DeZURIK

BULLETIN 2200
FEBRUARY 2025

WILLAMETTE CONE VALVES (VMC)

A Valve That Will Last for Decades

Willamette Cone Valves (VMC) are built tough to last under the most severe conditions. Every valve is designed and built for precise operation, long life and low maintenance. The VMC is available in sizes 6-48" (150-1200mm). Standard design pressures are up to 300 psi (2068 kPa).

Dependable Operation in Tough Applications

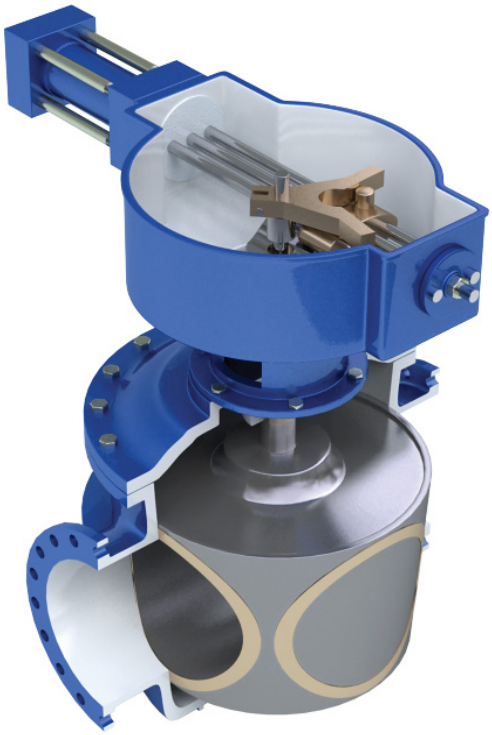
Cone Valves are designed with wide, welded-on Monel metal seats that eliminate erosion and abrasion failures commonly associated with polymer and elastomer seals in other valve types. The robust metal-to-metal seating ensures dependable operation and typically requires no replacement or preventive maintenance under normal conditions.

This durable seating design makes the valve ideal for challenging applications where high velocities and continuous throttling are necessary.

Design & Construction Features

Each valve consists of a conical plug that fits precisely into a mating valve body, along with a head cover, valve operating mechanism, and actuator. These are 100% full port, conical plug-type valves with a circular waterway through both the body and plug when in the fully open position.

The valve body features weld-overlayed Monel seats around the bore, which are accurately precision machined after welding. The conical plug can be equipped with either fo ur (4) seats or two (2) seats. For valves equipped with four (4) seats, one pair of seats engages the body seat in the open position, while the other pair engages in in the closed position (rotated 90 degrees.) For valves equipped with two (2) seats, one pair of seats engages the body seat in the closed position.



In operation, the plug is first lifted to separate the seat from the valve body seat. It is then rotated 90° to the desired open or closed position before being lowered to reseat in place. The body and plug seat are designed to form a secure, consistent and dependable closure.

Metal-to-metal seats mate firmly and accurately to provide tight shutoff and adheres to the allowable leak rate AWWA C522. Under normal operating conditions, the seal will last the life of the valve.

Bronze pivot bearings are provided on the plug trunnions, and the seat rings on the plug engage with the valve body seats during operation.

