

VA93



EN Description

The pressure independent control valve (PIC) combines the functions of a differential pressure controller, a regulation valve and a 2 port control valve into a single body. The VA93 incorporates a small diaphragm type DPCV in order to keep a constant differential pressure across the orifice of the regulating valve and to provide a constant flow rate whilst the differential pressure is kept in the operating limits of the valve. Beyond these working pressures the valve acts as a fixed orifice. Thanks to the new diaphragm technology, the valve can work also with very dirty water. For more information about that see the "Dirt resistant feature" section.

Making this orifice adjustable allows the valve to be presetted and deliver a range of flow rates (unlike automatic balancing valves). The presetting gear can be easily adjusted and works by varying the stroke of the control valve.

The VA93 valve also includes a 2 port valve in order to control temperature 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 VA93 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 VA93 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 VA93 valve maintains design flow regardless of pressure changes in the system;
- It can be easily 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-resistant: the valve worked during and after a Contaminated Water Test (proprietary test) with high concentration of iron oxide;
- Fast and easy maintenance: internal element (control valve and DPCV) can be easily removed, replaced or cleaned.

ΔP max.	Temperature	Max. working pressure	Stroke (max)		Rangeability	Leakage	Accuracy (0 ÷ 1 bar)*
600 kPa / 6 bar	-10 ÷ 120 °C	2500 kPa / 25 bar	DN15-20 3 mm	DN25-32 6 mm	50÷100 IEC 60534-2-3	Class IV IEC 60534-4	± 5%

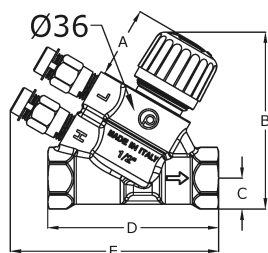
	VA93VL 1/2"	VA93L 1/2"	VA93H 1/2"	VA93L 3/4"	VA93H 3/4"	VA93L 1"	VA93H 1"	VA93H 1 1/4"
Flow rate max.	150 l/h 0,042 l/s	450 l/h 0,125 l/s	850 l/h 0,236 l/s	1000 l/h 0,277 l/s	1850 l/h 0,514 l/s	2500 l/h 0,694 l/s	3300 l/h 0,917 l/s	5200 l/h 1,44 l/s
Start-up max.	25 kPa 0,25 bar	35 kPa 0,35 bar	30 kPa 0,30 bar	30 kPa 0,30 bar	35 kPa 0,35 bar	30 kPa 0,30 bar	30 kPa 0,30 bar	35 kPa 0,35 bar
Connections	Rp 1/2" F EN 10226-1	Rp 1/2" F EN 10226-1	Rp 1/2" F EN 10226-1	Rp 3/4" F EN 10226-1	Rp 3/4" F EN 10226-1	Rp 1" Union F EN 10226-1	Rp 1" Union F EN 10226-1	Rc 1 1/4" Union F 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	600 kPa 6 bar

* At pos. 9. For different presettings and ΔP, please refer to the graph in the "Flow setting accuracy" section. ** Closed by electromotive actuator.

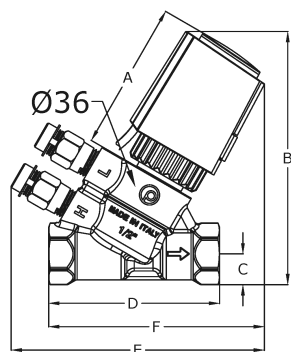
^ 300 kPa / 3 bar with thermo-electric actuators.



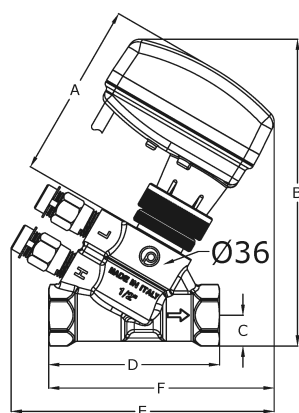
EN Dimensional data



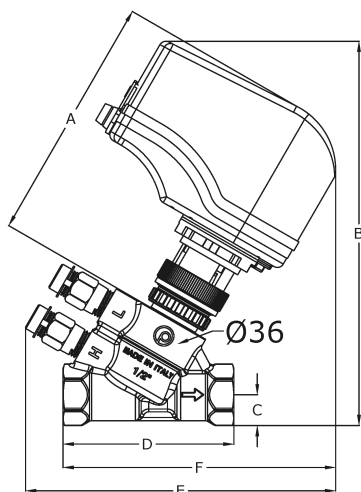
Manual valve						
Figura	Flow rate [l/h]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
VA93VL 1/2"	150	33	83	14,5	80,5	98
VA93L 1/2"	450	33	83	14,5	80,5	98



Valve with thermo-electric actuator							
Figura	Flow rate [l/h]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]
VA93VL 1/2"	150	70	119	14,5	80,5	119	-
VA93L 1/2"	450	70	119	14,5	80,5	119	-

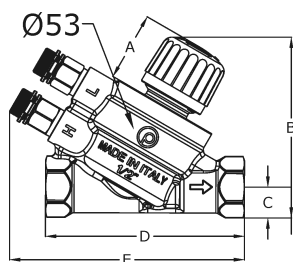


Valve with electromotive actuator							
Figura	Flow rate [l/h]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]
VA93VL 1/2"	150	83	144,5	14,5	80,5	124	-
VA93L 1/2"	450	83	144,5	14,5	80,5	124	-

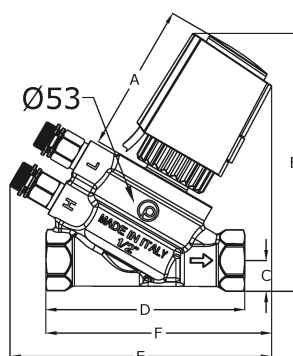


Valve with VM060							
Figura	Flow rate [l/h]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]
VA93VL 1/2"	150	116,5	181	14,5	80,5	146	-
VA93L 1/2"	450	116,5	181	14,5	80,5	146	-

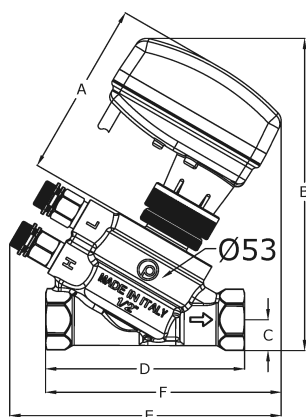




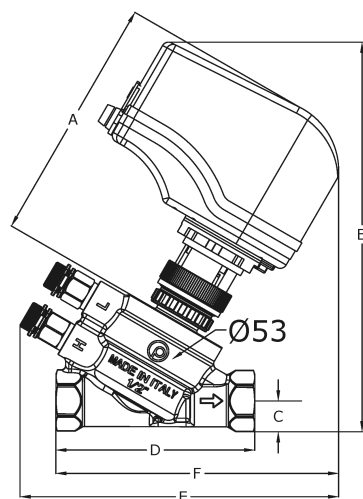
Manual valve						
Figura	Flow rate [l/h]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
VA93H 1/2"	850	33	84,5	14,5	93,5	110,5



Valve with thermo-electric actuator							
Figura	Flow rate [l/h]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]
VA93H 1/2"	850	70	121	14,5	93,5	123	-

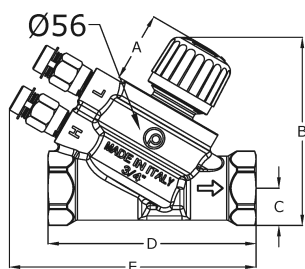


Valve with electromotive actuator							
Figura	Flow rate [l/h]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]
VA93H 1/2"	850	83	147	14,5	93,5	127	-

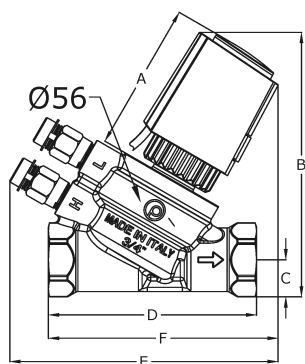


Valve with VM060							
Figura	Flow rate [l/h]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]
VA93H 1/2"	850	116,5	184	14,5	93,5	150	-

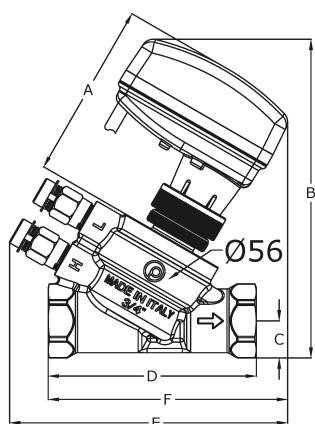




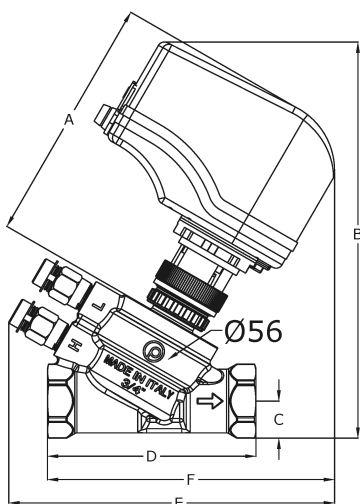
Manual valve						
Figura	Flow rate [l/h]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
VA93L 3/4"	1000	33	88	17,5	98	116
VA93H 3/4"	1850	33	88	17,5	98	116



