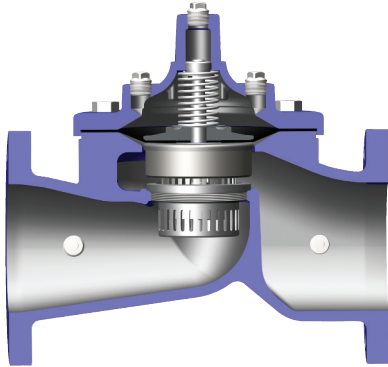




# — MODEL — 100-20KO Reduced Port Anti-Cavitation Hytrol Valve



- Virtually Cavitation Free Operation
- Severe Service Design - High Pressure Differentials
- Reduced Noise and Vibration
- 316 Stainless Steel Disc Guide and Seat Standard
- Drip-Tight, Positive Sealing
- Serviced Without Removal From Line
- Retrofit to Standard Hytrol Valves

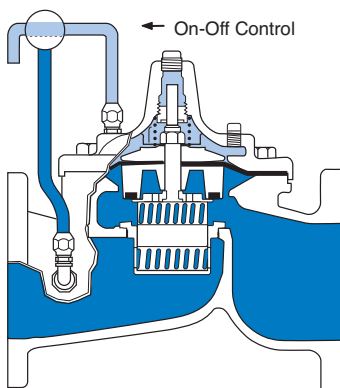
The Cla-Val Model 100-20KO Anti-Cavitation Hytrol Valve is designed for applications where there is a high potential for damage from cavitation. Specify this valve series for a wide variety of control valve applications having pressure differentials up to 350 psid or for relief valves having atmospheric discharge up to 150 psid.

The 100-20KO Hytrol main valve provides optimum internal pressure control through a unique anti-cavitation trim design. Constructed of 316 Stainless Steel, the seat and disc guide trim components feature dual interlocked sleeves containing radial slots that deflect internal flow to impinge upon itself in the center of the flow path, harmlessly dissipating the potential cavitation damage. This unique design also lessens the possibility of fouling if large particles in the water are present due to the large flow path of the radial slots.

The 100-20KO Hytrol is the basic valve used in Cla-Val Automatic Control Valves for high differential applications requiring remote control, pressure regulation, solenoid operation, rate of flow control, or liquid level control.

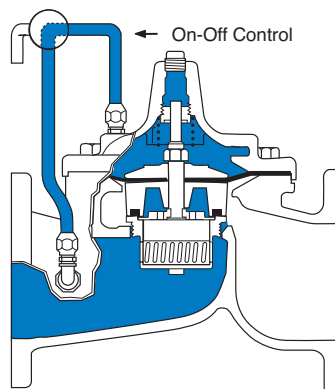
The Anti-Cavitation Trim components can be retrofitted to existing valves if the application indicates an appropriate need. Please consult factory for details.

## Principle of Operation



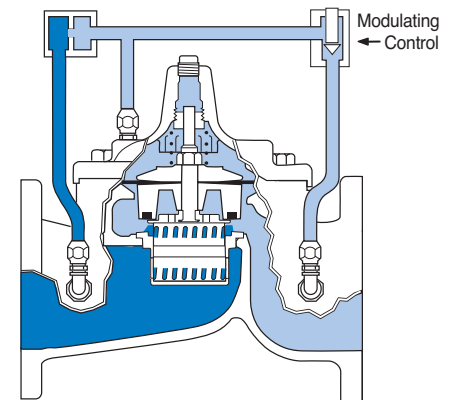
### Full Open Operation

When pressure in the cover chamber is relieved to a zone of lower pressure, the line pressure at the valve inlet opens the valve, allowing full flow.



### Tight Closing Operation

When pressure from the valve inlet is applied to the cover chamber, the valve closes drip-tight.



### Modulating Action

The valve holds any intermediate position when operating pressures are equal above and below the diaphragm. A Cla-Val "Modulating" Pilot Control will allow the valve to automatically compensate for line pressure changes.

