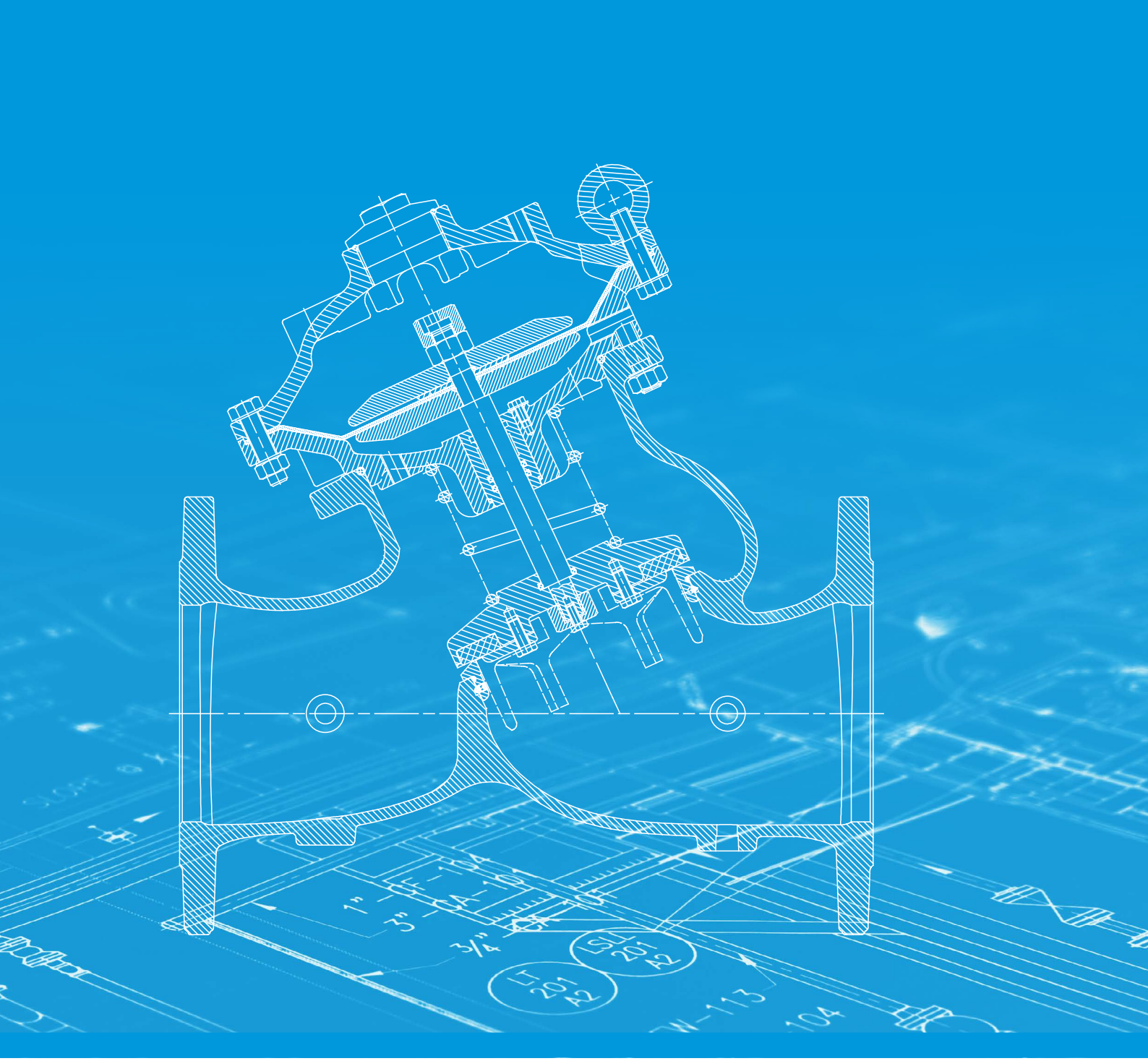


BERMAD 700 SERIES

ENGINEERING DATA

CONTENTS

700 SERIES FAMILY

BERMAD 700 series are hydraulically operated, oblique or angle pattern control valves with excellent flow capacity and double chamber unitized actuator, that can be disassembled from the body as a separate integral unit.

The valves hydrodynamic body is designed for unobstructed flow path and provides excellent and highly effective modulation capacity for high differential pressure applications, with minimal noise and vibrations.

The 700 series valves are threaded, grooved or flanged to meet all standards.

700 SIGMA EN

Full port valve with high cavitation resistance and extraordinarily high flow capacity enabling optimized use of resources and minimizing energy costs.

700 SIGMA ES

Designed mainly for regulating applications with high risk of cavitation, the valve achieves the optimal performance under variable flow velocities in pipes.

700-00

With high flow capacity and double chamber actuator the 700-00 is the origin of the family, available in a variety of construction materials, patterns and configurations.

Features and Benefits

- Drinking Water certifications
- Double-Chambered Actuator
  - Actuator assembly can be removed as one integral unit for easier and quicker maintenance.
  - Simple on-site conversion from Single to Double chambered actuator or vice versa.
  - Wide Body-Oblique "Y" or angle pattern design
- Hydro-dynamically designed for efficient flow with minimal pressure loss and excellent resistance to cavitation.
- Valve port area clear of obstructions; no ribs or stem guides. Increases capacity by 25% over standard globe valves.
- Valves are suitable to work with all types of command: Hydraulic, Electric and Pneumatic.
- Self operated valves that can work without an external source of power.
- Diaphragm Assembly
  - The flexible, flat fabric reinforced diaphragm is supported over the majority of its surface.
  - Diaphragm load is limited to only the stretching forces applied to the active area.
  - Diaphragm is fully protected by the separation partition from stones, wood and debris.
- Wide range of options:
  - One-way or two-way flow direction
  - V-Port
  - Cavitation cages (Single or Double)
  - Visual position indicator
  - Limit switches
  - Analog opening output
  - Large selection of control accessories

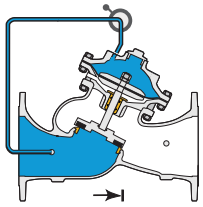
Typical Applications

The 700 series valves are an excellent solution for a wide range of applications:

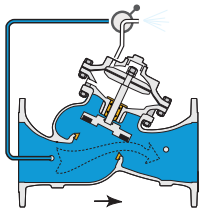
- Extreme high or low pressure, flow, water quality and pressure differential conditions.
- Conditions that require double chamber actuator:
  - Proportional "Pilotless" pressure reducing valves
  - Pressure reducing valves with low supply pressure (avoiding lockout)
  - Pump control active check valve
  - Power opening and closing level control valves
  - Safe "close and lock" burst control valves

Principle of Operation

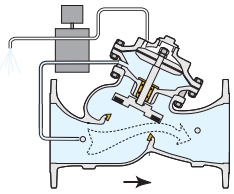
On-Off Modes



Closed Position
Line pressure applied to the upper control chamber of the valve creates a superior force that moves the valve to the closed position and provides drip-tight sealing

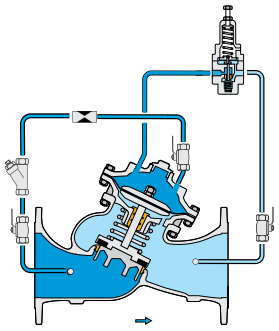


Open Position
Discharging the pressure in the upper control chamber to atmosphere or some other lower pressure zone causes the line pressure acting on the seal-disk to move the valve to the open position.

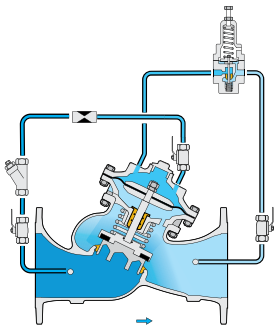


Powered Open Position
Line pressure is applied to the lower control chamber as pressure in the upper control chamber is vented. This, together with the line pressure acting on the seal-disk, creates a force that powers the valve to the open position.

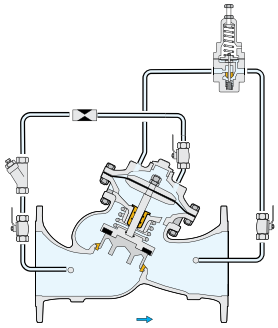
2-Way Modulating Mode - Pressure Reducing



Closed Position
The closed adjustable pilot valve traps line pressure in the upper control chamber. The resulting superior force moves the valve to the fully closed position and provides drip-tight sealing.

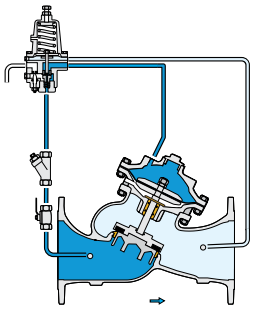


Modulating Position
The pilot valve senses line pressure changes and opens or closes accordingly. It controls the accumulated pressure in the valve upper control chamber, causing main valve to modulate to an intermediate position and maintain the preset pressure value.

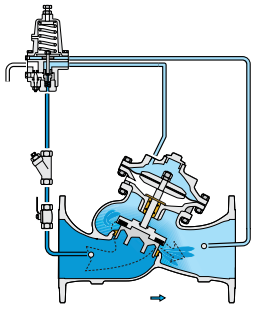


Open Position
The open pilot valve releases line pressure from the upper control chamber. The line pressure acting on both the lower control chamber and the seal-disk, moves the valve to the open position.

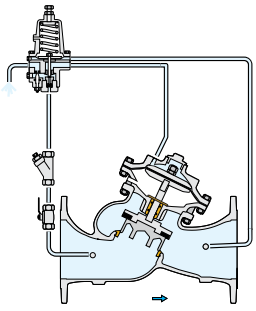
3-Way Modulating Mode - Pressure Reducing



Closed Position
The pilot responds to high downstream pressure and introduces upstream pressure to the upper control chamber. The Double Chamber configuration ensures powered closing at zero flow.

