92

Patent US9910447B2
Patent IT1428884
Patent EP3067772B1

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 with the operating limits of the valve. Beyond these working pressures the valve acts as a fixed orifice. Thanks to the new diaphgram cartrige technology, the valve can work also with very dirty water.
Making this orifice adjustable allows the valve to be pre-set and deliver a range of flow rates (unlike automatic balancing valves). The presetting gear can b easily adjusted. It works varying the control valve stroke.
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 linear 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 92 series PICV valve offers the following functions:

- Good valve authority to maintain temperature control and power output from the terminal unit.
- Maximum design flow limitation: once set, the 92 valve maintains design flow regardless of pressure changes in the system.
- it can easily be set up once installed, using the setting ring (with no actuator on).
- 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.
- DPCV dirt-free.
- Fast and easy maintenace: internal element (control valve and DPCV) can be easily removed, replaced or cleaned.

ΔP max.	Temperature	Working pressure max.	Stroke (max)	Rangeability	Leakage	Accuracy 0 ÷ 1 bar*
600 kPa / 6 bar	-10 ÷ 120 °C	2500 kPa / 25 bar	DN15-20 3 mm DN25 6 mm	50÷100 IEC 60534-2-3	Class IV IEC 60534-4	± 5%

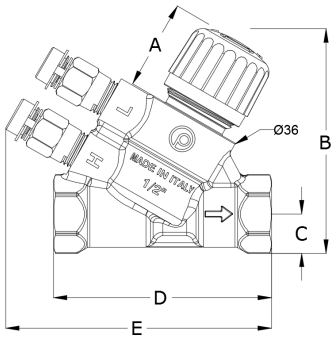
	92VL ½”	92L ½”	92H ½”	92L ¾”	92H ¾”	92L 1”	92H 1”
Flow rate max.	150 l/h 0,042 l/s	450 l/h 0,125 l/s	850 l/h 0.236 l/s	1000 l/h 0,277 l/s	1850 l/h 0,514 l/s	2500 l/h 0,694 l/s	3300 l/h 0,917 l/s
Start-up max.	25 kPa 0,25 bar	35 kPa 0,35 bar	25 kPa 0,25 bar	30 kPa 0,30 bar	35 kPa 0,35 bar	30 kPa 0,30 bar	30 kPa 0,30 bar
Connections	Rp ½" F EN 10226-1	Rp ½" F EN 10226-1	Rp ½" F EN 10226-1	Rp ¾" F EN 10226-1	Rp ¾" F EN 10226-1	Rp 1" UnionF EN 10226-1	Rp 1" UnionF EN 10226-1
Close off pressure**	600 kPa 6 bar	600 kPa 6 bar	600 kPa 6 bar	600 kPa 6 bar	600 kPa 6 bar^	600 kPa 6 bar	600 kPa 6 bar

* at pos. 9. For different presettings and delta P, please refers to the graph in Flow setting accuracy section.

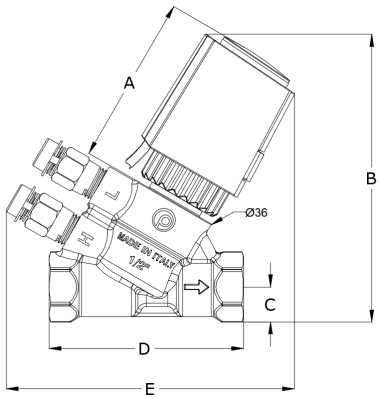
** Closed by electromechanical actuator

^ 300 kPa / 3 bar ith thermoelectrical actuators series A5

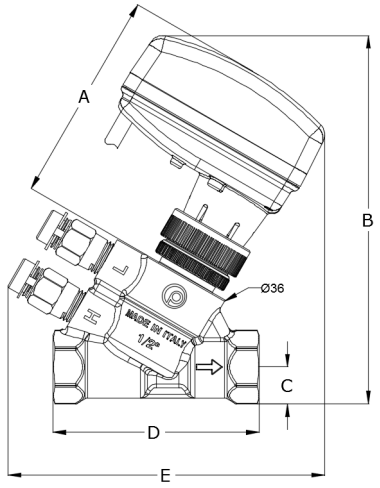
EN Dimensional data



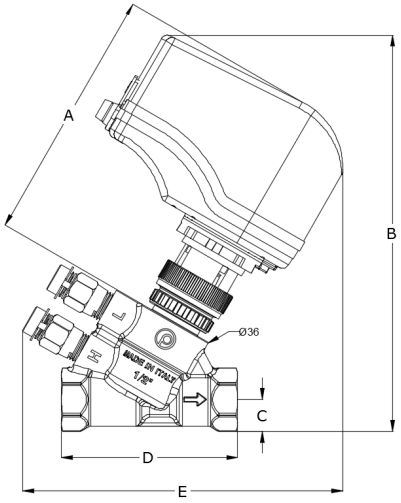
Manual valve						
Art.	**Flow rate [l/h]**	**A (mm)**	**B (mm)**	**C (mm)**	**D (mm)**	**E (mm)**
92VL ½"	150	33	83	14.5	80.5	98
92L ½"	450	33	83	14.5	80.5	98



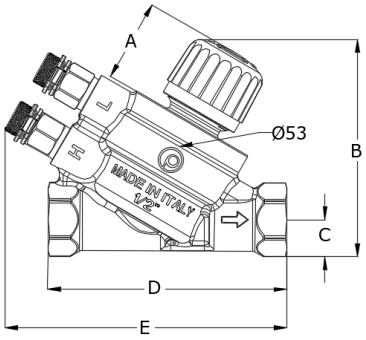
Valve with thermo-electric actuator						
Art.	**Flow rate [l/h]**	**A (mm)**	**B (mm)**	**C (mm)**	**D (mm)**	**E (mm)**
92VL ½"	150	70	119	14.5	80.5	119
92L ½"	450	70	119	14.5	80.5	119



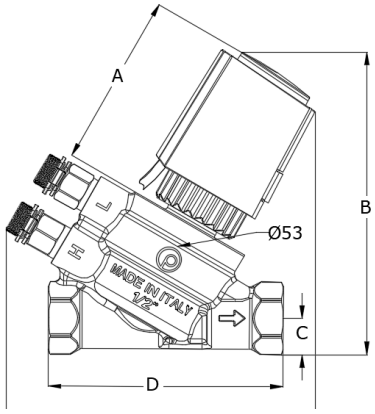
Valve with electromotive actuator						
Art.	**Flow rate [l/h]**	**A (mm)**	**B (mm)**	**C (mm)**	**D (mm)**	**E (mm)**
92VL ½"	150	83	144.5	14.5	80.5	124
92L ½"	450	83	144.5	14.5	80.5	124



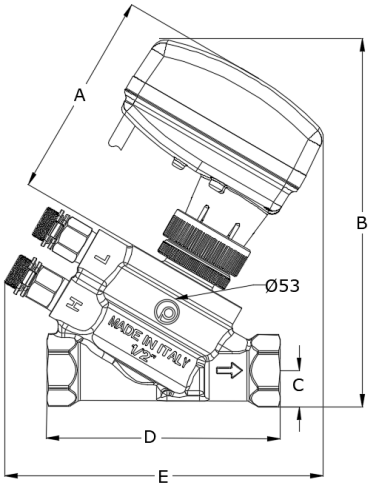
Valve with VM060						
Art.	**Flow rate [l/h]**	**A (mm)**	**B (mm)**	**C (mm)**	**D (mm)**	**E (mm)**
92VL ½"	150	116.5	181	14.5	80.5	146
92L ½"	450	116.5	181	14.5	80.5	146



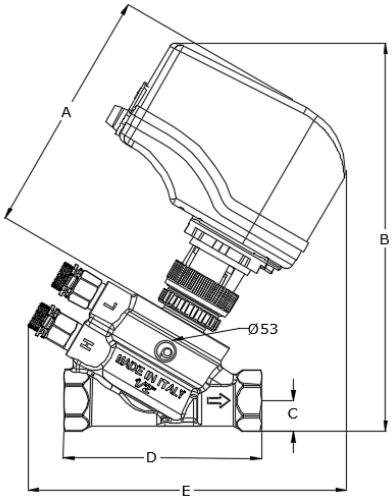
Manual valve						
Art.	**Flow rate [l/h]**	**A (mm)**	**B (mm)**	**C (mm)**	**D (mm)**	**E (mm)**
92H ½"	850	33	84.5	14.5	93.5	110.5



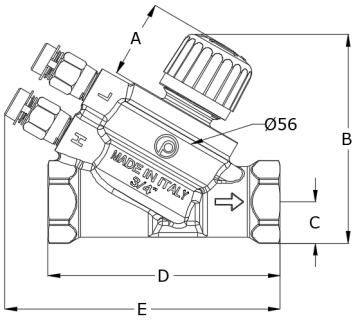
Valve with thermo-electric actuator						
Art.	**Flow rate [l/h]**	**A (mm)**	**B (mm)**	**C (mm)**	**D (mm)**	**E (mm)**
92H ½"	850	70	121	14.5	93.5	123