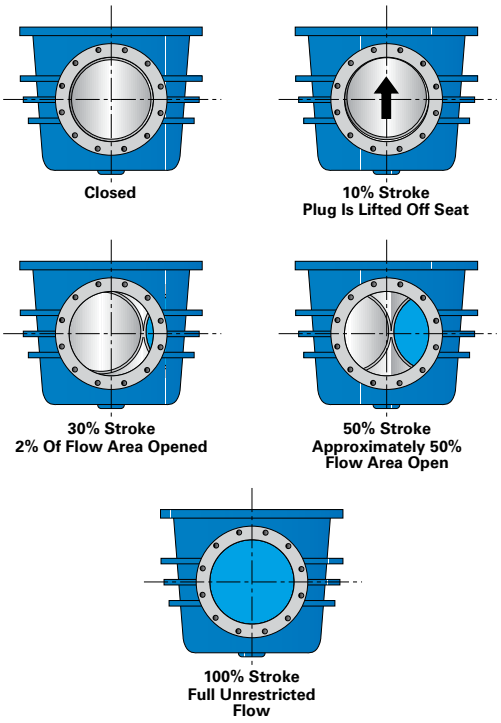
Link and Lever Torque Unit

Cone Valve's Unique Operating Cycle

The unique operating mechanism of the Cone Valve unseats the plug axially without rotation then smoothly rotates the plug 90°. After rotation, crosshead travel reseats the plug creating a full port unobstructed waterway. This operation provides positive protection for the seats at all times assuring long, maintenance free service.

The progressive effects of this movement are as follows:

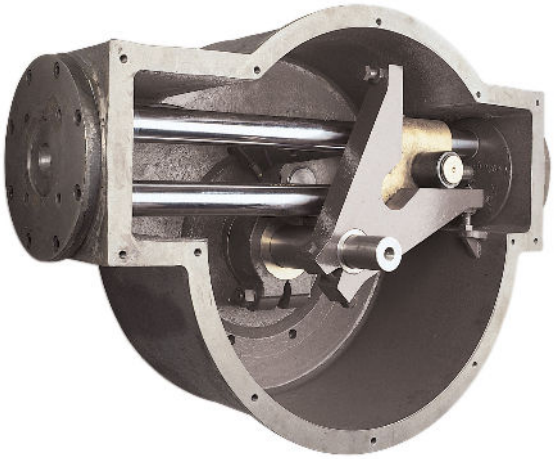
- The actuator input shaft moves the crosshead assembly.
- Motion from the crosshead is coupled through a link and lever to a threaded lift nut. As the crosshead moves, it causes the lift nut to rotate. This action causes the threaded stem to rise which lifts the plug off its seat.
- As the crosshead continues to travel, it engages the rotator which causes the plug stem to rotate. This action slowly opens the valve.
- The valve pointer always indicates the position of the valve plug.
- At the end of the opening cycle, the rotator stop screw contacts the actuator housing which stops all rotation of the plug.
- Further travel of the crosshead causes the threaded lift nut to lower the plug to engage the valve body and plug seats.



Cone Valve Link and Lever Torque Unit

The Link and Lever Torque Unit operating mechanism is totally enclosed in its own housing separate from the valve itself and is easily accessible for stem packing replacement or inspection maintenance. Maintenance does not require shut-down of the pipeline. Included in the mechanism housing is an external valve position indicator.

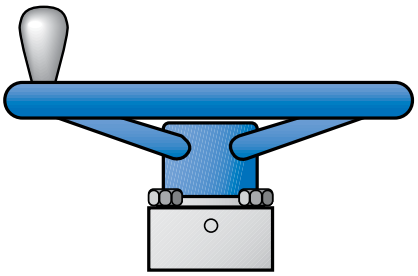
The operating mechanism is designed to allow slight repositioning of the seats in case of future wear.



Operator Characteristics

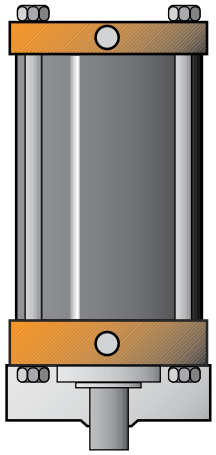
Operators

Willamette Valves can be supplied with standard manual, electric motor or cylinder operators for most applications. Other operator control accessories can be supplied that allow the user to tailor the valve to specific performance requirements.



Manual Operator

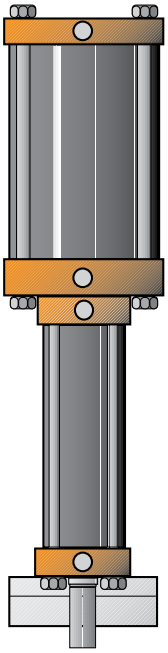
The manual operator is used for any stop service where dependability is critical and where automation is not necessary. Since the valve can be easily operated by one person, no bypass is necessary. The operator is supplied with a standard AWWA handwheel or 2" (50mm) square operating nut.