Valve with thermo-electric actuator							
Figura	Flow rate [l/h]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]
VA93L 3/4"	1000	70	125	17,5	98	126	-
VA93H 3/4"	1850	70	125	17,5	98	116	-

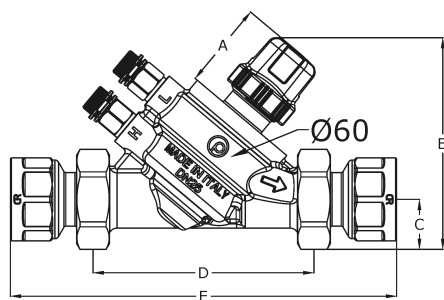


Valve with electromotive actuator							
Figura	Flow rate [l/h]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]
VA93L 3/4"	1000	83	150	17,5	98	131	-
VA93H 3/4"	1850	83	150	17,5	98	131	-

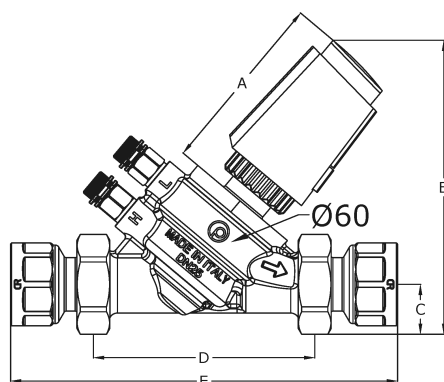


Valve with VM060							
Figura	Flow rate [l/h]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]
VA93L 3/4"	1000	116,5	187	17,5	98	153	-
VA93H 3/4"	1850	116,5	187	17,5	98	153	-

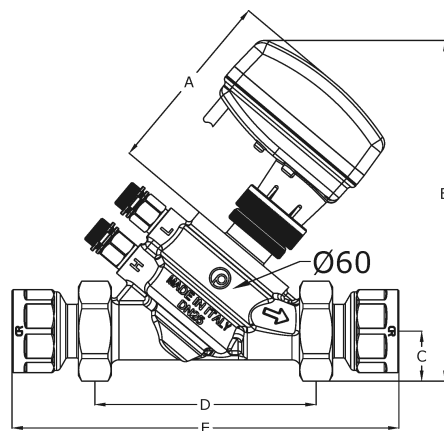




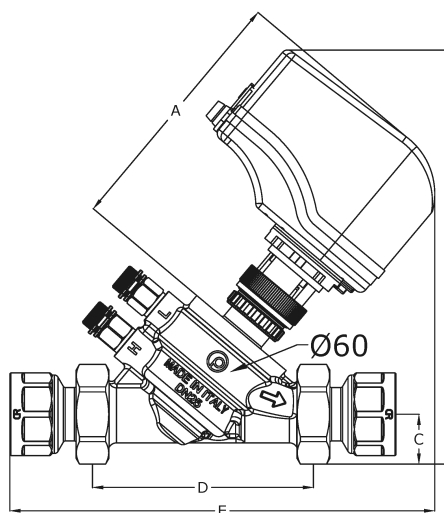
Manual valve						
Figura	Flow rate [l/h]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
VA93L 1"	2500	41	99	23,5	108	182
VA93H 1"	3300	41	99	23,5	108	182



Valve with thermo-electric actuator						
Figura	Flow rate [l/h]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
VA93L 1"	2500	86	138	23,5	108	182
VA93H 1"	3300	86	138	23,5	108	182

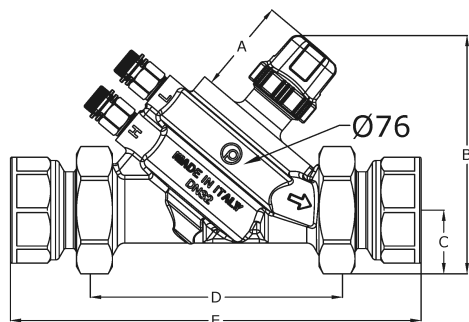


Valve with electromotive actuator						
Figura	Flow rate [l/h]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
VA93L 1"	2500	87,5	160	23,5	108	182
VA93H 1"	3300	87,5	160	23,5	108	182

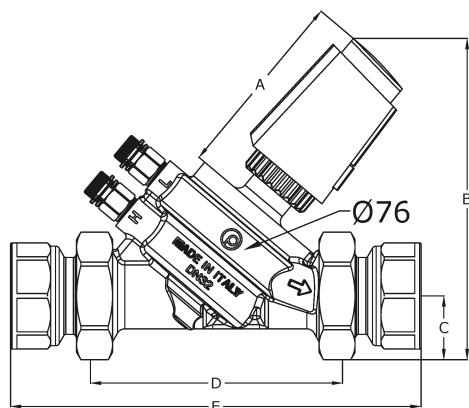


Valve with VM060						
Figura	Flow rate [l/h]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
VA93L 1"	2500	121	195	23,5	108	200
VA93H 1"	3300	121	195	23,5	108	200

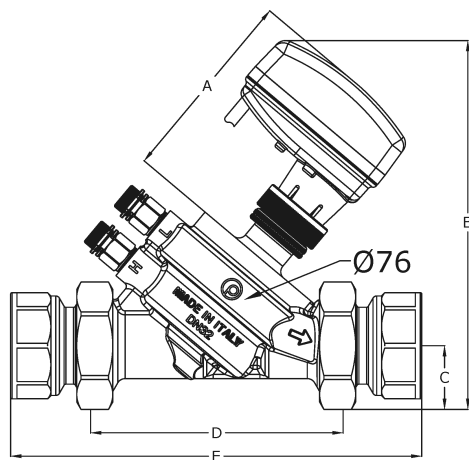




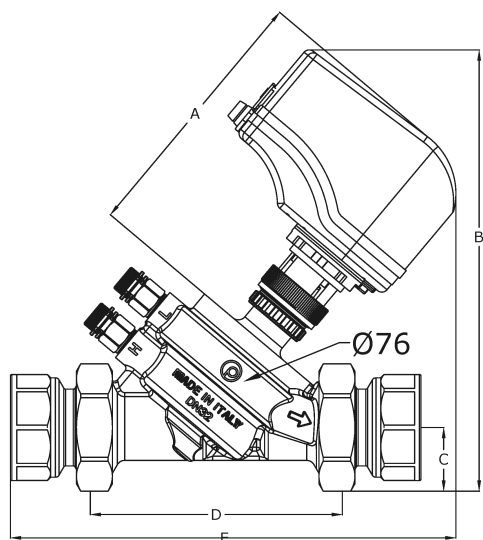
Manual valve						
Figura	Flow rate [l/h]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
VA93H 1 1/4"	5200	44,5	107,5	30	119	194



Valve with thermo-electric actuator						
Figura	Flow rate [l/h]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
VA93H 1 1/4"	5200	90	151	30	119	194



Valve with electromotive actuator						
Figura	Flow rate [l/h]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
VA93H 1 1/4"	5200	89	168,5	30	119	194

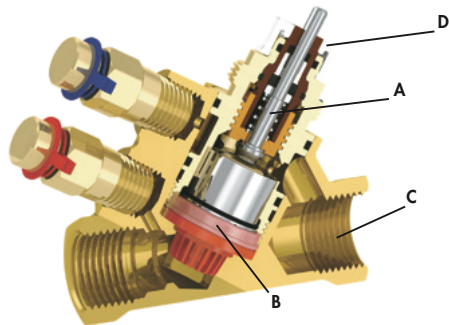


Valve with VM060						
Figura	Flow rate [l/h]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
VA93H 1 1/4"	5200	124,5	208	30	119	210



EN Materials and weight

VA93 VA93



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

Art.	Weight (kg)	Art.	Weight (kg)
VA93VL 1/2"	0,46	VA93H 3/4"	0,69
VA93L 1/2"	0,46	VA93L 1"	1,17
VA93H 1/2"	0,65	VA93H 1"	1,17
VA93L 3/4"	0,69	VA93H 1 1/4"	1,80

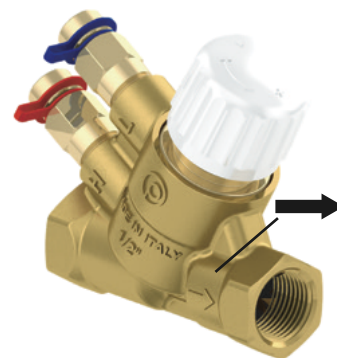
EN Installation and maintenance VA93

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 are listed in the table below.



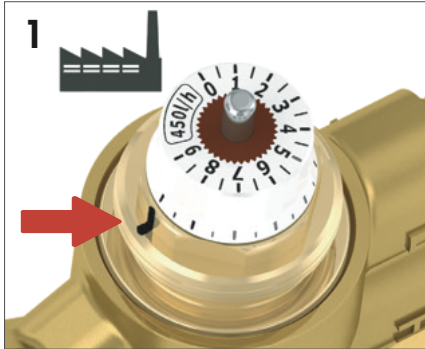
	VA93VL 1/2"	VA93L 1/2"	VA93H 1/2"	VA93L 3/4"	VA93H 3/4"	VA93L 1"	VA93H 1"	VA93H 1 1/4"
ΔP Start-up	25 kPa 0,25 bar	35 kPa 0,35 bar	30 kPa 0,30 bar	30 kPa 0,30 bar	35 kPa 0,35 bar	30 kPa 0,30 bar	30 kPa 0,30 bar	35 kPa 0,35 bar

Medium
Water / Water+glycol 30%

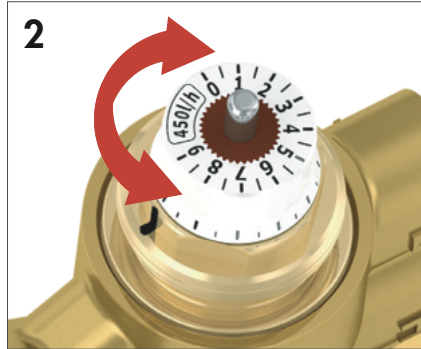


2. Flow preset

On the top of the valve there's a black mark which indicates the current position of the presetting. By setting the position of the white selector it is possible to set the desired flow rate, to do that please 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.