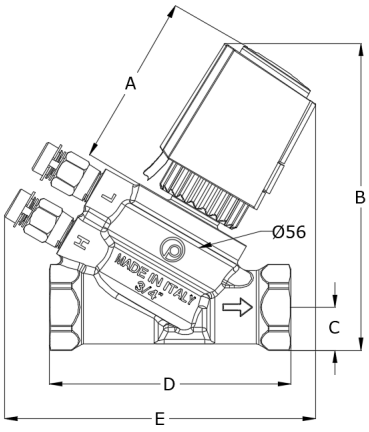
Valve with electromotive actuator						
Art.	**Flow rate [l/h]**	**A (mm)**	**B (mm)**	**C (mm)**	**D (mm)**	**E (mm)**
92H ½"	850	83	147	14.5	93.5	127



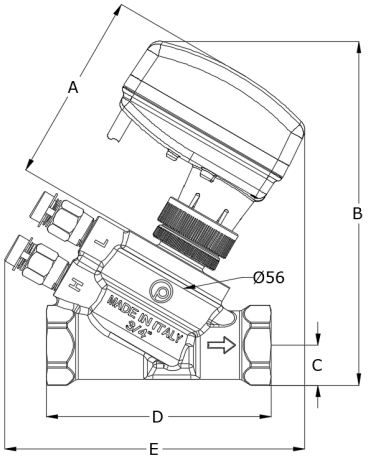
Valve with VM060						
Art.	**Flow rate [l/h]**	**A (mm)**	**B (mm)**	**C (mm)**	**D (mm)**	**E (mm)**
92H ½"	850	116.5	184	14.5	93.5	150



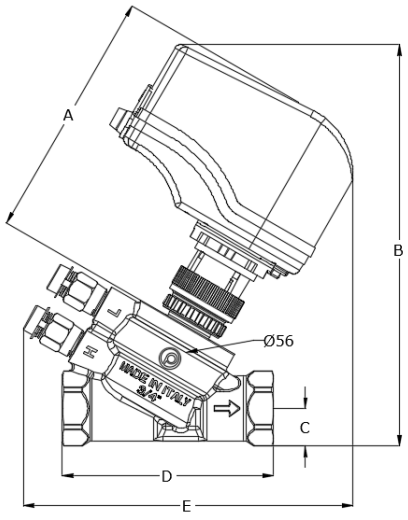
Manual valve						
Art.	**Flow rate [l/h]**	**A (mm)**	**B (mm)**	**C (mm)**	**D (mm)**	**E (mm)**
92L ¾”	1000	33	88	17.5	98	116
92H ¾”	1850	33	88	17.5	98	116



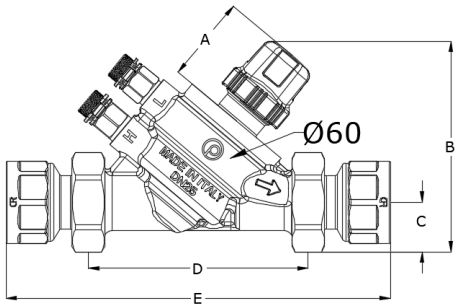
Valve with thermo-electric actuator						
Art.	**Flow rate [l/h]**	**A (mm)**	**B (mm)**	**C (mm)**	**D (mm)**	**E (mm)**
92L ¾”	1000	70	125	17.5	98	126
92H ¾”	1850	70	125	17.5	98	126



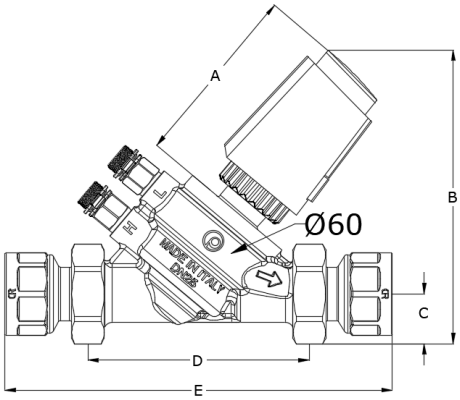
Valve with electromotive actuator						
Art.	**Flow rate [l/h]**	**A (mm)**	**B (mm)**	**C (mm)**	**D (mm)**	**E (mm)**
92L ¾”	1000	83	150	17.5	98	131
92H ¾”	1850	83	150	17.5	98	131



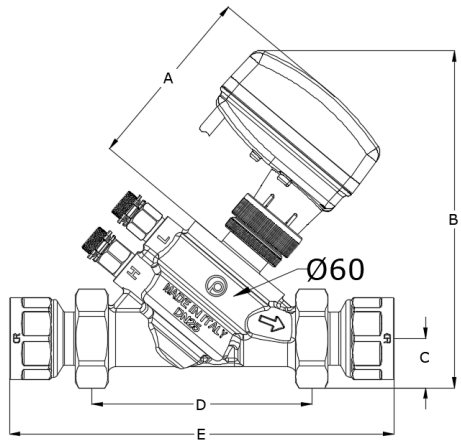
Valve with VM060						
Art.	**Flow rate [l/h]**	**A (mm)**	**B (mm)**	**C (mm)**	**D (mm)**	**E (mm)**
92L ¾”	1000	116.5	187	17.5	98	153
92H ¾”	1850	116.5	187	17.5	98	153



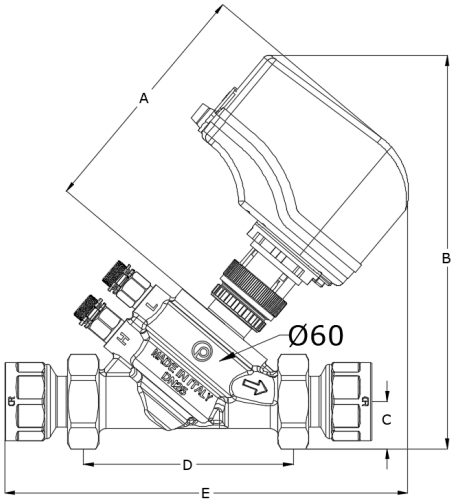
Manual valve						
Art.	**Flow rate [l/h]**	**A (mm)**	**B (mm)**	**C (mm)**	**D (mm)**	**E (mm)**
92L 1”	2500	41	89.5	23.5	108	182
92H 1”	3300	41	89.5	23.5	108	182



Valve with thermo-electric actuator						
Art.	**Flow rate [l/h]**	**A (mm)**	**B (mm)**	**C (mm)**	**D (mm)**	**E (mm)**
92L 1”	2500	86	138	23.5	108	182
92H 1”	3300	86	138	23.5	108	182

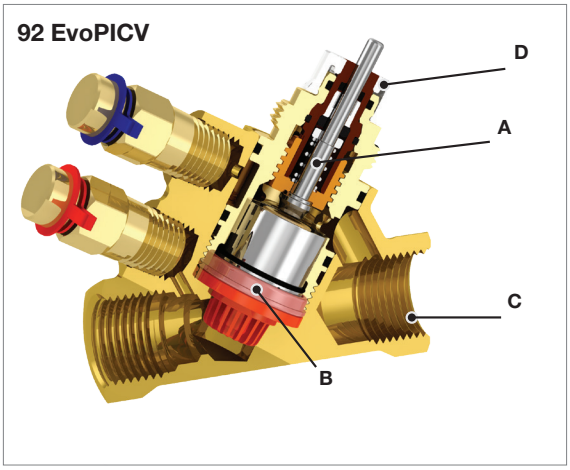


Valve with electromotive actuator						
Art.	**Flow rate [l/h]**	**A (mm)**	**B (mm)**	**C (mm)**	**D (mm)**	**E (mm)**
92L 1”	2500	87.5	160	23.5	108	182
92H 1”	3300	87.5	160	23.5	108	182



Valve with VM060						
Art.	**Flow rate [l/h]**	**A (mm)**	**B (mm)**	**C (mm)**	**D (mm)**	**E (mm)**
92L 1”	2500	121	195	23.5	108	200
92H 1”	3300	121	195	23.5	108	200

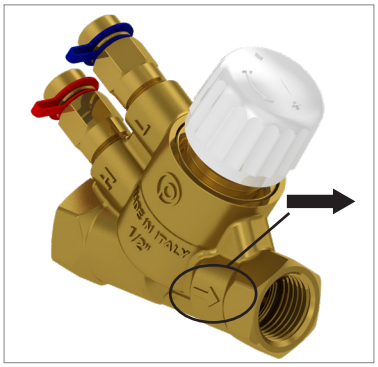
EN Materials and weight



	Material list
Regulating valve (A)	High resistance polymer Stainless steel 18/8
Diaphragm (B)	High resistance polymer - EPDM, WMQ, Silicone Stainless steel AISI 303, HNBR
Presetting (D)	ABS, PC
Body (C)	Corrosion resistant brass CW602N
Gaskets	EPDM-x

Art.	Weight (kg)
92VL ½"	0,46
92L ½"	0,46
92H ½"	0,65
92L ¾"	0,69
92H ¾"	0,69
92L 1"	1,17
92H 1"	1,17

