

# 91X / 91X/2 / 91X/3 / 91X3S



## 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.

## EN Valve features

The 91X 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 91X valve maintains design flow regardless of pressure changes in the system.
- it can easily be set up once installed, using the external setting ring.

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	3 mm	50÷100 IEC 60534-2-3	Class IV IEC 60534-4	± 5%

	91XVL 1/2"	91XL 1/2"	91XH 1/2"	91XVL/2 1/2"	91XL/2 1/2" & 3/4"	91XH/2 3/4"
<b>Flow rate max.</b>	150 l/h 0,042 l/s	600 l/h 0,167 l/s	900 l/h 0,250 l/s	150 l/h 0,042 l/s	600 l/h 0,167 l/s	900 l/h 0,250 l/s
<b>Start-up max.</b>	20 kPa 0,20 bar	25 kPa 0,25 bar	30 kPa 0,30 bar	20 kPa 0,20 bar	25 kPa 0,25 bar	30 kPa 0,30 bar
<b>Connections</b>	Rp 1/2" F EN 10226-1	Rp 1/2" F EN 10226-1	Rp 1/2" F EN 10226-1	G 1/2" M (flat) EN 10226-1	G 1/2" / 3/4" M (flat) EN 10226-1	G 3/4" M (flat) EN 10226-1

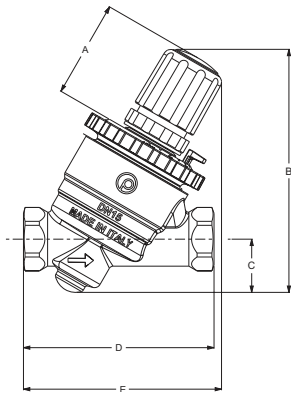
	91XVL/3 1/2" x 1/2"	91XL/3 1/2" x 1/2"	91XH/3 1/2" x 1/2"	91XVL3S 1/2" F x 3/4" M	91XL3S 1/2" F x 3/4" M	91XH3S 1/2" F x 3/4" M
<b>Portata max.</b>	150 l/h 0,042 l/s	600 l/h 0,167 l/s	900 l/h 0,250 l/s	150 l/h 0,042 l/s	600 l/h 0,167 l/s	900 l/h 0,250 l/s
<b>Start-up max.</b>	20 kPa 0,20 bar	25 kPa 0,25 bar	30 kPa 0,30 bar	20 kPa 0,20 bar	25 kPa 0,25 bar	30 kPa 0,30 bar
<b>Conessioni</b>	1/2" F x 1/2" union M EN 10226-1	1/2" F x 1/2" union M EN 10226-1	1/2" F x 1/2" union M EN 10226-1	1/2" F x 3/4" M BS5200 60° EN 10226-1	1/2" F x 3/4" M BS5200 60° EN 10226-1	1/2" F x 3/4" M BS5200 60° EN 10226-1

\* Closed by actuator

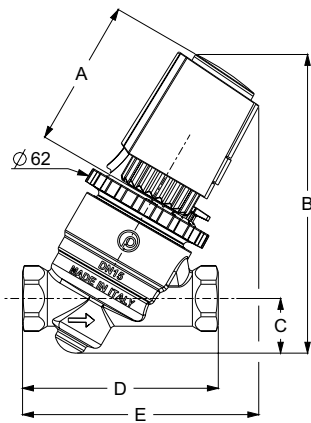
\*\* at 100%. For other presetting and differential pressure, refer to "Flow setting accuracy" on the PICV manual.



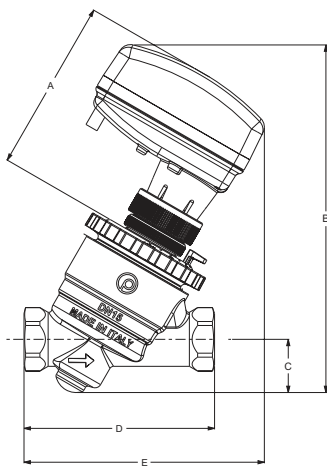
EN Dimensional data



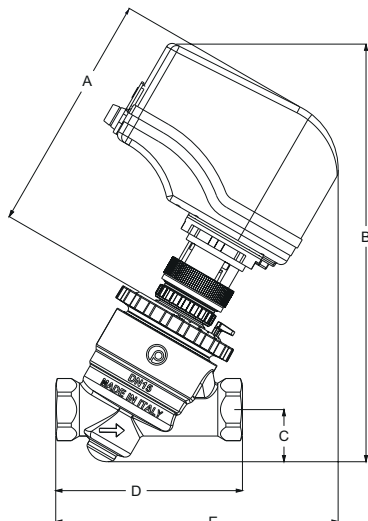
Manual valve						
Art.	Portata [ l/h ]	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)
91XVL 1/2"	150	47	115	25	90	93.5
91XL 1/2"	600	47	115	25	90	93.5
91XH 1/2"	900	47	115	25	90	93.5



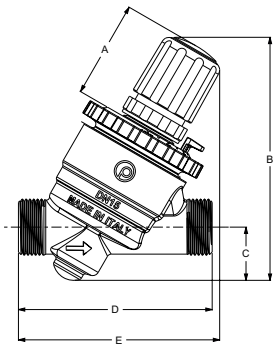
Valve with thermo-electric actuator						
Art.	Portata [ l/h ]	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)
91XVL 1/2"	150	68	137,5	25	90	109
91XL 1/2"	600	68	137,5	25	90	109
91XH 1/2"	900	68	137,5	25	90	109



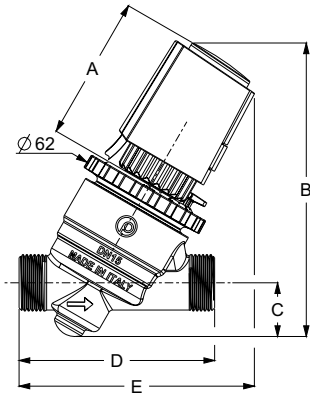
Valve with electromotive actuator						
Art.	Portata [ l/h ]	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)
91XVL 1/2"	150	82	164	25	90	114
91XL 1/2"	600	82	164	25	90	114
91XH 1/2"	900	82	164	25	90	114



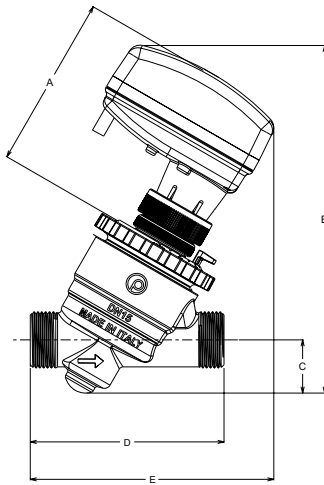
Valve with VM060						
Art.	Portata [ l/h ]	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)
91XVL 1/2"	150	116	201	25	90	136
91XL 1/2"	600	116	201	25	90	136
91XH 1/2"	900	116	201	25	90	136



