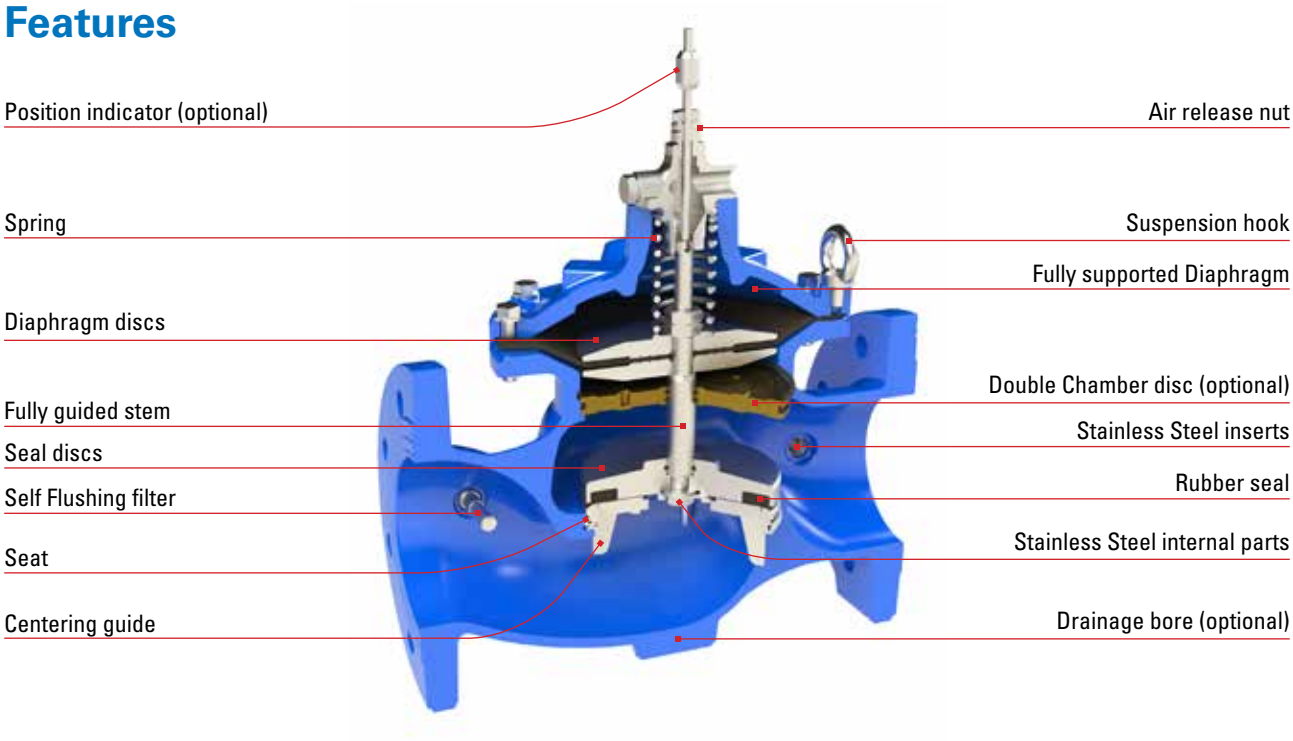
Overview

DOROT'S 300 Series, state-of-the-art automatic control valves are designed to withstand the most demanding requirements of water system control. The experts at DOROT developed this technically-advanced valve with capabilities- far beyond any other on the market.
This Engineering Data guide will asist the reader in the selection of the optimal DOROT Series 300 valve.

Features



Features of the 300 Series

- The capability to regulate near zero flow, as standard on all sizes, eleminates the need for a special low flow (throttling plug) or valve, while ensuring very low head loss in "fully open" position.
- The flange (face-to-face) dimensions suit ISO Standards.
- The valve has an internal floating shaft, allowing for frictionless operation. The unique design of the shaft provides for easy field maintenance.
- The valve has a resilient seal disc, guided by a frictionless centering device.
- The valve's body is made of Ductile Iron, withstanding both high hydraulic and mechanical stresses.
- The standard single - chamber valve provides smooth operation in sensitive regulation conditions. When required, conversion from a single to a double chambered valve is easily accomplished through the insertion of Dorot's innovative separation disc, without the need to remove the valve from the pipeline during the conversion.
- The valve is supplied with a replaceable Stainless Steel seat, which maintains excellent durability against erosion and ensures a drip-tight seal.
- During valve closure the rate slows, preventing potential damage from water hammer or surges.
- The 300 Series includes an optional valve position indicator, attached by a floating connection (ball & socket), resulting in smooth movement, with no wear or tear on the indicator seal.

Technical Specifications

Parameter	Standard	Optional
Connections	• Flanged ISO 7005 or ANSI B16 • Threaded BSP or NPT	• Flanged AS10, JIS B22, ABNT and others
Pressure range	• Model 30: 0.5 – 16 bar 7 – 250 psi • Models 31, 32: 0.5 – 25 bar 7 – 360 psi Note: higher pressure rating available on special demand and for tailor-made projects	• 0 min. press. with N.O spring assisted opening. • 0.2 bar / 3 psi min. pressure without a spring Note: both options require usage of external higher closing pressure
Max. Water Temperature	• 80ºC / 180ºF	• 95ºC / 200ºF

Materials

Part	Standard	Optional
Body & Cover	Ductile Iron GGG50 (ASTM A-536)	Cast Steel A-216 WCB Cast Bronze or Marine Bronze Cast SST CF8M (316) Ni Aluminum Bronze Others
Main Valve Internals	SST, Bronze and Coated Steel	SST 316, HASTELLOY, SMO, DUPLEX
Spring	SST 302	SST 316, INCONNEL
Diaphragm	Nylon fabric reinforced EPDM (WRAS and NSF approved)	NBR, Viton
Seals	EPDM	NBR, Viton
Coating *	Fusion Bonded Epoxy (FBE) RAL 5010	UV protected FBE RAL 5010 FBE RAL 3000 (fire red) UV protected FBE RAL 3000 Rilsan (Nylon) Halar
Control Trim: Fittings and control devices	Brass	SST 304, SST 316, Duplex
Control Trim: Tubes	Reinforced, heavy-duty Polypropylene	Copper, SST 316, Duplex

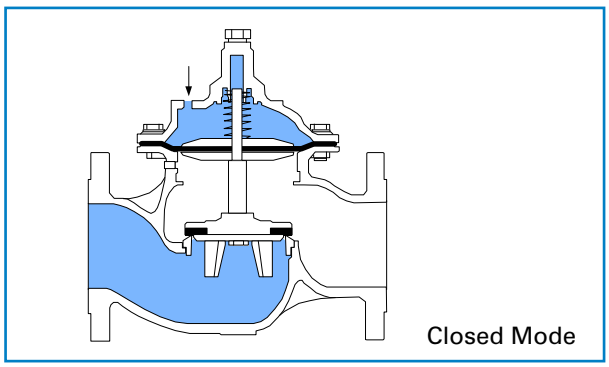
Note: The Dorot S-300 valves in all sizes, meet the USA amendment for reducing lead in drinking water marked as S.3874 dated 01.05.2010.