EN Installation and maintenance EvoPICV 92



1. Use conditions

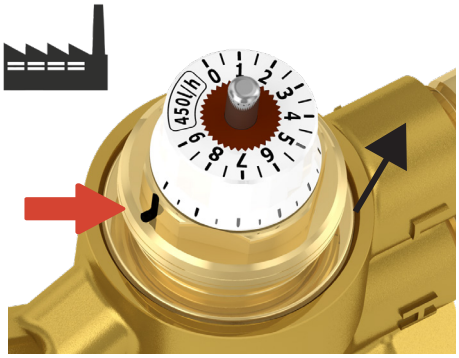
The valve has to be mounted with the arrow in the direction of the flow. Mounting it in the wrong direction may damage the system and the valve itself.
If flow reversal is possible, a non-return valve should be mounted.
Minimum differential pressure above which the valve begins to exercise its regulating effect:

	92VL ½"	92L ½"	92H ½"	92L ¾"	92H ¾"	92L 1"	92H 1"
ΔP Start-up	25 kPa 0,25 bar	35 kPa 0,35 bar	25 kPa 0,25 bar	30 kPa 0,30 bar	35 kPa 0,35 bar	30 kPa 0,30 bar	30 kPa 0,30 bar

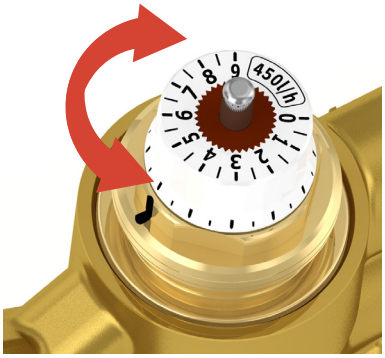
Medium
Water / Water+glycol 30%

2. Flow preset

To set the selected flow, follow these steps:



Remove the handwheel or the actuator. default setting: pos. **9**

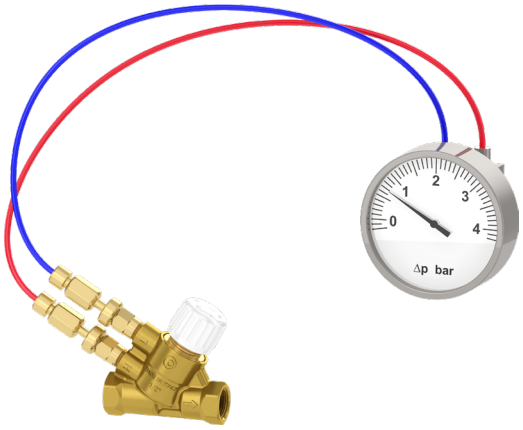


Turn the selector to the target position to set the flow rate

Re-assembly the handwheel or the actuator

3. Operating control

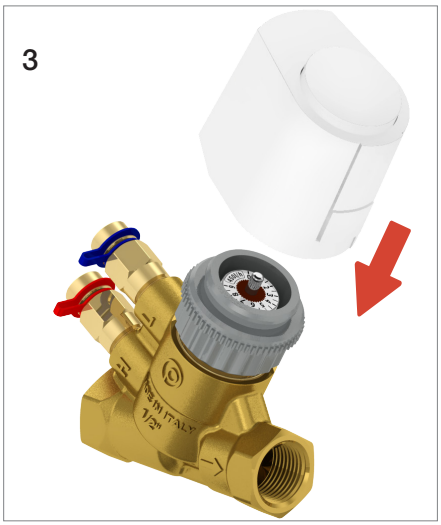
It is necessary to be sure that the valve is actually working in the operating range. In order to verify it, just measure the differential pressure across the valve, as shown in the picture.
If the measured differential pressure is higher than the start-up pressure, the valve is actually keeping the 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 differntial pressure compared to the start-up differential pressure of the valve (proper valve has to be selected among all the Pettinaroli EvoPICV catalogue).



4. 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.

Thermal-electric actuator

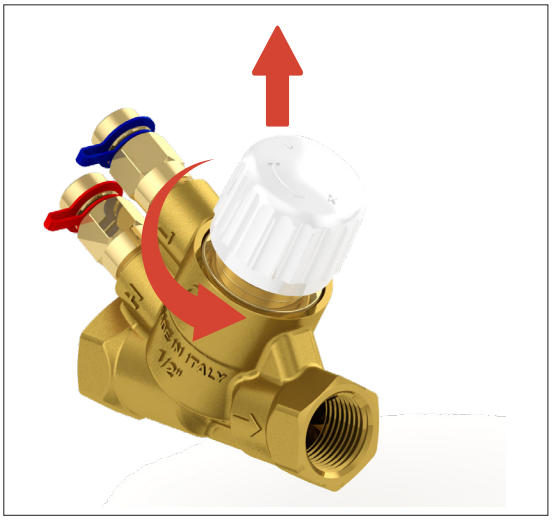


Electro-mechanical actuator

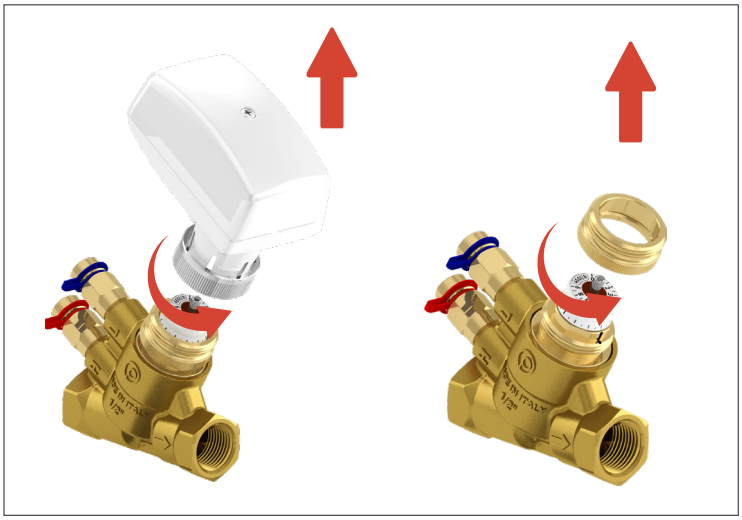
5. Maintenance, cleaning and replacement of the diaphragm of 92 EVOPICV valve

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. Maintenance and cleaning of the differential pressure regulator and the control valve must be carried out as per following instructions.

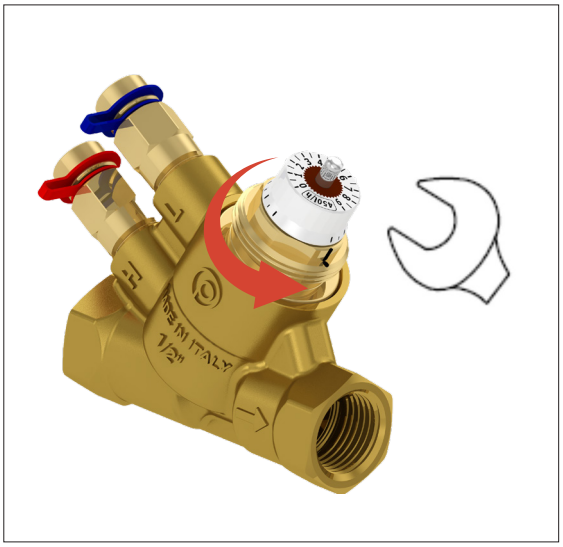
Step 1a: completely remove the knob



Step 1b: remove the actuator and the adapter.



Step 2: using a 21mm spanner unscrew the headwork.



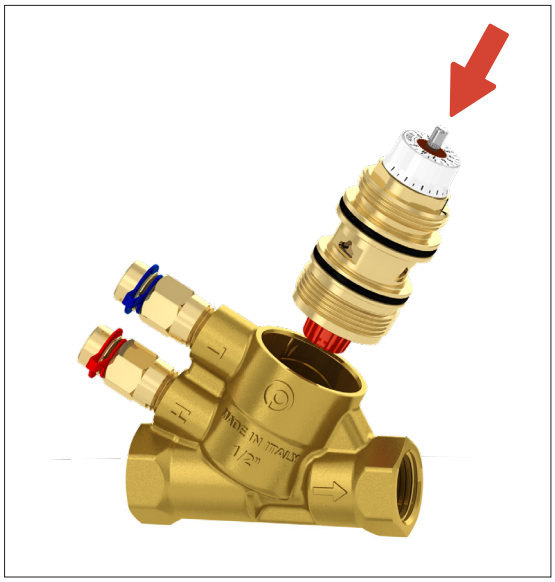
Step 3: remove the headwork.

