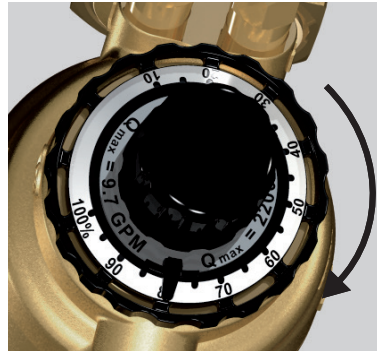


2. Flow preset

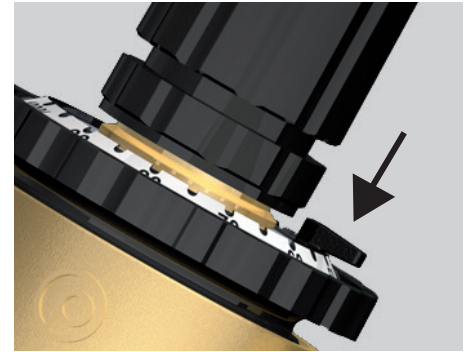
To set the selected flow, follow these steps:



Lift the lock pin to unlock the selector



Turn the selector to the target position



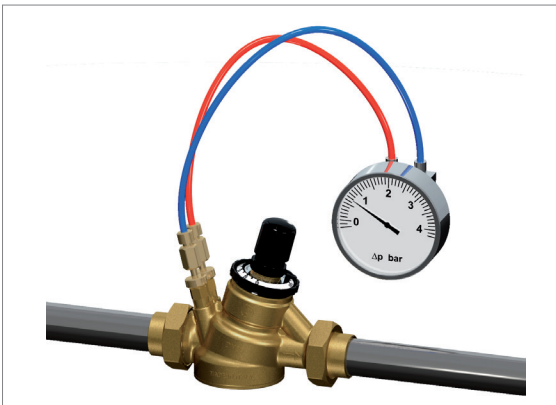
Press the lock pin to lock the selector in the final position

3. Operating control

It is necessary to be sure that the valve is actually working in the operating range. In order to verify it, just measure the differential pressure across the valve, as shown in the picture.

If the measured differential pressure is higher than the start-up pressure, the valve is actually keeping the flow constant at the set value.

Pettinaroli **MDPS2** is the device which allows to do it: along with a smartphone and the dedicated app, it can directly give the user the differential pressure compared to the start-up differential pressure of the valve (proper valve has to be selected among all the Pettinaroli EvoPICV catalogue).

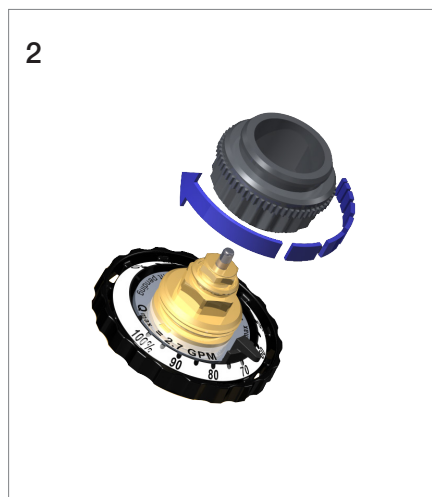


4. Maintenance and cleaning

During valve cleaning operations, use a damp cloth. **DO NOT** use any detergent or chemical product that may seriously damage or compromise the proper functioning and the reliability of the valve.

5. Actuator assembly

The valve can be equipped with a series of thermal-electric or electro-mechanical actuators, according to the requirements of the system. Actuators come along with an adaptor for proper mounting on the valve and for proper functioning of the whole device.