* Coating: Complying with European coating standard EN 14901-2014

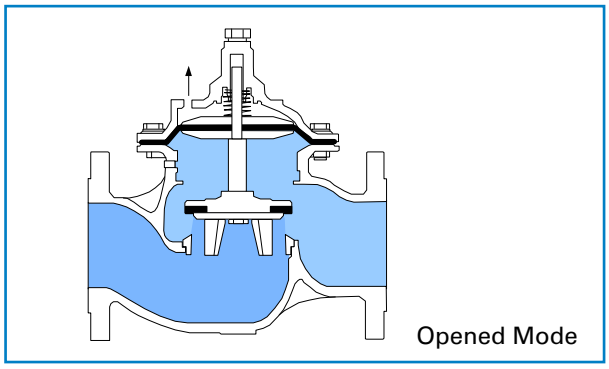
Basic Valve Operating Modes
On-Off Mode

Standard (Single Chamber) Valve

Closed Mode: The control pressure (taken from the pipeline) is applied by the control device to the control chamber (top of the diaphragm). The pipeline pressure pushes the seal to open, and the control chamber pressure forces the diaphragm to close. Since the diaphragm area is larger than the seal area, it has greater hydraulic force so the valve remains in the closed position.


Closed Mode

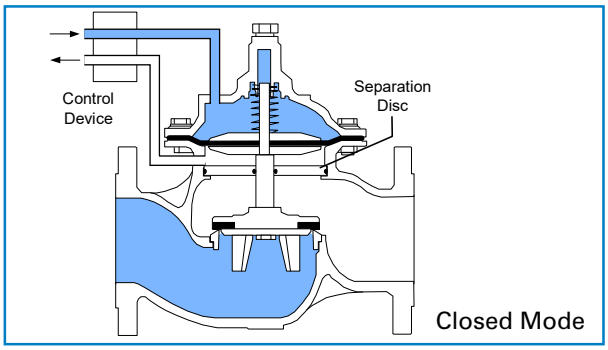
Open Mode: The control device relieves the pressure from the control chamber. The pipeline pressure forces the seal to the "open" position so that the fluid can pass through the valve. While the valve is open, outlet pressure is applied to the lower side of the diaphragm, assisting the opening.


Opened Mode

Double Chamber Valve (Version D)

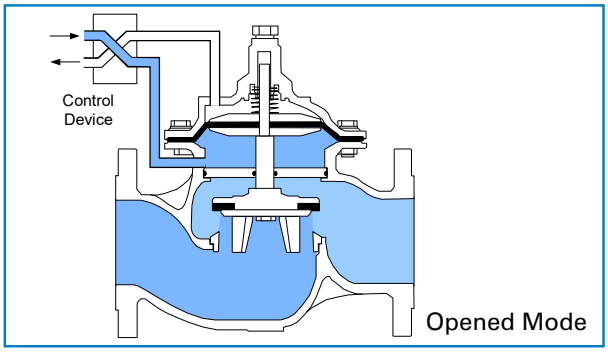
The double chamber version is created by inserting a separation disc between the diaphragm and the seal. This assembly creates a second control chamber below the diaphragm, permitting for the activation of the valve in low-pressure systems and enabling the activation faster valve response. The response to varying conditions is quick, since closure downward movement is not resisted by pressure below the diaphragm.

Closed Mode: The control pressure (taken from the pipeline or from supplementary pressure source) is applied to the top of the external diaphragm. The bottom control chamber drains. The pipeline pressure pushes the seal to open, but since the diaphragm area is larger than the seal area it creates greater hydraulic force and which forces the valve to close thus the valve closes. At this stage, the bottom chamber should be drained.



Closed Mode

Open Mode: The control device releases the pressure from the top control chamber.
The seal assembly is forced to the "open" position by the pipeline pressure, allowing flow through the valve.



Opened Mode

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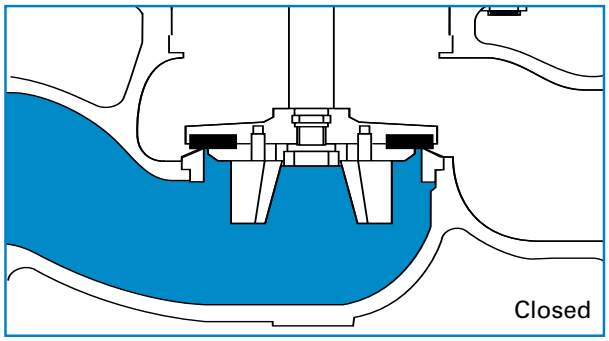
Modulating Mode

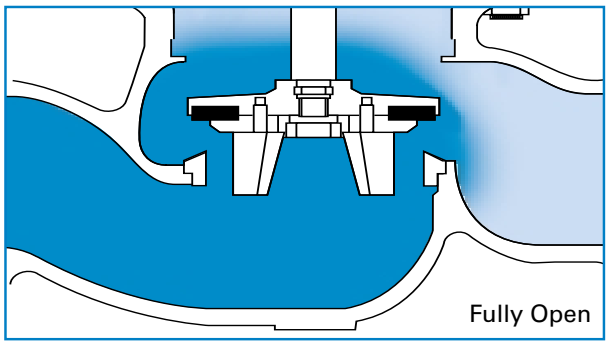
General

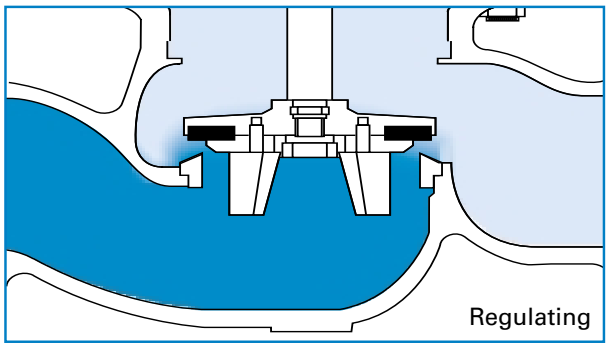
Positioning the seal a short distance (less than 1/4 of the seat diameter) from the seat, creates friction and turbulence, causing energy loss in the fluid passing through the valve. The results are:
- Reduction of pressure and flow rate.
- Increase of inlet pressure.

The position of the seal assembly is dictated by the volume of control fluid in the top control chamber, which is determined by the control device. The control device is operated by hand (manual control), by electric current (solenoid valve), or by hydraulic pressure (pilot valves, hydraulic relays). All can be used in standard (single chamber) valves as well as in double chamber valves.