## Cla-Val 100-02KO Main Valve Specifications

Pattern	Globe	Angle
Size	3" - 36" 32 - 900 mm	4", 6", 8", 10", 12", 18", 20" 100, 150, 200, 250, 300, 450, 500 mm

### Operating Temp. Range

Fluids
-40° to 180° F
-40° to 82° C

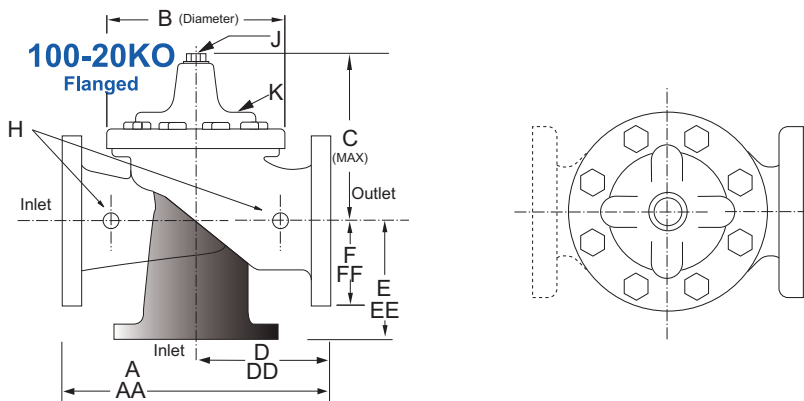
### Materials

Component	Standard Material Combinations		
Body & Cover	Ductile Iron	Cast Steel	Bronze
Available Sizes	3" - 36" 80 - 900 mm	3" - 16" 80 - 400 mm	3" - 16" 80 - 400 mm
Disc Retainer & Diaphragm Washer	Cast Iron	Cast Steel	Bronze
Trim: Disc Guide, Seat & Cover Bearing	Stainless Steel is Standard		
Disc	Buna-N® Rubber		
Diaphragm	Nylon Reinforced Buna-N® Rubber		
Stem, Nut & Spring	Stainless Steel		
For material options not listed consult factory.			

### Pressure Ratings (Recommended Maximum Pressure - psi)

Valve Body & Cover		Pressure Class		
		Flanged		
Grade	Material	ANSI Standards*	150 Class	300 Class
ASTM A536	Ductile Iron	B16.42	250	400
ASTM A216-WCB	Cast Steel	B16.5	285	400
UNS 87850	Bronze	B16.24	225	400
Note: * ANSI standards are for flange dimensions only. Flanged valves are available faced but not drilled.				

### Cla-Val 100-02KO Main Valve Dimensions



Cla-Val Control Valves with KO ANTI-CAVITATION Trim operate with maximum efficiency when mounted in horizontal piping with the main valve cover Up. We recommend isolation valves be installed on inlet and outlet for maintenance. Adequate space above and around the valve for service personnel should be considered essential. A regular maintenance program should be established based on the specific application data. However, we recommend a thorough inspection be done at least once a year. Consult factory for specific recommendations.

Valve Size (Inches)	3	4	6	8	10	12	14	16	18	20	24	30	36
A 150 ANSI	10.25	13.88	17.75	21.38	26.00	30.00	34.25	35.00	42.12	48.00	48.00	63.25	65.00
AA 300 ANSI	11.00	14.50	18.62	22.38	27.38	31.50	35.75	36.62	43.63	49.62	49.75	63.75	67.00
B Diameter	6.62	9.12	11.50	15.75	20.00	23.62	27.47	28.00	35.44	35.44	35.44	53.19	56.00
C Maximum	7.00	8.62	11.62	15.00	17.88	21.00	20.88	25.75	25.00	31.50	31.50	43.94	54.75
D 150 ANSI	—	6.94	8.88	10.69	12.75	14.94	—	—	20.93	21.06	—	—	—
DD 300 ANSI	—	7.25	9.38	11.19	—	—	—	—	—	—	—	—	—
E 150 ANSI	—	5.50	6.75	7.25	8.06	8.68	—	—	15.81	15.94	—	—	—
EE 300 ANSI	—	5.81	7.25	7.75	—	—	—	—	—	—	—	—	—
F 150 ANSI	3.75	4.50	5.50	6.75	8.00	9.50	11.00	11.75	15.88	14.56	17.00	19.88	25.50
FF 300 ANSI	4.12	5.00	6.25	7.50	8.75	10.25	11.50	12.75	15.88	16.06	19.00	22.00	27.50
H NPT Body Tapping	0.375	0.50	0.75	0.75	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00
J NPT Cover Center Plug	0.50	0.50	0.75	0.75	1.00	1.00	1.25	1.25	2.00	2.00	2.00	1.00	2.00
K NPT Cover Tapping	0.375	0.50	0.75	0.75	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00
Stem Travel	0.60	0.80	1.10	1.70	2.30	2.80	3.40	4.50	4.50	4.50	6.50	7.50	7.50
Approx. Ship Weight (lbs)	45	85	195	330	625	900	1250	1380	2365	2551	2733	6500	8545