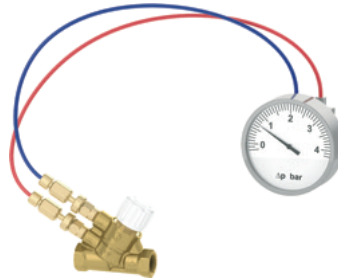


Re-assembly the handwheel or the actuator.

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.

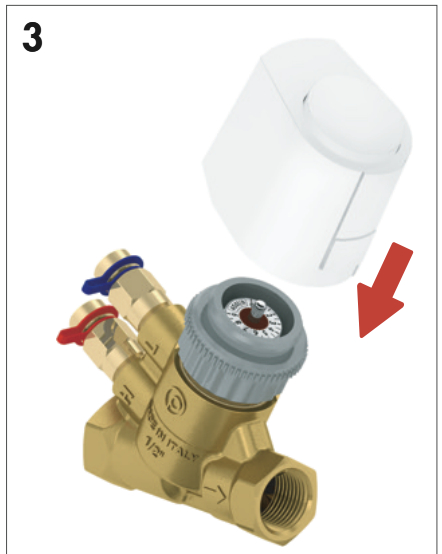
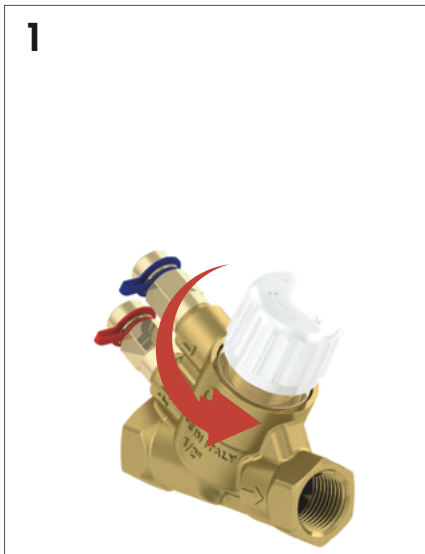
If the measured differential pressure is higher than the start-up pressure, the valve is actually keeping the flow constant at the set value.



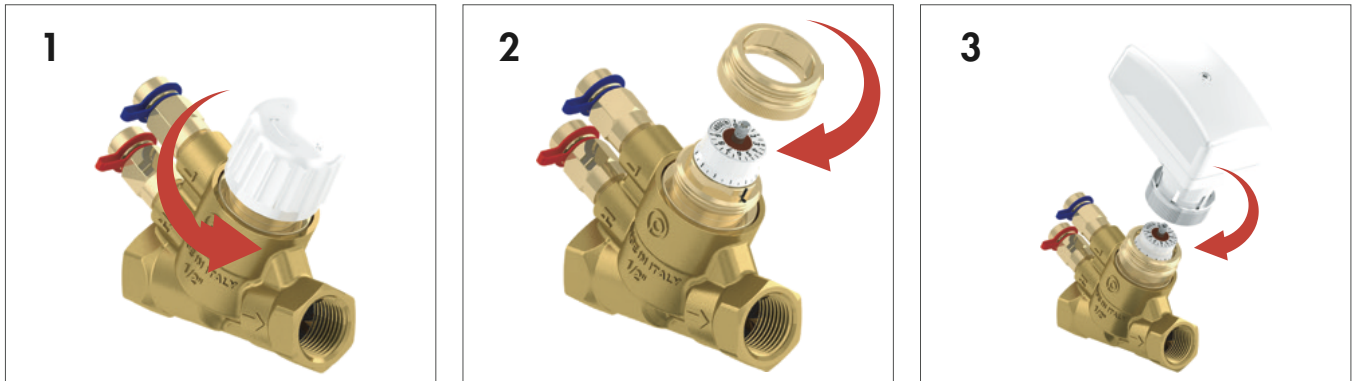
4. Actuator assembly

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

Thermo-electric actuator



Electromotive actuator



5. Maintenance, cleaning and replacement of the diaphragm of VA93 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:

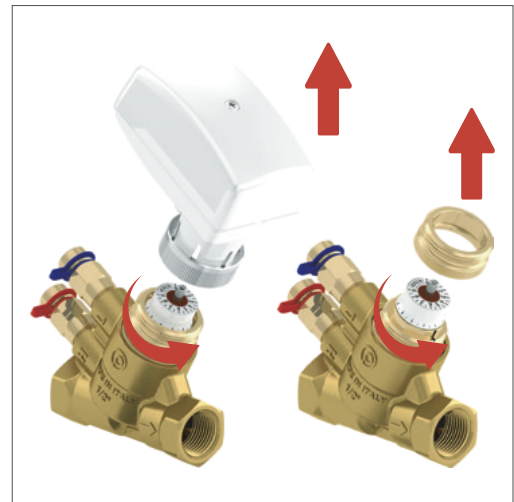
Step 1a: completely remove the knob.



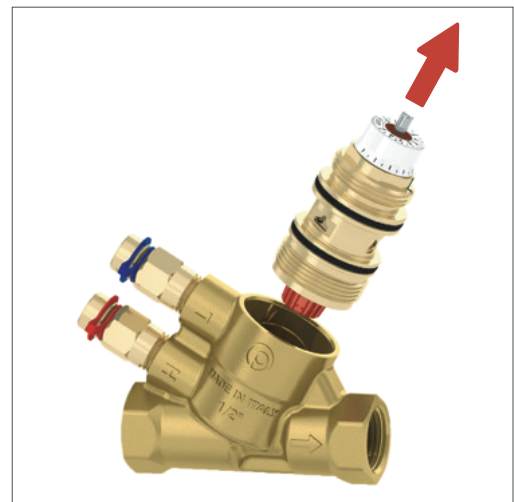
Step 2: using a 21mm (DN15 to DN25) or a 30mm (DN32) spanner unscrew the headwork.



Step 1b: remove the actuator and its adapter.



Step 3: remove the headwork.



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



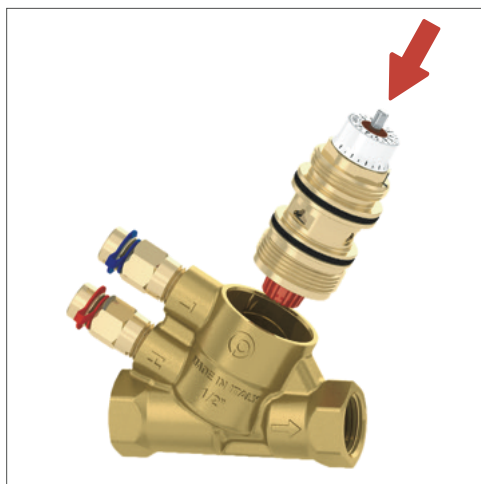
Step 5: clean the diaphragm with water and a cloth. Do not use chemical products.



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



Step 7: replace the headwork.



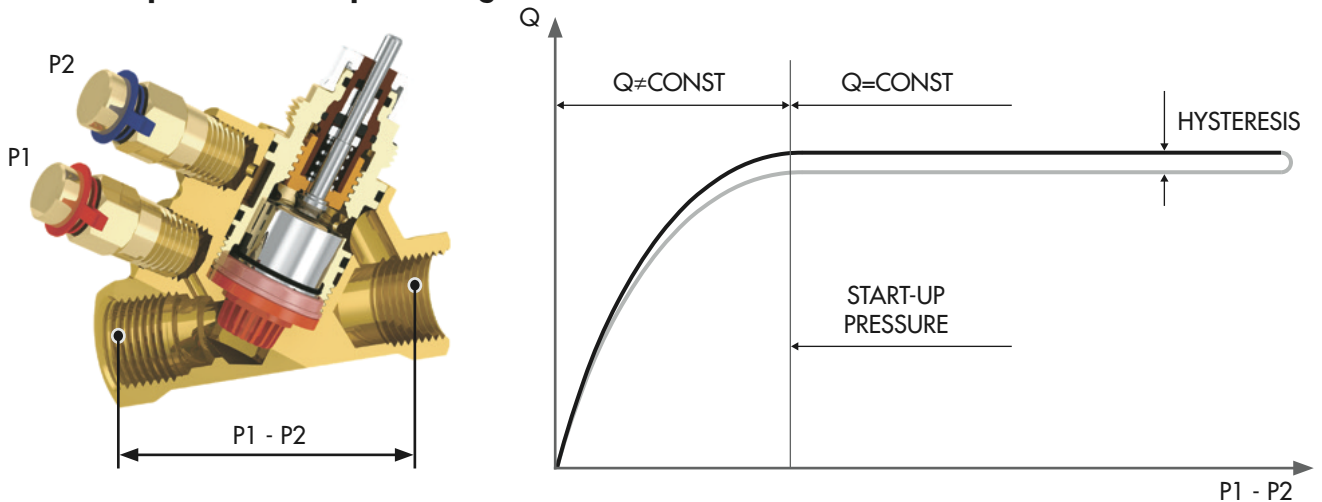
Step 8: screw the headwork with 20 Nm torque (refer to step 2 for dimensions of the tool).



