

Series 706 and Series 709 Butterfly Valves Design Data

PRODUCT DESCRIPTION



Series 706



Series 709

The Series 706 and Series 709 grooved end butterfly valves offer an easily installed choice to cumbersome, multi-bolt wafer, lug-type or flanged valves. The valves have excellent flow characteristics with low torque operation. The resilient EPDM seat is rated for water services up to +230°F (+110°C). The offset disc securely retains the resilient seat for bi-directional working pressure.

The Series 709 valve has a working pressure of 175 psi (1270 kPa) and the Series 706 valve has a working pressure of 300 psi (2065 kPa). While these valves appear to be similar, the Series 706 has age hardened 17-4 PH stainless steel upper and lower stems and reinforced hardware, in order to operate at higher pressure services.

For dimensions and material specifications request Section 08.03 (for Series 709) or Section 08.17 (for Series 706).

Victaulic now offers a line of Advanced Groove System (AGS) products for this size range. Please request publication 20.06 for information on W706 AGS butterfly valves and 20.07 for W709 AGS butterfly valves. Consult your Victaulic sales representative for availability in your area.

! WARNING

Victaulic AGS products use a patent-pending groove profile that requires the use of special AGS rolls. AGS products must not be used on pipe that has been grooved using standard grooving rolls.

Failure to use AGS products on AGS grooved pipe could result in serious personal injury, property damage, joint leakage or joint separation.

FLOW PERFORMANCE

C_v Values

Series 706 and Series 709 butterfly valves have the same excellent flow characteristics due to the narrow profile disc design with separate upper and lower stems.

C_v values for flow of water at +60°F (+16°C) with various disc positions are shown in the table at right.

Formulas for C_v Values:

$$\Delta P = \frac{Q^2}{C_v^2}$$

$$Q = C_v \times \sqrt{\Delta P}$$

Where:

Q = Flow (GPM)

ΔP = Pressure Drop (psi)

C_v = Flow Coefficient

Valve Size		FLOW COEFFICIENTS – C _v					
Nominal Outside Diameter In./mm	Actual Outside Diameter In./mm	Disc Position (Degrees open)					
		90° 	70° 	60° 	50° 	40° 	30°
14 350	14.000 355,6	9360	4350	3040	2130	1490	900
16 400	16.000 406,4	12400	5680	3940	2730	1880	1130
18 450	18.000 457,0	15900	7200	4970	3420	2340	1400
20 500	20.000 508,0	19800	8810	6010	4080	2740	1610
24 600	24.000 610,0	28900	12700	8580	5760	3800	2210

NOTE: Because of strong dynamic effects, flow instabilities and poor control, Victaulic butterfly valves should only be used for throttling with the disc between 30° and 75° open.

VALVE TORQUE REQUIREMENTS

Operating Torques

The flow of water through a butterfly valve induces a torque (rotary turning effort) on the shaft. This torque and the pressure drop across the valve, create stresses in the valve which are considered in the charts and data. To estimate the magnitude of the operating torque, multiply the values listed in the table at the right by the pressure drop across the valve in psi.

The actual or estimated pressure drop for each disc position must be evaluated to determine the maximum operating torque. If the maximum operating torque exceeds the maximum actuator torque, a larger actuator will be required. Contact Victaulic for details. The maximum operating torque must not exceed the maximum allowable stem torque values listed.

Victaulic Series 706 and 709 valves have low torque requirements for operating the valve. The torque data listed below is required to operate the valve at the given pressure in wet service. These torque values are based on testing by Victaulic. When using this information for sizing actuators, use either the maximum operating torque or seating/unseating torque, whichever is largest.

SERIES 706 AND SERIES 709									SERIES 706	SERIES 709
Valve Size		OPERATING TORQUES Inch Pounds per PSI/Newton Meters per kPa						Max. Actuator Torque In. Lb. N • m	Max. Allow. Stem Torque In. Lb. N • m	Max. Allow. Stem Torque In. Lb. N • m
Nominal Outside Dia. In./mm	Actual Outside Dia. In./mm	Disc Position (Degrees open)								
		90°	70°	60°	50°	40°	30°			
14 350	14.000 355,6	620 10,2	460 7,5	270 4,4	140 2,3	110 1,8	90 1,5	9000 1017	9300 1051	8300 938
16 400	16.000 406,4	970 15,9	710 11,6	420 6,9	220 3,6	160 2,6	130 2,1	15,000 1695	11,300 1277	10,300 1164
18 450	18.000 457,0	1430 23,5	1050 17,2	620 10,2	330 5,4	240 3,9	200 3,3	20,000 2260	18,500 2090	16,700 1887
20 500	20.000 508,0	2050 33,6	1500 24,6	890 14,6	470 7,7	340 5,6	280 4,6	30,000 3389	28,000 3163	25,200 2847
24 600	24.000 610,0	3700 60,7	2700 44,3	1600 26,2	830 13,6	600 9,8	490 8,0	30,000 3389	36,200 4090	33,800 3819

! WARNING

Failure to follow instructions, operating restrictions and warnings can result in serious personal injury and damage to the equipment.

- Do not exceed the maximum allowable torque (In. Lb.) as described in the last two columns of the above table.