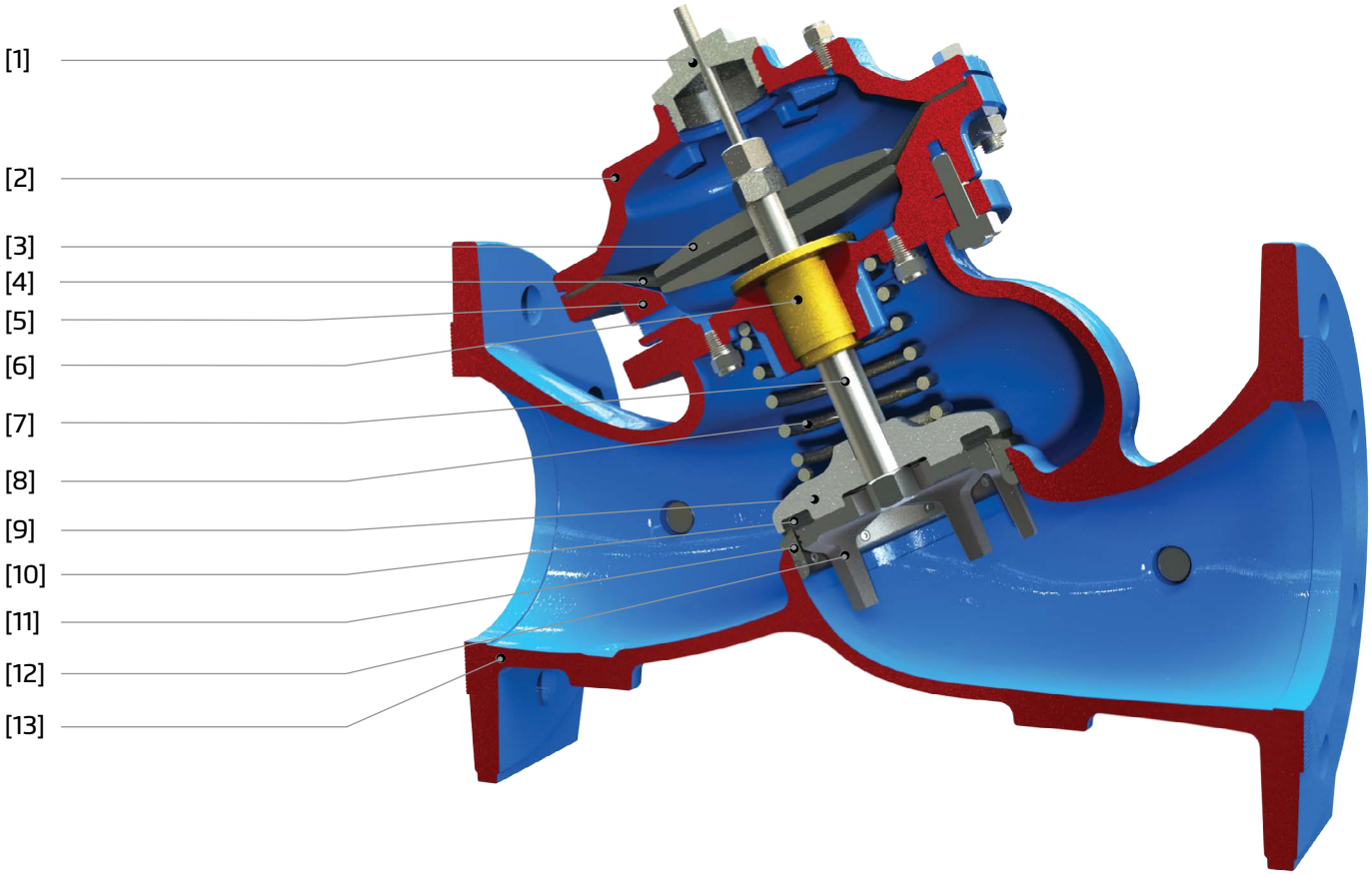


Modulating Position
When the downstream pressure is equal to setting, the plunger in the pilot valve moves to block all passages and freezes the valve. The pilot valve responds to downstream pressure changes and moves the valve to maintain the setting by either venting or pressurizing the control chamber.



Open Position
When downstream pressure is lower than the setting, the plunger in the pilot valve moves to vent the pressure from the control chamber, allowing the valve to fully open. This minimizes pressure loss and ensures maximum possible downstream pressure. The 3-way control on the Double Chambered valves avoids the risk of a hydraulic lockout.

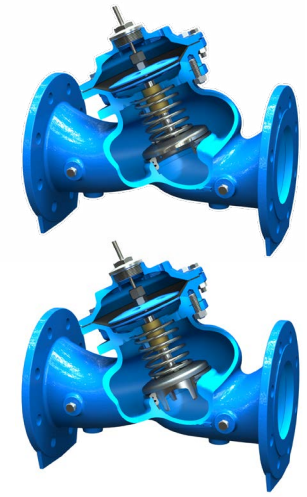
Material Specifications



Item Number	Description	Material (Standard) *
1	Indicator Assembly	Stainless Steel
	Plug	Stainless Steel
2	Cover	Fusion bonded Epoxy Coated Ductile Iron, EN 1563 or ASTM A-536
3	Diaphragm washer	Epoxy Coated Steel
4	Diaphragm	Fabric-reinforced EPDM
5	Separating Partition	Fusion bonded Epoxy Coated Ductile Iron, EN 1563 or ASTM A-536
6	Bearing	Tin Bronze
7	Shaft	Stainless Steel, AISI 303
8	Spring	Stainless Steel, AISI 302
9	Seal Disc	Stainless Steel, AISI 410
10	Seal	EPDM
11	Seat	Stainless Steel, AISI 304
12	V-Port	POM-C, Tin Bronze **
	Flat Disc	Stainless Steel, AISI 304
13	Valve Body	Fusion bonded Epoxy Coated Ductile Iron, EN 1563 or ASTM A-536
	O-Rings	EPDM
	Internal Bolts	Stainless Steel, AISI 316/304
	External Bolts, Studs, Nuts & Disks	Stainless Steel, AISI 316

* Drinking Water certified (Other materials available on request)
** Refer to V-Port product page

Plug Options



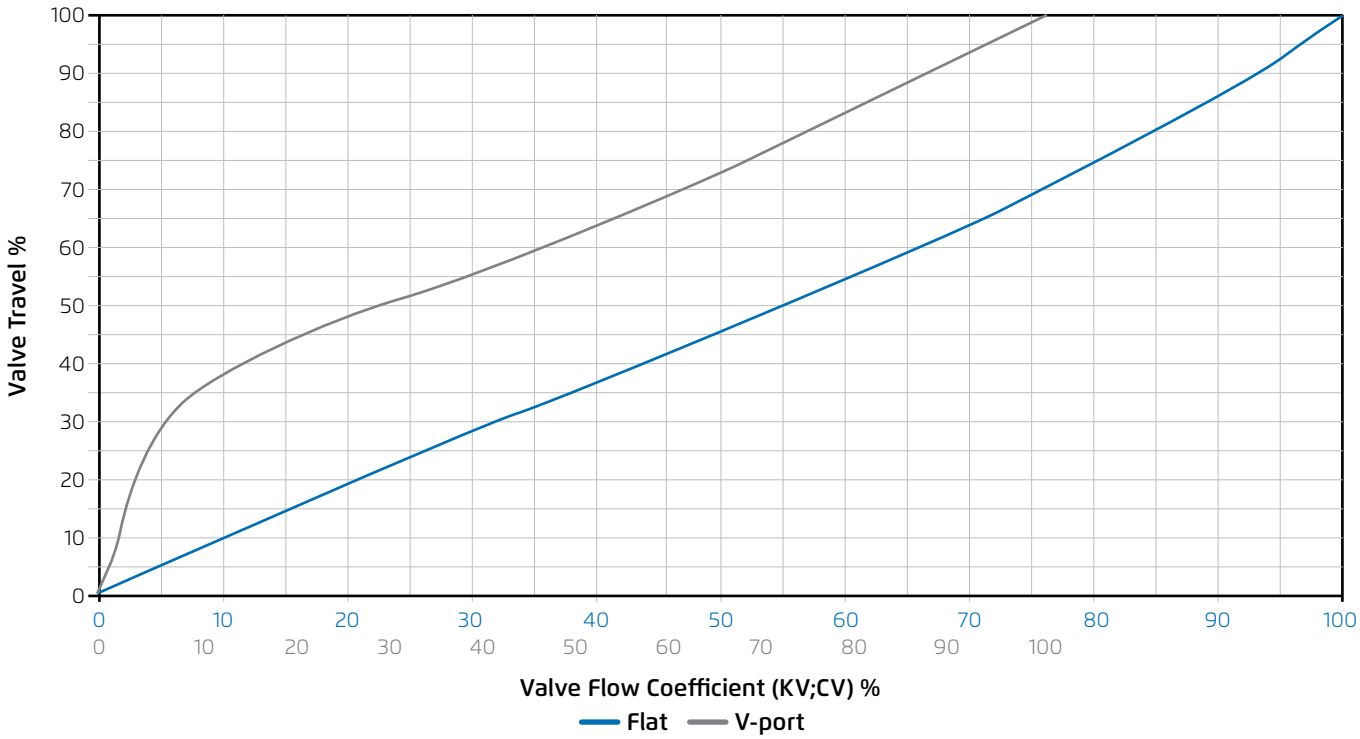
BERMAD's 700 series has various plug options to enable different valve characteristics.

BERMAD's 700 series plugs can easily be change before or after valve installation on site

Flat plug - standard plug for on-off and high flow applications.

V-Port plug - uniquely designed throttling plug. It changes the ratio of flow to stem travel allowing very wide flow range with relatively high pressure reduction and provides more accurate, stable and smoother response during pressure and flow regulation, while reducing noise and vibration.

Valve Plugs Characteristics



Metric

Cavitation

The cavitation phenomenon has a significant affect on control valve and system performance.

When the fluid's pressure reaches liquid vapor pressure, vapor cavities (bubbles) form and grow until they violently implode by the recovered pressure downstream to the valve seat.

The implosion of these cavities generates high-pressure surges, micro jets and intensive heat, which erode valve components and downstream piping. In its final stage, cavitation flashes and chokes the flow.

Noise constraints:

The imploding vapor bubbles in the cavitation phenomena create a sonic wave in the fluid that upon impact with the pipe wall create vibrations that can result in disturbing noise levels.

Many factors affect the noise level generated by pipe fixtures, such as pipe material and wall thickness, installation rigidness, acoustic conditions in the installation space, fluid physical and chemical characteristics and many more.

In terms of hydraulic conditions, working at values greater than σ=0.5 with control valve can significantly reduce noise generation.