Valve Size (mm)	80	100	150	200	250	300	350	400	450	500	600	750	900
A 150 ANSI	260	353	451	543	660	762	870	889	1070	1219	1219	1607	1651
AA 300 ANSI	279	368	473	568	695	800	908	930	1108	1260	1263	1619	1702
B Diameter	168	232	292	400	508	600	698	711	900	900	900	1351	1422
C Maximum	178	219	295	381	454	533	530	654	635	800	800	1116	1391
D 150 ANSI	—	176	226	272	324	380	—	—	532	535	—	—	—
DD 300 ANSI	—	184	238	284	—	—	—	—	—	—	—	—	—
E 150 ANSI	—	140	171	184	205	349	—	—	402	405	—	—	—
EE 300 ANSI	—	148	184	197	—	—	—	—	—	—	—	—	—
F 150 ANSI	95	114	140	171	203	241	279	289	403	370	432	505	648
FF 300 ANSI	105	127	159	191	222	260	292	324	403	408	483	559	699
H NPT Body Tapping	0.375	0.50	0.75	0.75	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00
J NPT Cover Center Plug	0.50	0.50	0.75	0.75	1.00	1.00	1.25	1.25	2.00	2.00	2.00	1.00	2.00
K NPT Cover Tapping	0.375	0.50	0.75	0.75	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00
Stem Travel	15	20	28	43	58	71	86	86	114	114	114	165	191
Approx. Ship Weight (kgs)	20	39	89	150	284	409	568	627	681	1157	1249	2951	3876

Valve Size		Inches	3	4	6	8	10	12	14	16	18	20	24	30	36
		mm.	80	100	150	200	250	300	350	400	450	500	600	760	900
C <sub>V</sub> Factor	Globe Pattern	Gal./Min. (gpm.)	25	46	98	240	409	660	910	925	1175	1225	1271	3900	6200
		Litres/Sec. (l/s.)	6.0	11.0	23.5	57.7	98	159	219	222	342	348	358	708	1490
	Angle Pattern	Gal./Min. (gpm.)	—	49	105	230	CF**	CF**	—	—	CF**	CF**	—	—	—
		Litres/Sec. (l/s.)	—	11.8	25.2	55	CF**	CF**	—	—	CF**	CF**	—	—	—
Equivalent Length of Pipe	Globe Pattern	Feet (ft.)	1800	2191	4244	3404	3884	3190	3359	6472	6155	9752	22789	8373	8611
		Meters (m.)	549	668	1294	1038	1184	972	1024	1973	1876	2973	6946	2552	2625
	Angle Pattern	Feet (ft.)	—	1931	3697	3257	CF**	CF**	—	—	CF**	CF**	—	—	—
		Meters (m.)	—	589	1127	993	CF**	CF**	—	—	CF**	CF**	—	—	—
K Factor	Globe Pattern	127	111	126	72	65	42	40	67	53	75	145	39	33	
	Angle Pattern	—	98	110	69	—	—	—	—	—	—	—	—	—	
Liquid Displaced from Cover Chamber When Valve Opens		U.S. Gal.	.03	.08	.17	.53	1.26	2.5	4.0	4.0	9.6	9.6	9.6	29.0	42.0
		Litres	.12	.30	.64	2.0	4.8	9.5	15.1	15.1	36.2	36.2	36.2	110	159

For assistance in selecting appropriate valve options or valves manufactured with special design requirements, please contact our Regional Sales Office or Factory.

**C<sub>V</sub> Factor**

Formulas for computing C<sub>V</sub> Factor, Flow (Q) and Pressure Drop (ΔP):

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

**K Factor (Resistance Coefficient)**

The Value of K is calculated from the formula:  $K = \frac{894d^4}{C_V^2}$  (U.S. system units)

**Equivalent Length of Pipe**

Equivalent lengths of pipe (L) are determined from the formula:  $L = \frac{Kd}{12f}$  (U.S. system units)

**Fluid Velocity**

Fluid velocity can be calculated from the following formula:  $V = \frac{.4085 Q}{d^2}$  (U.S. system units)

**Where:**

C<sub>V</sub> = U.S. (gpm) @ 1 psi differential at 60° F water  
 or  
 = (l/s) @ 1 bar (14.5 PSIG) differential at 15° C water

d = inside pipe diameter of Schedule 40 Steel Pipe (inches)  
 f = friction factor for clean, new Schedule 40 pipe (dimensionless) (from Cameron Hydraulic Data, 18th Edition, P 3-119)

K = Resistance Coefficient (calculated)

L = Equivalent Length of Pipe (feet)