Modulating mode in standard (single chamber) valves

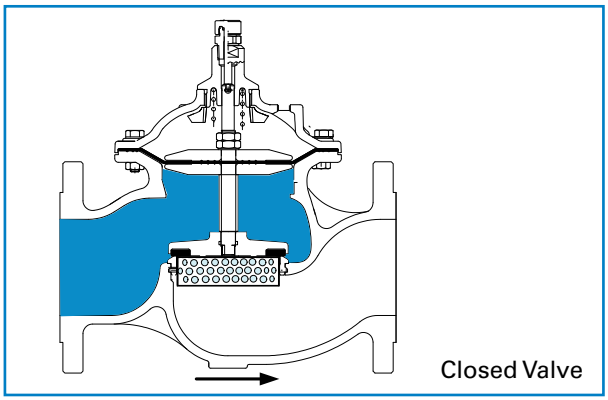


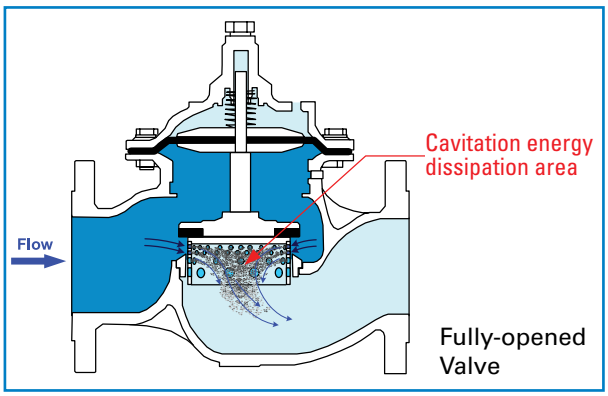




Regulation at high pressures difference

The S-300 has exceptional resistance to damages, caused by cavitation conditions. This feature was certified by extensive tests, carried by an independent laboratories in US and Europe. The operation limits, as found in these tests, can be calculated for any specific location- using a simple computer program (supplied on request). For operation conditions that exceed the safe limit- a special Cavitation-Free valve can be supplied. This version, marked by the suffix "F" (example 30F-3 is a cavitation-free, 80mm / 3" valve), can operate at any pressure differential without being ruined by it. The internal structure includes a Stainless Steel, perforated cylinder, that is connected below the standard seal disc and moving freely inside the seat. The valve is assembled to generate "over the seat" flow, so the water stream enters the cylinder from its external side and emerges through the internal side. The energy is dissipated by the high-velocity, turbulent flow through the exposed holes above the seat (due to varying trim position). The pressure recovery, that is the cause of cavitation damage, happens now inside the cylinder and not adjacent to the body wall. As the SST material is highly- resistant to cavitation- it is not damaged.

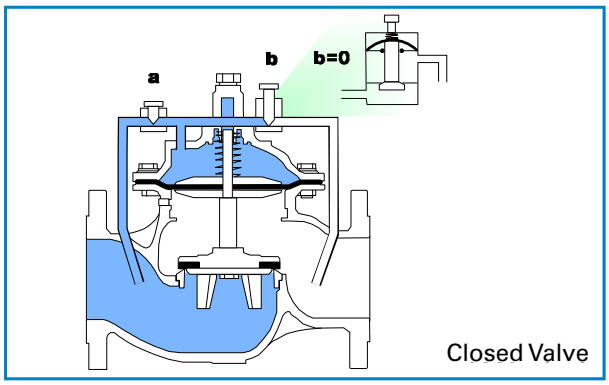




2-Way Control Device

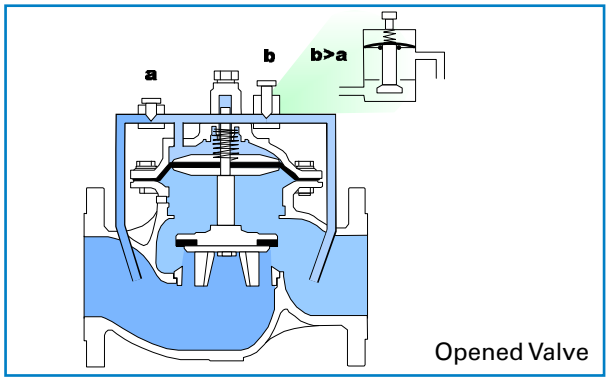
The 2-way control device is assembled on a control circuit, connecting upstream to downstream through the control chamber.
There are two restrictors assembled in this circuit:
(a) A nozzle or a needle valve, at a fixed opening.
(b) A modulating device (pilot), whose passage may vary from complete closure (b=o) to a fully open size (when b>a).
The volume of the control media in the chamber is determined by the relative passages (a) and (b), or, in fact, by the opening of (b), as (a) is fixed.

Closed Mode: Pilot (b) senses a downstream pressure higher than the set-point and closes passage (b). Through passage (a) the upstream water flows directly into the upper part of the control chamber, forcing the diaphragm to close the valve.



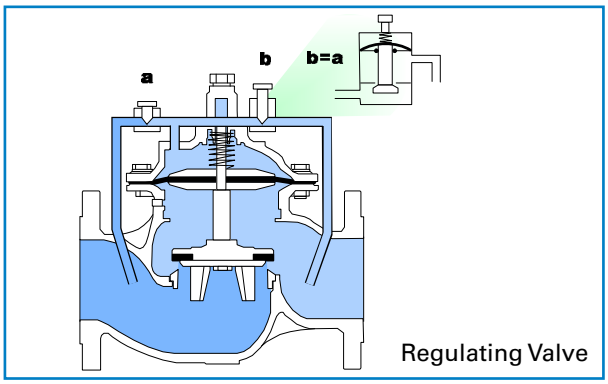
Closed Valve

Open Mode: Pilot (b) senses a downstream pressure lower than the set-point, and fully opens passage (b), larger than (a). All the water from the upstream flows through (a) and (b), directly to the downstream, allowing water from the upper part of the control chamber to partially drain until the pressure in the chamber equals the downstream pressure.
Pressure in the upper part of the control chamber is decreased and the upstream water pressure forces the seal disc to rise (opening the valve).



Opened Valve

Regulating Mode: The pilot is set to the required downstream pressure. The pilot senses when the downstream pressure reaches the required value causing passage (b) to equal passage (a) b=a. Now, water that flows through the control loop passes from (a) through (b) and into the downstream.
The control media in the upper part of the control chamber is now steady, keeping the diaphragm and seal in a fixed position. Any change in the downstream pressure will change the b=a balance. This change adds or drains water from the control chamber, thus opening or closing the main valve until it reaches the balanced regulating position b=a once again.