The Cavitation Guide is based on the formula commonly used in the valve industry:

$$\sigma = (P2-Pv) / (P1-P2)$$

Where:

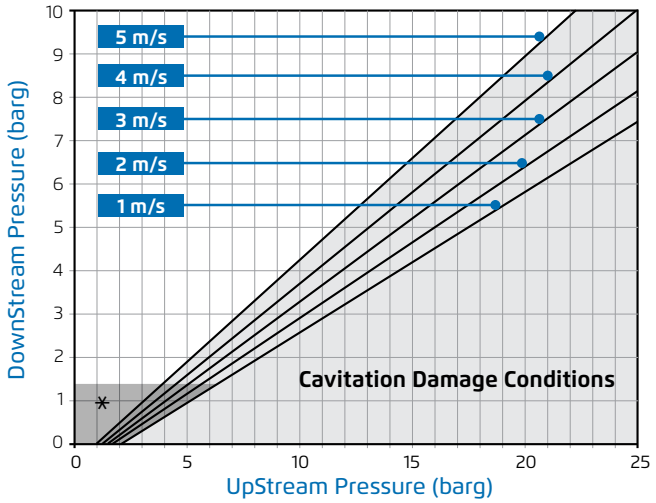
σ	=	Sigma, cavitation index, dimensionless
P1	=	Upstream pressure, absolute
P2	=	Downstream pressure, absolute
Pv	=	Liquid vapor pressure, absolute (Water, 18°C => 0.02 bara)

Notes:

1. An alternate cavitation index formula introduced by ISA is: σISA = (P1-Pv) / (P1-P2) which equals σ+1
2. The below charts should be considered only as a general guide.
3. Charts represent Flat plug.
4. Velocity values refer to flow velocity in pipe line.
5. Consider 700-00 valves as between 700 Sigma EN and 700 Sigma ES.
6. For optimum system and control valve application please refer to Bermad Sizing or consult Bermad.

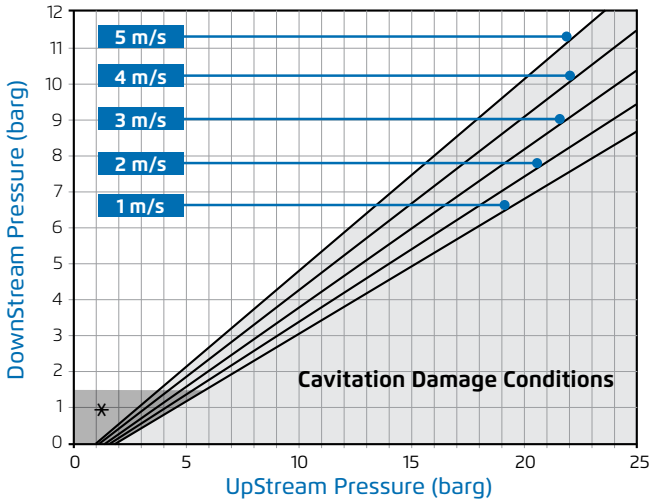
Cavitation Charts

700 SIGMA EN



* Consider back pressure orifice, or consult BERMAD

700 SIGMA ES



US units

Cavitation

The cavitation phenomenon has a significant affect on control valve and system performance.

When the fluid's pressure reaches liquid vapor pressure, vapor cavities (bubbles) form and grow until they violently implode by the recovered pressure downstream to the valve seat.

The implosion of these cavities generates high-pressure surges, micro jets and intensive heat, which erode valve components and downstream piping. In its final stage, cavitation flashes and chokes the flow.

Noise constraints:

The imploding vapor bubbles in the cavitation phenomena create a sonic wave in the fluid that upon impact with the pipe wall create vibrations that can result in disturbing noise levels.

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In terms of hydraulic conditions, working at values greater than σ=0.5 with control valve can significantly reduce noise generation.

The Cavitation Guide is based on the formula commonly used in the valve industry:

$\sigma = (P2-Pv) / (P1-P2)$

Where:

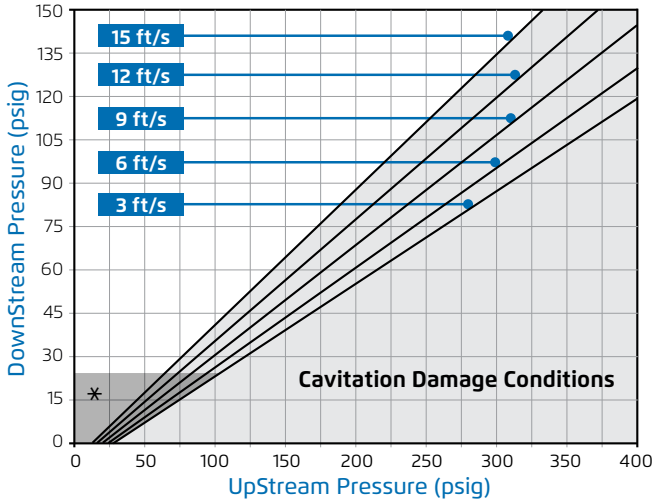
σ	=	Sigma, cavitation index, dimensionless
P1	=	Upstream pressure, absolute
P2	=	Downstream pressure, absolute
Pv	=	Liquid vapor pressure, absolute (Water, 65°F => 0.3 psia)

Notes:

1. An alternate cavitation index formula introduced by ISA is: σISA = (P1-Pv) / (P1-P2) which equals σ+1
2. The below charts should be considered only as a general guide.
3. Charts represent Flat plug.
4. Velocity values refer to flow velocity in pipe line.
5. Consider 700-00 valves as between 700 Sigma EN and 700 Sigma ES.
6. For optimum system and control valve application please refer to Bermad Sizing or consult Bermad.

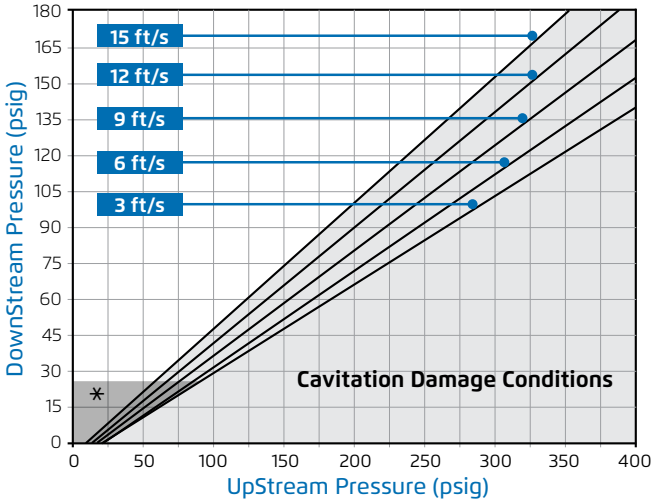
Cavitation Charts

700 SIGMA EN



* Consider back pressure orifice, or consult BERMAD

700 SIGMA ES



Cavitation Cage

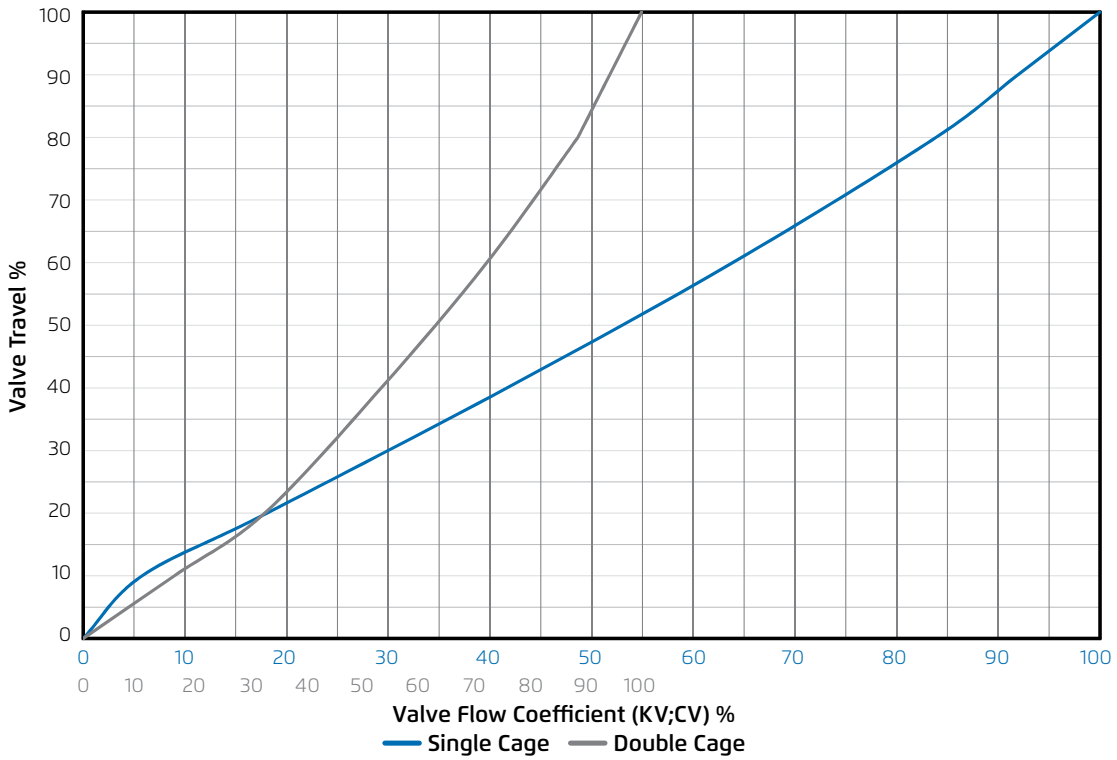
Single Cavitation Cage - C1

The BERMAD Single Cavitation Cage trim is designed to reduce cavitation, noise and vibration under higher differential pressure operation, as well as smart pressure reducing.

Double Cavitation Cage - C2

The BERMAD Double Cavitation Cage trim is designed to resist cavitation, cavitation damage, noise and vibration under extreme differential pressure operation, as well as smart pressure reducing.