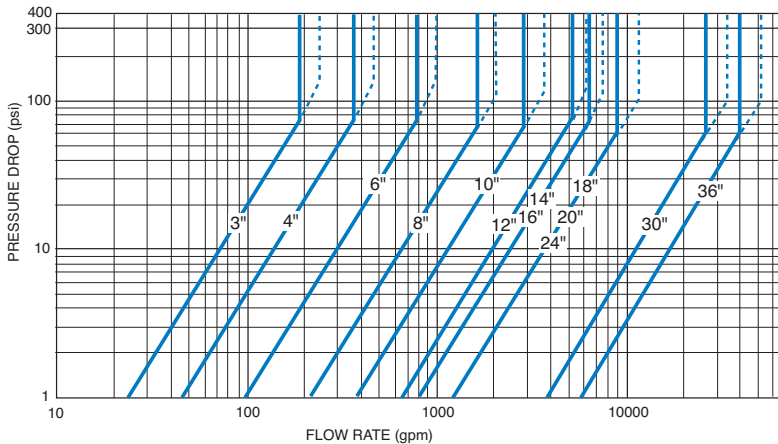
Q = Flow Rate in U.S. (gpm) or (l/s)

V = Fluid Velocity (feet per second) or (meters per second)

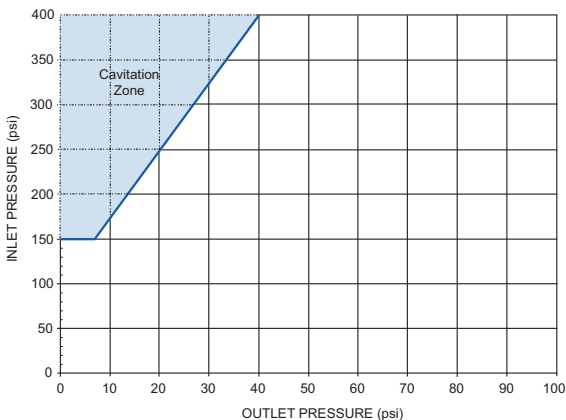
ΔP = Pressure Drop in (psi) or (bar)

100G-20KO ANTI-CAVITATION VALVE CURVES

SOLID LINE IS FULL OPEN FLOW CURVES AT 18 FT/SEC FOR CONTINUOUS DUTY APPLICATIONS \*  
 DASHED LINE IS FULL OPEN FLOW CURVE AT 25 FT/SEC FOR INTERMITTENT DUTY APPLICATIONS \*

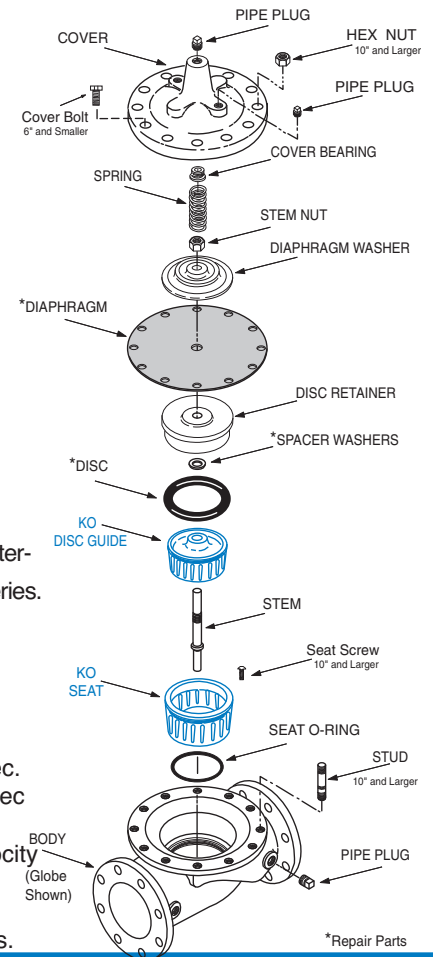


SELECTION GUIDELINE FOR KO ANTI-CAVITATION VALVES



**Notes: On Operating Differential**

- \*The 100-20KO Series is the reduced internal port size version of the 100-01KO Series.
- 1. For atmospheric discharge, the maximum inlet pressure cannot exceed 150 psi.
- 2. For pressure differentials greater than 300 psi the maximum flow velocity should not exceed 18 ft/sec.
- 3. Flow velocities greater than 25 ft/sec are not recommended.
- 4. Recommended minimum flow velocity is 1 ft/sec.
- 5. Consult factory for conditions exceeding these recommendations.