Hydraulic Cylinder

This operator uses a double-acting piston which opens and closes the valve when pressure is introduced. This is a standard cylinder powered by water or oil, designed per AWWA C541.

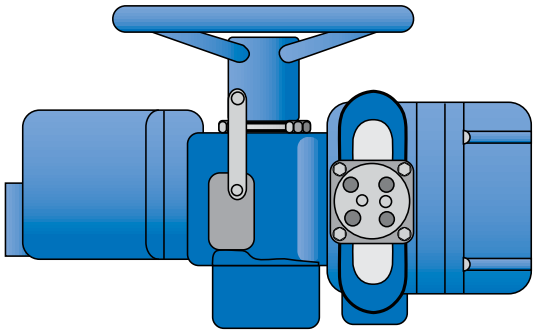
Air/Oil Tandem Cylinder



The tandem cylinder is our preferred operator. This air/oil system eliminates the installation of a costly hydraulic accumulator system by using a compressed air supply for a power source. This supply of compressed air also furnishes an accumulated source of energy to provide an emergency closure of the valve during power failure or other unexpected conditions.

A clean reliable source of air (for best results, 85-125 psig (586 - 862 kPa)) is provided to the upper cylinder to power the valve. The lower cylinder is oil filled and is used to provide control of the opening and closing times with the smooth operation of oil.

For all valves, emergency fast closing functionality can be provided for rapid closure in the event of loss of power.