Valve Cage Characteristics



Metric

700 SIGMA **EN**

Technical Data

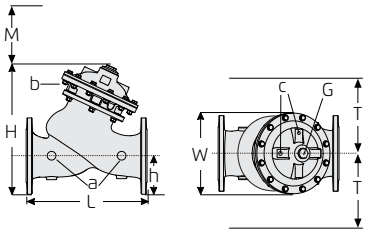
Valve Patterns: "Y" (Globe)
Pressure Rating: 25 bar
End Connections: Flanged (all standards)
Plug Types: Flat disc, V-port , Cavitation cages
Working Temperature: Water up to 60°C
Optional higher temperature: Available on request

Standard Materials:
Body & actuator: Ductile Iron
Bolts, nuts & studs: Stainless Steel
Internals: Stainless Steel, Bronze & Coated Steel, POM
Diaphragm: Fabric-reinforced synthetic rubber
Seals: Synthetic rubber
Coating: Dark blue Fusion bonded epoxy
For other materials contact BERMAD.

Dimensions & Weights

Nominal Diameter	inch	1.5"	2"	2.5"	3"	4"	6"	8"	10"	12"	16"
	mm	40	50	65	80	100	150	200	250	300	400
L*	mm	230	230	290	310	350	480	600	730	850	1100
W	mm	155	165	190	210	255	320	400	480	570	815
h**	mm	81	86	98	108	131	163	193	227	272	334
H**	mm	235	240	295	335	400	525	625	735	890	1180
M	mm	180	180	180	230	275	385	460	580	685	965
T	mm	350	350	350	370	395	430	475	520	545	645
Weight**	kg	12	14	22	28	47	96	158	256	403	974
Control Chamber Volume	Liters	0.125	0.125	0.26	0.3	0.55	2.15	4.5	8.5	12.4	29.8
Valve travel	mm	16	16	22	25	32	50	62	70	100	134
a	inch	¼" NPT			⅜" NPT				½" NPT		1" BSP
b	inch	⅛" NPT					¼" NPT		⅜" NPT		¾" BSP
c	inch	¼" NPT							½" NPT		¾" BSP
G	inch	¾" G					2" G				3" G

* Length according to ISO 5752; EN 558-1
** Maximum Dimensions & Weights
M - Actuator maintenance allowance
T - Trim space allowance at either side



Metric

Flow Factors

Nominal Diameter	inch	1.5"	2"	2.5"	3"	4"	6"	8"	10"	12"	16"
	mm	40	50	65	80	100	150	200	250	300	400
Flat Disc	Kv	57	62	98	130	200	540	905	1480	2140	3300
	K	1.2	2.6	2.9	3.8	3.9	2.7	3.1	2.8	2.8	2.7
V-Port	Kv	46	48	73	102	140	453	767	1310	1940	2970
	K	1.9	4.3	5.3	6.2	8	3.9	4.3	3.6	3.4	4.6

Differential Pressure & Flow Calculation

Valve flow coefficient, Kv $Kv = Q\sqrt{\frac{Gf}{\Delta P}}$

Where:

Kv = Valve flow coefficient (flow in m^3/h at 1bar ΔP)

Q = Flow rate (m^3/h)

ΔP = Differential pressure (bar)

Gf = Liquid specific gravity (Water = 1.0)

Practical formulas for water:

$$Q = Kv\sqrt{\Delta P} \qquad \Delta P = \left(\frac{Q}{Kv}\right)^2$$

Flow resistance or Head loss coefficient, $K = \Delta H \frac{2g}{V^2}$

Where:

K = Flow resistance or Head loss coefficient (dimensionless)

ΔH = Head loss (m)

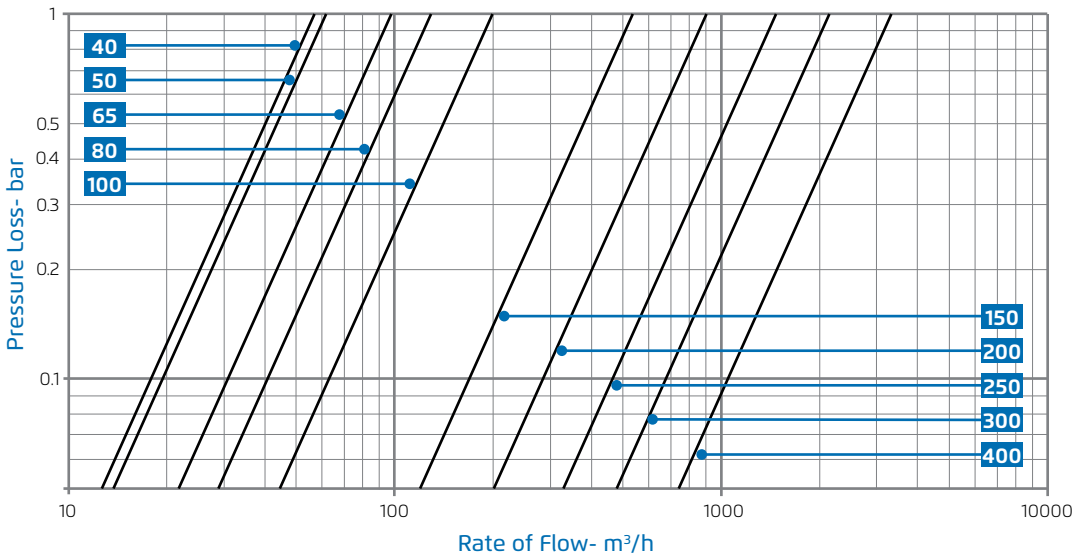
V = Nominal size flow velocity (m/sec)

g = Acceleration of gravity (9.81 m/sec^2)

Practical formula:

$$\Delta H = K \frac{V^2}{2g}$$

Flow Chart



Charts represent fully open valves with a flat plug.
Use BERMAD Sizing program for proper valve selection.

Metric

700 SIGMA **ES**

Technical Data

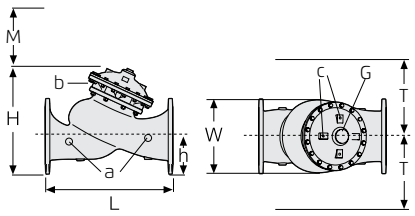
Valve Patterns: "Y" (Globe)
Pressure Rating: 25 bar
End Connections: Flanged (all standards)
Plug Types: Flat disc, V-port, Cavitation cages
Working Temperature: Water up to 60°C
Optional higher temperature: Available on request

Standard Materials:
Body & actuator: Ductile Iron
Bolts, nuts & studs: Stainless Steel
Internals: Stainless Steel, Tin Bronze & Coated Steel, POM
Diaphragm: Fabric-reinforced synthetic rubber
Seals: Synthetic rubber
Coating: Dark blue Fusion bonded epoxy
For other materials contact BERMAD.

Dimensions & Weights

Nominal Diameter	inch	2.5"	3"	4"	5"	6"	8"	10"	12"	14"	16"	18"	20"	24" #
	mm	65	80	100	125	150	200	250	300	350	400	450	500	600
L*	mm	290	310	350	400	480	600	730	850	980	1100	1200	1250	1450
W	mm	190	210	255	270	320	380	450	540	585	660	815	815	920
h**	mm	98	108	131	140	163	193	227	265	299	334	361	398	465
H**	mm	240	315	335	375	445	535	625	760	920	960	1200	1220	1260
M	mm	180	180	230	275	330	385	460	580	685	685	965	965	965
T	mm	350	370	395	410	430	475	520	545	565	645	720	720	770
Weight**	kg	18	27	38	62	78	125	198	306	457	515	1024	1085	1290
Control Chamber Volume	Liters	0.125	0.26	0.3	0.55	1.05	2.15	4.5	8.5	12.4	12.4	29.8	29.8	29.8
Valve travel	mm	16	22	25	32	41	50	62	70	100	100	134	134	134
a	inch	¼" NPT	⅜" NPT					½" NPT				1" BSP		
b	inch	⅛" NPT				¼" NPT			⅜" NPT			¾" BSP		
c	inch	¼" NPT							½" NPT			¾" BSP		
G	inch	¾" G				2" G						3" G		

* Length according to ISO 5752; EN 558-1
** Maximum Dimensions & Weights
# - 24"; 600mm without cradle
M - Actuator maintenance allowance
T - Trim space allowance at either side



Metric

Flow Factors

Nominal Diameter	inch	2.5"	3"	4"	5"	6"	8"	10"	12"	14"	16"	18"	20"	24"
	mm	65	80	100	125	150	200	250	300	350	400	450	500	600
Flat Disc 	Kv	60	98	143	215	395	610	905	1520	2140	2250	3300	3300	3300
	K	7.8	6.7	7.7	8.3	5.1	6.7	7.5	5.5	5.1	7.9	5.9	9	18.7
V-Port 	Kv	51	73	123	183	336	519	769	1292	1857	2027	2970	2970	2970
	K	10.8	12	10.4	11.4	7	9.3	10.4	7.6	6.8	9.8	7.3	11.1	23

Differential Pressure & Flow Calculation

Valve flow coefficient, Kv $Kv = Q\sqrt{\frac{Gf}{\Delta P}}$

Where:

Kv = Valve flow coefficient (flow in m^3/h at 1bar ΔP)

Q = Flow rate (m^3/h)

ΔP = Differential pressure (bar)

Gf = Liquid specific gravity (Water = 1.0)

Practical formulas for water:

$Q = Kv\sqrt{\Delta P}$ $\Delta P = \left(\frac{Q}{Kv}\right)^2$

Flow resistance or Head loss coefficient, $K = \Delta H \frac{2g}{V^2}$

Where:

K = Flow resistance or Head loss coefficient (dimensionless)

ΔH = Head loss (m)

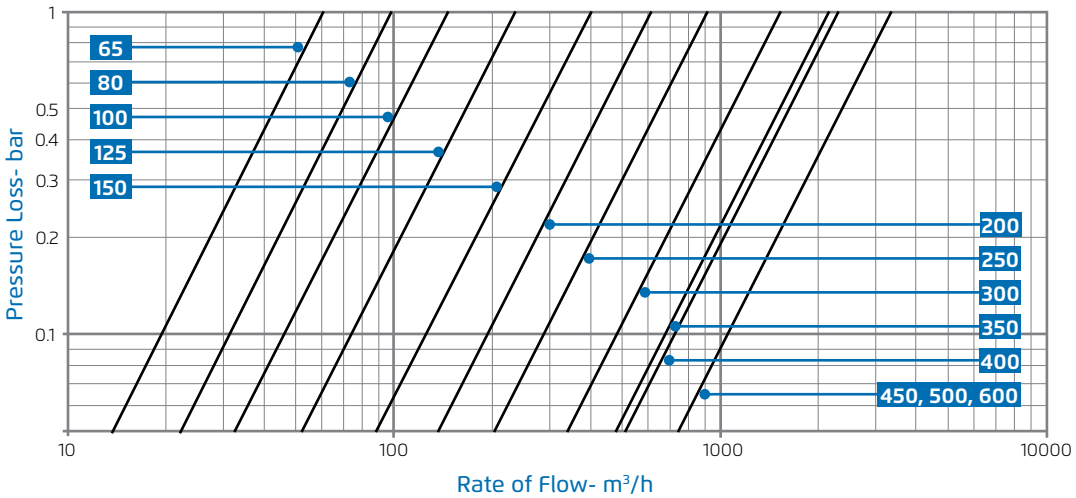
V = Nominal size flow velocity (m/sec)

g = Acceleration of gravity (9.81 m/sec^2)

Practical formula:

$\Delta H = K \frac{V^2}{2g}$

Flow Chart



Charts represent fully open valves with a flat plug.
Use BERMAD Sizing program for proper valve selection.