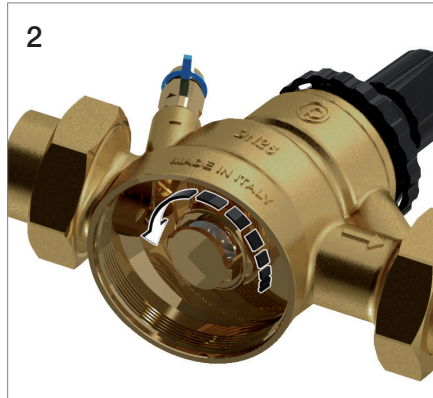


6. Diaphragm replacement and flushing

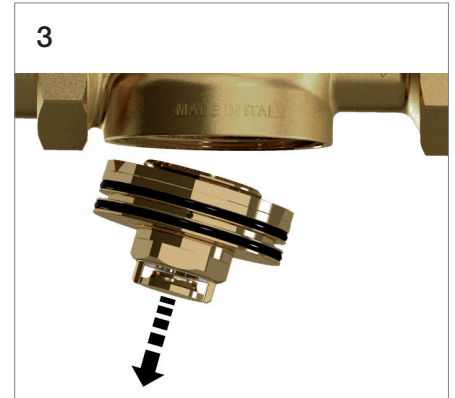
If the Diaphragm (ΔP regulator) needs to be replaced or when flushing the pipework during pre-commissioning, follow instructions below.



1 Unscrew bottom cap

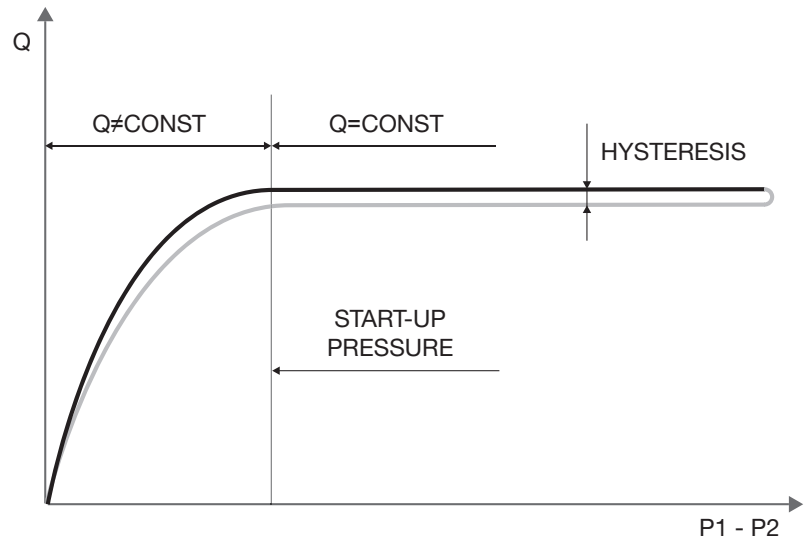
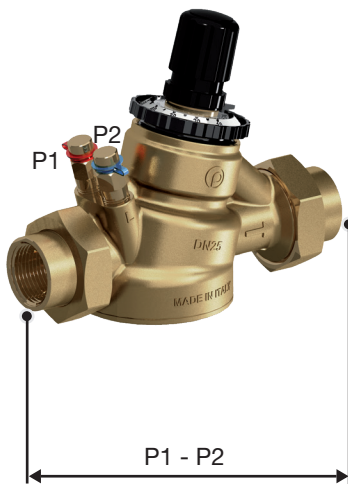