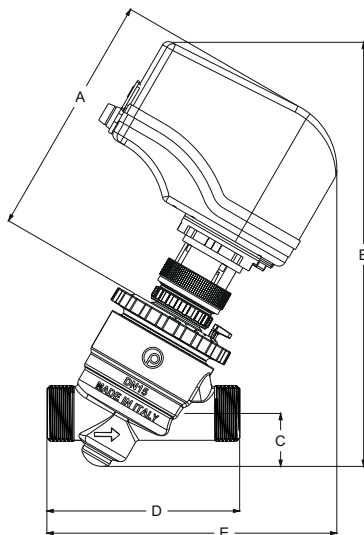
Manual valve						
Art.	Portata [ l/h ]	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)
91XVL/2 1/2"	150	47	115	25	91.5	95
91XL/2 1/2"	600	47	115	25	91.5	95
91XL/2 3/4"	600	47	115	25	91.5	95
91XH/2 3/4"	900	47	115	25	91.5	95



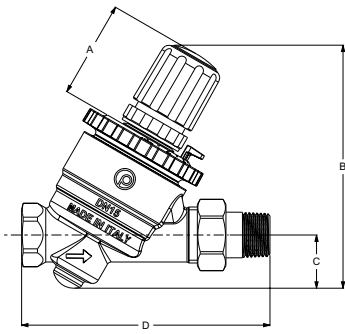
Valve with thermo-electric actuator						
Art.	Portata [ l/h ]	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)
91XVL/2 1/2"	150	68	137,5	25	91.5	110
91XL/2 1/2"	600	68	137,5	25	91.5	110
91XL/2 3/4"	600	68	137,5	25	91.5	110
91XH/2 3/4"	900	68	137,5	25	91.5	110



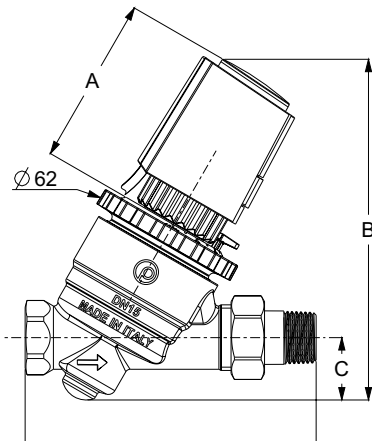
Valve with electromotive actuator						
Art.	Portata [ l/h ]	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)
91XVL/2 1/2"	150	82	164	25	91.5	115
91XL/2 1/2"	600	82	164	25	91.5	115
91XL/2 3/4"	600	82	164	25	91.5	115
91XH/2 3/4"	900	82	164	25	91.5	115



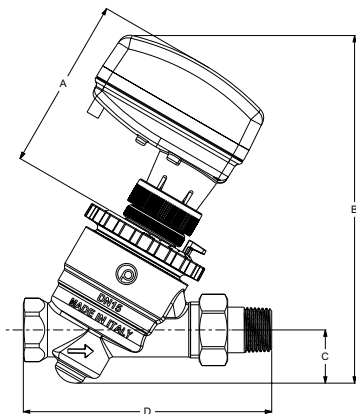
Valve with VM060						
Art.	Portata [ l/h ]	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)
91XVL/2 1/2"	150	116	201	25	91.5	137
91XL/2 1/2"	600	116	201	25	91.5	137
91XL/2 3/4"	600	116	201	25	91.5	137
91XH/2 3/4"	900	116	201	25	91.5	137



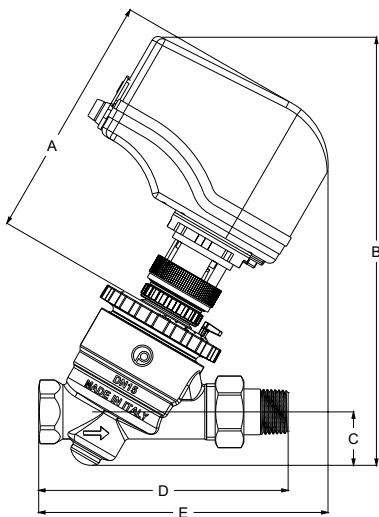
Manual valve					
Art.	Portata [ l/h ]	A (mm)	B (mm)	C (mm)	D (mm)
91XVL/3 1/2"	150	46	115	25	117
91XL/3 1/2"	600	46	115	25	117
91XH/3 1/2"	900	46	115	25	117



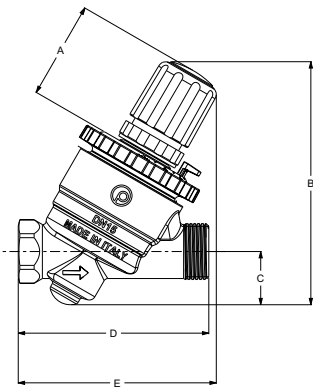
Valve with thermo-electric actuator					
Art.	Portata [ l/h ]	A (mm)	B (mm)	C (mm)	D (mm)
91XVL/3 1/2"	150	68	137,5	25	117
91XL/3 1/2"	600	68	137,5	25	117
91XH/3 1/2"	900	68	137,5	25	117



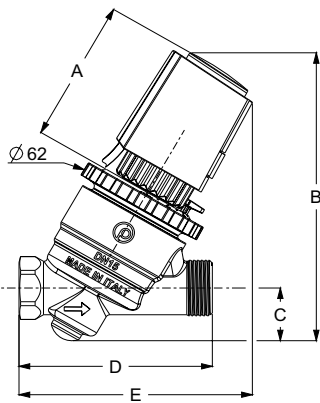
Valve with electromotive actuator					
Art.	Portata [ l/h ]	A (mm)	B (mm)	C (mm)	D (mm)
91XVL/3 1/2"	150	82	164	25	117
91XL/3 1/2"	600	82	164	25	117
91XH/3 1/2"	900	82	164	25	117



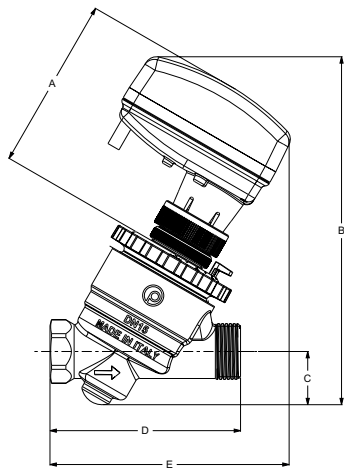
Valve with VM060						
Art.	Portata [ l/h ]	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)
91XVL/3 1/2"	150	116	201	25	117	136
91XL/3 1/2"	600	116	201	25	117	136
91XH/3 1/2"	900	116	201	25	117	136



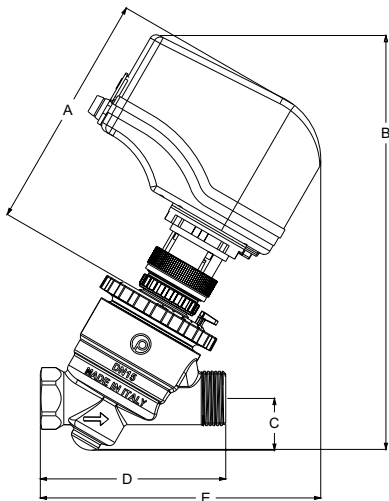
Manual valve						
Art.	Portata [ l/h ]	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)
91XVL3S 1/2"	150	47	115	25	90	93.5
91XL3S 1/2"	600	47	115	25	90	93.5
91XH3S 1/2"	900	47	115	25	90	93.5