Step 9: place the actuator with its adapter or the knob.



EN Start-up curves and presetting

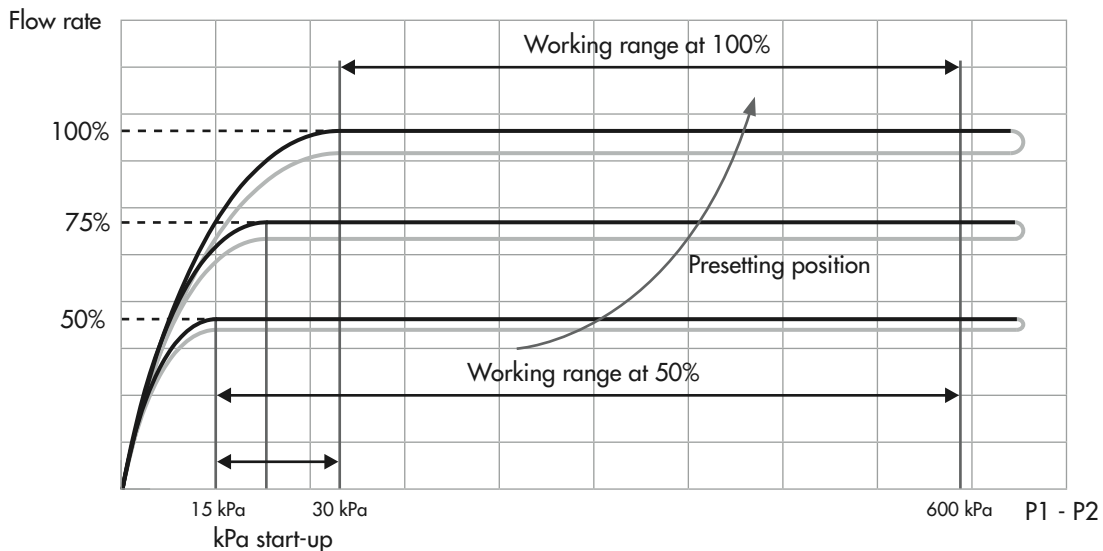


The example above shows a characteristic curve where start-up pressure, hysteresis and accuracy can be evaluated.

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 for the presetting position selected.

If the ΔP measured value is lower than the start-up value, then the valve works as a fixed orifice valve so it doesn't keep the flow rate constant.

Start-up value varies with flow setting of the valve, as shown by the example below:



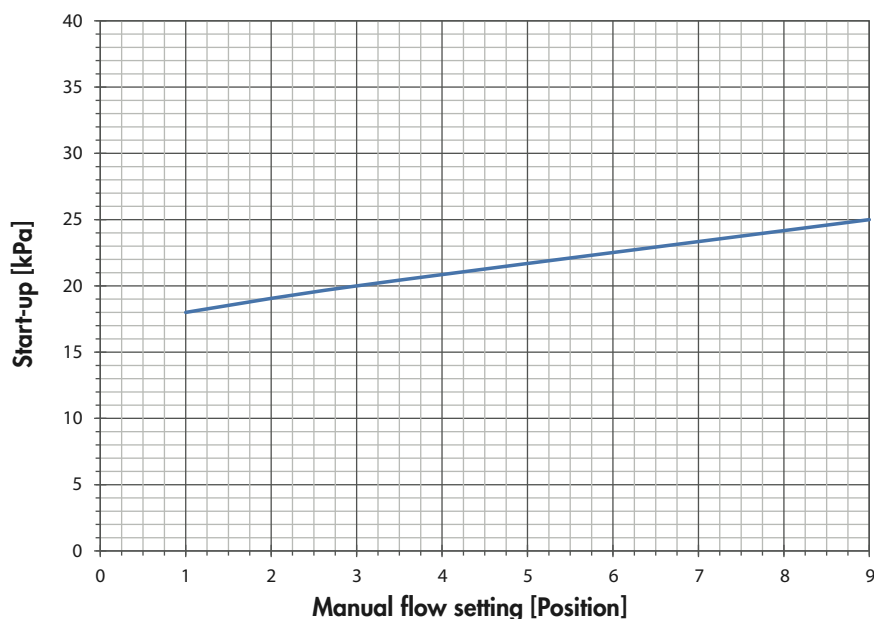
When the valve is set at 100% of nominal (maximum) flow, the curve begins to remain constant at 30 kPa, therefore the suggested working range of the valve is $30 \div 600$ kPa;

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 $15 \div 600$ kPa.

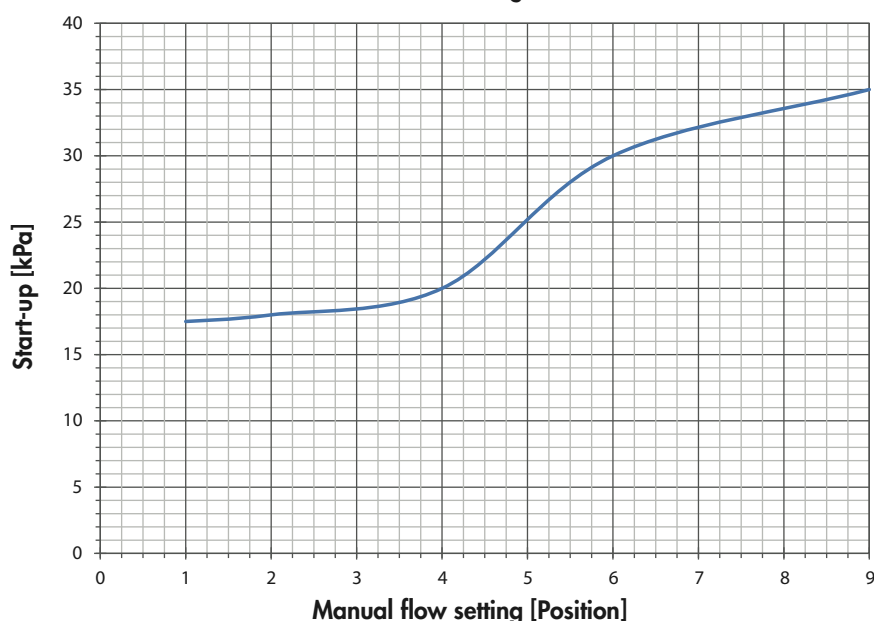
Over 600 kPa the fluid velocity through the valve is extremely high and cavitation may happen due to extreme turbulence of the flow. Because of these phenomena the valve can get damaged. For energy saving reasons, we suggest to continuously work the valve under 600 kPa.

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

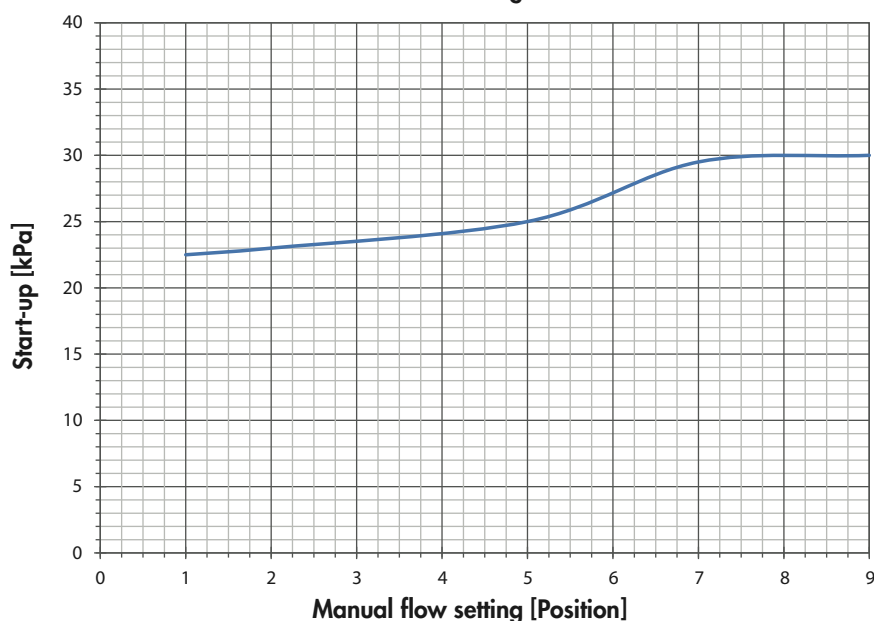




Valve			
VA93VL 1/2" - 150 l/h			
Presetting [Position]	Start-up [kPa]	Presetting [Position]	Start-up [kPa]
1	18	5.5	22,1
1.5	18,5	6	22,5
2	19,05	6.5	22,95
2.5	19,55	7	23,35
3	20	7.5	23,75
3.5	20,45	8	24,6
4	20,85	8.5	24,6
4.5	21,3	9	25
5	21,7		