2 Unscrew the Diaphragm using an hexagonal socket wrench



3 Manually pull out the Diaphragm and replace with a new 093D. Wear gloves.

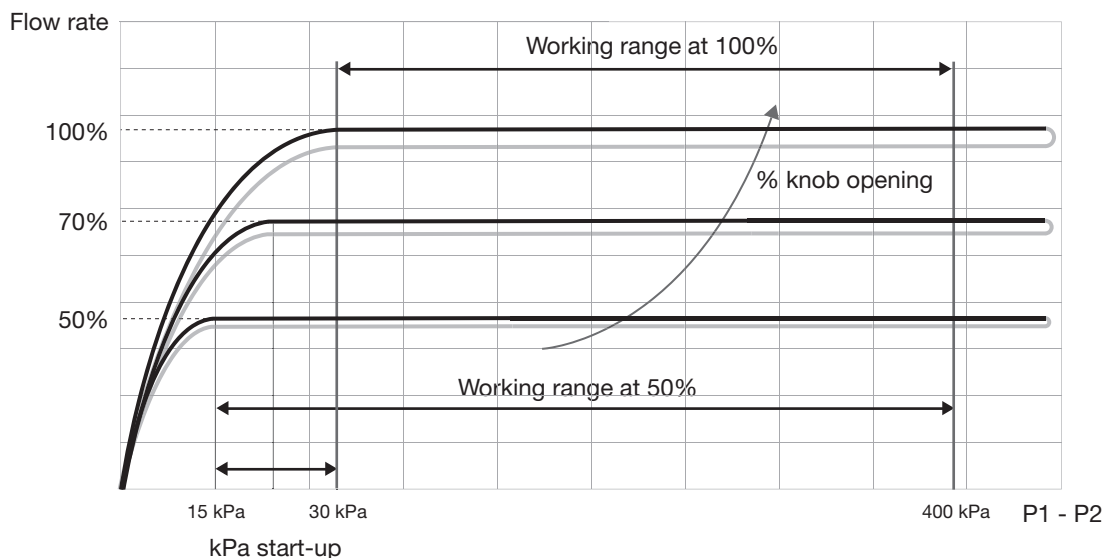
EN Start-up curves and presetting



The example above shows a characterisitic curve where start-up pressure, hysteresis and accuracy can be evaluated.

Using a differential pressure gauge to measure the pressure drop the valve absorbs, allows to check whether the valve is in the operating range (and, therefore, whether the flow is constant) by simply verifying that the measured value $P1 - P2$ is higher than the start-up value.

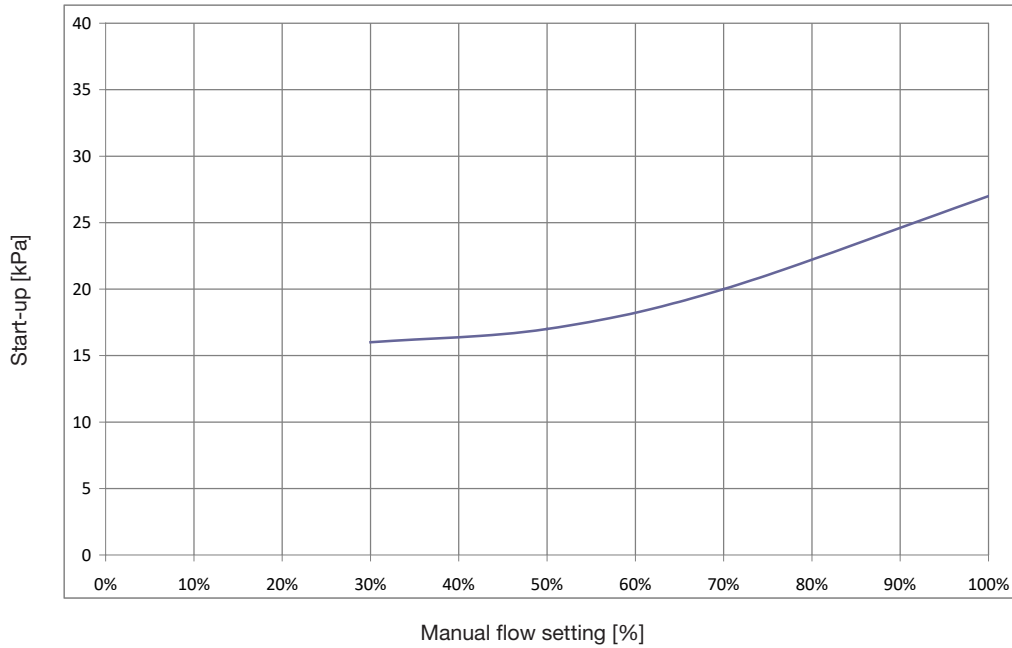
If the ΔP measured value is lower than the start-up value, then the valve works as a fixed orifice valve. Start-up value varies with flow setting of the valve, as shown by the example below:



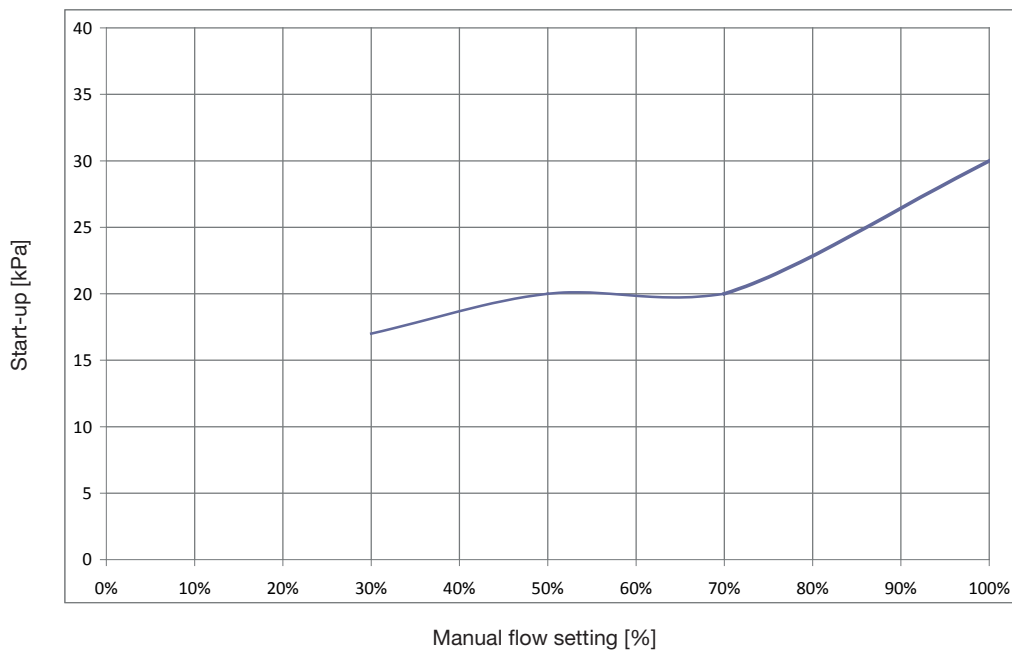
When the valve is set at 100% of nominal (maximum) flow, the curve begins to remain constant at 30 kPa, therefore the working range of the valve is 30 ÷ 400 kPa;

When the valve is set at 50% of nominal flow, the curve begins to remain constant at 15 kPa, therefore the working range of the valve is 15 ÷ 400 kPa.

The following diagrams show the start-up pressure at different presetting.

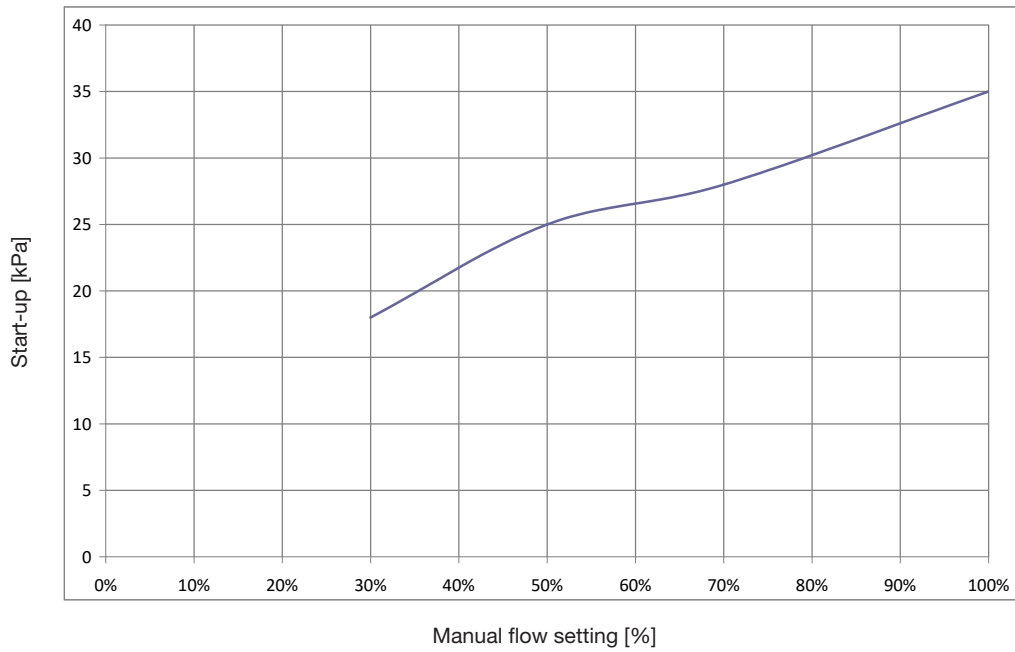


| Valve model |
|----------------------|
| 93L 3/4" - 2200 l/h |
| 93L1 3/4" - 2200 l/h |
| 93L 1" - 2200 l/h |
| 93L1 1" - 2200 l/h |



| Valve model |
|------------------------|
| 93H 3/4" - 2700 l/h |
| 93H1 3/4" - 2700 l/h |
| 93H 1" - 2700 l/h |
| 93H1 1" - 2700 l/h |
| 93L 1 1/4" - 2700 l/h |
| 93L1 1 1/4" - 2700 l/h |





| Valve model |
|------------------------|
| 93H 1 1/4" - 3000 l/h |
| 93H1 1 1/4" - 3000 l/h |