Valve with thermo-electric actuator						
Art.	Portata [ l/h ]	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)
91XVL3S 1/2"	150	68	137,5	25	90	109
91XL3S 1/2"	600	68	137,5	25	90	109
91XH3S 1/2"	900	68	137,5	25	90	109



Valve with electromotive actuator						
Art.	Portata [ l/h ]	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)
91XVL3S 1/2"	150	82	164	25	90	114
91XL3S 1/2"	600	82	164	25	90	114
91XH3S 1/2"	900	82	164	25	90	114



Valve with VM060						
Art.	Portata [ l/h ]	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)
91XVL3S 1/2"	150	82	201	25	90	136
91XL3S 1/2"	600	82	201	25	90	136
91XH3S 1/2"	900	82	201	25	90	136

EN Materials and weight



Material list	
Regulating valve	Brass CW614N Stainless steel 18/8
Diaphragm	High resistance polymer - EPDM Stainless steel AISI 303
Presetting	High resistance polymer Brass CW614N
Body	Brass CW617N
Gaskets	EPDM-x

Art.	Weight (kg)
91XVL 1/2"	0,77
91XL 1/2"	0,77
91XH 1/2"	0,77

Art.	Weight (kg)
91XVL/2 1/2"	0,76
91XL/2 1/2"	0,76
91XL/2 3/4"	0,76
91XH/2 1/2"	0,76

Art.	Weight (kg)
91XVL/3 1/2"	0,84
91XL/3 1/2"	0,84
91XH/3 1/2"	0,84

Art.	Weight (kg)
91XVL3S 1/2"	0,77
91XL3S 1/2"	0,77
91XH3S 1/2"	0,77

**EN Installation and maintenance EvoPICV 91X / 91X/2 / 91X/3 / 91X3S**

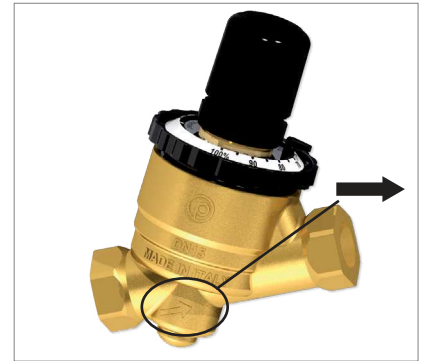
**1. Use conditions**

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:

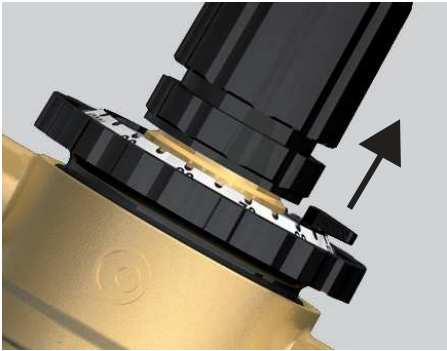
	91XVL 1/2"	91XL 1/2"	91XH 1/2"	
	91XVL/2 1/2"	91XL/2 1/2"	91XH/2 3/4"	91XL/2 3/4"
	91XVL/3 1/2"	91XL/3 1/2"	91XH/3 1/2"	
	91XVL3S 1/2"	91XL3S 1/2"	91XH3S 1/2"	
<b>ΔP Start-up</b>	20 kPa 0,20 bar	25 kPa 0,25 bar	30 kPa 0,30 bar	25 kPa 0,25 bar



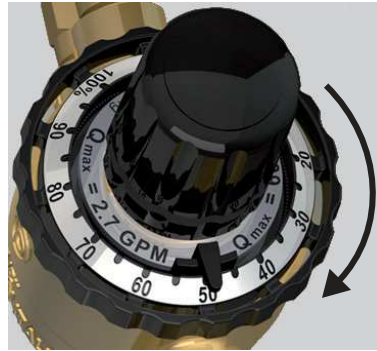
Medium
Water / Water+glycol 30%

**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



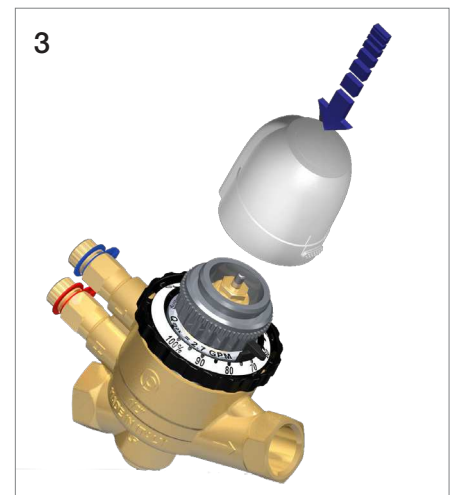
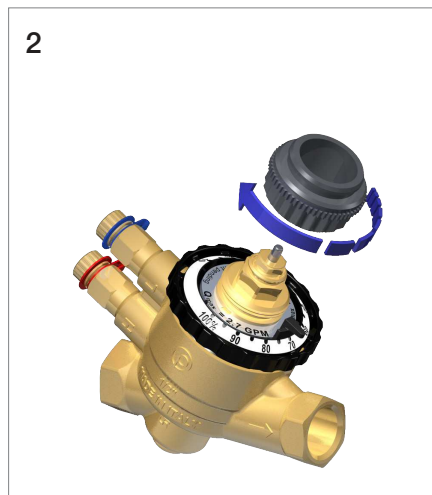
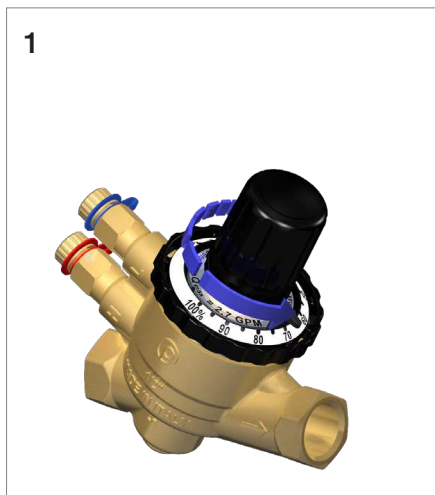
Press the lock pin to lock the selector in the final position

**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**

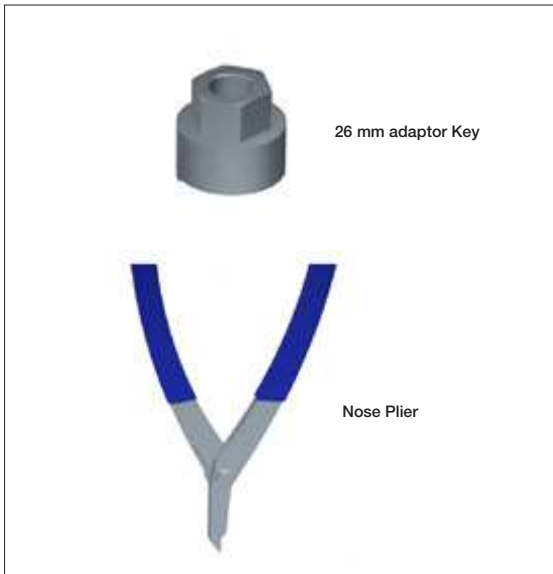
The valve can be equipped with a series of thermal-electric or electro-mechanical actuators, according to the requirements of the system. Actuators come along with an adaptor for proper mounting on the valve and for proper functioning of the whole device.