Step 4: push down the control valve stem and pull the diaphragm out

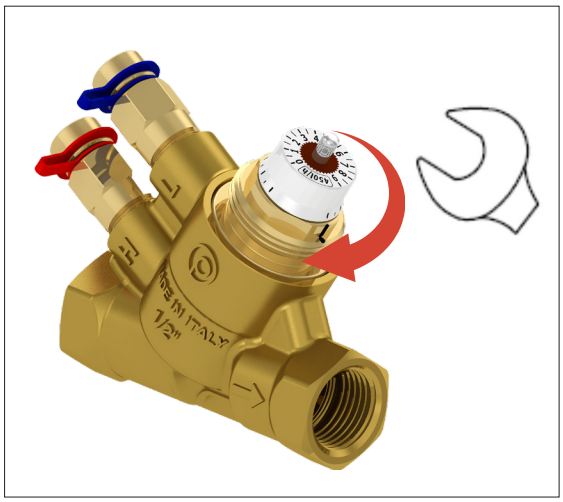
Step 5: clean the diaphragm with water and a cloth

Step 6: put back the diaphgram. Push it in its seat

Step 7: replace the headwork



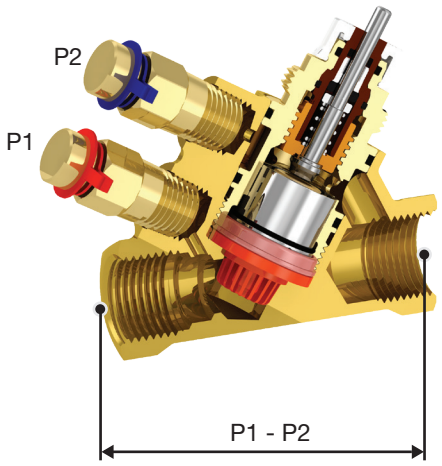
Step 8: Screw the headwork with 20 Nm torque

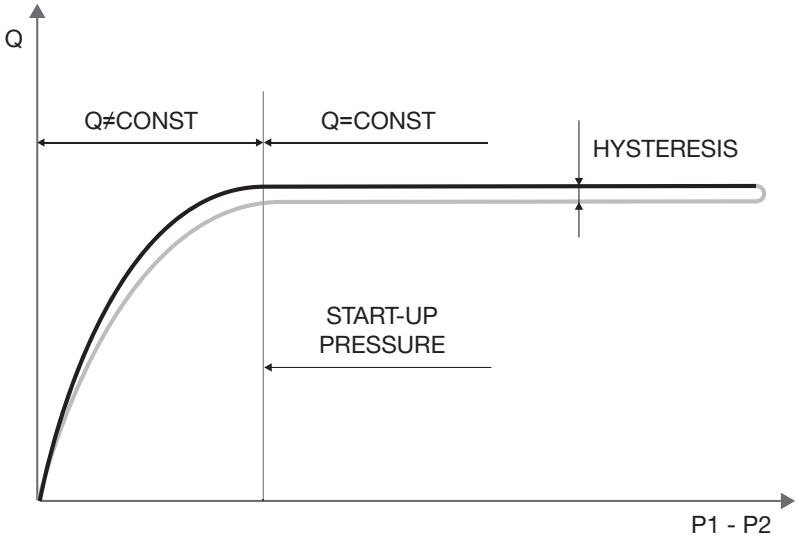


Step 9: replace the actuator adapter and the actuator or the handwheel.

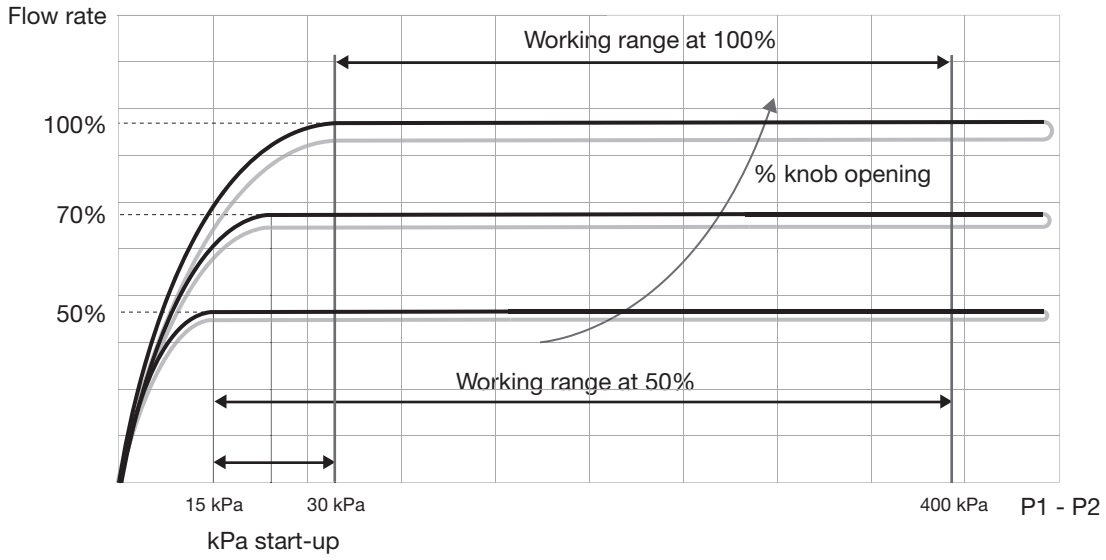
To replace the element control valve-DPCV, follow the instructions above except steps 4, 5 and 6. In step 7, put a new headwork (092DC).

EN Start-up curves and presetting





The example above shows a characterisitc 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:

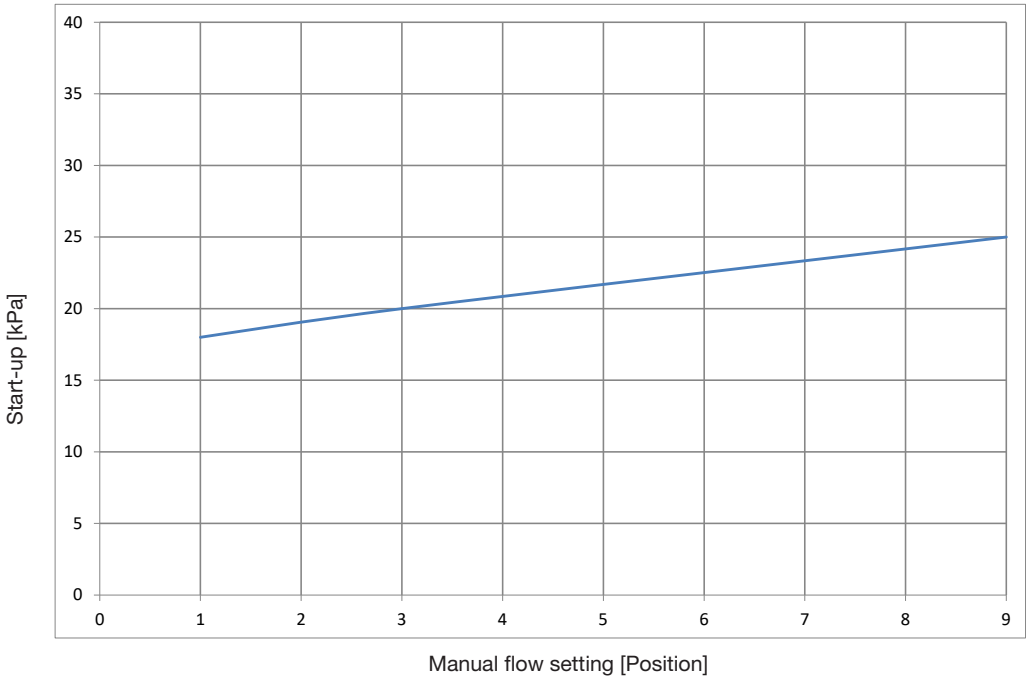


When the valve is set at 100% of nominal (maximum) flow, the curve begins to remain constant at 30 kPa, therefore the working range of the valve is 30 ÷ 400 kPa;

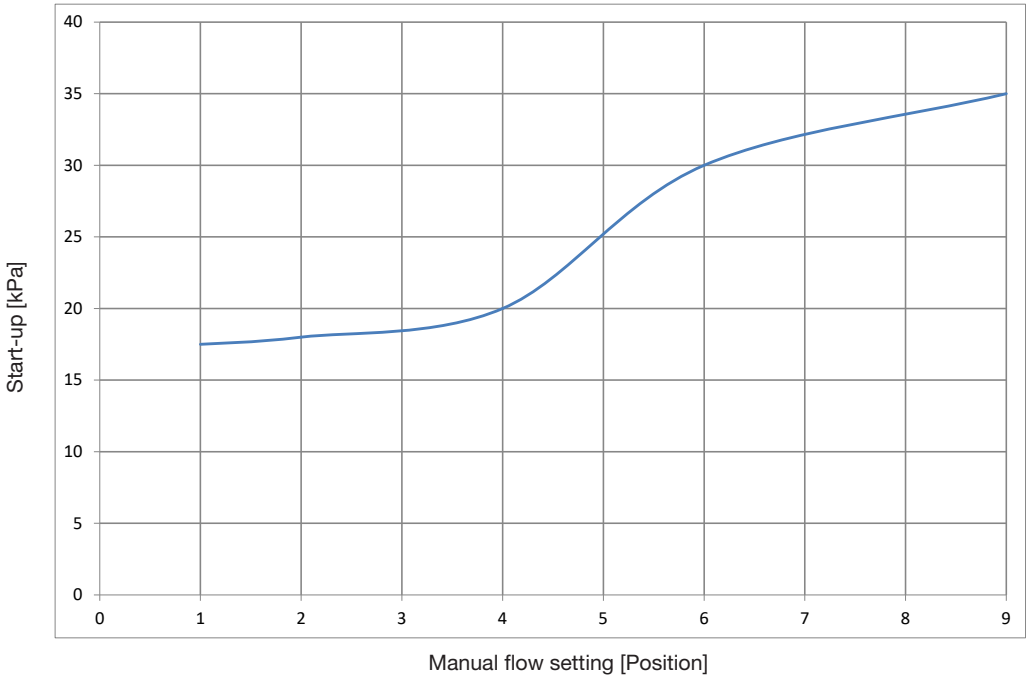
When the valve is set at 50% of nominal flow, the curve begins to remain constant at 15 kPa, therefore the working range of the valve is 15 ÷ 400 kPa.