Valve Size		Seating/Unseating Torque Inch Pounds/Newton Meters
Nominal Outside Diameter Inches/mm	Actual Outside Diameter Inches/mm	
		Differential Pressure – PSI/kPa

SERIES 706 AND SERIES 709

		0/0	50/345	100/690	150/1035	175/1200
14 350	14.000 355,6	2970 335,6	3830 432,7	4700 531,0	5560 628,2	5990 676,8
16 400	16.000 406,4	3875 437,8	4820 544,6	5750 649,7	6700 757,0	7175 810,6
18 450	18.000 457,0	4900 553,6	6005 678,5	7105 802,8	8200 926,5	8755 989,2
20 500	20.000 508,0	6060 684,7	7310 825,9	8570 968,3	9825 1110,1	10450 1180,7
24 600	24.000 610,0	8720 985,2	10130 1144,5	11545 1304,4	13000 1469,0	13665 1544,0

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		200/1380	250/1725	300/2070
14 350	14.000 355,6	6400 723,2	7200 813,6	8100 915,3
16 400	16.000 406,4	7600 858,8	8500 960,5	9500 1073,5
18 450	18.000 457,0	9300 1050,9	10400 1175,2	11500 1299,5
20 500	20.000 508,0	11000 1243,0	12300 1389,9	13500 1525,5
24 600	24.000 610,0	14400 1627,2	15800 1785,4	17200 1943,6

MAXIMUM ALLOWABLE PRESSURE DROPS

Series 706

SERIES 706							
Valve Size		Maximum Allowable Pressure Drops* – PSI/kPa					
Nominal Outside Diameter Inches/mm	Actual Outside Diameter Inches/mm	Disc Position (Degrees open)					
		90°	70°	60°	50°	40°	30°
14 350	14.000 355,6	0.54 4	2.5 17	5.1 35	10 69	21 145	59 407
16 400	16.000 406,4	0.54 4	2.6 18	5.4 37	11 76	24 165	65 448
18 450	18.000 457,0	0.54 4	2.6 18	5.5 38	12 83	25 172	70 483
20 500	20.000 508,0	0.54 4	2.7 19	5.8 40	13 90	28 193	81 558
24 600	24.000 610,0	0.54 4	2.8 19	6.1 42	14 97	31 214	61 † 421 †

*Based on either mechanical considerations or a maximum recommended velocity of 16 ft./sec.

† Limited by actuator.

Note: High pipeline velocities and/or throttling with the disc less than 30 degrees open, may result in noise, vibration, cavitation, severe line erosion, and loss of control.

WARNING

Failure to follow instructions, operating restrictions and warnings can result in serious personal injury and damage to the equipment.

- Do not exceed the maximum allowable pressure drop (psi) as described in the table above.

Series 709

SERIES 709							
Valve Size		Maximum Allowable Pressure Drops* – PSI/kPa					
Nominal Outside Diameter Inches/mm	Actual Outside Diameter Inches/mm	Disc Position (Degrees open)					
		90°	70°	60°	50°	40°	30°
14 350	14.000 355,6	0.54 4	2.5 17	5.1 35	10 69	21 145	59 407
16 400	16.000 406,4	0.54 4	2.6 18	5.4 37	11 76	24 165	65 448
18 450	18.000 457,0	0.54 4	2.6 18	5.5 38	12 83	25 172	70 483
20 500	20.000 508,0	0.54 4	2.7 19	5.8 40	13 90	28 193	81 558
24 600	24.000 610,0	0.54 4	2.8 19	6.1 42	14 97	31 214	61 † 421 †

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MAXIMUM ALLOWABLE FLOW RATES

The maximum allowable flow rate has been determined using the maximum allowable pressure drop and the C_v values. The Victaulic Series 706 and Series 709 butterfly valves are rated to the full valve working pressure for ON-OFF service. To ensure proper operation of the valves when the valves are open, flow through the valves should not exceed the values in the tables below.

Series 706

Valve Size		SERIES 706 MAXIMUM ALLOWABLE FLOW RATES – GPM/LPM					
Nominal Outside Diameter In./mm	Actual Outside Diameter In./mm	Disc Position (Degrees open)					
		90°	70°	60°	50°	40°	30°
14 350	14.000 355,6	6880 26050	6890 26090	6900 26130	6910 26160	6910 26160	6890 26090
16 400	16.000 406,4	9120 34530	9120 34530	9130 34570	9140 34610	9130 34570	9140 34610
18 450	18.000 457,0	11700 44300	11700 44300	11700 44300	11700 44300	11700 44300	11800 44680
20 500	20.000 508,0	14600 55280	14600 55280	14600 55280	14600 55280	14600 55280	14600 55280
24 600	24.000 610,0	21300 80650	21300 80650	21200 80270	21200 80270	21200 80270	17400 65880

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- Do not exceed the maximum allowable pressure drop (psi) as described in the table above.

Series 709

Valve Size		SERIES 709 MAXIMUM ALLOWABLE FLOW RATES – GPM/LPM					
Nominal Outside Diameter In./mm	Actual Outside Diameter In./mm	Disc Position (Degrees open)					
		90°	70°	60°	50°	40°	30°
14 350	14.000 355,6	6880 26050	6890 26090	6900 26130	6910 26160	6910 26160	6890 26090
16 400	16.000 406,4	9120 34530	9120 34530	9130 34570	9140 34610	9130 34570	9140 34610
18 450	18.000 457,0	11700 44300	11700 44300	11700 44300	11700 44300	11700 44300	11800 44680
20 500	20.000 508,0	14600 55280	14600 55280	14600 55280	14600 55280	14600 55280	14600 55280
24 600	24.000 610,0	21300 80650	21300 80650	21200 80270	21200 80270	21200 80270	17400 † 65880 †

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- Do not exceed the maximum allowable pressure drop (psi) as described in the table above.