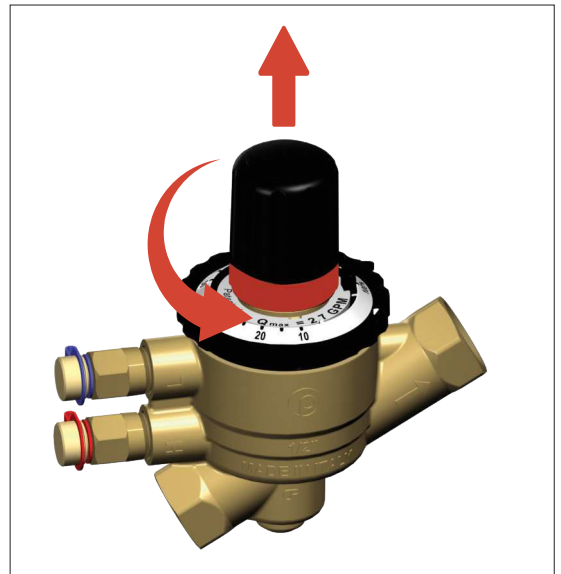
6. Replacement of the diaphragm of EVOPICV valve - 091SET maintenance kit

For further information please refer to instruction 208 - 091SET

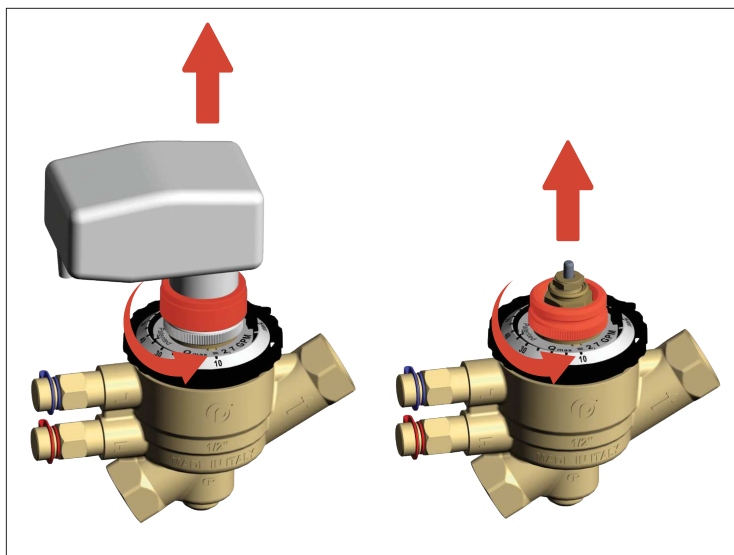
091SET maintenance kit



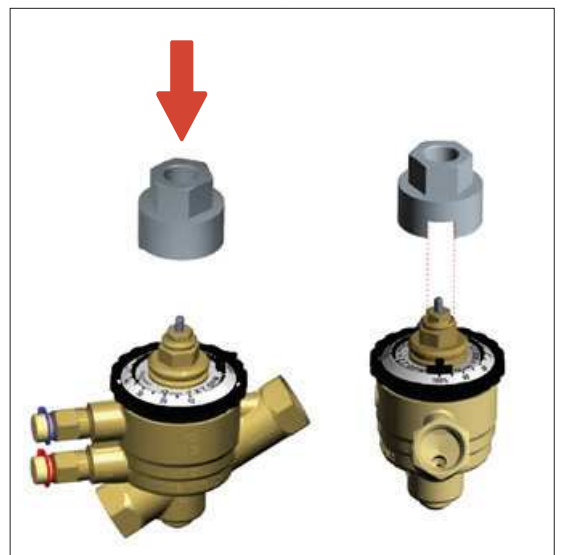
Step 1: remove completely the knob



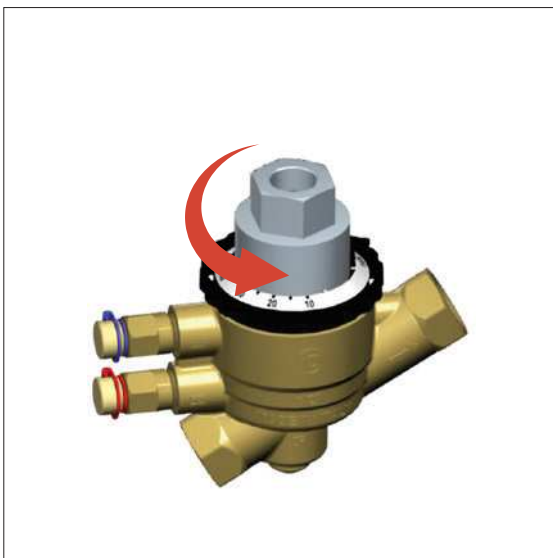
Step 1a: remove the actuator and the adapter.



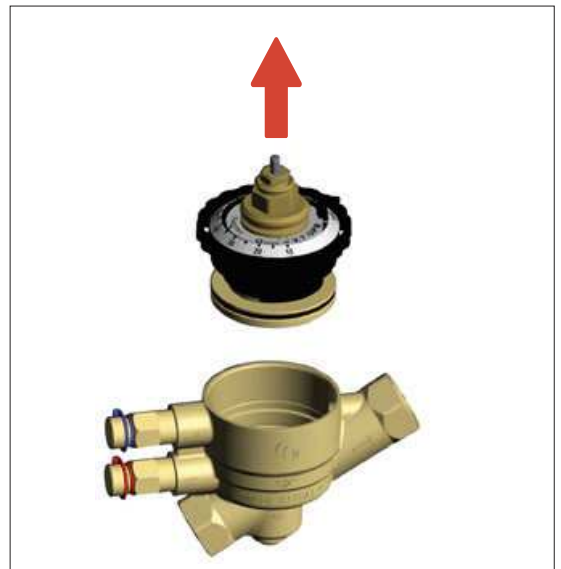
Step 2: using the 26mm adaptor key provided to remove the headwork. Align latches.



Step 3: using a 26mm spanner unscrew the headwork.



Step 4: remove the headwork.



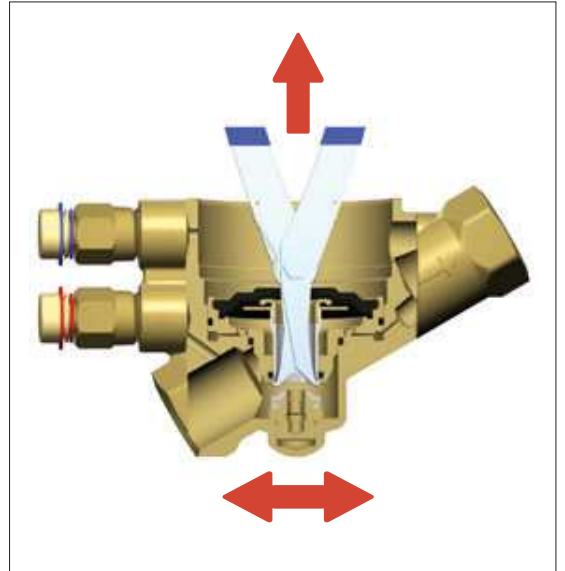


## TECHNICAL SPECIFICATION

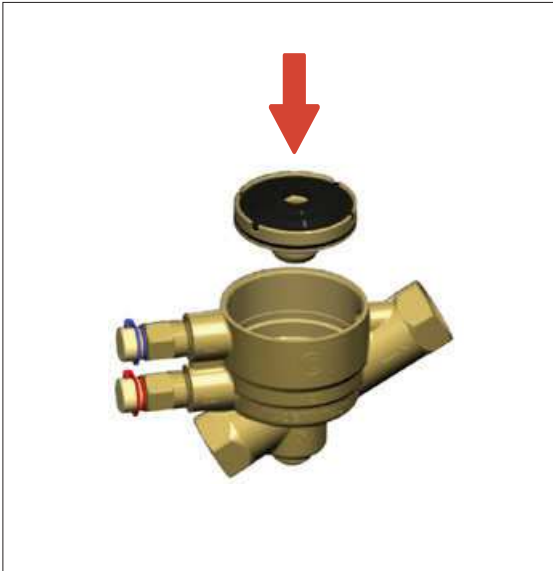
Step 5: Insert the nose pliers through the center of the diaphragm