Regulating Valve

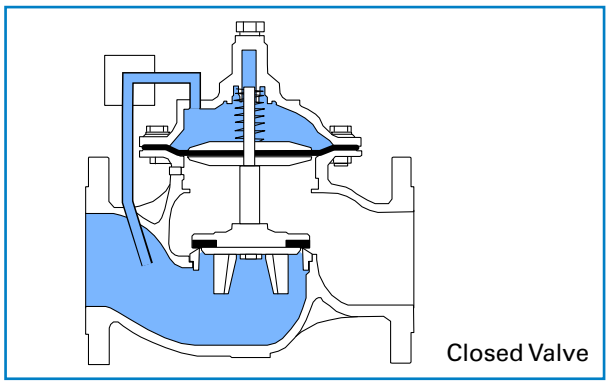
The 2-way control device provides sensitive, accurate, and constant modulating, control of the main valve. The main valve does not fully open, as the control device prevents total draining of the control chamber.
The 2-way control device is standard in most pressure
regulating valves.

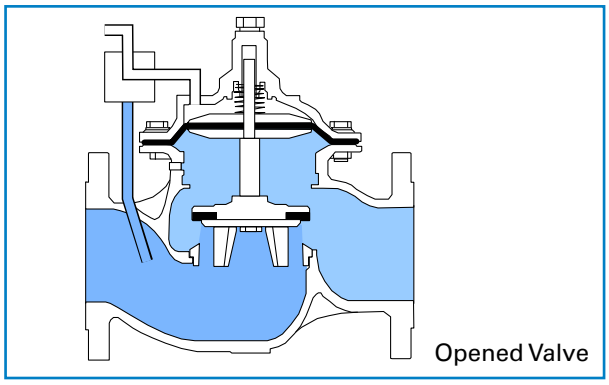
3-Way Control Device

The 3-way control device is a small selector valve which:

1. Permits passage of the control media into the main valve control chamber (initiating the "closing" procedure), or
2. Permits drainage of the control media from the control chamber to the atmosphere (initiating the "opening" procedure).

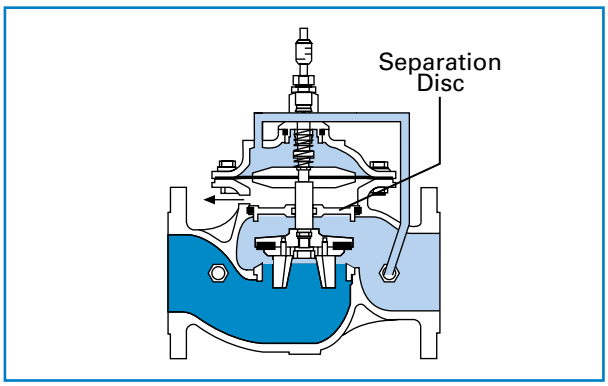
Some of the 3-way control devices have a third mode as well, which prevents inflow or outflow from the control chamber, so that the main valve remains fixed when the device is in this mode.
The 3-way mode is used in on-off valves or when the regulating valve is fully open, in order to obtain specific operating conditions. Once in position, there is no water flow through the control chamber.
The 3-way control circuit may open the main valve entirely, creating minimum head loss.
The 3-way control device must be used when external media (not pipeline water) is used to control the valve, or when the control media is dirty or abrasive.





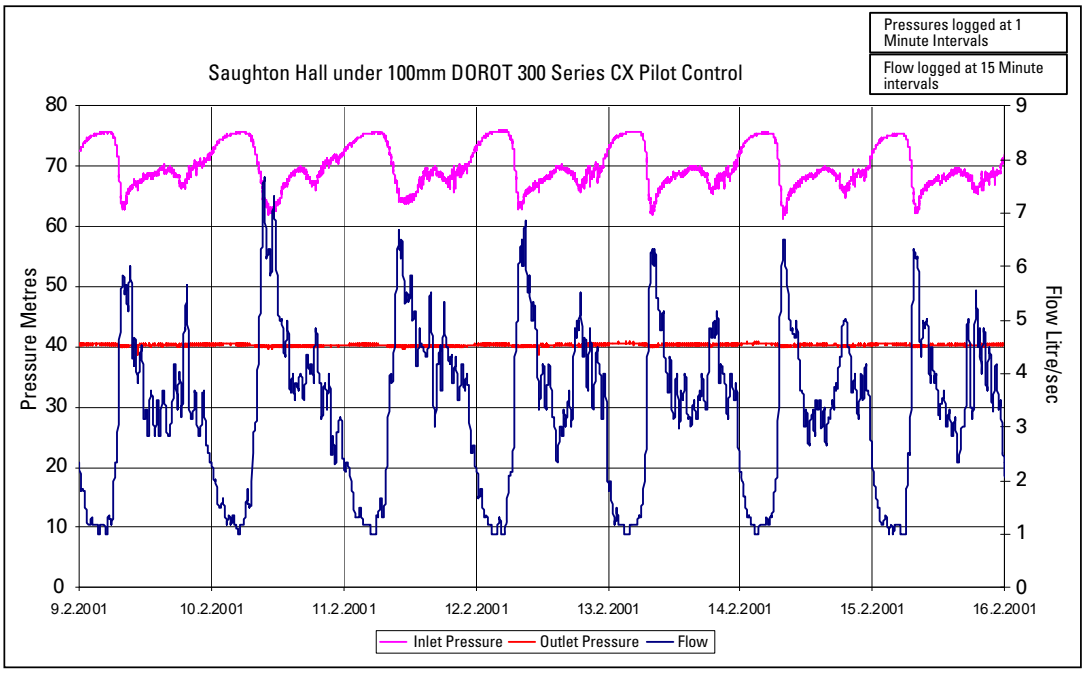
Proportional Pressure Reducer

The proportional pressure reducer is a valve that has a control chamber permanently connected to the downstream.
This valve must be a double chamber [D] type.
The balance of hydraulic forces created between the high pressure on the small seal area, and the lower downstream pressure on the larger diaphragm area, causes a fixed ratio of inlet/outlet pressure of approximately 3:1.
No other control device is needed.