Metric

700-00

Technical Data

Valve Patterns: "Y" (Globe); "A" (Angle)
Pressure Rating: 16 bar; 25 bar
End Connections: Flanged (all standards), Grooved, Threaded
Plug Types: Flat disc, V-port, Cavitation cages
Working Temperature: Water up to 60°C
Optional higher temperature: Available on request

Standard Materials:
Body & Actuator:
Threaded, Grooved & Angle: Ductile Iron EN 1563 GR.GJS-450-10
Bolts, nuts & studs: Stainless Steel
Internals: Stainless Steel, Bronze, Coated Steel & POM
Diaphragm: Fabric-reinforced synthetic rubber
Seals: Synthetic rubber
Coating: Dark blue Fusion Bonded Epoxy

Optional Body & Actuator Materials:
Flanged (A+Y): Carbon Steel – DIN 17245 GS-C25 1.0619
Oblique (Y): St. St. 316 – EN 1.4408 Stainless Steel
Oblique (Y) Flanged: Ni. Al. Bronze – EN C333G

Consult BERMAD for final specification.

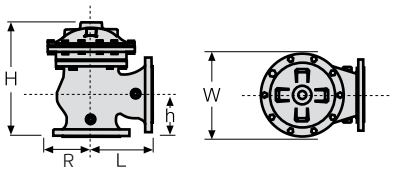
Dimensions & Weights

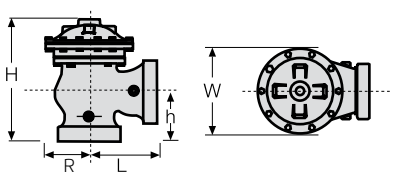
Angle - Flanged

Size	inch	1.5"	2"	2.5"	3"	4"	6"	8"	10"	12"	14"	16"	18"	20"
	mm	40	50	65	80	100	150	200	250	300	350	400	450	500
PN10; PN16														
L	mm	124	124	149	152	190	225	265	320	396	400	450	450	468
R	mm	64	78	90	100	115	160	195	240	275	275	370	370	370
W	mm	127	155	178	200	229	320	390	480	550	550	740	740	740
h	mm	85	85	109	102	127	152	203	219	273	279	369	369	387
H	mm	227	227	251	281	340	440	549	633	786	792	1084	1084	1101
Weight	kg	9.5	10	12	21.5	35	71	118	205	350	370	800	820	104
PN25														
L	mm	124	124	149	159	200	234	277	336	415	419	467	467	475
R	mm	78	83	95	105	127	160	195	240	275	293	370	370	370
W	mm	155	165	190	210	254	320	390	480	550	586	740	740	775
h	mm	85	85	109	109	135	165	216	236	294	299	386	386	395
H	mm	227	227	251	287	350	453	558	649	806	812	1099	1099	1110
Weight	kg	11	11.5	13.5	23	41	81	138	233	390	425	855	870	1140

Angle - Threaded

Size	inch	2"	2.5"	3"
	mm	50	65	80
L	mm	120	140	159
R	mm	63	63	82
W	mm	125	125	163
h	mm	83	102	115
H	mm	225	242	294
Weight	kg	5.5	7	15



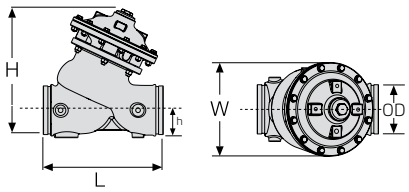


Metric

Dimensions & Weights

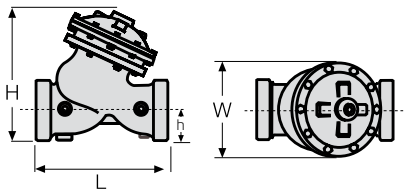
Y-Pattern - Grooved

Nominal Diameter	inch	1.5"	2"	2.5"	3"	4"	6"	8"
	mm	40	50	65	80	100	150	200
OD ANSI C606	mm	48.3	60.3	73.0	88.9	114.3	168.3	219.1
OD BS 1387 / EN 10255	mm	48.3	60.3	76.1	88.9	114.3	165.1	219.1
L	mm	205	210	215	250	320	415	500
W	mm	122	122	122	168	200	320	390
h	mm	33	40	40	60	74	95	125
H	mm	194	201	201	265	325	465	529
Weight	kg	6	6.2	6.5	17	29	58	102



Y-Pattern - Threaded

Nominal Diameter	inch	1.5"	2"	2.5"	3"
	mm	40	50	65	80
L	mm	155	155	212	250
W	mm	129	129	129	163
h	mm	37	40	48	56
H	mm	201	203	209	264
Weight	kg	5.5	5.5	8	17

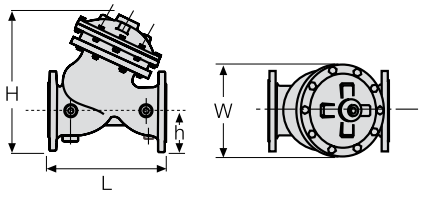


Y-Pattern - Flanged

Only for Carbon Steel, St. St. 316, Ni. Al. Bronze

For Ductile Iron refer to 700 Sigma EN/ES

Nominal Diameter	inch	1.5"	2"	2.5"	3"	4"	6"	8"	10"	12"	14"	16"	18"	20"
	mm	40	50	65	80	100	150	200	250	300	350	400	450	500
PN10; PN16														
L	mm	205	205	215	250	320	415	500	605	725	733	990	1000	1100
W	mm	155	155	178	200	229	320	390	480	557	557	740	740	740
h	mm	78	78	89	100	115	143	172	207	242	268	300	319	358
H	mm	239	239	250	309	366	512	584	696	822	847	1095	1118	1153
Weight	kg	9.1	10.6	13	22	37	75	125	217	370	381	846	945	962
PN25														
L	mm	205	210	222	264	335	433	524	637	762	767	1024	1030	1136
W	mm	155	165	190	210	254	320	390	472	557	585	740	740	777
h	mm	78	83	95	105	127	159	191	223	261	295	325	357	389
H	mm	239	244	257	314	378	528	602	711	845	873	1122	1154	1186
Weight	kg	10	12.2	15	25	43	85	146	245	410	434	900	967	986

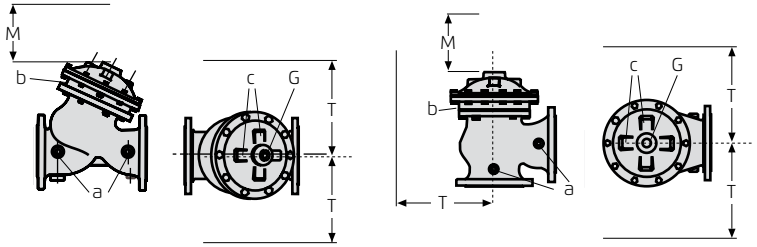


Metric

Actuator, Trim Ports and Maintenance

Size	inch	1.5"	2"	2.5"	3"	4"	6"	8"	10"	12"	14"	16"	18"	20"
	mm	40	50	65	80	100	150	200	250	300	350	400	450	500
Control Chamber Volume	Liters	0.125	0.125	0.125	0.3	0.55	2.15	4.5	8.5	12.4	12.4	29.8	29.8	29.8
Valve travel	mm	16	16	16	25	32	50	62	70	100	100	134	134	134
M	mm	180	180	180	230	275	385	460	580	685	685	965	965	965
T	mm	350	350	350	370	395	430	475	520	545	545	645	645	645
a	inch	¼" NPT			⅜" NPT				½" NPT			1" BSP		
b	inch	⅛" NPT					¼" NPT		⅜" NPT			¾" BSP		
c	inch	¼" NPT							½" NPT			¾" BSP		
G	inch	¾" G					2" G					3" G		

M - Actuator maintenance allowance
T - Maximal control trim space for left or right side trim



Metric

Flow Factors

Nominal Diameter		inch	1.5"	2"	2.5"	3"	4"	6"	8"	10"	12"	14"	16"	18"	20"
		mm	40	50	65	80	100	150	200	250	300	350	400	450	500
Y-Pattern Flat Disc		Kv	42	50	55	115	200	460	815	1250	1850	2106	3080	3080	3080
		K	2.3	3.9	9.2	4.8	3.9	3.7	3.8	3.9	3.7	5.3	4.2	6.8	10.3
Y-Pattern V-Port		Kv	36	43	47	98	170	391	693	1063	1573	1790	2600	2600	2600
		K	3.1	5.3	12.6	6.7	5.4	5.2	5.2	5.4	5.1	7.3	5.9	9.5	14.5
Angle Flat Disc		Kv	46	55	61	127	220	506	897	1375	2035	2200	3350	3350	N/A
		K	1.9	3.2	7.5	4	3.2	3.1	3.1	3.2	3.1	4.9	3.6	5.7	N/A
Angle V-Port		Kv	39	47	52	108	187	430	762	1169	1730	1900	2850	2850	N/A
		K	2.6	4.4	10.3	5.5	4.5	4.3	4.3	4.5	4.2	6.5	4.9	7.9	N/A

Differential Pressure & Flow Calculation

Valve flow coefficient, Kv $Kv = Q\sqrt{\frac{Gf}{\Delta P}}$

Where:

Kv = Valve flow coefficient (flow in m^3/h at 1bar ΔP)

Q = Flow rate (m^3/h)

ΔP = Differential pressure (bar)