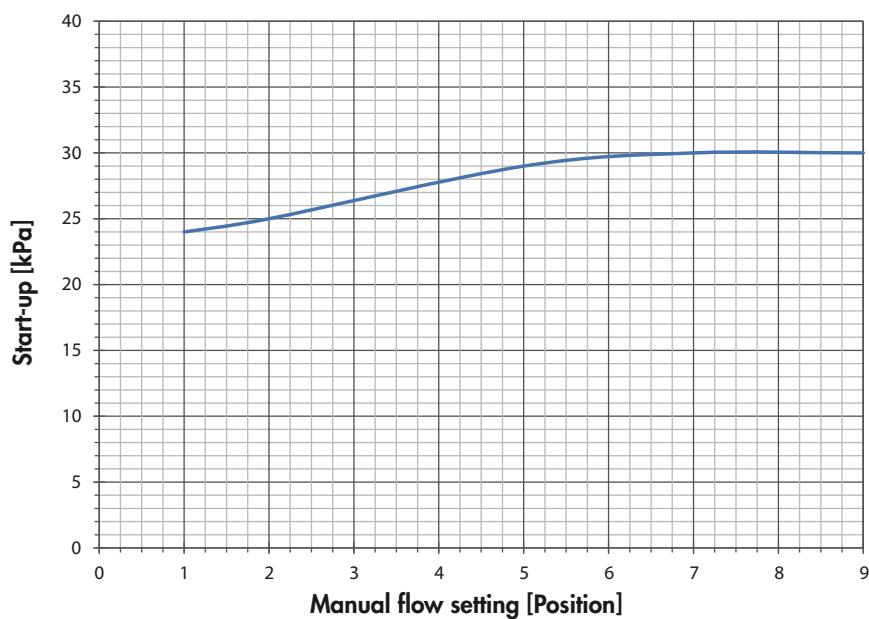


Valve			
VA93L 1/2" - 450 l/h			
Presetting [Position]	Start-up [kPa]	Presetting [Position]	Start-up [kPa]
1	17,5	5.5	28
1.5	17,7	6	30
2	18	6.5	31,25
2.5	18,3	7	32,15
3	18,55	7.5	32,9
3.5	19,05	8	33,55
4	20	8.5	34,25
4.5	22,15	9	35
5	25,2		

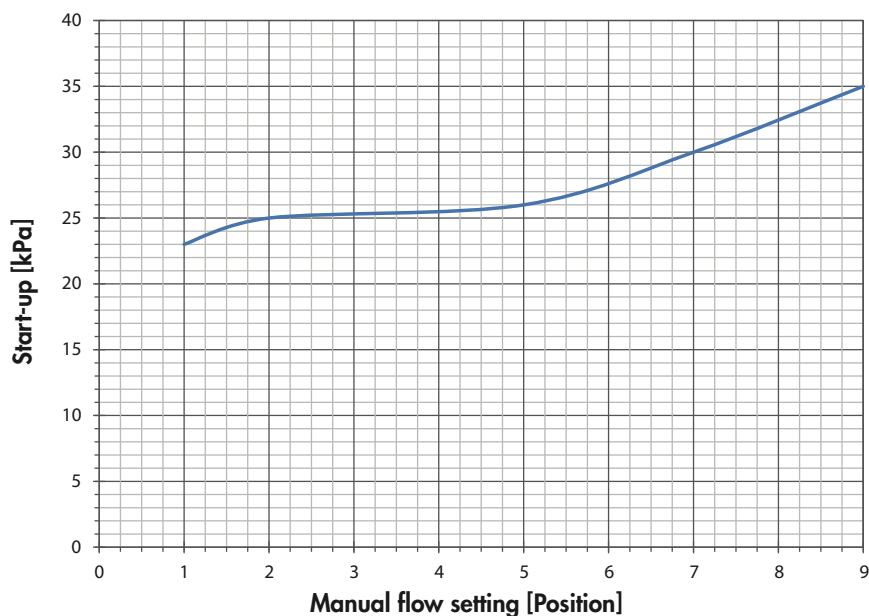


Valve			
VA93H 1/2" - 850 l/h			
Presetting [Position]	Start-up [kPa]	Presetting [Position]	Start-up [kPa]
1	22,5	5.5	25,9
1.5	22,7	6	27,15
2	23	6.5	28,55
2.5	23,3	7	29,5
3	23,5	7.5	29,9
3.5	23,8	8	30
4	24,1	8.5	30
4.5	24,5	9	30
5	25		

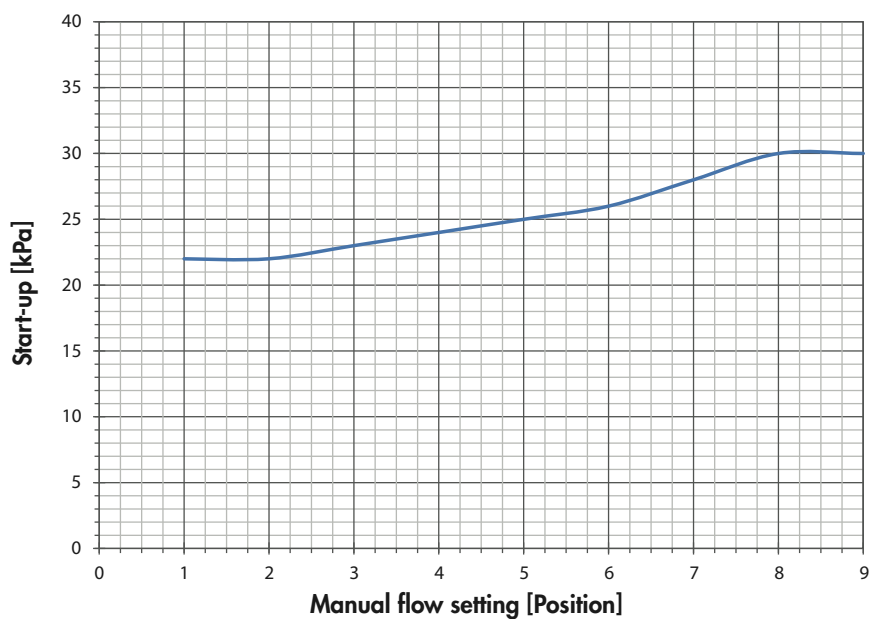




Valve			
VA93L 3/4" - 1000 l/h			
Presetting [Position]	Start-up [kPa]	Presetting [Position]	Start-up [kPa]
1	24	5.5	29,45
1.5	24,45	6	29,7
2	25	6.5	29,9
2.5	25,7	7	30
3	26,4	7.5	30
3.5	27,1	8	30
4	27,8	8.5	30
4.5	28,4	9	30
5	29		

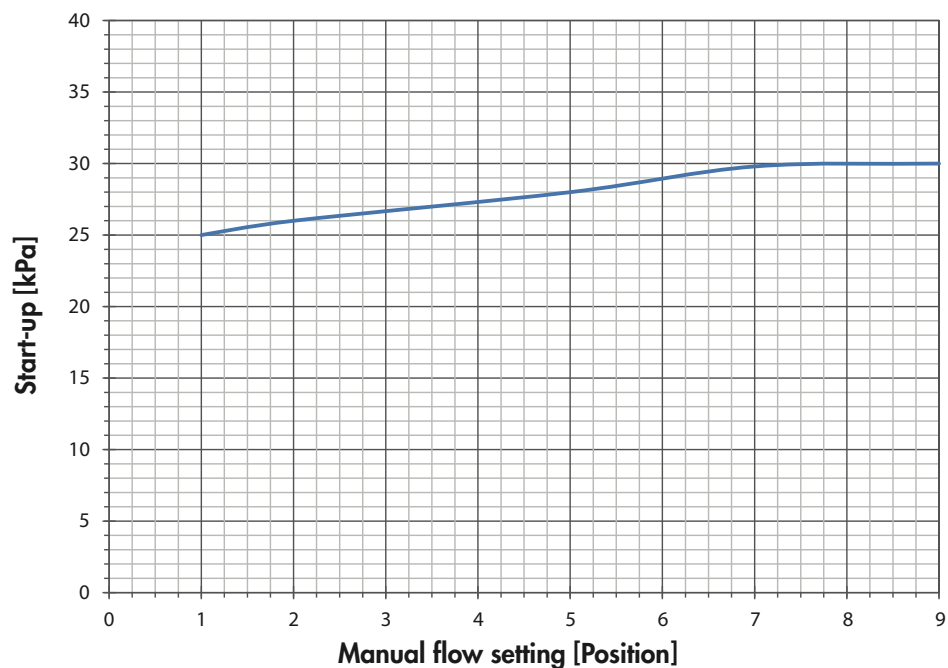


Valve			
VA93H 3/4" - 1850 l/h			
Presetting [Position]	Start-up [kPa]	Presetting [Position]	Start-up [kPa]
1	23	5.5	26,7
1.5	24,4	6	27,6
2	25	6.5	28,8
2.5	25,2	7	30
3	25,3	7.5	31,2
3.5	25,4	8	32,4
4	25,5	8.5	33,7
4.5	25,65	9	35
5	26		