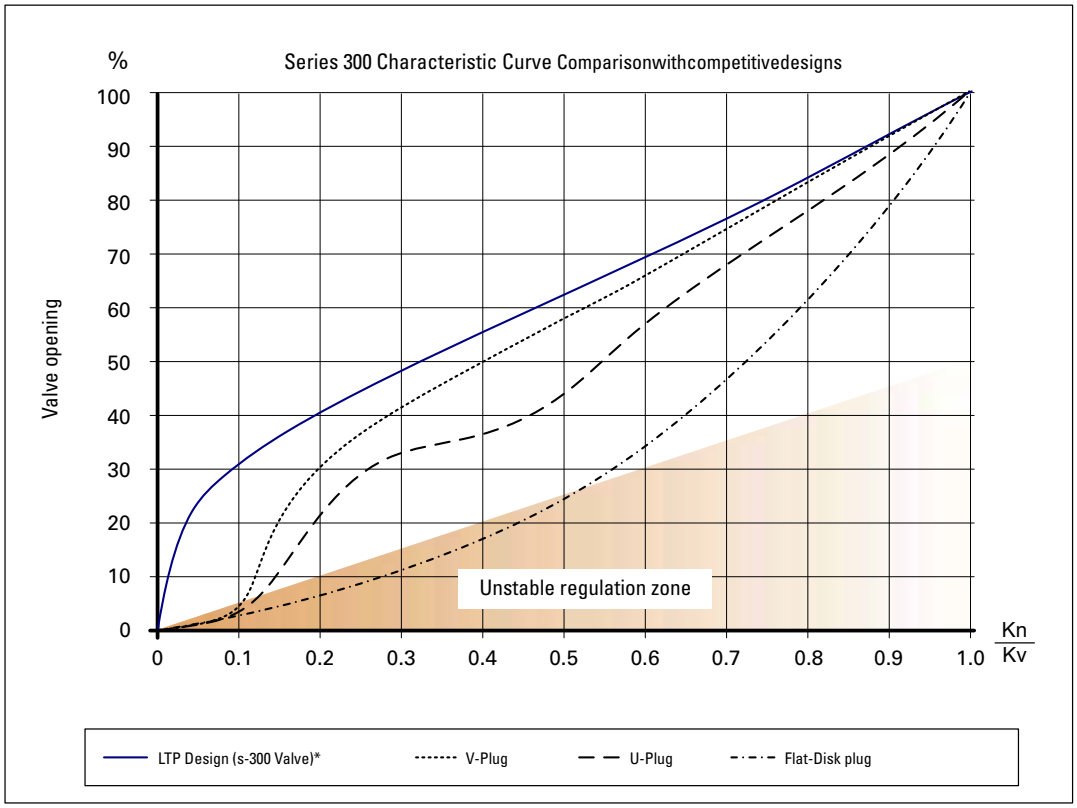


Typical Pressure Reducing Performance Chart

100 mm / 4" Dorot 300 Series Pressure Reducing Valve



Comparison of different seal structures



* Independent laboratory report data source

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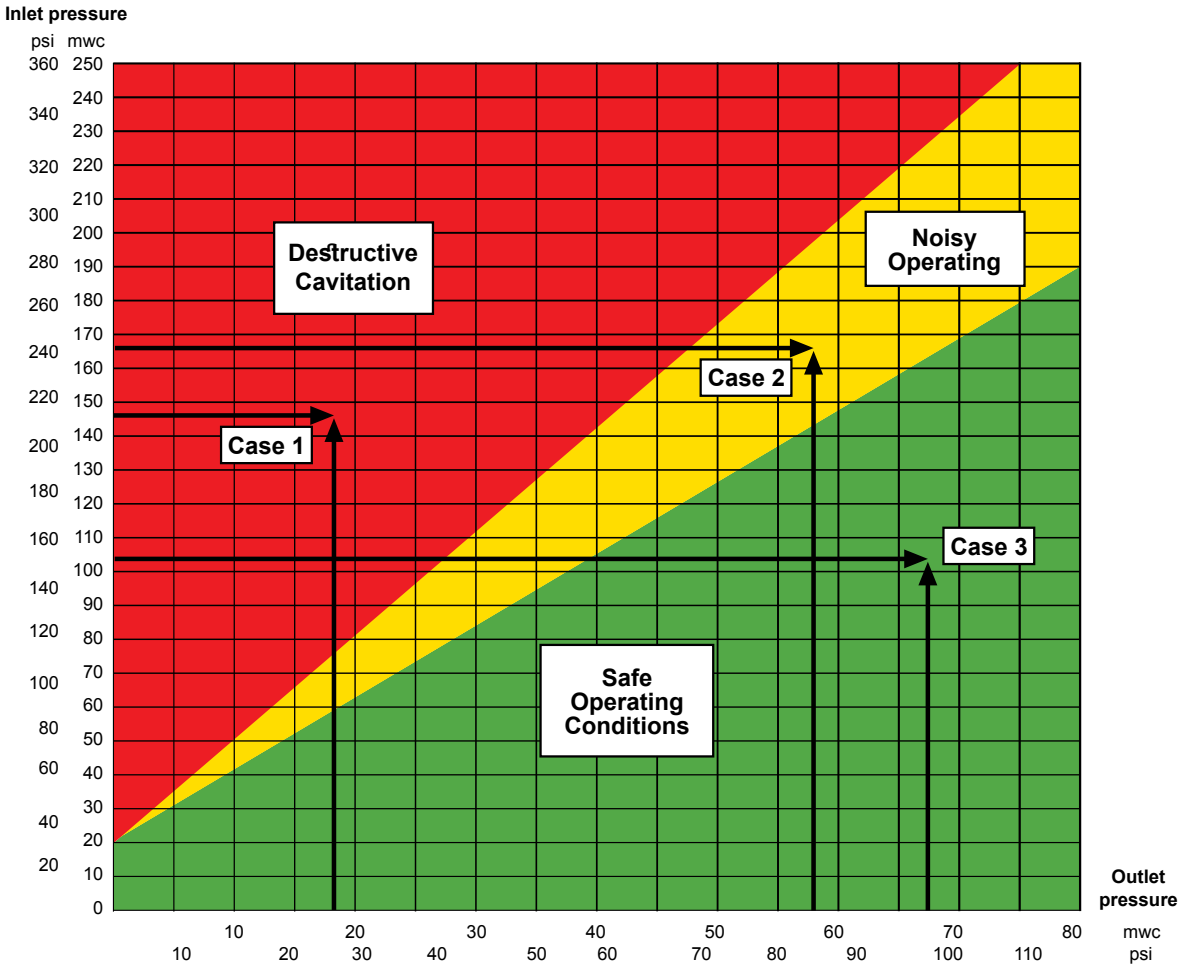
Cavitation Data



Cavitation Chart

Limits of operating conditions
The chart above sets the safe limits for valves that are supposed to operate at a considerable pressure differential.
Such conditions generate noise and possible cavitation damages to the valve body.
How to use the chart:
i. Determine the maximal dynamic pressure that may be applied in the inlet of the valve.
ii. Draw an horizontal line from the pressure scale at the left side of the chart
iii. Find the requested outlet pressure in the pressure scale at the bottom of the chart.
iv. Draw an upward line at this point.
v. The intersection of the two lines defines the cavitation characteristics of the valve operation.
- In the case that it falls in the RED zone (case I)- the valve may be damaged in a fairly short time.
- In the case that it falls in the YELLOW zone (case II)- the valve may generate a noise that exceeds 80db.
- In the case that the intersection is within the GREEN zone (case III)- the valve will perform safely and quietly

General remark: The cavitation and noise data are based on tests done by the Utah State University, US, and Delft Hydraulic Laboratories, Holland.