Over 400 kPa the fluid velocity through the valve is extremely high and cavitation may happen due to extreme turbolence of the flow.
Because of these phenomena the valve can get demaged. For energy saving reasons, we suggest to continuosly work the valve under 400 kPa.

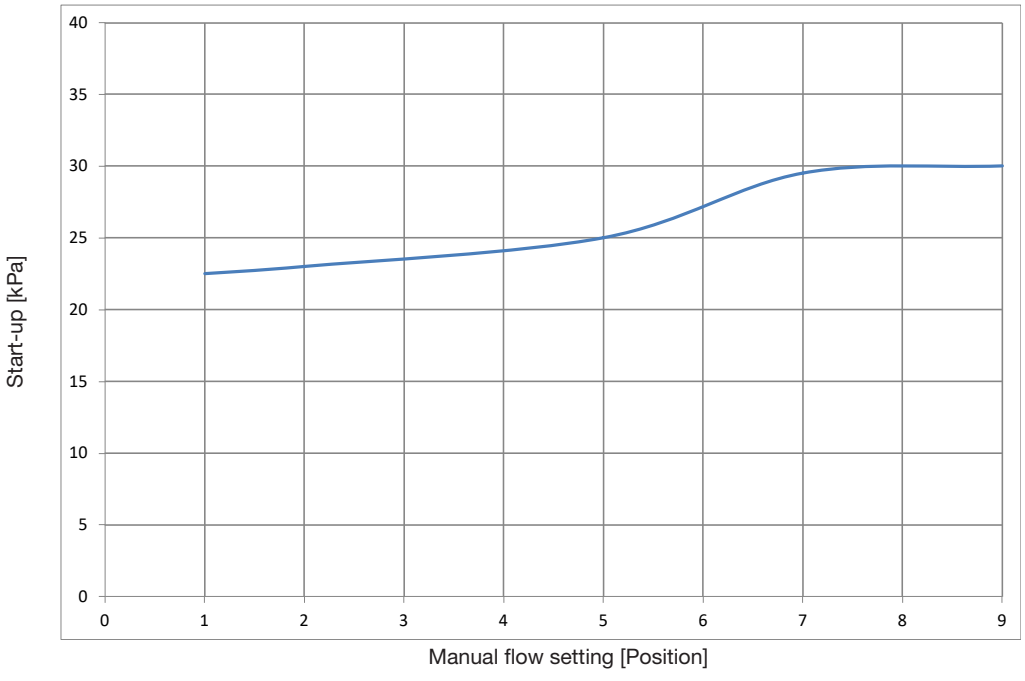
The following diagrams show the start-up pressure at different presetting.