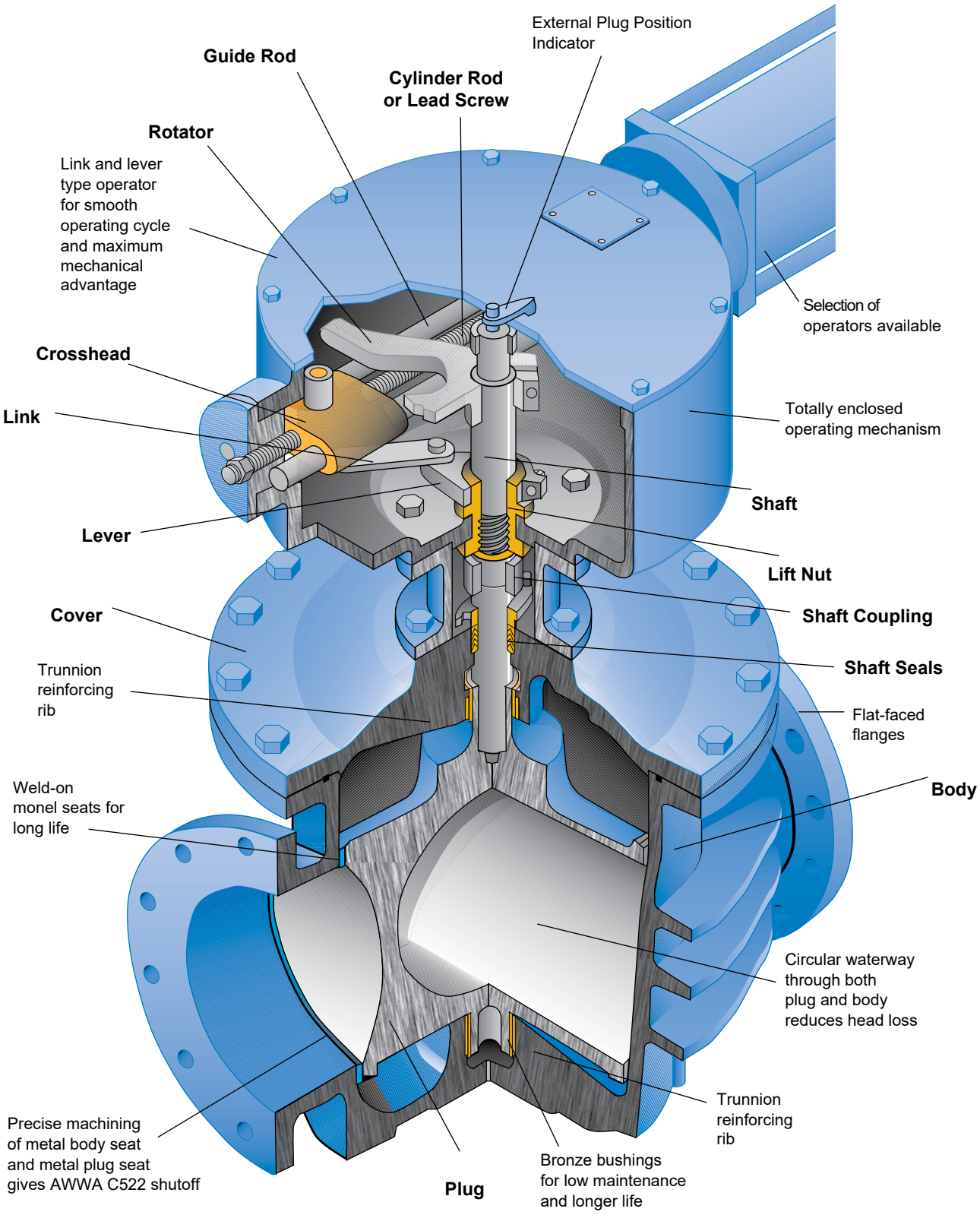
Motor Operator

The electric motor operator is available on a standard link and lever torque unit for remote modulating, flow control applications.

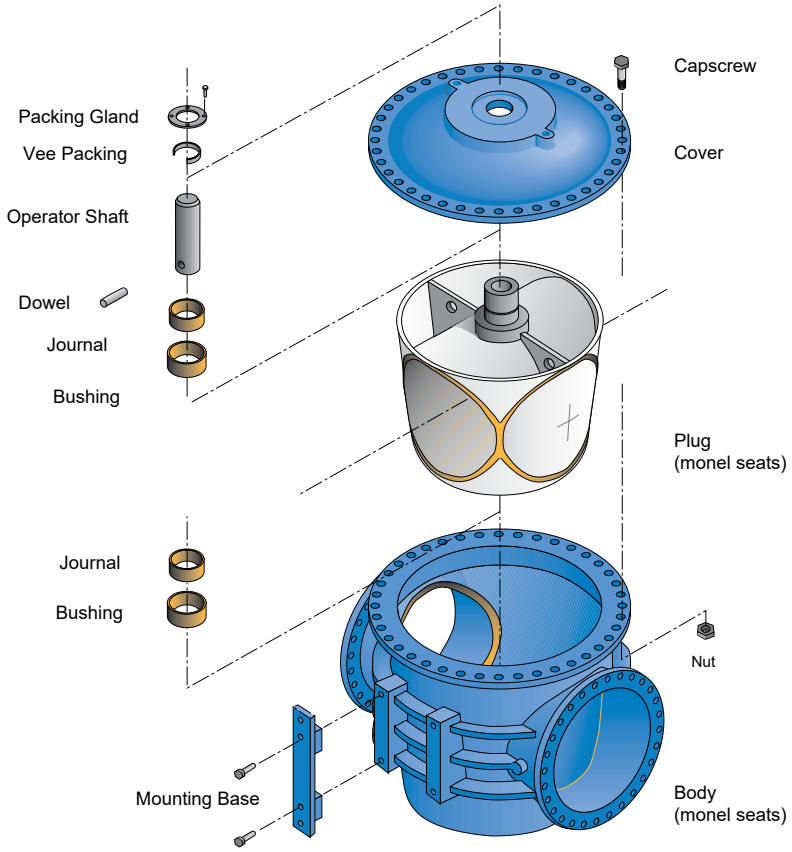
Buried and Submersible Service

The operating mechanism is permanently lubricated and can be sealed, making it suitable for submersible service to approximately 20 feet (6m) for extended periods of time. A complete range of stem extensions and valve boxes are available with indicators as well as floor stands.