# 100-20KO Hytrol Main Valve with Anti-Cavitation Trim Purchase Specifications

## Function

The valve shall be hydraulically operated, single diaphragm actuated, globe pattern. The valve shall consist of three major components: the body with seat installed, the cover with bearing installed, and the diaphragm assembly. The diaphragm assembly shall be the only moving part and shall form a sealed chamber in the upper portion of the valve, separating operating pressure from line pressure. Packing glands and/or stuffing boxes are not permitted and there shall be no pistons operating the main valve or pilot controls. Ductile Iron is standard, other materials shall be available. No fabrication or welding shall be used in the manufacturing process.

## Description

The anti-cavitation features of the seat and disc guide detail shall have flow slots equally spaced around their perimeters. The seat slots shall be orientated around the perimeter of the seat so that fluid entering the valve shall flow through the seat slot detail such that the fluid flow converges in the center chamber of the seat allowing potential cavitation to dissipate. The disc guide slots shall be positioned around the perimeter of the disc guide, configured and oriented in an angular direction so that fluid flow exiting through the slots is diverted away from direct impact into pressure boundary surfaces. Flow exiting the disc guide slots is directed in an angular path to increase the distance between the slot geometry and pressure boundary surfaces. If cavitation conditions exist, the increased distance between the slots and pressure boundary surfaces minimizes the potential for damage by allowing the cavitation bubbles to dissipate before they come in contact with pressure boundary surfaces. Anti-cavitation characteristics shall be controlled by the described slotted seat and disc guide components. The disc guide shall slide in the seat and allow controlled flow through the seat slots into the central seat chamber where flow shall continue from the seat chamber and exit through the angularly oriented slots of the disc guide. The seat and disc guide features used together shall provide anti-cavitation characteristics suitable for applications where a large controlled pressure drop is desired.

The flexible, non-wicking, FDA approved diaphragm shall consist of nylon fabric bonded with synthetic rubber compatible with the operating fluid. The diaphragm must withstand a Mullins burst test of a minimum of 600 psi per layer of nylon fabric and shall be cycle tested 100,000 times to insure longevity. The diaphragm shall be fully supported in the valve body and cover by machined surfaces which support no less than one-half of the total surface area of the diaphragm in either the fully open or fully closed position.

The valve seat in eight inch and smaller size valves shall be threaded into the body. Valve seat in ten inch and larger size valves shall be retained by flat head machine screws for ease of maintenance. The seat shall be of the solid, one-piece design and shall have a minimum of a five degree taper on the seating surface for positive drip-tight shut-off. Pressed-in bearings and/or multi-piece seats shall not be permitted.

To insure proper alignment of the valve stem, the valve body and cover shall be machined with a locating lip. No "pinned" covers to the valve body shall be permitted. All necessary repairs and/or modifications other than replacement of the main valve body shall be possible without removing the valve from the pipeline.

The valve manufacturer shall warrant the valve to be free of defects in material and workmanship for a period of three years from date of shipment, provided the valve is installed and used in accordance with all applicable instructions. The valve manufacturer shall be able to supply a complete line of equipment from 1½" through 48" (32 mm through 1200 mm) sizes and a complete selection of complementary equipment.

## Material Specification

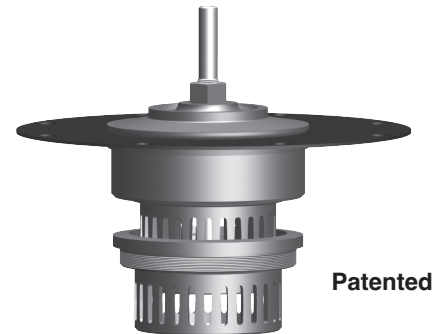
Valve Size:	Pressure Rating:
Main Valve Body and Cover:	Temperature Range:
Main Valve Trim:	Coating:
End Detail:	Desired Options:

## Application Information

Inlet/Outlet Pressures:  
 Flow Rate:  
 Pipe Diameter:  
 Function (i.e. - Pressure Reducing, Pressure Relief, etc.):

This valve shall be a Cla-Val Model No. 100-20KO Hytrol Main Valve with Anti-Cavitation Trim as manufactured by Cla-Val, Newport Beach, CA

**Note:** Add this Hytrol Anti-Cavitation Trim Purchase Specification to main valve specification for control valves where there is a high potential for cavitation damage. Please contact our Regional Sales Offices or Factory for assistance.



The Anti-Cavitation Trim components can be retrofitted to existing Hytrol valves if the application indicates an appropriate need. Please consult factory for details.



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