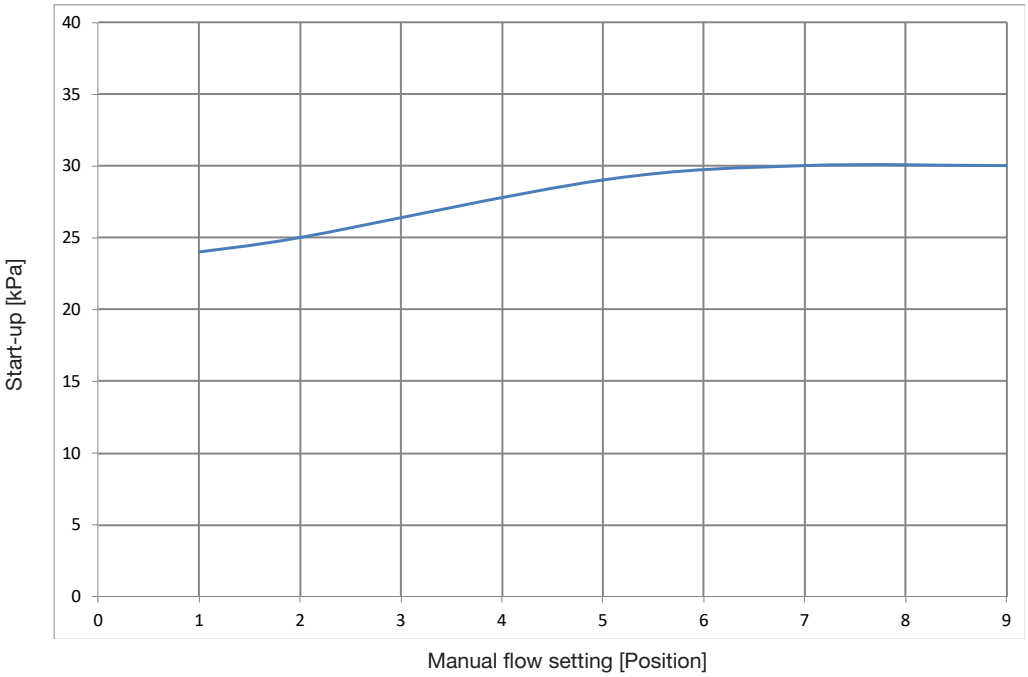
Valve model
92VL 1/2" - 150 l/h



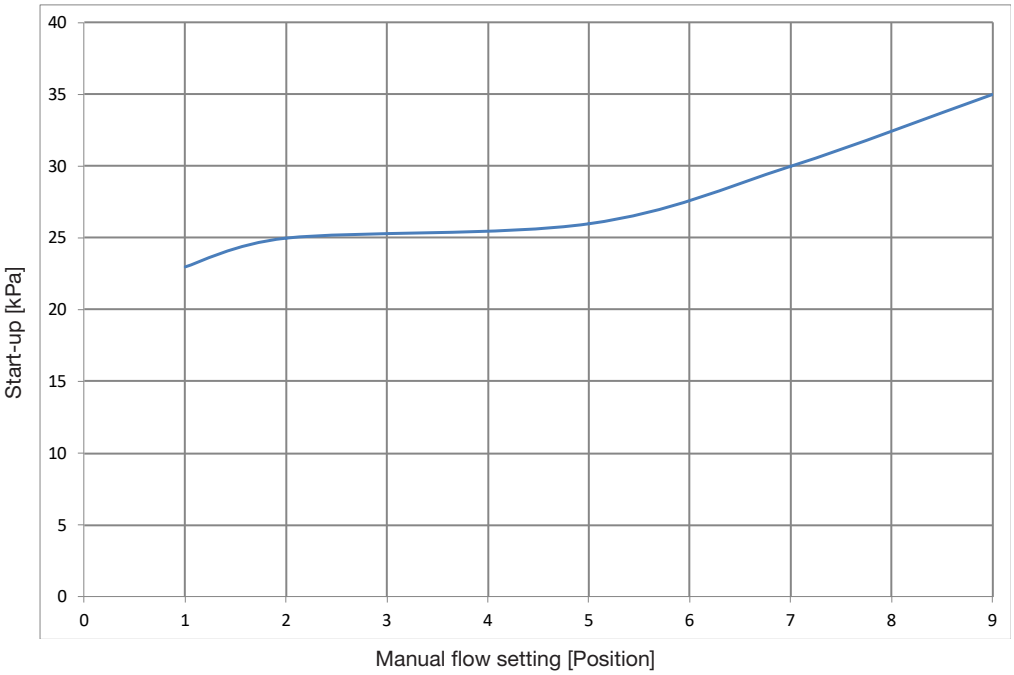
Valve model
92L 1/2" - 450 l/h



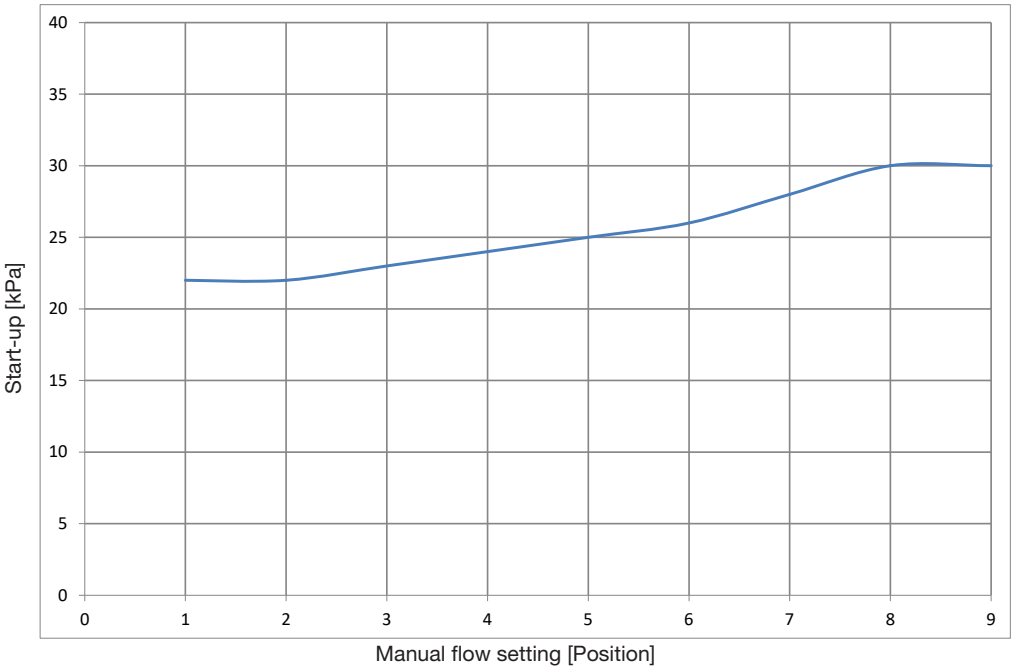
Valve model
92H 1/2" - 850 l/h



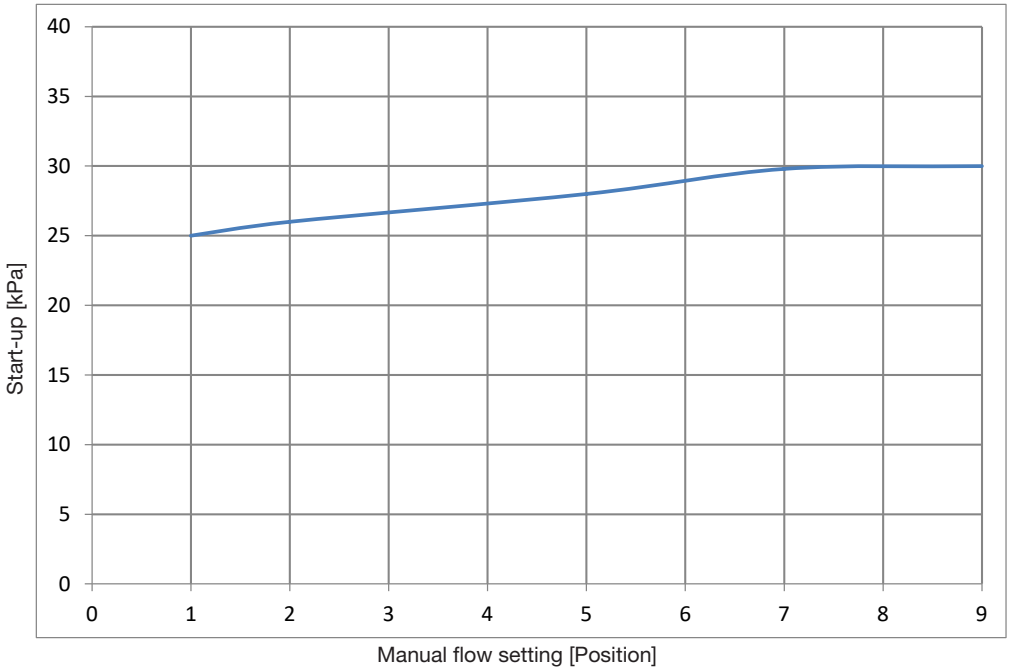
Valve model
92L 3/4" - 1000 l/h



Valve model
92H 3/4" - 1850 l/h



Valve model
92L 1" - 2500 l/h



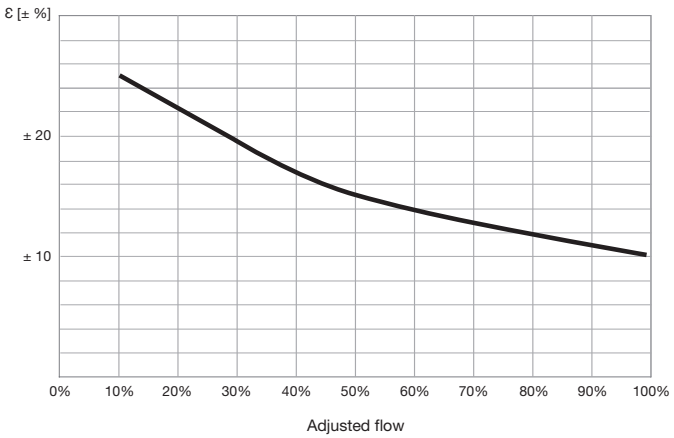
Flow pre-setting 92 EvoPICV

Presetting %	92VL ½"		92L ½"		92H ½"		92L ¾"		92H ¾"	
	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
9	150	0,043	450	0,125	850	0,236	1000	0,277	1850	0,514
8	133,2	0,037	387	0,108	774	0,215	911	0,253	1734	0,484
7	114	0,032	328,8	0,091	689	0,191	804	0,223	1548	0,430
6	99,6	0,028	261	0,073	606	0,168	722	0,201	1320	0,367
5	85,2	0,024	207	0,058	496	0,138	573	0,159	1080	0,300
4	70,8	0,020	165	0,046	393	0,109	451	0,125	846	0,235
3	55,2	0,015	121,2	0,034	331	0,092	376	0,104	624	0,173
2	39,6	0,011	81,6	0,023	265	0,074	291	0,081	492	0,137
1	19,2	0,005	42	0,012	157	0,044	169	0,047	276	0,077
0	0	0	0	0	0	0	0	0	0	0

Presetting %	92L 1"		92H 1"	
	Flow rate		Flow rate	
	l/h	l/s	l/h	l/s
9	2500	0,684	3300	0,917
8	2202	0,612	3046	0,846
7	1875	0,521	2682	0,745
6	1577	0,438	2265	0,629
5	1304	0,362	1849	0,514
4	1048	0,291	1387	0,385
3	798	0,222	884	0,246
2	560	0,155	543	0,151
1	339	0,094	173	0,048
0	0	0	0	0

Flow setting accuracy

Max flow deviation over 1 bar differential pressure and max flow deviation for settings below pos. 9.

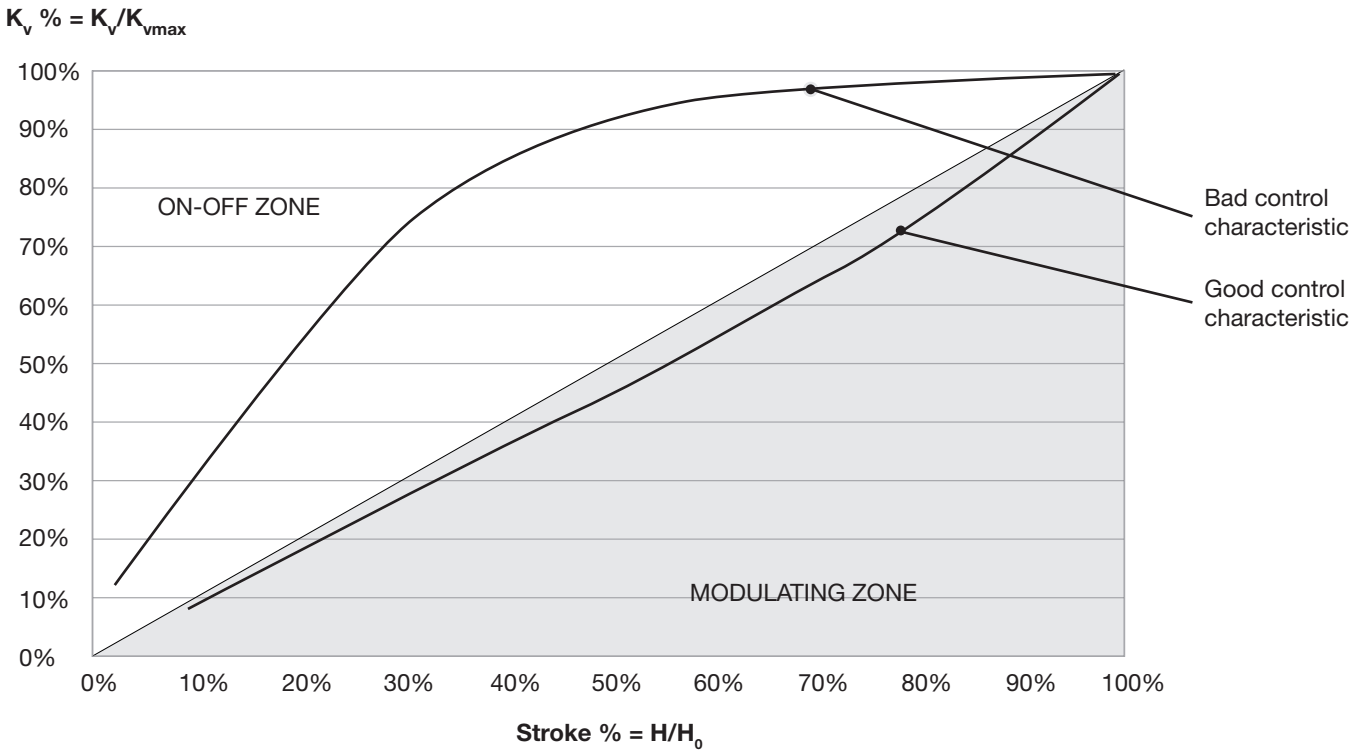


Please contact technical department for further infomation.