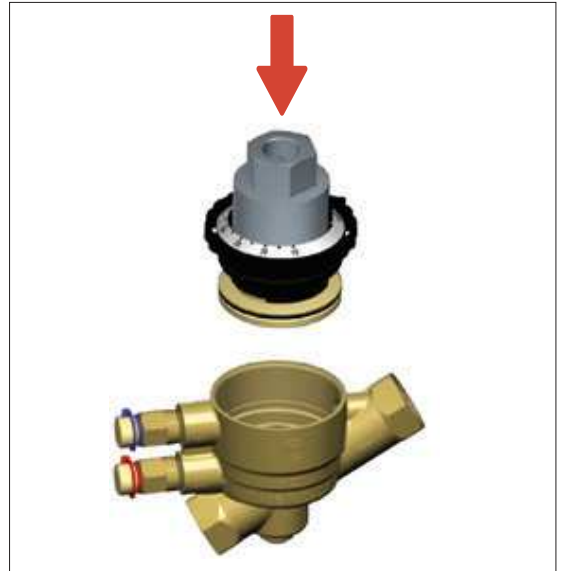
Step 6: open the plier and pull the diaphragm up out of the body



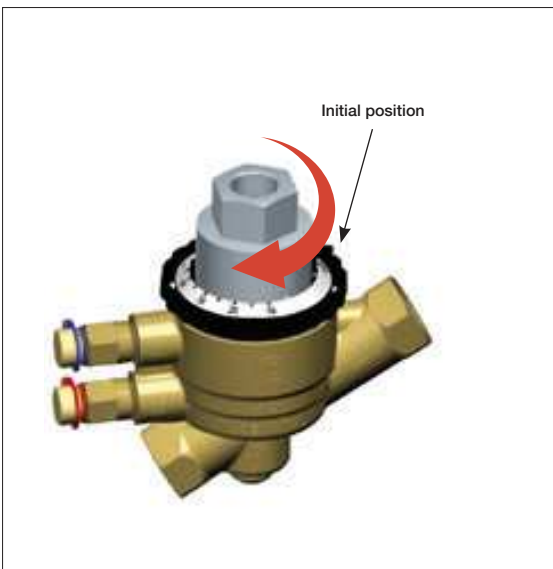
Step 7: Insert the new diaphragm 091D



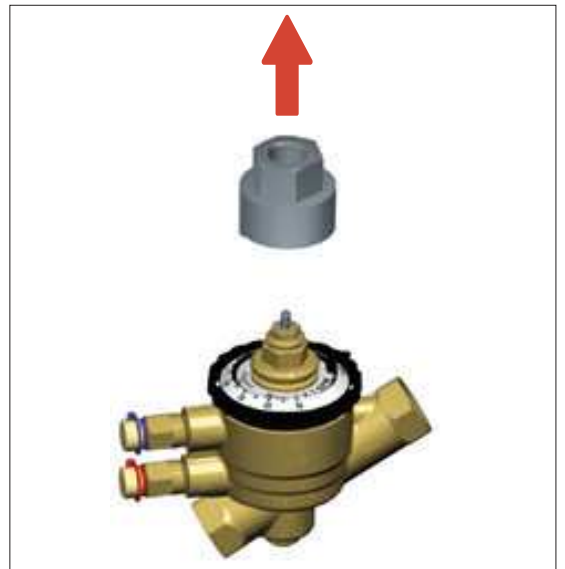
Step 8: Replace the headwork



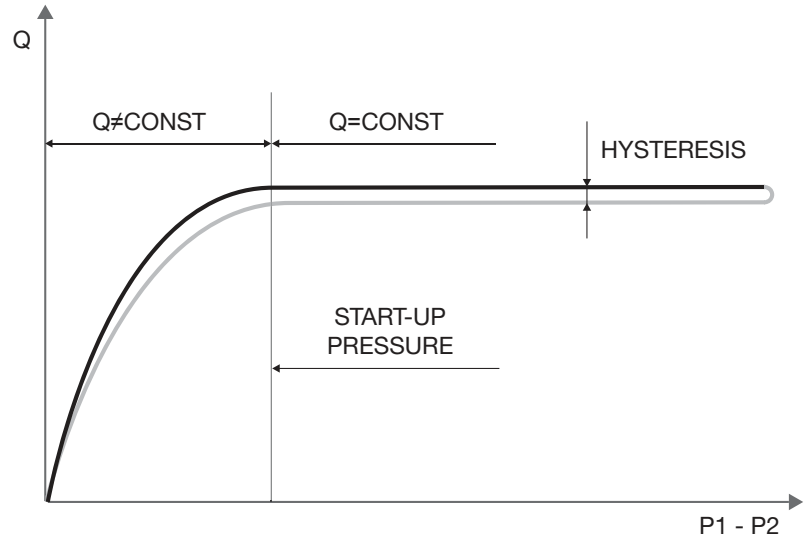
Step 9: Screw the headwork with 15/20 Nm torque reaching the initial position of the lock pin



Step 10: remove the 26 mm adapter key and replace the actuator a adapter



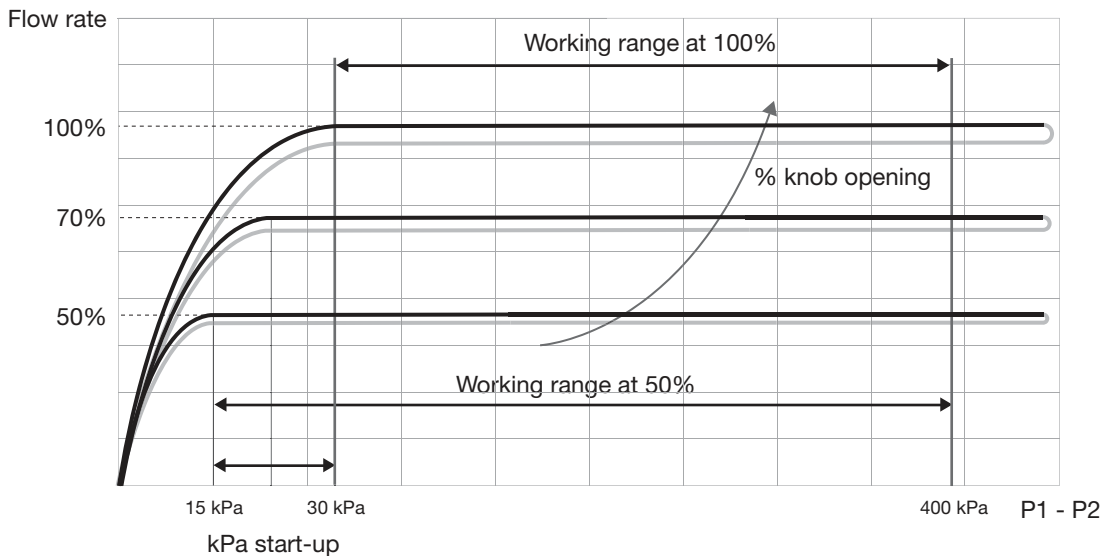
# EN Start-up curves and presetting



The example above shows a characteristic 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  $\Delta P$  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:

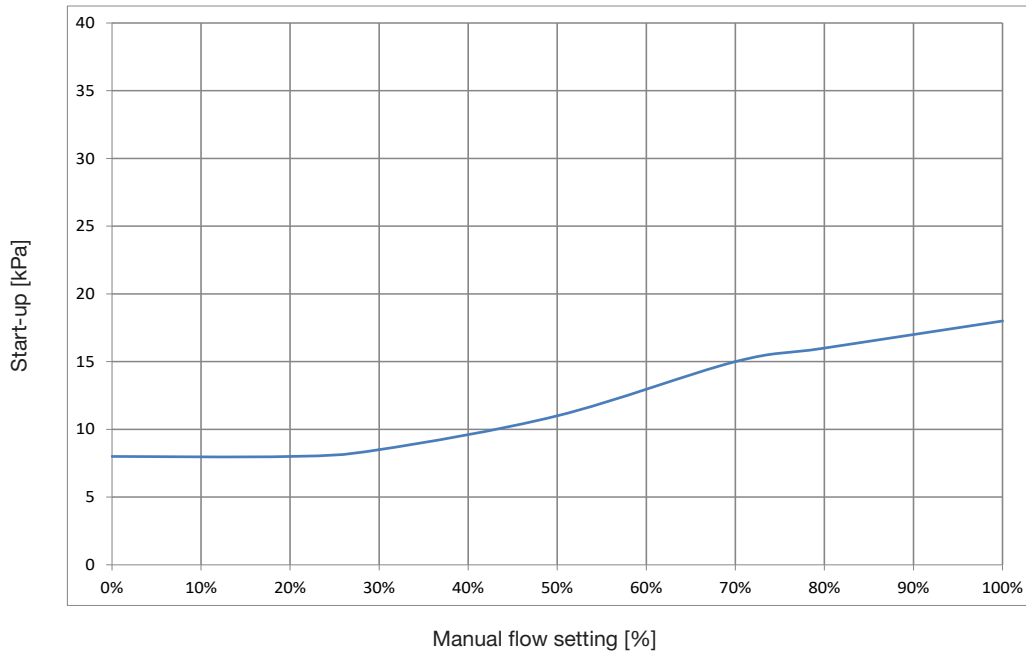


When the valve is set at 100% of nominal (maximum) flow, the curve begins to remain constant at 30 kPa, therefore the working range of the valve is  $30 \div 400$  kPa;

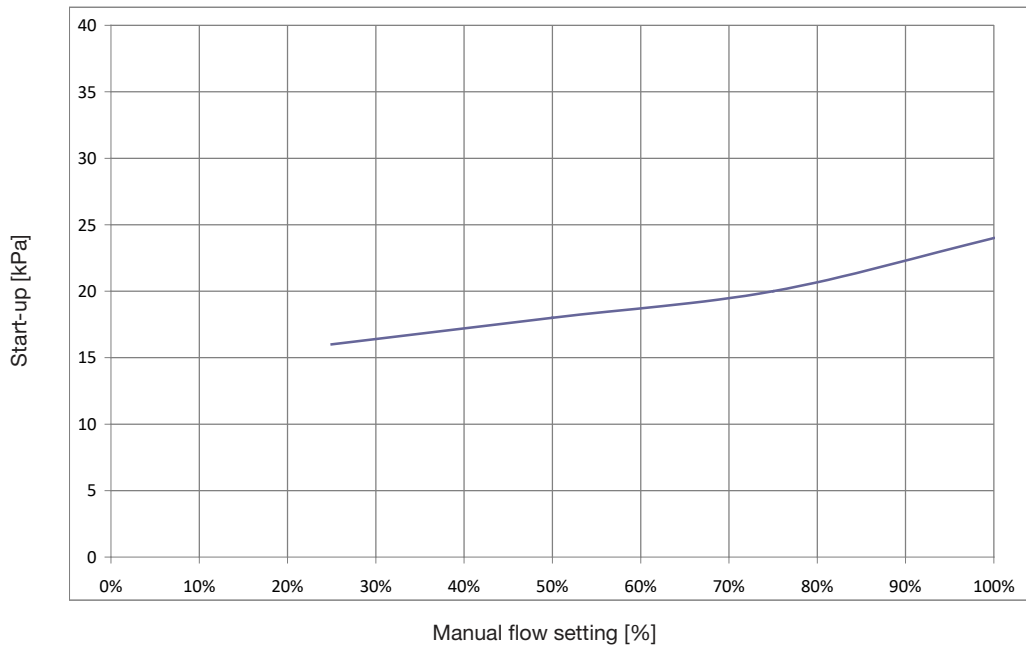
When the valve is set at 50% of nominal flow, the curve begins to remain constant at 15 kPa, therefore the working range of the valve is  $15 \div 400$  kPa.

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

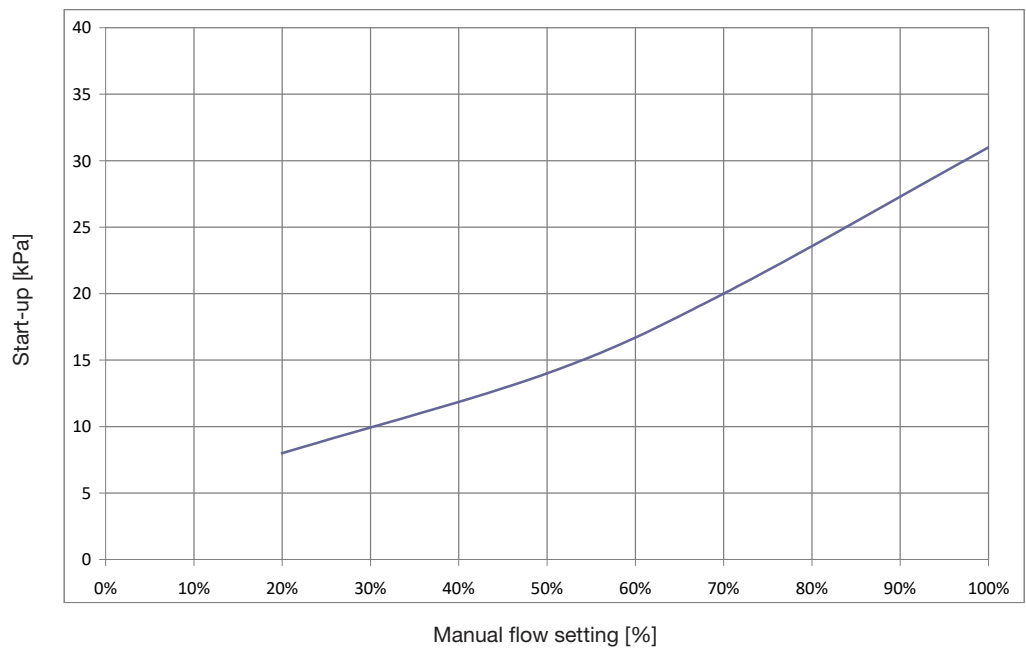




Valve model
91XVL 1/2" - 150 l/h
91XVL/2 1/2" - 150 l/h
91XVL/3 1/2" - 150 l/h
91XVL3S 1/2" - 150 l/h