Flow pre-setting 93 / 93-1 EvoPICV

| Presetting % | 93L-93L1 3/4" | | 93H-93H1 3/4" | | 93L-93L1 1" | | 93H-93H1 1" | | 93L-93L1 1 1/4" | | 93H-93H1 1 1/4" | |
|--------------|---------------|-------|---------------|-------|-------------|-------|-------------|-------|-----------------|-------|-----------------|-------|
| | Flow rate | | Flow rate | | Flow rate | | Flow rate | | Flow rate | | Flow rate | |
| | l/h | l/s | l/h | l/s | l/h | l/s | l/h | l/s | l/h | l/s | l/h | l/s |
| 100 | 2200 | 0,611 | 2700 | 0,750 | 2200 | 0,611 | 2700 | 0,750 | 2700 | 0,750 | 3000 | 0,833 |
| 90 | 1980 | 0,550 | 2430 | 0,675 | 1980 | 0,550 | 2430 | 0,675 | 2430 | 0,675 | 2700 | 0,750 |
| 80 | 1760 | 0,489 | 2160 | 0,600 | 1760 | 0,489 | 2160 | 0,600 | 2160 | 0,600 | 2400 | 0,667 |
| 70 | 1540 | 0,428 | 1890 | 0,525 | 1540 | 0,428 | 1890 | 0,525 | 1890 | 0,525 | 2100 | 0,583 |
| 60 | 1320 | 0,367 | 1620 | 0,450 | 1320 | 0,367 | 1620 | 0,450 | 1620 | 0,450 | 1800 | 0,500 |
| 50 | 1100 | 0,306 | 1350 | 0,375 | 1100 | 0,306 | 1350 | 0,375 | 1350 | 0,375 | 1500 | 0,417 |
| 40 | 880 | 0,244 | 1080 | 0,300 | 880 | 0,244 | 1080 | 0,300 | 1080 | 0,300 | 1200 | 0,333 |
| 30 | 660 | 0,183 | 810 | 0,225 | 660 | 0,183 | 810 | 0,225 | 810 | 0,225 | 900 | 0,250 |
| 20 | 440 | 0,122 | 540 | 0,150 | 440 | 0,122 | 540 | 0,150 | 540 | 0,150 | 600 | 0,167 |
| 10 | 220 | 0,061 | 270 | 0,075 | 220 | 0,061 | 270 | 0,075 | 270 | 0,075 | 300 | 0,083 |