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.

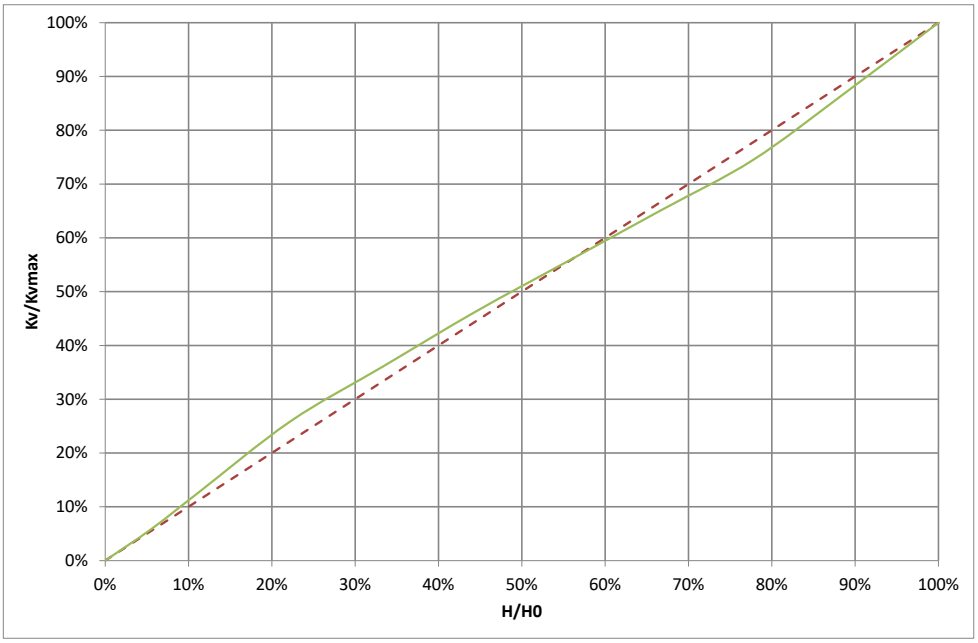
Typical control valve characteristic curves.*



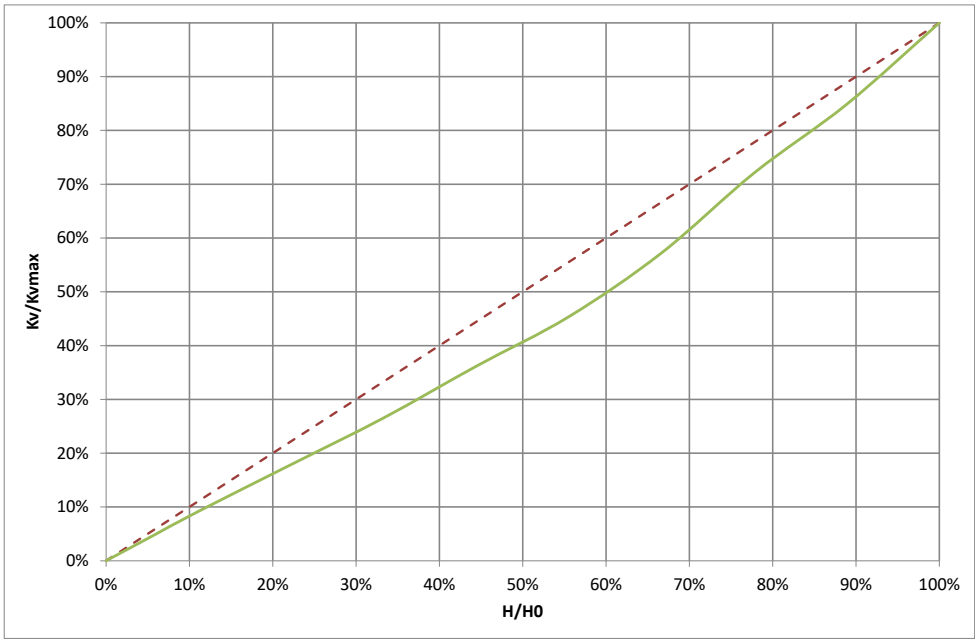
Combining the **EvoPICV** valve characteristic with heat exchanger results in a linear control system.

In the next page control curves of **92** are shown.

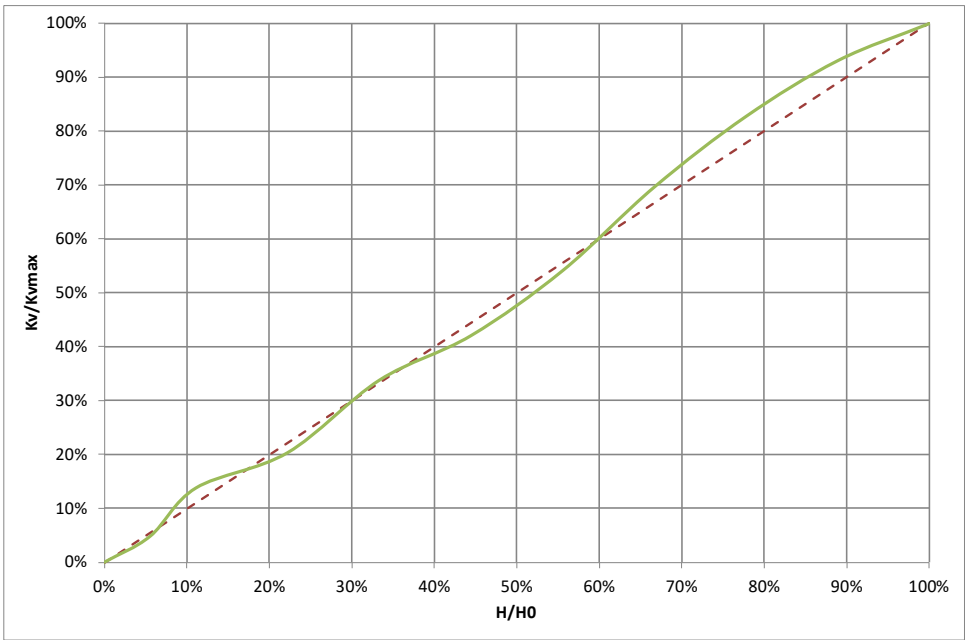
* Control curve characteristic may change according to valve version.



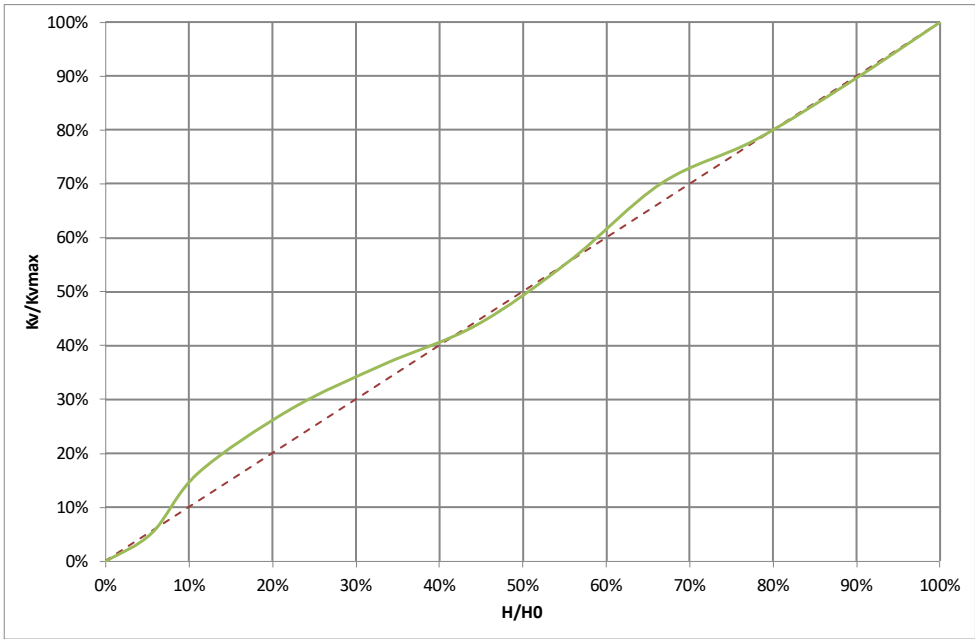
Valve model
92VL 1/2" - 150 l/h
Presetting positions
100% Open