Gf = Liquid specific gravity (Water = 1.0)

Practical formulas for water:

$Q = Kv\sqrt{\Delta P}$ $\Delta P = \left(\frac{Q}{Kv}\right)^2$

Flow resistance or Head loss coefficient, $K = \Delta H \frac{2g}{V^2}$

Where:

K = Flow resistance or Head loss coefficient (dimensionless)

ΔH = Head loss (m)

V = Nominal size flow velocity (m/sec)

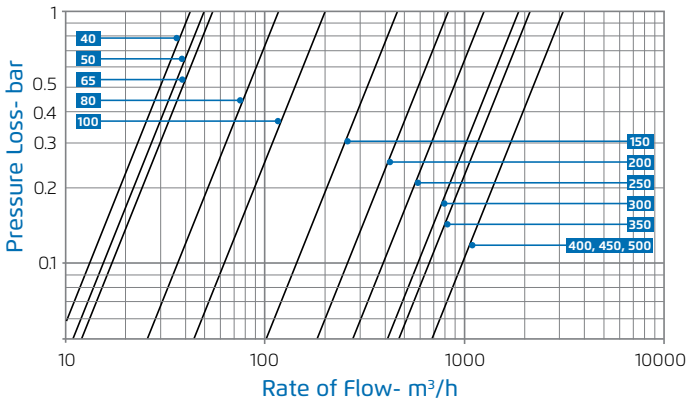
g = Acceleration of gravity (9.81 m/sec^2)

Practical formula:

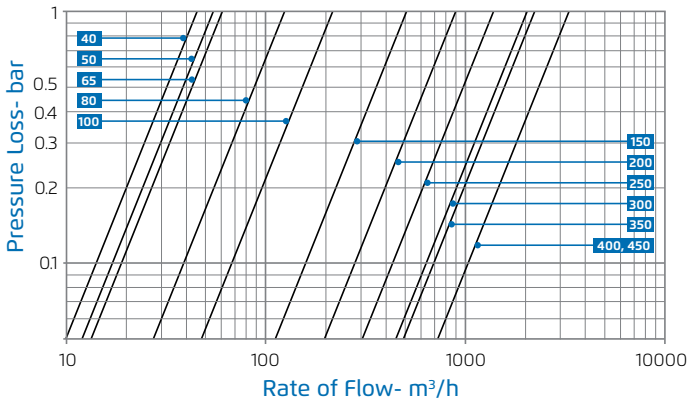
$\Delta H = K \frac{V^2}{2g}$

Flow Charts

Y-Pattern



Angle



Charts represent fully open valves with a flat plug.
Use BERMAD Sizing program for proper valve selection.

US Units

700 SIGMA EN

Technical Data

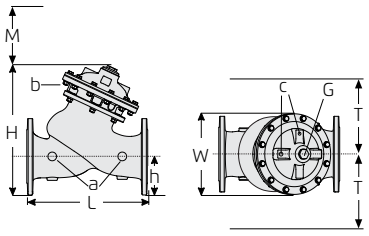
Valve Patterns: "Y" (Globe)
Pressure Rating: 400 psi
End Connections: Flanged (all standards)
Plug Types: Flat disc, V-port , Cavitation cages
Working Temperature: Water up to 140°F
Optional higher temperature: Available on request

Standard Materials:
Body & actuator: Ductile Iron
Bolts, nuts & studs: Stainless Steel
Internals: Stainless Steel, Tin Bronze & Coated Steel, POM
Diaphragm: Fabric-reinforced synthetic rubber
Seals: Synthetic rubber
Coating: Dark blue Fusion bonded epoxy
For other materials contact BERMAD.

Dimensions & Weights

Nominal Diameter	inch	1.5"	2"	2.5"	3"	4"	6"	8"	10"	12"	16"
	mm	40	50	65	80	100	150	200	250	300	400
L*	inch	9.06	9.06	11.42	12.20	13.78	18.90	23.62	28.74	33.46	43.31
W	inch	6.10	6.50	7.48	8.27	10.04	12.60	15.75	18.90	22.44	32.09
h**	inch	3.19	3.39	3.86	4.25	5.16	6.42	7.60	8.94	10.71	13.15
H**	inch	9.25	9.45	11.61	13.19	15.75	20.67	24.61	28.94	35.04	46.46
M	inch	7	7	7	9	11	15	18	23	27	38
T	inch	14	14	14	15	16	17	19	20	21	25
Weight**	lbs	26	31	49	62	104	212	348	564	888	2147
Control Chamber Volume	Gallons	0.03	0.03	0.07	0.08	0.15	0.57	1.19	2.25	3.28	7.87
Valve travel	inch	0.63	0.63	0.87	0.98	1.26	1.97	2.44	2.76	3.94	5.28
a	inch	¼" NPT			⅜" NPT				½" NPT		1" BSP
b	inch	⅛" NPT					¼" NPT		⅜" NPT		¾" BSP
c	inch	¼" NPT							½" NPT		¾" BSP
G	inch	¾" G					2" G				3" G

* Length according to ISO 5752; EN 558-1
** Maximum Dimensions & Weights
M - Actuator maintenance allowance
T - Trim space allowance at either side



US Units

Flow Factors

Nominal Diameter	inch	1.5"	2"	2.5"	3"	4"	6"	8"	10"	12"	16"
	mm	40	50	65	80	100	150	200	250	300	400
Flat Disc 	Cv	66	72	113	150	231	624	1045	1709	2472	3812
	K	1.2	2.6	2.9	3.8	3.9	2.7	3.1	2.8	2.8	2.7
V-Port 	Cv	53	55	84	118	162	523	886	1513	2241	3430
	K	1.9	4.3	5.3	6.2	8	3.9	4.3	3.6	3.4	4.6

Differential Pressure & Flow Calculation

Valve flow coefficient, Cv $Cv = Q\sqrt{\frac{Gf}{\Delta P}}$

Where:

Cv = Valve flow coefficient (flow in gpm at 1psi ΔP)

Q = Flow rate (gpm)

ΔP = Differential pressure (psi)

Gf = Liquid specific gravity (Water = 1.0)

Practical formulas for water:

$Q = Cv\sqrt{\Delta P}$ $\Delta P = \left(\frac{Q}{Cv}\right)^2$

Flow resistance or Head loss coefficient, $K = \Delta H \frac{2g}{V^2}$

Where:

K = Flow resistance or Head loss coefficient (dimensionless)

ΔH = Head loss (feet)

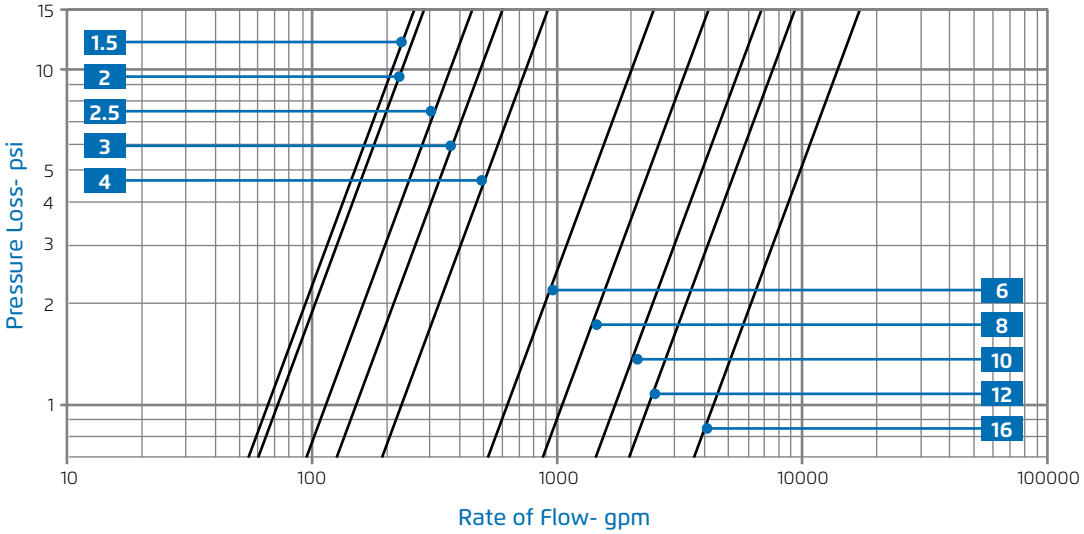
V = Nominal size flow velocity (feet/sec)

g = Acceleration of gravity (32.18 feet/sec²)

Practical formula:

$\Delta H = K \frac{V^2}{2g}$

Flow Chart



Charts represent fully open valves with a flat plug.
Use BERMAD Sizing program for proper valve selection.

US Units

700 SIGMA **ES**

Technical Data

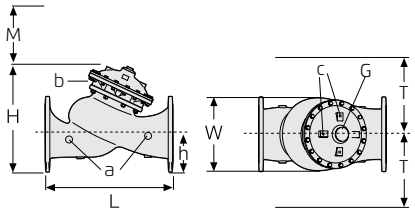
Valve Patterns: "Y" (Globe)
Pressure Rating: 400 psi
End Connections: Flanged (all standards)
Plug Types: Flat disc, V-port, Cavitation cages
Working Temperature: Water up to 140°F
Optional higher temperature: Available on request

Standard Materials:
Body & actuator: Ductile Iron
Bolts, nuts & studs: Stainless Steel
Internals: Stainless Steel, Tin Bronze & Coated Steel, POM
Diaphragm: Fabric-reinforced synthetic rubber
Seals: Synthetic rubber
Coating: Dark blue Fusion bonded epoxy
For other materials contact BERMAD.