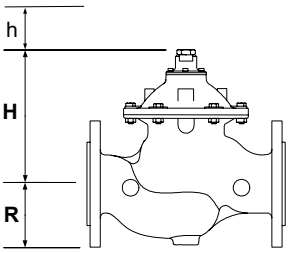
Dimensions & Weights

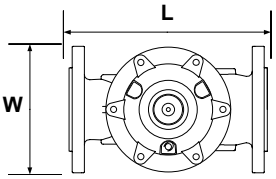
Models 30 (16 bar rated valves) / 31 (25 bar rated valves)

Globe Flanged Type

Valve Size	40 (1½")		50 (2")		65 (2½")		80 (3")		100 (4")		150 (6")		200 (8")	
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
L	230	9 1/16	230	9 1/16	290	11 3/8	310	12 3/16	350	13 3/4	480	18 7/8	600	23 5/8
L (ANSI#300)	230	9 1/16	235	9 3/16	292	12 1/2	345	13 1/2	400	15 11/16	525	20 5/8	605	23 13/16
H	185	7 5/16	185	7 5/16	185	7 5/16	230	9 1/16	240	9 7/16	330	13	390	15 3/8
h**	140	5 1/2	140	5 1/2	140	5 1/2	170	6 11/16	180	7	230	9	300	11 13/16
W	153	6	170	6 11/16	185	7 3/16	200	7 7/8	235	9 1/4	330	13	415	16 5/16
R	82.5	3 1/4	82.5	3 1/4	92.5	3 5/8	100	3 15/16	110	4 5/16	142.5	5 5/8	172.5	6 3/4
Weight Kg/lbs*	12 / 26		12 / 26		13 / 29		22 / 49		37 / 82		80 / 176		157 / 346	
Vol.control chamber lit/gal	0.1 / 0.02		0.1 / 0.02		0.1 / 0.02		0.3 / 0.08		0.7 / 0.2		1.5 / 0.4		4.3 / 1.1	

Valve Size	250 (10")		300 (12")		350 (14")		400 (16")		450 (18")		500 (20")		600 (24")	
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
L	730	28 3/4	850	33 7/16	980	38 9/16	1100	43 5/16	1200	47 1/4	1250	49 3/16	1450	57 1/16
L (ANSI#300)	790	31 1/8	910	35 13/16	980	38 9/16	1150	45 5/16	1200	47 1/4	1250	49 3/16	1450	57 1/16
H	520	20 1/2	635	25	635	25	855	33 5/8	855	33 5/8	855	33 5/8	1200	47
h**	390	15 1/4	450	17 11/16	450	17 11/16	590	23 1/4	600	23 5/8	600	23 5/8	740	29 1/8
W	525	20 11/16	610	24	610	24	850	33 7/16	850	33 7/16	850	33 7/16	1100	43 5/16
R	205	8 1/16	230	9	272	10 11/16	290	11 7/16	310	12 3/16	357.5	14 1/16	490	19 5/16
Weight Kg/lbs*	245 / 540		405 / 893		510 / 1124		822 / 1812		945 / 2083		980 / 2160		1950 / 4299	
Vol.control chamber lit/gal	9.7 / 2.6		18.6 / 4.9		18.6 / 4.9		50 / 13.2		50 / 13.2		50 / 13.2		84 / 22.2	

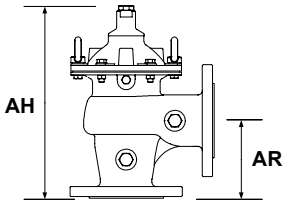


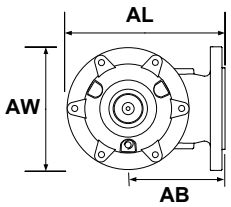


Angle Type*

Valve Size	50 (2")		80 (3")		100 (4")		150 (6")		200 (8")		250 (10")	
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
AL	208	8 3/16	250	9 13/16	295	11 1/16	405	16	505	19 7/8	585	23
AH	240	9 7/16	415	16 5/16	445	17 1/2	570	22 7/16	635	25	832	32 3/4
AW	170	6 11/16	200	7 7/8	235	9 1/4	330	13	415	16 5/16	495	19 1/2
AR	107	4 3/16	138	5 7/16	147	5 13/16	180	7 1/16	302	11 7/8	338	13 5/16
AB	125	4 15/16	150	5 7/8	173	6 13/16	240	9 7/16	300	11 13/16	338	13 5/16
Weight kg/lbs*	12 / 26		20 / 44		37 / 81		76 / 167		150 / 330		234 / 550	

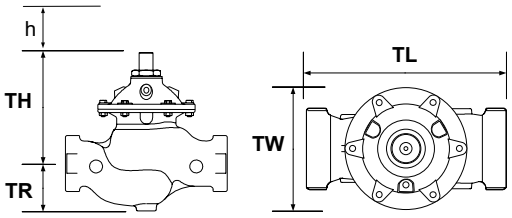
*Min order quantities - consult factory





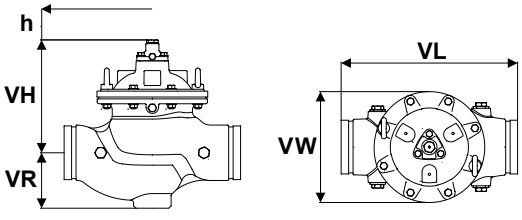
Globe Threaded Type

Valve Size	40 (1½") TH		50 (2") TH	
	mm	inch	mm	inch
TL	215	8 7/16	215	8 7/16
TH	185	7 5/16	185	7 5/16
h	140	5 1/2	140	5 1/2
TW	129	5	129	5
TR	62	2 3/8	62	2 3/8
Weight kg/lbs*	7 / 15		7 / 15	



Grooved Type

Valve Size	50 (2")		80 (3")		100 (4")		150 (6")	
	mm	inch	mm	inch	mm	inch	mm	inch
VL	215	8 1/2	351	13 13/16	376	14 13/16	521	20 1/2
VH	173	6 13/16	228	9	240	9 7/16	330	13
h	140	5 1/2	170	6 11/16	180	7 1/16	230	9 1/16
VW	128	5	197	7 3/4	236	9 5/16	331	13 1/16
VR	78	3	106	4 3/16	118	4 5/8	147.5	5 13/16
Weight kg/lbs*	6.5 / 14.5		15.1 / 33.25		26.5 / 58.5		58.25 / 128.5	



* Approximate shipping Weight (PN 25)
** h = Minimal required maintenance space

- End Connections (for PN16 or PN25)
- ISO 2084, 2441, 5752 ANSI B16, AS2129, JIS B22