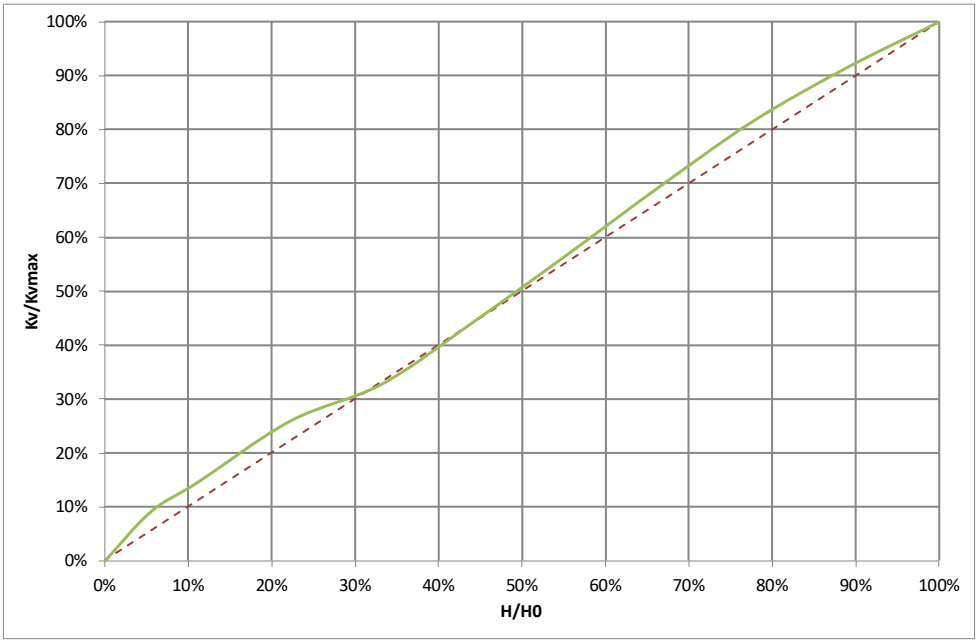
Valve model
92L 1/2" - 450 l/h
Presetting positions
100% Open



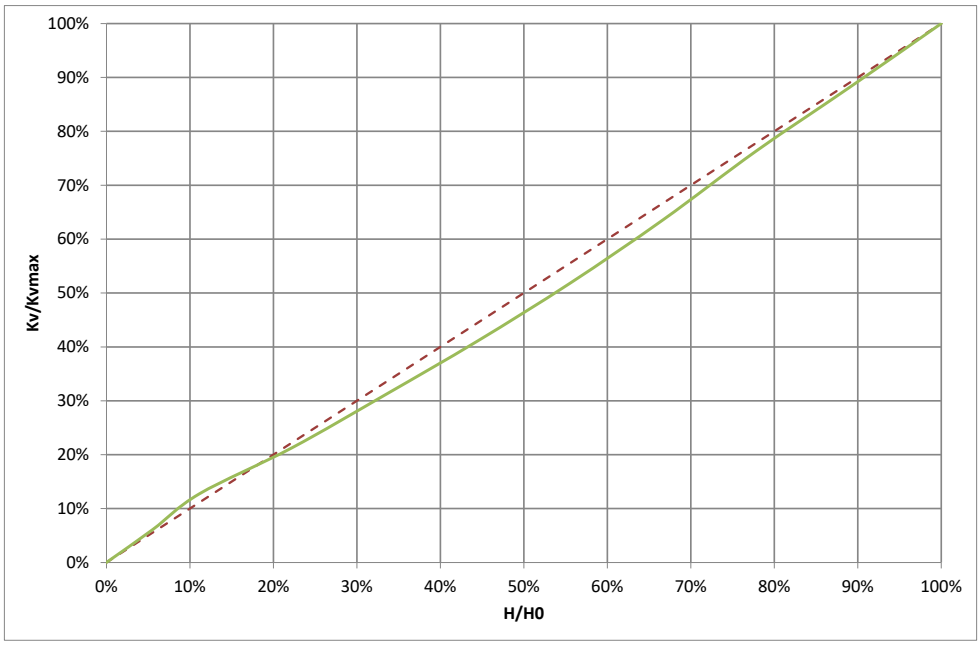
Valve model
92H 1/2" - 850 l/h
Presetting %
100% Open



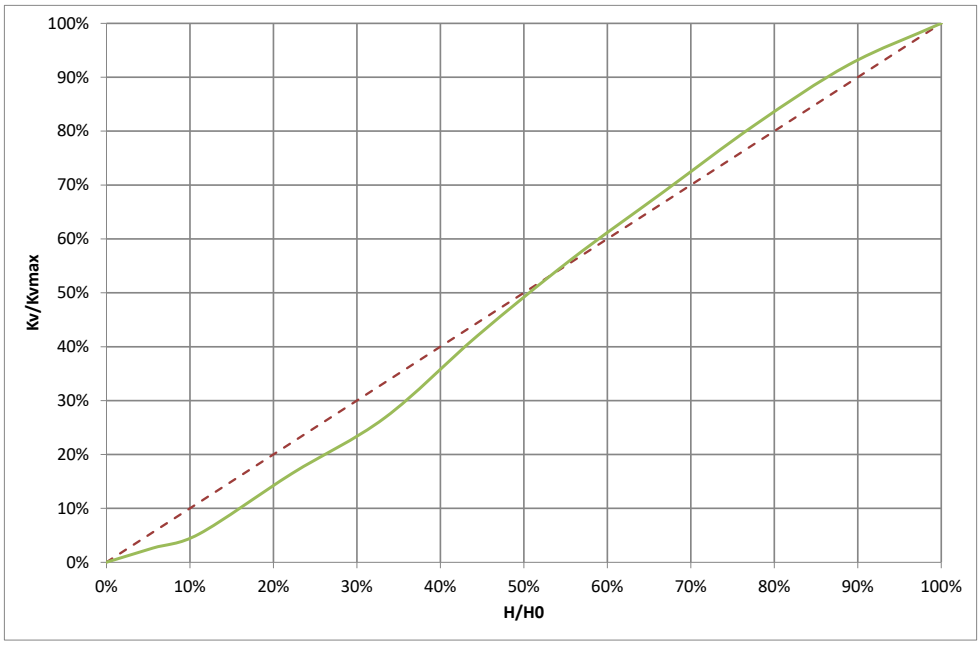
Valve model
92L 3/4" - 1000 l/h
Presetting %
100% Open



Valve model
92H 3/4" - 1850 l/h
Presetting %
100% Open



Valve model
92L 1" - 2500 l/h
Presetting %
100% Open



Valve model
92H 1" - 3300 l/h
Presetting %
100% 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	Suitable size	Adaptor
24v, 0-10v Proportional	VA7482	3,2 mm	DN15, DN20	0A7010*
24v, 0-10v Proportional	VA7482	6,3 mm	DN25	0A748X*
24v, 3 Point Floating	VA7481	6.3 mm	DN15, DN20	0A7010*
24v, 3 Point Floating	VA7481	6.3 mm	DN25	0A748X*
230v, 3 Point Floating	VA7481	6.3 mm	DN15, DN20	0A7010*
230v, 3 Point Floating	VA7481	6.3 mm	DN25	0A748X*
24v, 0-10v Proportional Thermic	A544P3	4 mm	DN15, DN20	VA64**
24v, 0-10v Proportional Thermic	A564P3	6.5 mm	DN25	VA64**
24v, ON-OFF Thermic, 2 wires	A544O2	4 mm	DN15, DN20	VA64**
24v, ON-OFF Thermic, 4 wires	A544O4	4 mm	DN15, DN20	VA64**
230v, ON-OFF Thermic, 2 wires	A542O2	4 mm	DN15, DN20	VA64**
230v, ON-OFF Thermic, 4 wires	A542O4	4 mm	DN15, DN20	VA64**
24v, ON-OFF Thermic, 2 wires	A564O2	6.5 mm	DN25	VA64**
230v, ON-OFF Thermic, 2 wires	A562O2	6.5 mm	DN25	VA64**
24v, 0-10v Proportional Fail Safe	VM060	6.5 mm	DN15, DN20, DN25	76TE**

* 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.

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

UL94 fire rated insulating case for PICV. For heating and cooling installations.

092IHV: case for heating, closure by Velcro®. Size has to be specified.

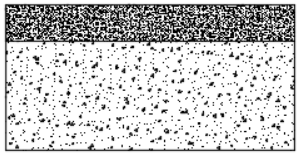
092IHB: case for heating, closure by double-sided tape. Size has to be specified.

092ICV: case for cooling, closure by Velcro®. Size has to be specified.

092ICB: case for cooling, closure by double-sided tape. Size has to be specified.

Cases for heating let the headwork and the actuator uncover wheras those for cooling cover the actuator too (all those in the range). Insulation sheel has a thin external layer made of 80 kg/m^3 density polyetylene cross linked foam and a thicker internal layer made of 29 kg/m^3 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 standards (Fe < 0.5 mg/kg and Cu < 0.1 mg/kg).
Although the valve operation has been verified with very contaminated water, maximum suggested iron oxide in the water passing through control valve (PICV) should 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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CLIMATE SYSTEMS TECHNOLOGY

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