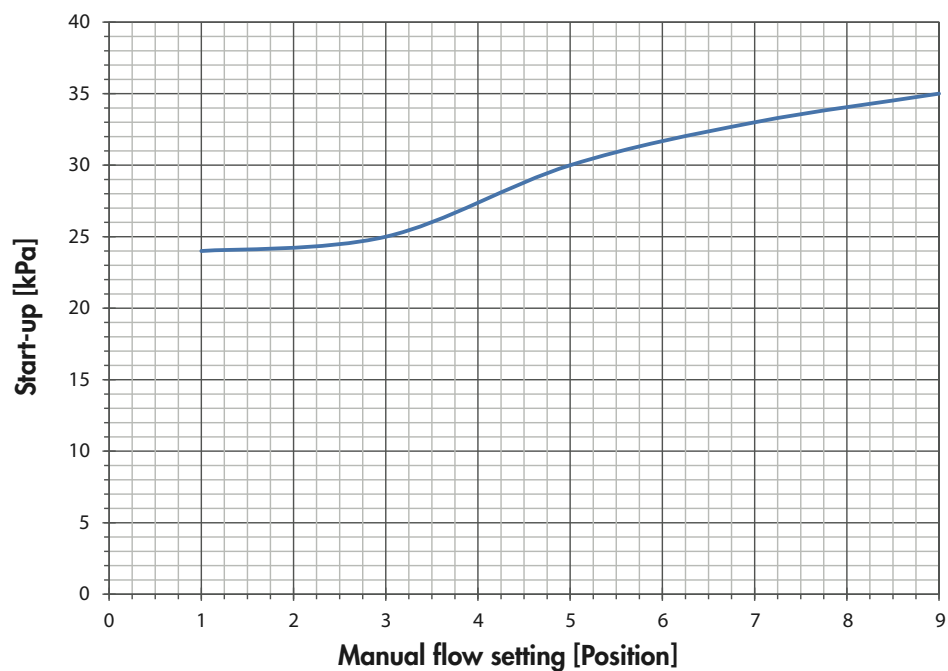


Valve			
VA93L 1" - 2500 l/h			
Presetting [Position]	Start-up [kPa]	Presetting [Position]	Start-up [kPa]
1	22	5.5	25,5
1.5	22	6	26
2	22	6.5	26,95
2.5	22,45	7	28
3	23	7.5	29,1
3.5	23,5	8	30
4	24	8.5	30
4.5	24,5	9	30
5	25		





Valve			
VA93H 1" - 3300 l/h			
Presetting [Position]	Start-up [kPa]	Presetting [Position]	Start-up [kPa]
1	25	5.5	28,4
1.5	25,55	6	28,95
2	26	6.5	29,45
2.5	26,35	7	29,8
3	26,65	7.5	29,95
3.5	27	8	30
4	27,3	8.5	30
4.5	27,65	9	30
5	28		



Valve			
VA93H 1 1/4" - 5200 l/h			
Presetting [Position]	Start-up [kPa]	Presetting [Position]	Start-up [kPa]
1	24	5.5	30,9
1.5	24,1	6	31,7
2	24,2	6.5	32,35
2.5	24,5	7	33
3	25	7.5	33,55
3.5	26	8	34,05
4	27,4	8.5	34,5
4.5	28,8	9	35
5	30		



EN Flow presetting for VA93

The following tables collect the flow rate values corresponding to the different presetting that can be set on the valve:

	VA93VL ½"		VA93L ½"		VA93H ½"		VA93L ¾"		VA93H ¾"	
Presetting [Position]	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

	VA93L 1"		VA93H 1"		VA93H 1 ¼"	
Presetting [Position]	Flow rate		Flow rate		Flow rate	
	l/h	l/s	l/h	l/s	l/h	l/s
9	2500	0,694	3300	0,917	5200	1,444
8	2202	0,612	3046	0,846	4680	1,300
7	1875	0,521	2682	0,745	4164	1,157
6	1577	0,438	2265	0,629	3582	0,995
5	1304	0,362	1849	0,514	2880	0,800
4	1048	0,291	1387	0,385	2220	0,617
3	798	0,222	884	0,246	1578	0,438
2	560	0,155	543	0,151	1026	0,285
1	339	0,094	173	0,048	540	0,150
0	0	0	0	0	0	0

In order to find the presetting position for a general flow rate value which isn't in the tables above it is possible to use the linear interpolation formula. Once the desired flow rate X has been designed, in order to find the corresponding presetting position Y , it is needed to identify the extremity flow rates values, X_1 and X_2 (respectively the upper end the lower ones) and their relative presetting positions Y_1 and Y_2 . Since the difference $Y_1 - Y_2$ it's always equal to 1, the desired presetting position can be easily calculated as:

$$Y = Y_2 + \frac{(Y_1 - Y_2) \times (X - X_2)}{(X_1 - X_2)} = Y_2 + \frac{(X - X_2)}{(X_1 - X_2)}$$

CALCULATION EXAMPLE

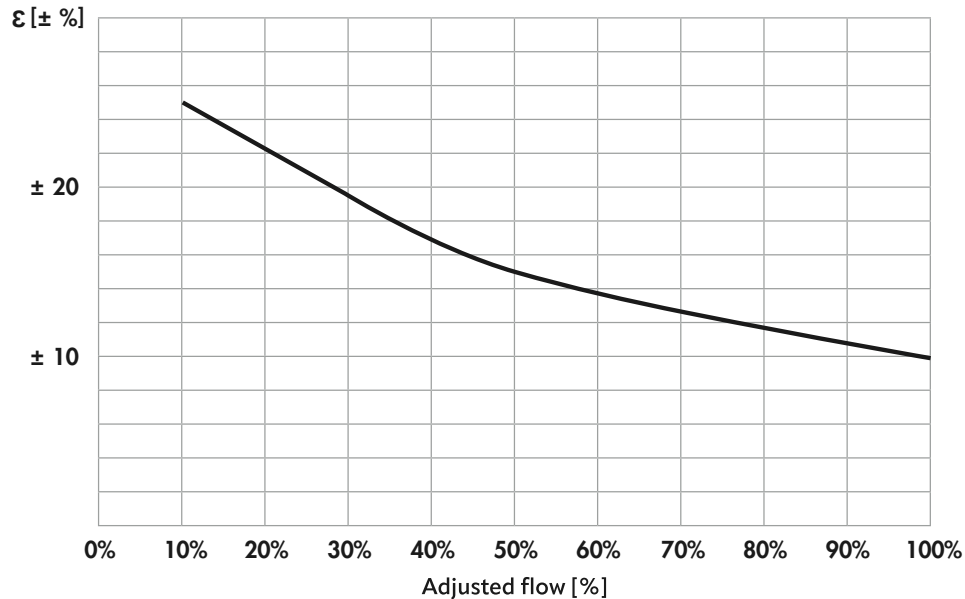
We want to obtain the position at which a VA93H 1 ¼" valve must be presetted in order to have a flow rate of 3200 l/h. From the tables above the extremity flow rate values are 3582 l/h e 2880 l/h which correspond to presetting 6 and 5. The presetting position that must be selected on the valve is:

$$Y = 5 + \frac{(6 - 5) \times (3200 - 2880)}{(3582 - 2880)} = 5 + \frac{(3200 - 2880)}{(3582 - 2880)} = 5.46 = 5.5$$



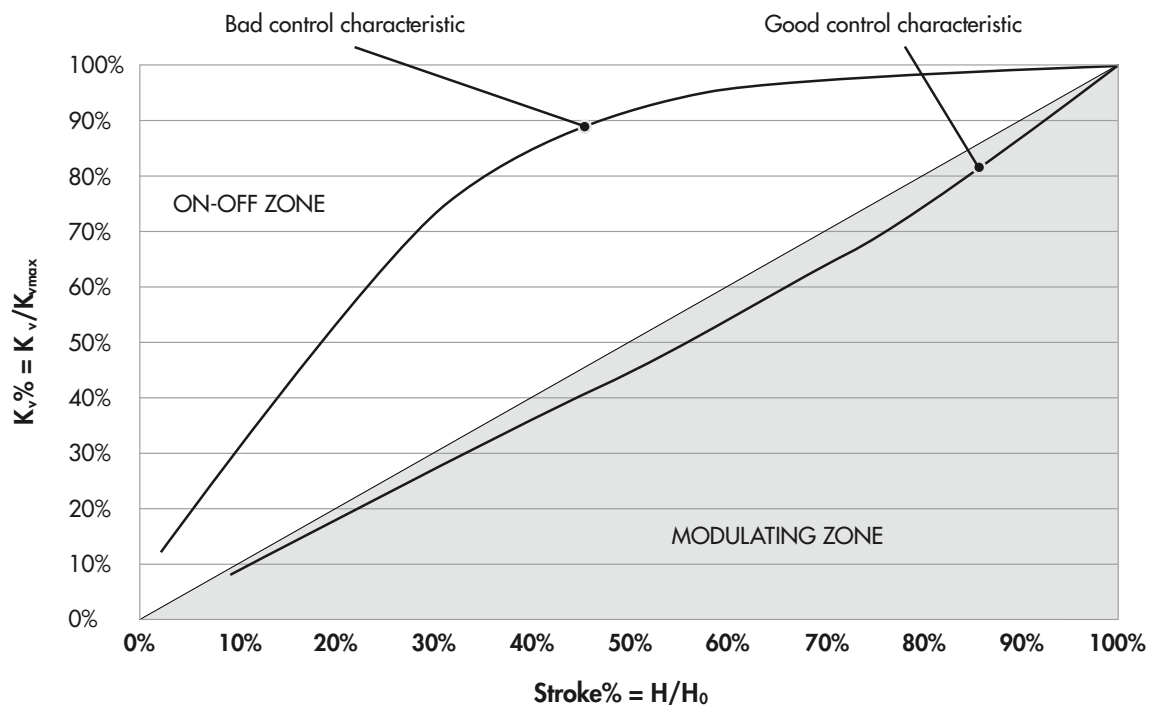
EN Flow setting accuracy

The following graph shows the max flow deviation for differential pressure over 1 bar and presetting below pos. 9. For presetting 9 and ΔP lower than 1 bar the max flow deviation is reduced to $\pm 5\%$. Please contact technical department for further informations.