Dimensions & Weights

Nominal Diameter	inch	2.5"	3"	4"	5"	6"	8"	10"	12"	14"	16"	18"	20"	24" #
	mm	65	80	100	125	150	200	250	300	350	400	450	500	600
L*	inch	11.42	12.20	13.78	15.75	18.90	23.62	28.74	33.46	38.58	43.31	47.24	49.21	57.09
W	inch	7.48	8.27	10.04	10.63	12.60	14.96	17.72	21.26	23.03	25.98	32.09	32.09	36.22
h**	inch	3.86	4.25	5.16	5.51	6.42	7.60	8.94	10.43	11.77	13.15	14.21	15.67	18.31
H**	inch	9.45	12.40	13.19	14.76	17.52	21.06	24.61	29.92	36.22	37.80	47.24	48.03	49.61
M	inch	7	7	9	11	13	15	18	23	27	27	38	38	38
T	inch	14	15	16	16	17	19	20	21	22	25	28	28	30
Weight**	lbs	40	60	84	137	172	276	437	675	1008	1135	2258	2392	2844
Control Chamber Volume	Gallons	0.03	0.07	0.08	0.15	0.28	0.57	1.19	2.25	3.28	3.28	7.87	7.87	7.87
Valve travel	inch	0.63	0.87	0.98	1.26	1.61	1.97	2.44	2.76	3.94	3.94	5.28	5.28	5.28
a	inch	¼" NPT	⅜" NPT					½" NPT				1" BSP		
b	inch	⅛" NPT				¼" NPT			⅜" NPT			¾" BSP		
c	inch	¼" NPT							½" NPT			¾" BSP		
G	inch	¾" G				2" G						3" G		

* Length according to ISO 5752; EN 558-1
** Maximum Dimensions & Weights
# - 24"; 600mm without cradle
M - Actuator maintenance allowance
T - Trim space allowance at either side



US Units

Flow Factors

Nominal Diameter	inch	2.5"	3"	4"	5"	6"	8"	10"	12"	14"	16"	18"	20"	24"
	mm	65	80	100	125	150	200	250	300	350	400	450	500	600
Flat Disc 	Cv	69	113	165	248	456	705	1045	1756	2472	2599	3812	3812	3812
	K	7.8	6.7	7.7	8.3	5.1	6.7	7.5	5.5	5.1	7.9	5.9	9	18.7
V-Port 	Cv	59	84	142	211	388	599	888	1492	2145	2341	3430	3430	3430
	K	10.8	12	10.4	11.4	7	9.3	10.4	7.6	6.8	9.8	7.3	11.1	23

Differential Pressure & Flow Calculation

Valve flow coefficient, Cv $Cv = Q\sqrt{\frac{Gf}{\Delta P}}$

Where:

Cv = Valve flow coefficient (flow in gpm at 1psi ΔP)

Q = Flow rate (gpm)

ΔP = Differential pressure (psi)

Gf = Liquid specific gravity (Water = 1.0)

Practical formulas for water:

$Q = Cv\sqrt{\Delta P}$ $\Delta P = \left(\frac{Q}{Cv}\right)^2$

Flow resistance or Head loss coefficient, $K = \Delta H \frac{2g}{V^2}$

Where:

K = Flow resistance or Head loss coefficient (dimensionless)

ΔH = Head loss (feet)

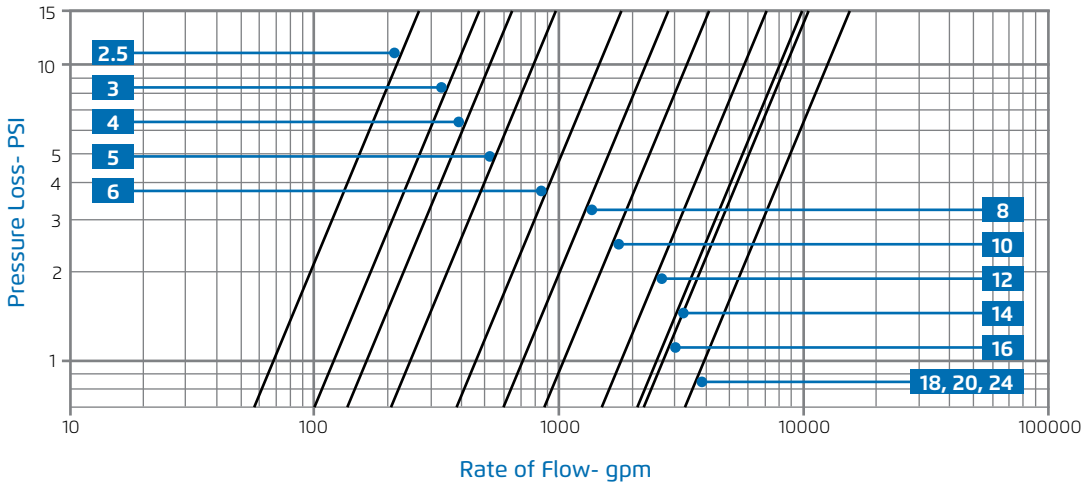
V = Nominal size flow velocity (feet/sec)

g = Acceleration of gravity (32.18 feet/sec²)

Practical formula:

$\Delta H = K \frac{V^2}{2g}$

Flow Chart



Charts represent fully open valves with a flat plug.
Use BERMAD Sizing program for proper valve selection.

US Units

700-00

Technical Data

Valve Patterns: "Y" (Globe); "A" (Angle)
Pressure Rating: 250 psi; 400 psi
End Connections: Flanged (all standards), Grooved, Threaded
Plug Types: Flat disc, V-port , Cavitation cages
Working Temperature: Water up to 140°F
Optional higher temperature: Available on request

Standard Materials:
Body & Actuator:
Threaded, Grooved & Angle: Ductile Iron EN 1563 GR.GJS-450-10
Bolts, nuts & studs: Stainless Steel
Internals: Stainless Steel, Bronze, Coated Steel & POM
Diaphragm: Fabric-reinforced synthetic rubber
Seals: Synthetic rubber
Coating: Dark blue Fusion Bonded Epoxy

Optional Body & Actuator Materials:
Flanged (A+Y): Carbon Steel – ASTM A216 GR.WCB
Oblique (Y): St. St. 316 – ASTM A351 GR. CF8M
Oblique (Y) Flanged: Ni. Al. Bronze – ASTM B148 GR.C95800

Consult BERMAD for final specification.

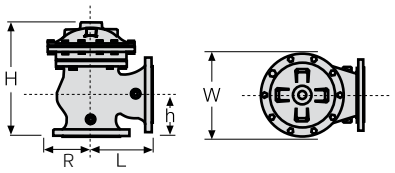
Dimensions & Weights

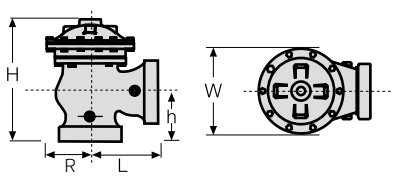
Angle - Flanged

Size	inch	1.5"	2"	2.5"	3"	4"	6"	8"	10"	12"	14"	16"	18"	20"
	mm	40	50	65	80	100	150	200	250	300	350	400	450	500
250psi; PN16														
L	inch	4.88	4.88	5.87	5.98	7.48	8.86	10.43	12.60	15.59	15.75	17.72	17.72	18.43
R	inch	2.52	3.07	3.54	3.94	4.53	6.30	7.68	9.45	10.83	10.83	14.57	14.57	14.57
W	inch	5.00	6.10	7.01	7.87	9.02	12.60	15.35	18.90	21.65	21.65	29.13	29.13	29.13
h	inch	3.35	3.35	4.29	4.02	5.00	5.98	7.99	8.62	10.75	10.98	14.53	14.53	15.24
H	inch	8.94	8.94	9.88	11.06	13.39	17.32	21.61	24.92	30.94	31.18	42.68	42.68	43.35
Weight	lbs	21	22	26	47	77	157	260	452	772	816	1764	1808	2293
400 psi; PN25														
L	inch	4.88	4.88	5.87	6.26	7.87	9.21	10.91	13.23	16.34	16.50	18.39	18.39	18.70
R	inch	3.07	3.27	3.74	4.13	5.00	6.30	7.68	9.45	10.83	11.54	14.57	14.57	14.57
W	inch	6.10	6.50	7.48	8.27	10.00	12.60	15.35	18.90	21.65	23.07	29.13	29.13	30.51
h	inch	3.35	3.35	4.29	4.29	5.31	6.50	8.50	9.29	11.57	11.77	15.20	15.20	15.55
H	inch	8.94	8.94	9.88	11.30	13.78	17.83	21.97	25.55	31.73	31.97	43.27	43.27	43.70
Weight	lbs	24	25	30	51	90	179	304	514	860	937	1885	1918	2513

Angle - Threaded

Size	inch	2"	2.5"	3"
	mm	50	65	80
L	inch	4.72	5.51	6.26
R	inch	2.48	2.48	3.23
W	inch	4.92	4.92	6.42
h	inch	3.27	4.02	4.53
H	inch	8.86	9.53	11.57
Weight	lbs	12	15	33



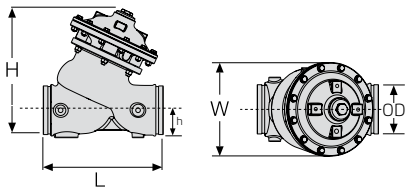


US units

Dimensions & Weights

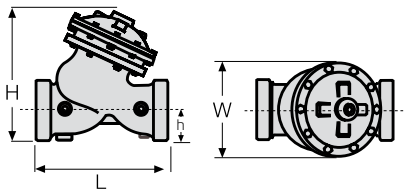
Y-Pattern - Grooved

Nominal Diameter	inch	1.5"	2"	2.5"	3"	4"	6"	8"
	mm	40	50	65	80	100	150	200
OD ANSI C606	inch	1.90	2.37	2.87	3.50	4.50	6.63	8.63
OD BS 1387 / EN 10255	inch	1.90	2.37	3.00	3.50	4.50	6.50	8.63
L	inch	8.07	8.27	8.46	9.84	12.60	16.34	19.69
W	inch	4.80	4.80	4.80	6.61	7.87	12.60	15.35
h	inch	1.30	1.57	1.57	2.36	2.91	3.74	4.92
H	inch	7.64	7.91	7.91	10.43	12.80	18.31	20.83
Weight	lbs	13	14	14	37	64	128	225



Y-Pattern - Threaded

Nominal Diameter	inch	1.5"	2"	2.5"	3"
	mm	40	50	65	80
L	inch	6.10	6.10	8.35	9.84
W	inch	5.08	5.08	5.08	6.42
h	inch	1.46	1.57	1.89	2.20
H	inch	7.91	7.99	8.23	10.39
Weight	lbs	12	12	18	37