Valve model
91XL 1/2" - 600 l/h
91XL/2 1/2" - 600 l/h
91XL/3 1/2" - 600 l/h
91XL3S 1/2" - 600 l/h
91XL/2 3/4" - 600 l/h



Valve model
91XH 1/2" - 900 l/h
91XH/2 3/4" - 900 l/h
91XH/3 1/2" - 900 l/h
91XH3S 1/2" - 900 l/h



**Flow pre-setting 91X / 91X/2 / 91X/3 / 91X3S EvoPICV**

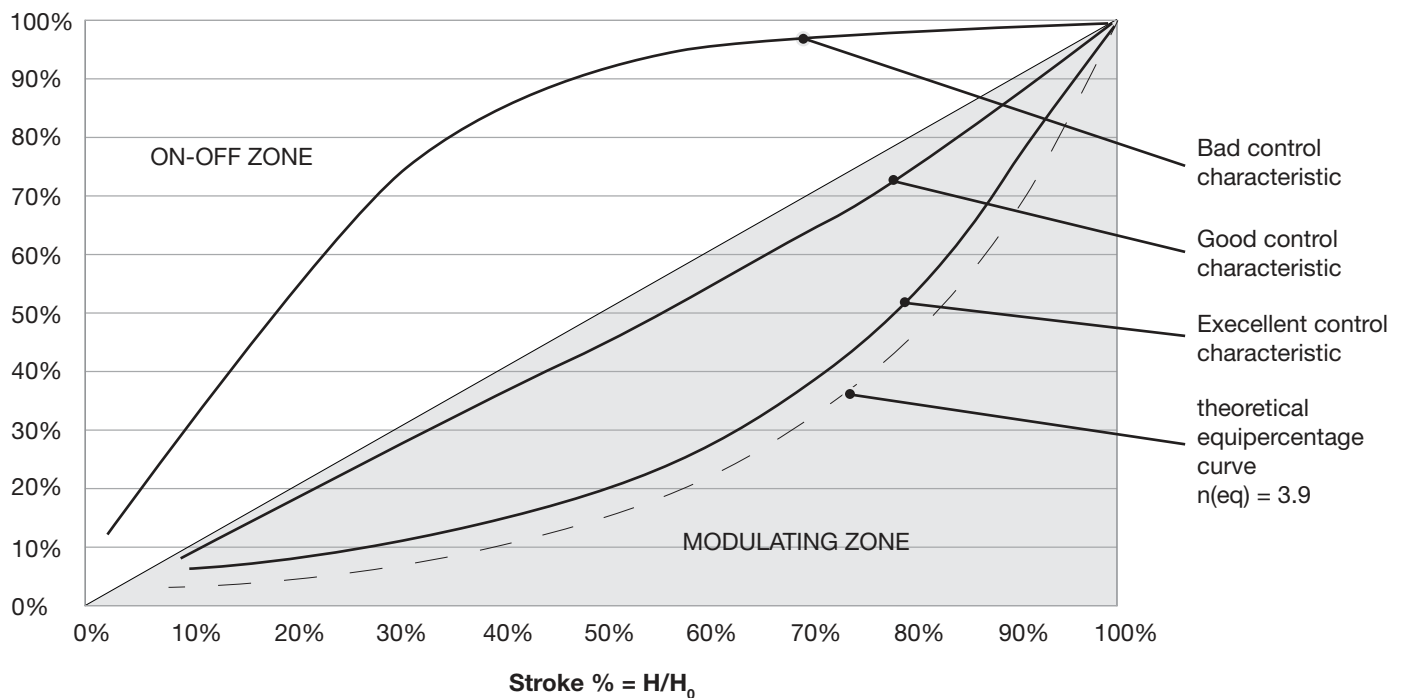
Presetting %	91XVL - 91XVL/2 91XVL/3 - 91XVL3S 1/2"		91XL - 91XL/2 - 91XL/3 91XL3S 1/2" - 91XL/2 3/4"		91XH - 91XH/3 91XH3S 1/2" - 91XH/2 3/4"	
	Flow rate		Flow rate		Flow rate	
	l/h	l/s	l/h	l/s	l/h	l/s
100	150	0,042	600	0,167	900	0,250
90	135	0,038	540	0,150	810	0,225
80	120	0,033	480	0,133	720	0,200
70	105	0,029	420	0,117	630	0,175
60	90	0,025	360	0,100	540	0,150
50	75	0,021	300	0,083	450	0,125
40	60	0,017	240	0,067	360	0,100
30	45	0,013	180	0,050	270	0,075
20	30	0,008	120	0,033	180	0,050
10	15	0,004	60	0,017	90	0,025

**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.\*

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

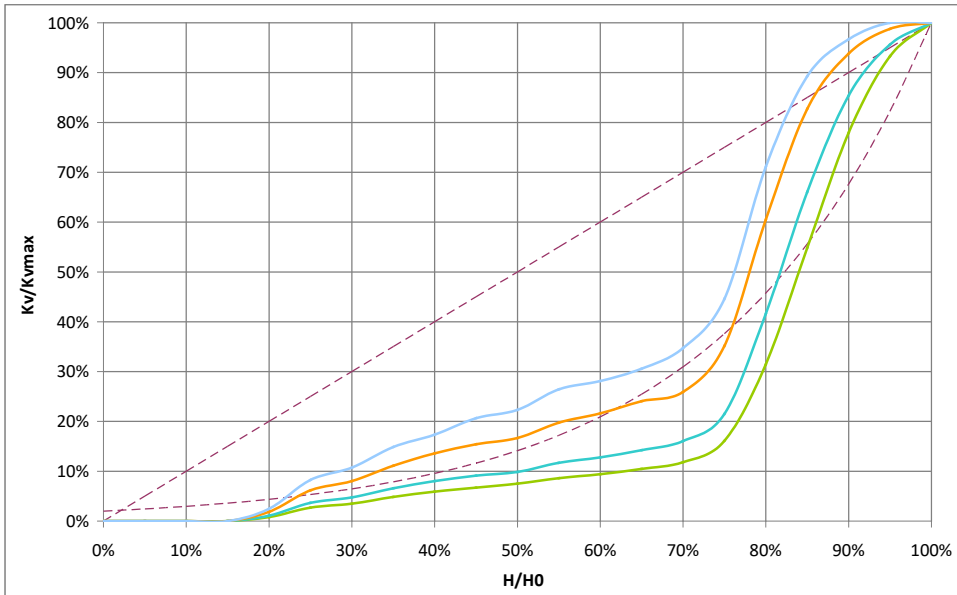


Combining the **EvoPICV** valve characteristic with heat exchanger results in a linear control system.