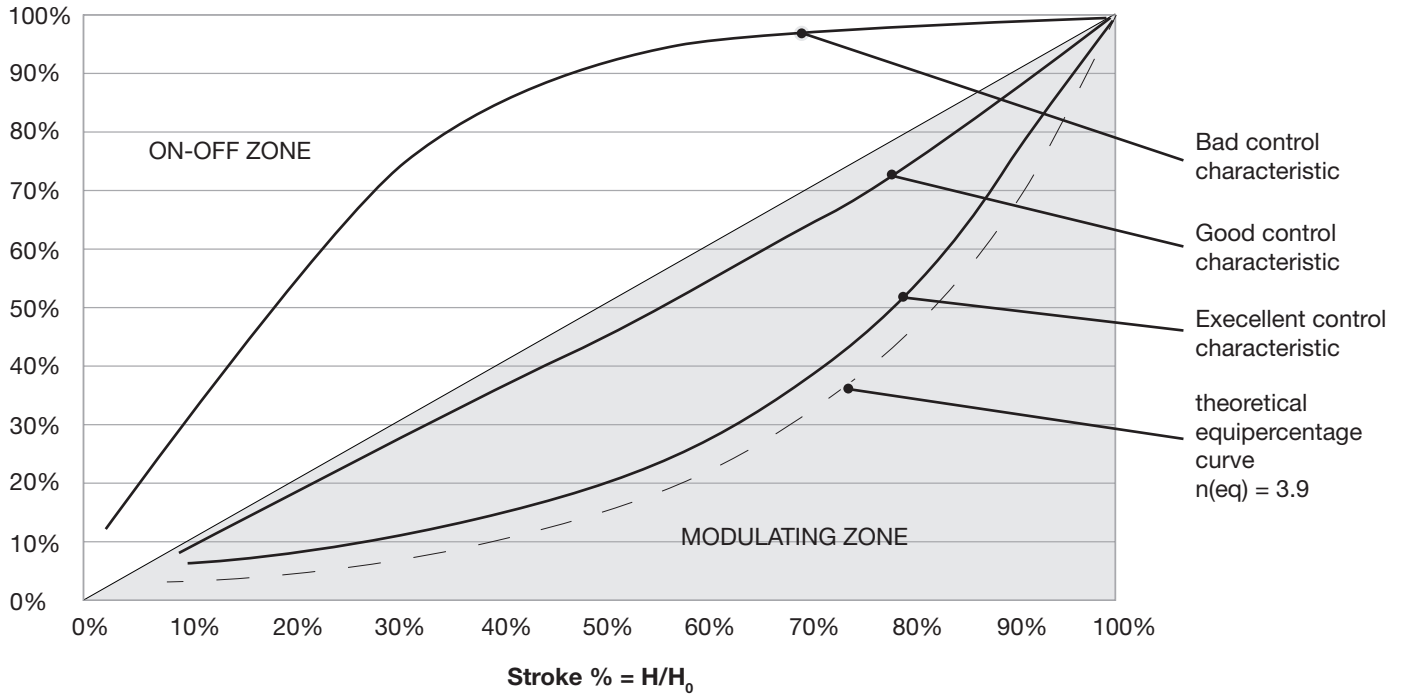


EN Control curves

Operating on the position of the regulating valve control stem A will modify the valve Kv, hence the flow rate. The relation between Kv and stroke is shown in the graph below.