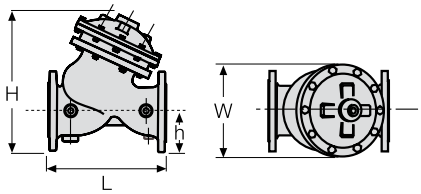


Y-Pattern - Flanged

Only for Carbon Steel, St. St. 316, Ni. Al. Bronze

For Ductile Iron refer to 700 Sigma EN/ES

Nominal Diameter	inch	1.5"	2"	2.5"	3"	4"	6"	8"	10"	12"	14"	16"	18"	20"
	mm	40	50	65	80	100	150	200	250	300	350	400	450	500
250 psi; PN16														
L	inch	8.07	8.07	8.46	9.84	12.60	16.34	19.69	23.82	28.54	28.86	38.98	39.37	43.31
W	inch	6.10	6.10	7.01	7.87	9.02	12.60	15.35	18.90	21.93	21.93	29.13	29.13	29.13
h	inch	3.07	3.07	3.50	3.94	4.53	5.63	6.77	8.15	9.53	10.55	11.81	12.56	14.09
H	inch	9.41	9.41	9.84	12.17	14.41	20.16	22.99	27.40	32.36	33.35	43.11	44.02	45.39
Weight	lbs	20	23	29	49	82	165	276	478	816	840	1865	2083	2121
400 psi; PN25														
L	inch	8.07	8.27	8.74	10.39	13.19	17.05	20.63	25.08	30.00	30.20	40.31	40.55	44.72
W	inch	6.10	6.50	7.48	8.27	10.00	12.60	15.35	18.58	21.93	23.03	29.13	29.13	30.59
h	inch	3.07	3.27	3.74	4.13	5.00	6.26	7.52	8.78	10.28	11.61	12.80	14.06	15.31
H	inch	9.41	9.61	10.12	12.36	14.88	20.79	23.70	27.99	33.27	34.37	44.17	45.43	46.69
Weight	lbs	22	27	33	55	95	187	322	540	904	957	1984	2132	2174

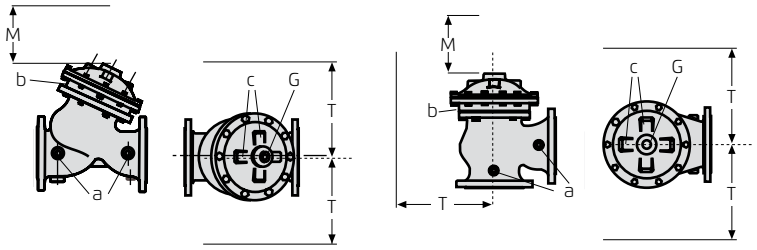


US Units

Actuator, Trim Ports and Maintenance

Size	inch	1.5"	2"	2.5"	3"	4"	6"	8"	10"	12"	14"	16"	18"	20"
	mm	40	50	65	80	100	150	200	250	300	350	400	450	500
Control Chamber Volume	Gallons	0.03	0.03	0.03	0.08	0.15	0.57	1.19	2.25	3.28	3.28	7.87	7.87	7.87
Valve travel	inch	0.63	0.63	0.63	0.98	1.26	1.97	2.44	2.76	3.94	3.94	5.28	5.28	5.28
M	inch	7	7	7	9	11	15	18	23	27	27	38	38	38
T	inch	14	14	14	15	16	17	19	20	21	21	25	25	25
a	inch	¼" NPT			⅜" NPT				½" NPT			1" BSP		
b	inch	⅛" NPT					¼" NPT		⅜" NPT			¾" BSP		
c	inch	¼" NPT							½" NPT			¾" BSP		
G	inch	¾" G					2" G					3" G		

M - Actuator maintenance allowance
T - Maximal control trim space for left or right side trim



US units

Flow Factors

Nominal Diameter		inch	1.5"	2"	2.5"	3"	4"	6"	8"	10"	12"	14"	16"	18"	20"
		mm	40	50	65	80	100	150	200	250	300	350	400	450	500
Y-Pattern Flat Disc		Cv	49	58	64	133	231	531	941	1444	2137	2432	3557	3557	3557
		K	2.3	3.9	9.2	4.8	3.9	3.7	3.8	3.9	3.7	5.3	4.2	6.8	10.3
Y-Pattern V-Port		Cv	42	50	54	113	196	452	800	1228	1817	2067	3003	3003	3003
		K	3.1	5.3	12.6	6.7	5.4	5.2	5.2	5.4	5.1	7.3	5.9	9.5	14.5
Angle Flat Disc		Cv	53	64	70	147	254	584	1036	1588	2350	2541	3869	3869	N/A
		K	1.9	3.2	7.5	4	3.2	3.1	3.1	3.2	3.1	4.9	3.6	5.7	N/A
Angle V-Port		Cv	45	54	60	125	216	497	880	1350	1998	2195	3292	3292	N/A
		K	2.6	4.4	10.3	5.5	4.5	4.3	4.3	4.5	4.2	6.5	4.9	7.9	N/A

Differential Pressure & Flow Calculation

Valve flow coefficient, Cv $Cv = Q\sqrt{\frac{Gf}{\Delta P}}$

Where:

Cv = Valve flow coefficient (flow in gpm at 1psi ΔP)

Q = Flow rate (gpm)

ΔP = Differential pressure (psi)

Gf = Liquid specific gravity (Water = 1.0)

Practical formulas for water:

$Q = Cv\sqrt{\Delta P}$ $\Delta P = \left(\frac{Q}{Cv}\right)^2$

Flow resistance or Head loss coefficient, $K = \Delta H \frac{2g}{V^2}$

Where:

K = Flow resistance or Head loss coefficient (dimensionless)

ΔH = Head loss (feet)

V = Nominal size flow velocity (feet/sec)

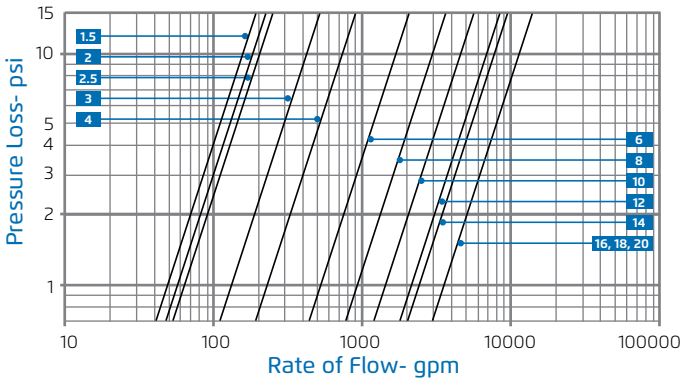
g = Acceleration of gravity (32.18 feet/sec²)

Practical formula:

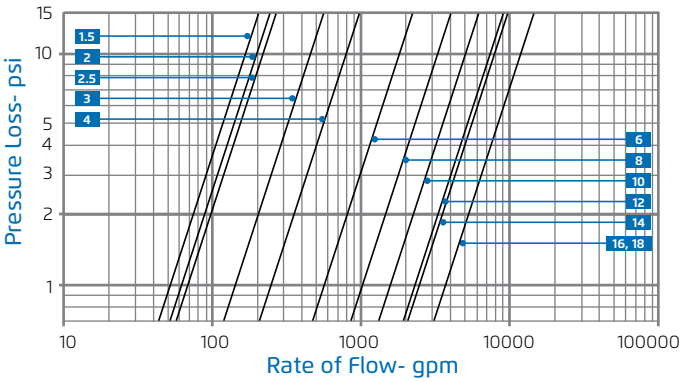
$\Delta H = K \frac{V^2}{2g}$

Flow Charts

Y-Pattern



Angle



Charts represent fully open valves with a flat plug.
Use BERMAD Sizing program for proper valve selection.

Valve Options and Features

Valve Position Indicator - I

The BERMAD Valve Position Indicator Assembly provides a visual indication of valve opening and regulation behavior.

Single Limit Switch - S

The BERMAD Single Limit Switch Assembly includes mechanical electrical change over contacts (NO + NC), enabling remote signaling of the closed valve position.

Double Limit Switch - SS

The BERMAD Double Limit Switch Assembly includes two mechanical electrical switches, enabling remote signaling of the closed and the open valve positions.

Analog Valve Position Transmitter - Q

This Analog Ultrasonic Valve Position Transmitter assembly is an accessory which enables remote signaling upon the rate of opening of the BERMAD control valves.

It is equipped with an easy to set ultrasonic sensor that measures, without mechanical contact, the movement of the valve position indicator.

Insertion Flow Meter - MT

The BERMAD Insertion Flow Meter can be inserted into the upstream side of the 700-Sigma EN/ES valves, adding accurate flow measurement function.

Independent Lift Check - 2S

The BERMAD Independent Lift Check feature is an integral, lift type, spring loaded non return trim that allow full control and regulation in the required direction and smoothly closes drip tight before flow changes direction, regardless of control status.

Flow Stem - M

The BERMAD Flow Stem Assembly enables limiting the opening stroke of the control valve or for safety ensured mechanical closure.

Lifting Spring - L

The BERMAD Lifting Spring Assembly enables the valve to remain open at zero pressure conditions and to minimize pressure losses.

For more details refer to relevant accessory product page.

International Standards

IQNet	INTERNATIONAL	ISO 9001-2015 Certified Quality Assurance System
ISO 9001	INTERNATIONAL	ISO 9001-2015 Certified Quality Assurance System
WRAS Water Regulations Advisory Scheme	WRAS, UK	The product complies with the Water Regulation Advisory Scheme of UK and BS 6920
DVGW Zertifizierungsstelle	DVGW, Germany	Compliance with the European Standard EN 1074 – Valves for water supply and German Standards KTW and W270
ATTESTATION DE CONFORMITÉ SANITAIRE ACS	ACS, France	Tests are based on the French Sanitary standard
NSF	NSF USA	Certified to NSF/ANSI/CAN 61-G & 372
БСК БЪЛГАРКОНТРОЛА 1952	Bulgarcontrola, Bulgaria	Compliance of Bermad Automatic Control Valves with the sanitary requirements of Bulgaria and with the EN 1074 European Standard for Valves for Water Supply
NATIONAL INSTITUTE OF PUBLIC HEALTH PZH Since 1918	PZH, Poland	Compliance of Bermad Automatic Control Valves with the Polish sanitary requirements
Certified Product Australian Standard	AUSTRALIA AS 5081 and water mark	Control valves for waterworks purposes
EAC	RUSSIAN Customs Union	Valves For Water Supply

BERMAD valves comply with a wide range of international standards.
Please consult with BERMAD about the current compliance of a required model to a specific standard.

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February 2024