EN Control curves

Operating on the position of the regulating valve control stem A will modify the valve K_v , hence the flow rate. Typical relations between K_v and stroke for a control valve are shown below:



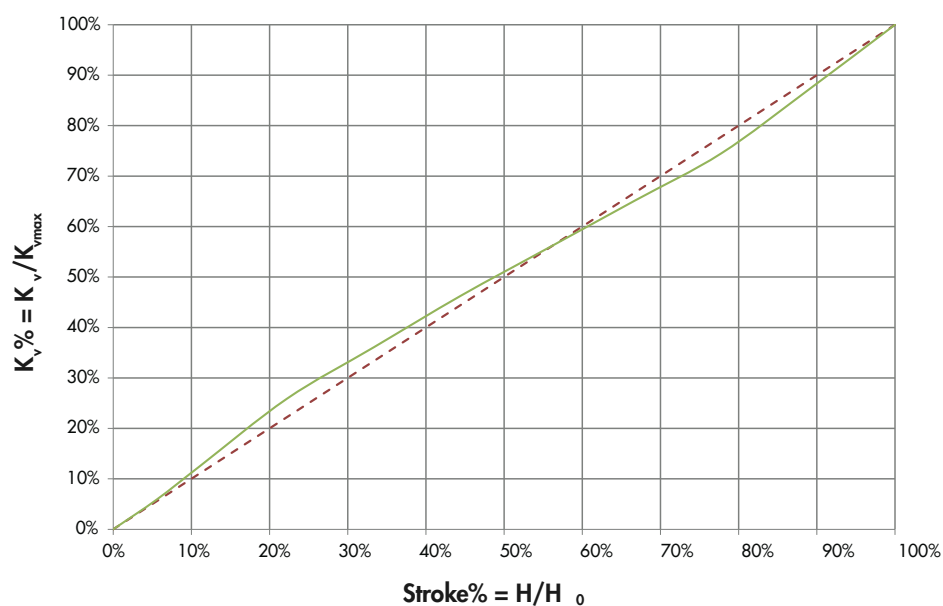
Where:

- H_0 is the maximum lift of the control valve
- K_{vmax} is the valve flow factor when the valve is fully open so at lift equal to H_0
- H is the current lift (opening) of the control valve. It will vary from 0 to H_0
- K_v is the valve flow factor related to lift H

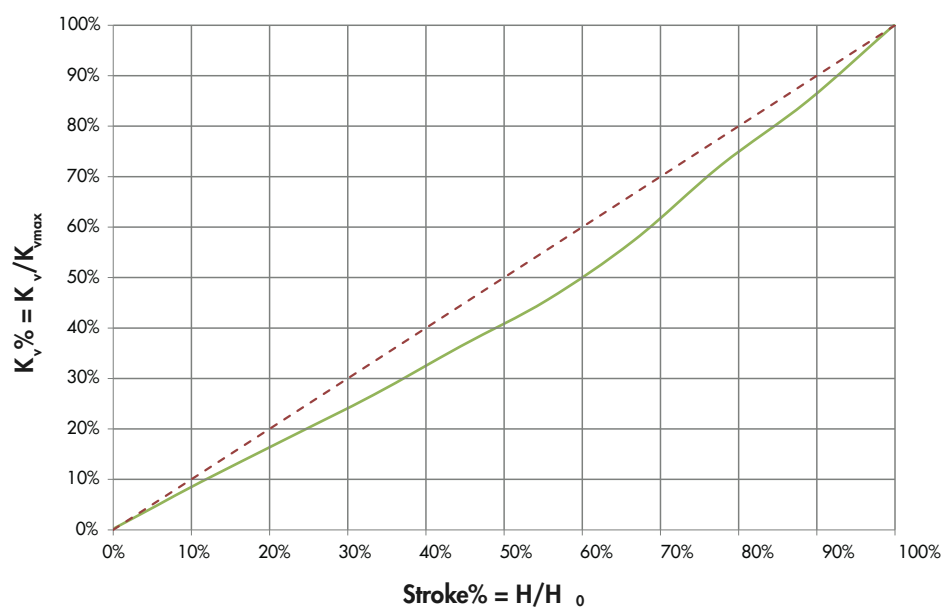
The **VA93** valve has an inherent linear characteristic.

Control curves for VA93 valves are shown below (control curve characteristic may change according to valve version):