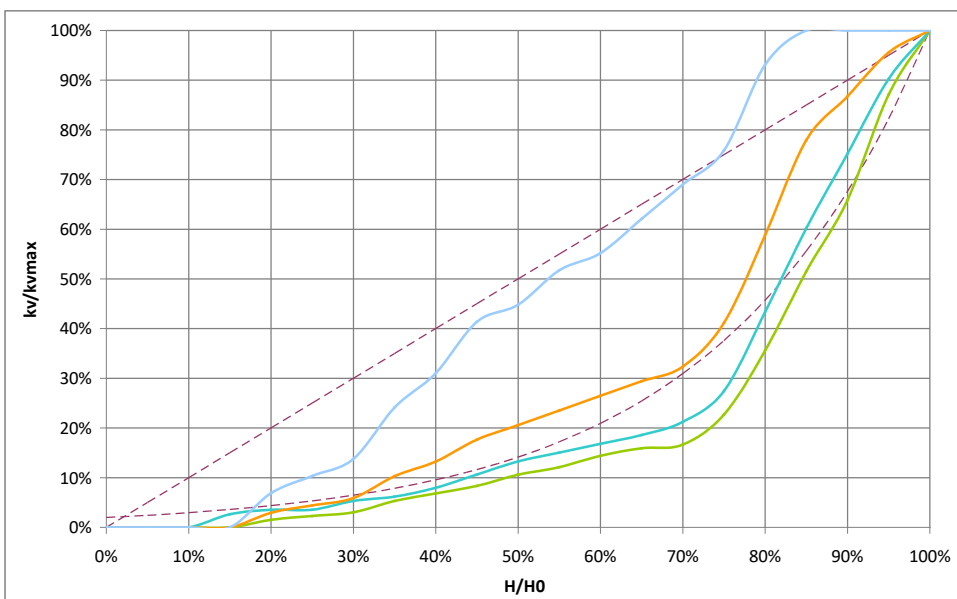
In the next page control curves of 91 and 91-1 are shown.

\* Control curve characteristic may change according to valve version.

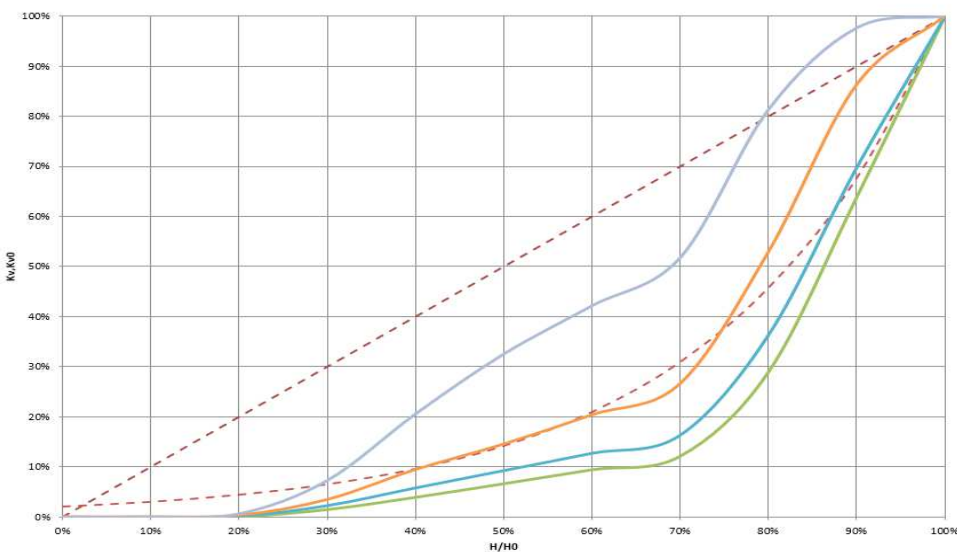




Valve model	
91XVL 1/2" - 150 l/h	
91XVL/2 1/2" - 150 l/h	
91XVL/3 1/2" - 150 l/h	
91XVL3S 1/2" - 150 l/h	
Presetting positions	
<span style="color: green;">—</span>	100% Open
<span style="color: teal;">—</span>	75% Open
<span style="color: orange;">—</span>	50% Open
<span style="color: blue;">—</span>	25% Open



Valve model	
91XL 1/2" - 600 l/h	
91XL/2 1/2" - 600 l/h	
91XL/3 1/2" - 600 l/h	
91XL3S 1/2" - 600 l/h	
91XL/2 3/4" - 600 l/h	
Presetting positions	
<span style="color: green;">—</span>	100% Open
<span style="color: teal;">—</span>	75% Open
<span style="color: orange;">—</span>	50% Open
<span style="color: blue;">—</span>	25% Open



Valve model	
91XH 1/2" - 900 l/h	
91XH/2 3/4" - 900 l/h	
91XH/3 1/2" - 900 l/h	
91XH3S 1/2" - 900 l/h	
Presetting positions	
<span style="color: green;">—</span>	100% Open
<span style="color: teal;">—</span>	75% Open
<span style="color: orange;">—</span>	50% Open

- H: current lift (opening) of the control valve; H varies from 0 to  $H_0$
- $H_0$ : maximum lift of the control valve;
- $K_v$ : valve flow factor at lift = H
- $K_{vmax}$ : valve flow factor at lift =  $H_0$



## EN Actuators

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

Type	Standard	Stroke	Adaptor
24v, 0-10v Proportional	VA7483	Self-detection	0A7010*
24v, 3 Point Floating	VA7481	6,3 mm	0A7010*
230v, 3 Point Floating	VA7481	6,3 mm	0A7010*
24v, 0-10v Proportional Thermic	A544P3	4 mm	VA64**
24v, ON-OFF Thermic, 2 wires	A544O2	4 mm	VA64**
24v, ON-OFF Thermic, 4 wires	A544O4	4 mm	VA64**
230v, ON-OFF Thermic, 2 wires	A542O2	4 mm	VA64**
230v, ON-OFF Thermic, 4 wires	A542O4	4 mm	VA64**
24v, 0-10v Proportional Fail Safe	VA7484	Self-detection	0A7010*

\* 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



### 091SETP

Kit for diaphragm replacement of EvoPICV 91X / 91X/2 / 91X/3 / 91X3S valves.



### INSULATING CASES

Class 1 fire rated insulating case for PICV. For heating and cooling installations.

**091XIHV:** case for heating, closure by Velcro®. Size has to be specified.

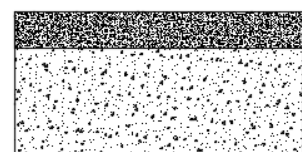
**091XIHB:** case for heating, closure by double-sided tape. Size has to be specified.

**091XICV:** case for cooling, closure by Velcro®. Size has to be specified.

**091XICB:** 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/m<sup>3</sup> density polyethylene cross linked foam and a thicker internal layer made of 29 kg/m<sup>3</sup> density polyethylene cross linked foam. Total thickness: 20 mm.

Feature	Insulation case	
Density [kg/m <sup>3</sup> ]	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.

\*The product color may be different with the actual product color due to printing procedure. \*The appearance and specifications may change with no prior notice for improvement.

\*The data and photo should not be used without permission of the copyright holder.