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Dimensions & Weights

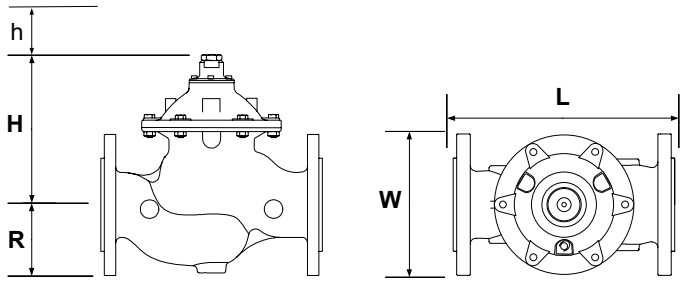
Model 32 (25 bar rated valves)

Globe Flanged Type

Valve Size	80 (3")		100 (4")		125 (5")*		150 (6")		200 (8")		250 (10")		300 (12")		350 (14")	
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
L	310	$12^{3}/_{16}$	350	$13^{3}/_{4}$	358	$14^{1}/_{8}$	480	$18^{7}/_{8}$	600	$23^{5}/_{8}$	730	$28^{3}/_{4}$	850	$33^{7}/_{16}$	980	$38^{9}/_{16}$
H	185	$7^{1}/_{4}$	232	$9^{3}/_{16}$	241	$9^{1}/_{2}$	250	10	334	$13^{1}/_{8}$	395	$15^{1}/_{2}$	545	$21^{1}/_{2}$	635	25
h**	107	$4^{1}/_{4}$	156	$6^{1}/_{8}$	156	$6^{1}/_{8}$	170	$6^{3}/_{4}$	220	$8^{11}/_{16}$	275	$10^{13}/_{16}$	400	$15^{3}/_{4}$	480	$18^{7}/_{8}$
W	200	$7^{7}/_{8}$	235	$9^{1}/_{4}$	270	$10^{5}/_{8}$	300	$11^{3}/_{4}$	360	$14^{3}/_{16}$	425	$16^{3}/_{4}$	489	$19^{1}/_{4}$	610	24
R	100	$3^{15}/_{16}$	120	$4^{11}/_{16}$	137	$5^{3}/_{8}$	150	$5^{7}/_{8}$	182	$6^{3}/_{16}$	215	$8^{7}/_{16}$	245	$9^{3}/_{8}$	260	$10^{3}/_{16}$
Weight Kg/lbs*	15 / 33		27 / 60		43 / 94		51 / 112		92 / 202		171 / 377		330 / 726		510 / 1124	
Vol.control chamber lit/gal	0.1 / 0.02		0.3 / 0.08		0.3 / 0.08		0.7 / 0.2		1.5 / 0.37		4.3 / 1.1		9.7 / 2.6		18.6 / 4.9	

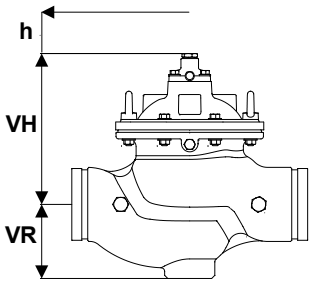
Valve Size	400 (16")		450 (18")		500 (20")		600 (24")		700 (28")		800 (32")		900 (36")		1000 (40")	
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
L	1100	$43^{5}/_{16}$	1200	$47^{1}/_{4}$	1250	$49^{3}/_{16}$	1259	$49^{9}/_{16}$	1650	$64^{15}/_{16}$	1850	$72^{7}/_{8}$	1850	$72^{13}/_{16}$	1864	$73^{5}/_{16}$
H	635	25	855	$33^{5}/_{8}$	855	$33^{5}/_{8}$	1311	$51^{5}/_{8}$	1200	47	1200	47	1200	$47^{3}/_{16}$	1200	$73^{3}/_{16}$
h**	480	$18^{7}/_{8}$	600	$23^{5}/_{8}$	600	$23^{5}/_{8}$	245	$9^{5}/_{8}$	860	$33^{7}/_{8}$	860	$33^{7}/_{8}$	740	$29^{1}/_{8}$	740	$29^{1}/_{8}$
W	628	$24^{3}/_{4}$	850	$33^{7}/_{16}$	850	$33^{7}/_{16}$	881	$34^{11}/_{16}$	1100	$43^{5}/_{16}$	1090	$42^{15}/_{16}$	1190	$46^{13}/_{16}$	1320	52
R	314	$12^{3}/_{8}$	310	$12^{3}/_{16}$	357.5	$14^{1}/_{16}$	459	$18^{1}/_{16}$	498	$19^{5}/_{8}$	603	$23^{3}/_{4}$	595	$23^{3}/_{8}$	660	26
Weight Kg/lbs*	544 / 1197		945 / 2083		980 / 2160		1030 / 2266		2070 / 4560		2600 / 5730		2700 / 5953		3200 / 7056	
Vol.control chamber lit/gal	18.6 / 4.9		50 / 13.2		50 / 13.2		50 / 13.2		84 / 22.2		84 / 22.2		84 / 22.2		84 / 22.2	

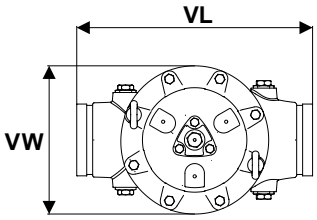
***125 (5")** - Min order quantities - consult factory



Grooved Type

Valve Size	80 (3")		100 (4")		150 (6")	
	mm	inch	mm	inch	mm	inch
VL	310	$12^{3}/_{16}$	348	$13^{11}/_{16}$	480	$20^{1}/_{2}$
VH	173	$6^{13}/_{16}$	228	9	330	13
h**	107	$4^{3}/_{16}$	156	$6^{1}/_{8}$	230	$9^{1}/_{16}$
VW	128	$5^{1}/_{16}$	197	$7^{3}/_{4}$	331	$13^{1}/_{16}$
VR	78	$3^{1}/_{16}$	105	$4^{1}/_{8}$	122	$5^{13}/_{16}$
Weight kg/lbs*	6.5 / 14.3		15 / 33		48 / 105	





* Approximate shipping Weight (PN 25)
** h = Minimal required maintenance space

- End Connections (for PN16 or PN25)
- ISO 2084, 2441, 5752 ANSI B16, AS2129, JIS B22.