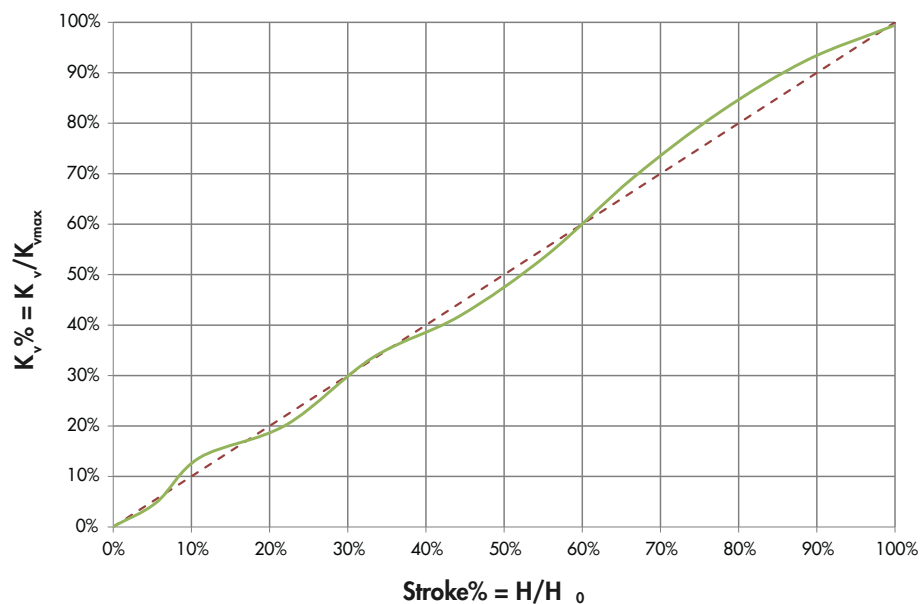




Valve
VA93VL 1/2" - 150 l/h
Selected presetting
Position 9

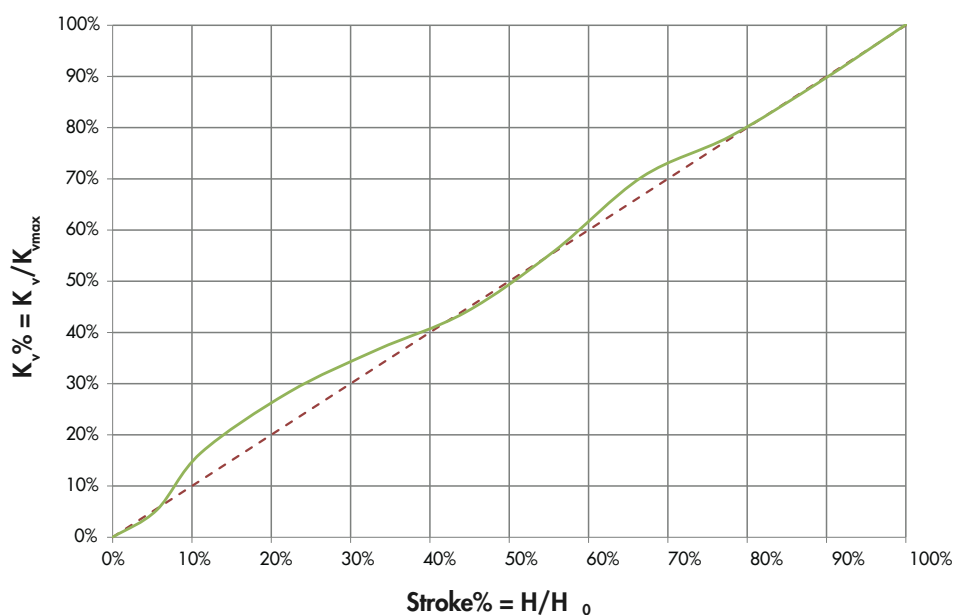


Valve
VA93L 1/2" - 450 l/h
Selected presetting
Position 9

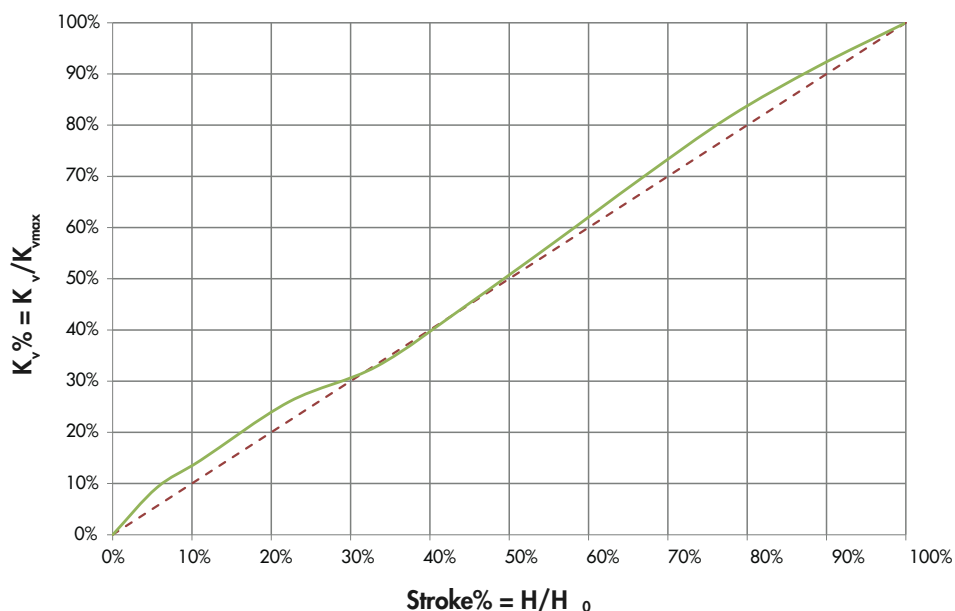


Valve
VA93H 1/2" - 850 l/h
Selected presetting
Position 9

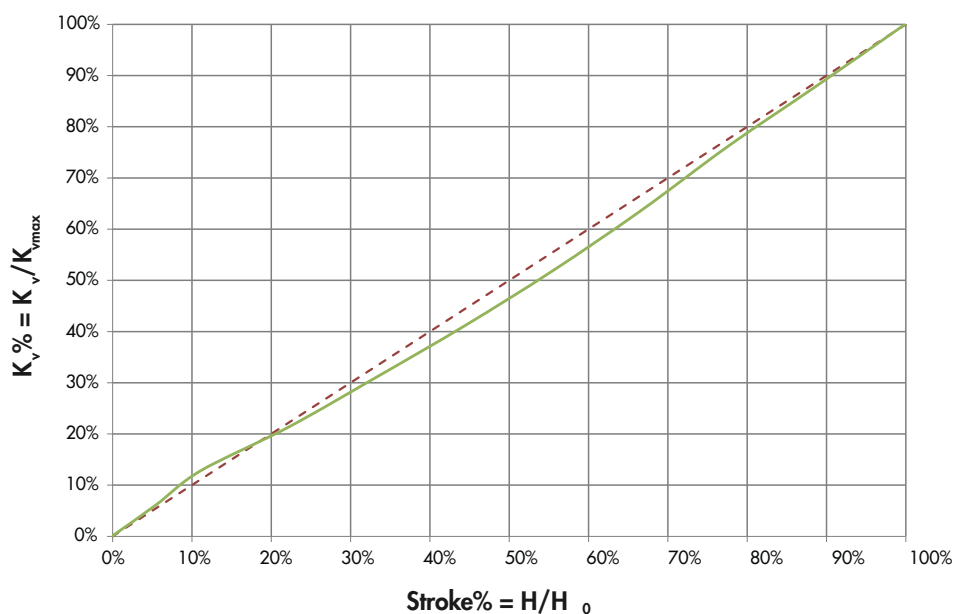




Valve
VA93L 3/4" - 1000 l/h
Selected presetting
Position 9

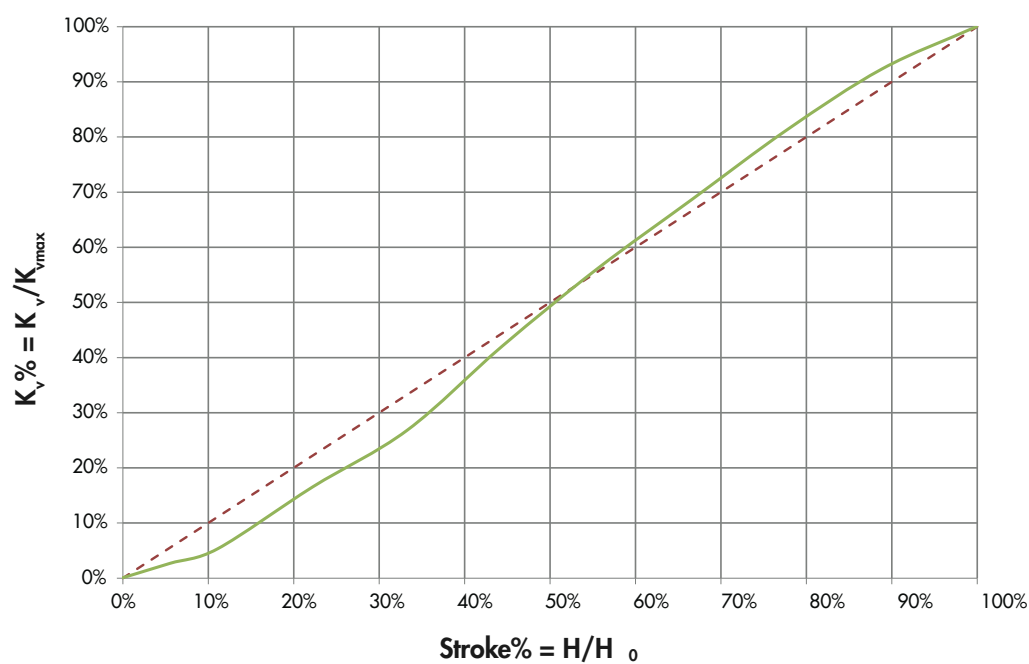


Valve
VA93H 3/4" - 1850 l/h
Selected presetting
Position 9

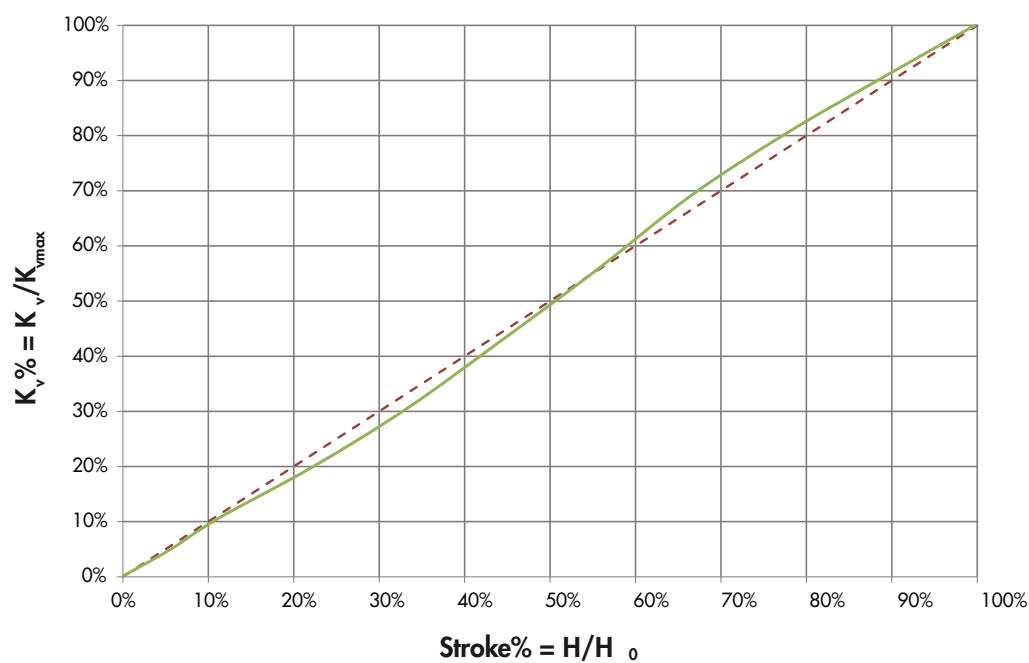


Valve
VA93L 1" - 2500 l/h
Selected presetting
Position 9





Valve
VA93H 1" - 3300 l/h
Selected presetting
Position 9



Valve
VA93H 1 1/4" - 5200 l/h
Selected presetting
Position 9



EN Dirt resistant feature

In general, low water quality affects negatively the operation of a PICV. The installation of strainers helps to reduce the problem but nevertheless does not completely cancel it: very small impurities in fact manage to by-pass the filtering meshes. Their accumulation inside the system can thus lead to the formation of deposits on moving parts, for example the differential pressure regulator of the PICV, consequently causing blockage.

One of the key features of the VA93 range is its ability to work even in dirty water conditions. The inspectable and washable differential pressure regulator has been specifically designed to prevent the valve from blocking even if the heat transfer fluid has micro-particles suspended inside.

The conformation of the differential pressure regulator, combined with the special design of all the components, ensures the minimum friction between the moving and fixed parts: this way the risk of blockage due to excessive friction is reduced.

In order to evaluate its efficiency, the valve has been tried out with an appropriate internal wear test. The purpose of this latter is in fact to simulate very demanding working conditions to get an experimental confirmation with a proper security factor. The test has been done on a dedicated circuit using water contaminated by ferric oxide Fe_2O_3 at a concentration of 900 ppm. In order to obtain a valid response on the time scale over 100000 opening and closing cycles of the valve have been done in this demanding conditions.

The manufacturer does not accept any liability for improper or wrong use of this product. PICV **VA93** series can work as per the specification with maximum iron oxide concentration up to 900 ppm, according to the results of the proprietary test carried out. The manufacturer suggests follow VDI 2035 standard to ensure suitable operation of all equipments of HVAC systems.

EN Actuators

The table below shows actuators part numbers for different control types:

Type - Electromotive	Part number	Stroke	Suitable size
24V, 0-10V Prop, Feedback, Fail safe	VAM85	6,3 mm [^]	DN15 to DN32

Type - Thermo-electric	Part number	Stroke	Suitable size
230V, ON-OFF, 2 wires	VAOF5	4 mm	DN15, DN20
230V, ON-OFF, 2 wires	VAOF6	6.5 mm	DN25, DN32

* Adapter NOT included. ** Adapter included. [^] Equipped with stroke detection system.

Vantec is not liable for unauthorized use of actuators not shown in the table above.

EN General conditions

To ensure the main pipework is cleaned appropriately, flushing by-passes should be used: for effective flushing (suitable water velocity), any flushing through the pressure regulator of the PICV is not suggested, according to BSRIA Guideline BG29.

*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.
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Vantec Industrial Ltd

128, City Road, London, EC1V 2NX, United Kingdom

<https://vantecindust.co.uk/>