Typical control valve characteristic curves.*

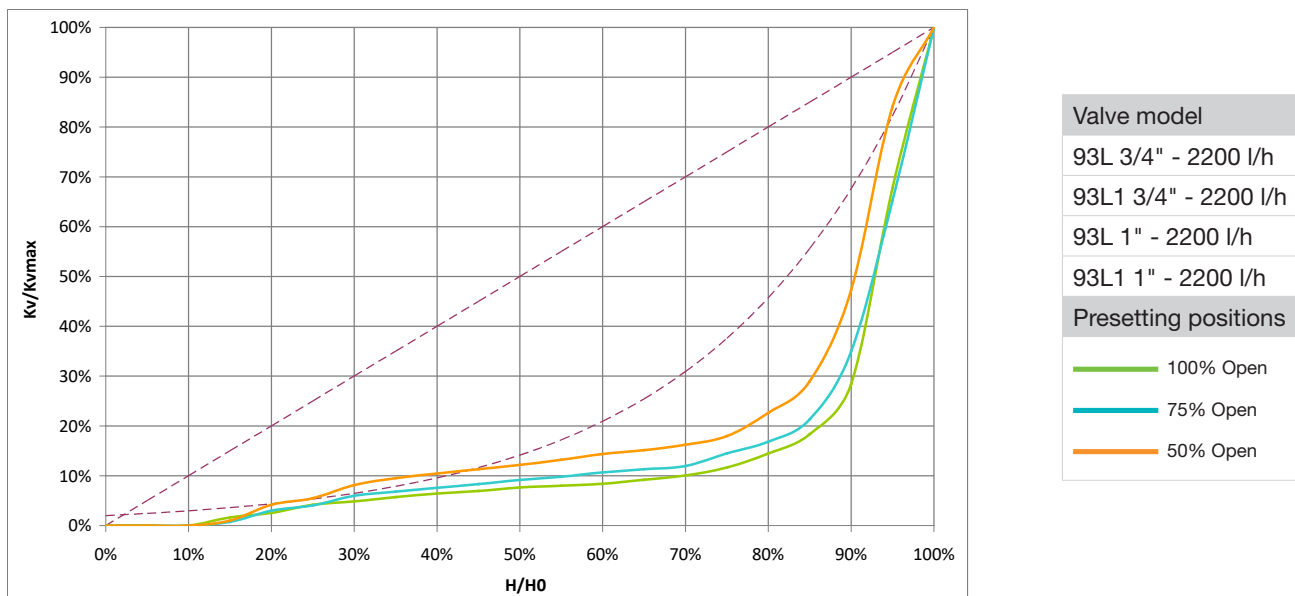
$$K_v \% = K_v / K_{vmax}$$

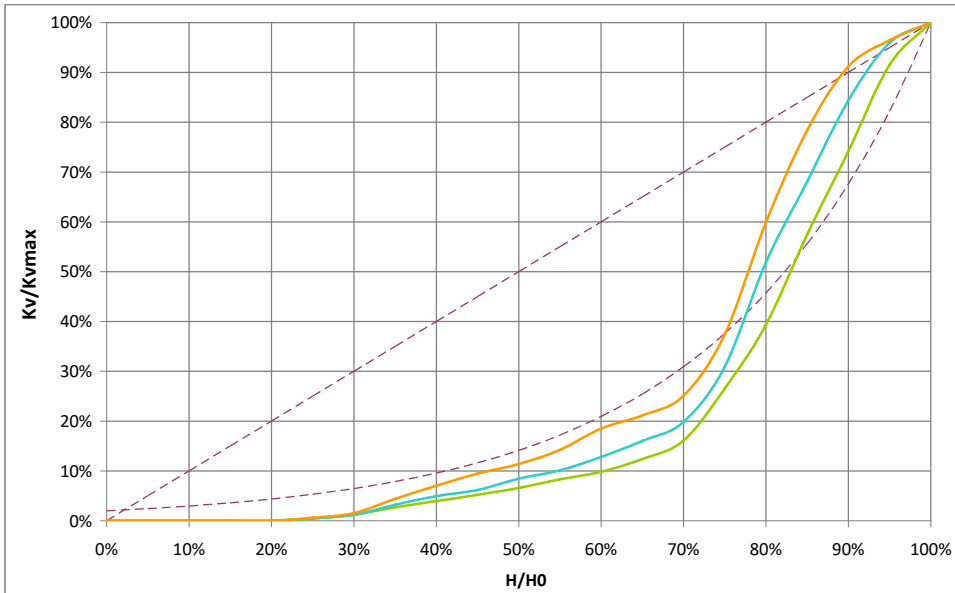


Combining the **EvoPICV** valve characteristic with heat exchanger results in a linear control system.

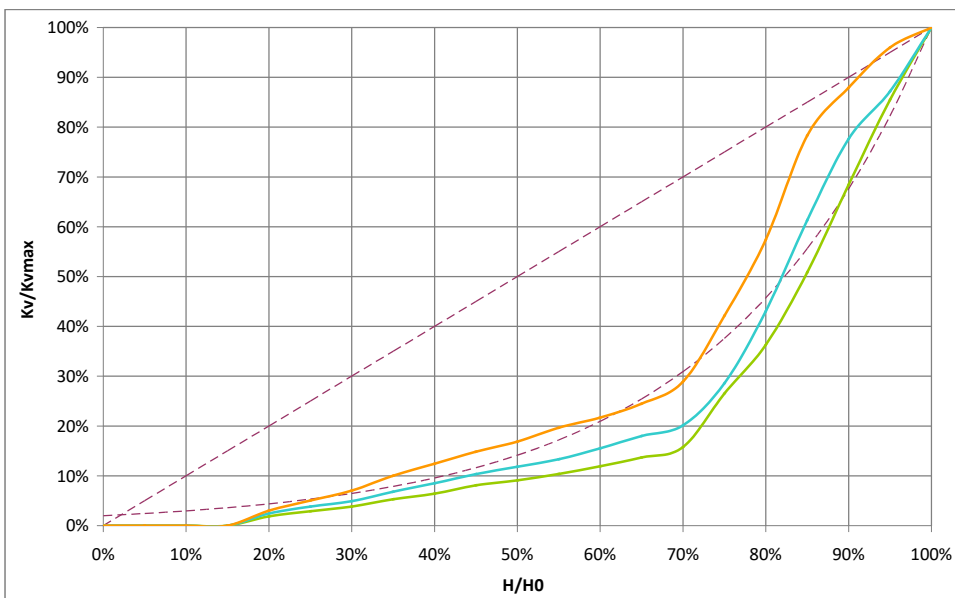
In the next page control curves of 93 and 93-1 are shown.