Size Selection Tables

Models 30 (16 bar rated valves) / 31 (25 bar rated valves)

Valve Size		40 (1½")	50 (2")	65 (2½")	80 (3")	100 (4")	150 (6")	200 (8")	250 (10")	300 (12")	350 (14")	400 (16")	450 (18")	500 (20")	600 (24")
Max. recommended flow rate for continuous operation ($m^3/_h$)		25	40	40	100	160	350	620	970	1400	1900	2500	3100	3600	5600
Max. recommended flow rate for continuous operation (Gpm)		110	180	180	440	700	1600	2800	4300	6200	8400	11000	13660	15800	24700
Min. recommended flow rate		<1$m^3/_h$ (<5 gpm)													
Globe Type															
Flow Rate Factor:	Kv (Metric) Cv (US)	43 50	43 50	43 50	115 133	167 195	407 475	676 790	1160 1360	1600 1900	1600 1900	3000 3500	3150 3700	3300 3860	6500 7600
Head Loss Factor K (dimensionless)		2.2	5.4	15.4	4.8	5.6	4.8	5.5	4.5	5	9	3.8	6	5.9	4.8
Angle Type															
Flow Rate Factor:	Kv (Metric) Cv (US)	60 70	60 70		140 164	190 222	460 537	770 900	1310 1533						
Head Loss Factor K (dimensionless)		1.3	2.8		3.3	4.3	4.3	4.2	3.6						

For head Loss of fully open valves use the following equations:

$H\ (Bar) = \left(\frac{Q\ [m^3/h]}{Kv}\right)^2$ | $H\ (Psi) = \left(\frac{Q\ [gpm]}{Cv}\right)^2$ | $H = K\ \frac{V^2}{2g}$

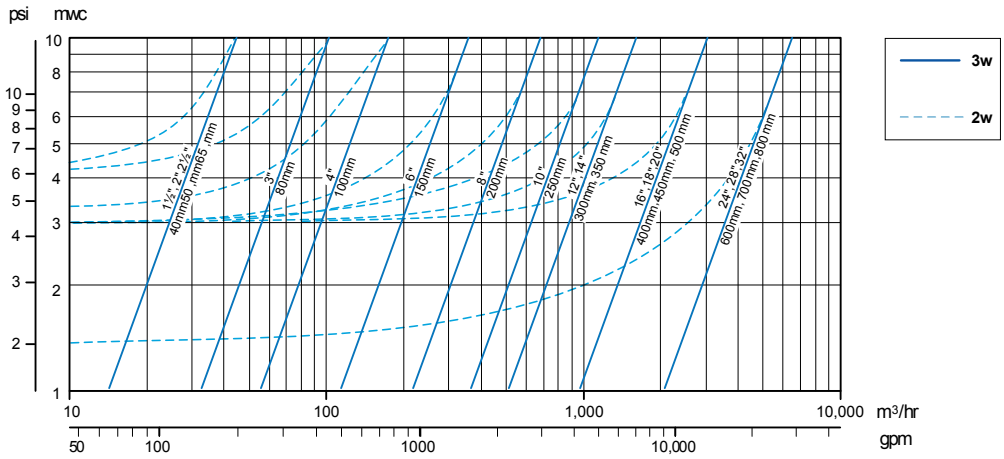
Model 32 (25 bar rated valves)

Valve Size		80 (3")	100 (4")	150 (6")	200 (8")	250 (10")	300 (12")	350 (14")	400 (16")	450 (18")	500 (20")	600 (24")	700 (28")	800 (32")
Max. recommended flow rate for continuous operation ($m^3/_h$)		60	145	225	510	970	1400	1900	2030	3100	3600	3600	7600	8135
Max. recommended flow rate for continuous operation (Gpm)		265	640	990	2250	3990	6200	8400	8940	13660	15860	15860	33500	35840
Min. recommended flow rate		<1 m^3/h (<5 GPM)												
Flow rate factor:	Kv	43	115	165	345	663	1160	1600	1600	3000	3000	3000	6500	6500
	Cv	50	133	192	400	770	1360	1900	1900	3500	3500	3500	7600	7600

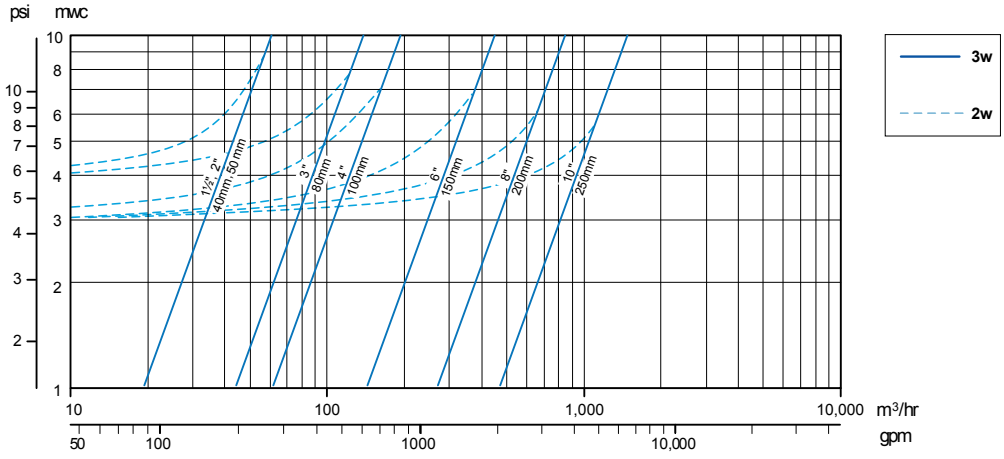
Edition 12/2020

Headloss Charts

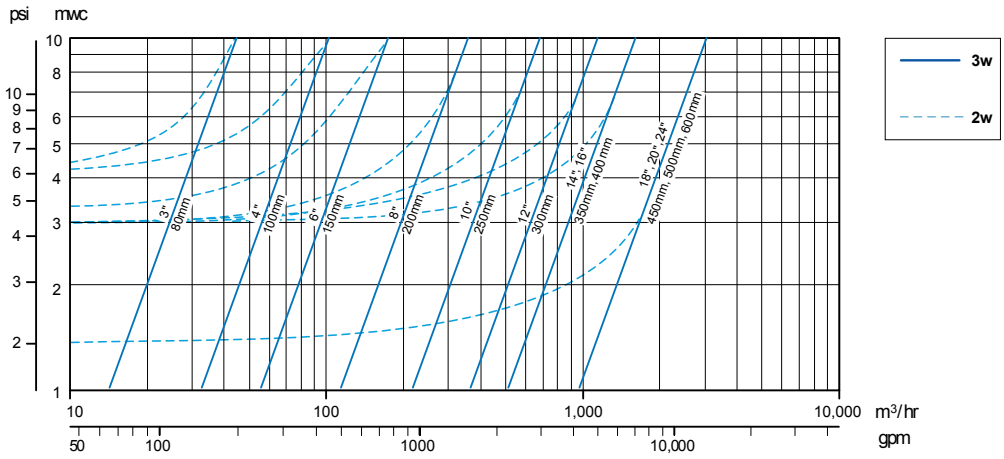
Models 30/31 (Globe Pattern) Pressure Loss Chart



Models 30A/31A (Angle Pattern) Pressure Loss Chart



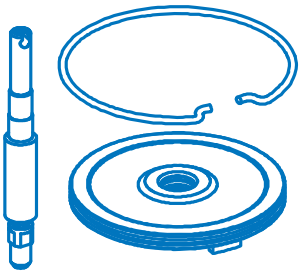
Model 32 (Globe Pattern) Pressure Loss



Components

Position Ind. Kit

Double-Chamber Conversion Kit



'F' Version Conversion Kit