* Control curve characteristic may change according to valve version.





| Valve model | |
|------------------------|----------|
| 93H 3/4" - 2700 l/h | |
| 93H1 3/4" - 2700 l/h | |
| 93H 1" - 2700 l/h | |
| 93H1 1" - 2700 l/h | |
| 93L 1 1/4" - 2700 l/h | |
| 93L1 1 1/4" - 2700 l/h | |
| Presetting positions | |
| 100% Open | 75% Open |
| 75% Open | 50% Open |



| Valve model | |
|------------------------|----------|
| 93H 1 1/4" - 3000 l/h | |
| 93H1 1 1/4" - 3000 l/h | |
| Presetting positions | |
| 100% Open | 75% Open |
| 75% Open | 50% Open |

- H: current lift (opening) of the control valve; H varies from 0 to H₀
- H₀: maximum lift of the control valve;
- K_v: valve flow factor at lift = H
- K_{vmax}: valve flow factor at lift = H₀

EN Actuators

The table below shows actuator part numbers for different control types.

| Type | Standard | Stroke | Adaptor |
|-----------------------------------|----------|----------------|---------|
| 24v, 0-10v Proportional | VA7483 | Self-detection | 0A748X* |
| 24v, 3 Point Floating | VA7481 | 6,3 mm | 0A748X* |
| 230v, 3 Point Floating | VA7481 | 6,3 mm | 0A748X* |
| 24v, 0-10v Proportional Thermic | A564P3 | 6,5 mm | VA64** |
| 24v, ON-OFF Thermic, 2 wires | A564O2 | 6,5 mm | VA64** |
| 230v, ON-OFF Thermic, 2 wires | A562O2 | 6,5 mm | VA64** |
| 24v, 0-10v Proportional Fail Safe | VA7484 | Self-detection | 0A748X* |

* Adaptor not included ** Adaptor included

Fratelli Pettinaroli is not liable for unauthorized use of actuator not shown in the table above. However, actuating force must not exceed 160 N. Available also VM060 (proportional electromechanical actuator with fail safe) with 76TE ring included.

EN Accessories



MDPS2

Digital differential manometer Bluetooth® for start-up test of PICV valves and flow rate measurement of Terminator balancing valves and Venturi devices. To be used with specific app installed on a smartphone.



MDP

Digital differential manometer differential pressure measurement.



INSULATING CASES

Insulating case for PICV. For heating and cooling installations.

093IHV: case for heating, closure by Velcro®. Size has to be specified.

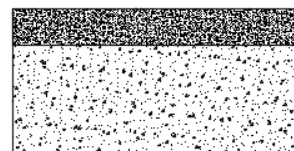
093IHB: case for heating, closure by double-sided tape. Size has to be specified.

093ICV: case for cooling, closure by Velcro®. Size has to be specified.

093ICB: case for cooling, closure by double-sided tape. Size has to be specified.

Cases for heating let the headwork and the actuator uncover whereas those for cooling cover the actuator too (all those in the range). Insulation sheel has a thin external layer made of 80 kg/m³ density polyetylene cross linked foam and a thicker internal layer made of 29 kg/m³ density polyetylene cross linked foam. Total thickness: 20 mm.

| Feature | Insulation case | |
|----------------------------------|-----------------|-----------|
| Density [kg/m ³] | 29 | 80 |
| Operating temperature range [°C] | -60 / +90 | -60 / +90 |
| Thermal conductivity [W/mK] | 0.040 | 0.049 |
| Thickness [mm] | 18 | 2 |



Cross section insulation sheel

EN Generals

Pettinaroli does not accept any liability for improper or wrong use of this product.

Always protect the pressure regulator by using strainers upstream of the valve and, in any case, make sure water quality complies with UNI 8065 standard. Fratelli Pettinaroli suggests to follow recommendations of VDI 2035/1 too. Maximum suggested content (total) content of Iron and Copper should be: Fe < 0.5 mg/kg and Cu < 0.1 mg/kg.

Furthermore, maximum iron oxide in the water passing through control valve (PICV) must not exceed 25 mg/Kg (25 ppm).

To ensure the main pipework is cleaned appropriately, flushing by-passes should be used without flushing through the pressure regulator of the PICV thereby preventing dirt that might clog the valve.

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