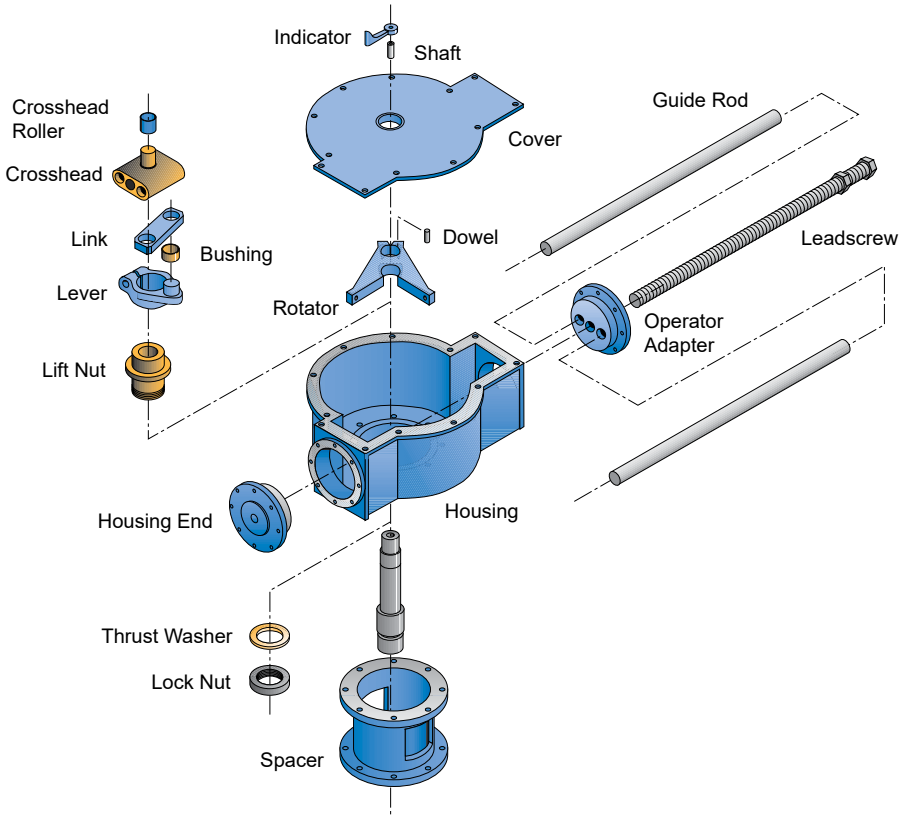
Cutaway View



Exploded Views



Standard Link and Lever Torque Unit



Valve Selection

Performance/Cost Characteristics

CV Values

This C_V table shows flow in gallons per minute through an Willamette Cone Valve in a closed loop system at 1.0 psig (6894 kPa) constant pressure drop. Valve sizes from 6-48" (150-1200mm) are shown at degrees of plug angle from closed.

APPROXIMATE C_V VALUES
Willamette Cone Valve for Closed Loop System Plug Angle in Degrees from Closed

Valve Size	10º	20º	30º	60º	80º	90º	Fully Open
6" 150mm	27	90	150	575	1,975	3,110	4,230
8" 200mm	48	162	265	1,025	3,510	5,525	6,620
10" 250mm	75	253	415	1,600	5,480	8,630	10,740
12" 300mm	107	364	598	2,304	7,900	12,430	13,400
14" 350mm	145	495	813	3,136	10,750	16,920	17,600
16" 400mm	190	647	1,063	4,096	14,040	22,100	23,000
18" 450mm	240	819	1,345	5,184	17,770	27,970	32,200
20" 500mm	297	1,011	1,661	6,400	21,940	34,530	38,200
24" 600mm	428	1,456	2,392	9,216	31,600	49,720	56,200
30" 750mm	670	2,275	3,740	14,400	49,400	77,700	102,000
36" 900mm	962	3,275	5,380	20,800	71,100	112,000	152,000
42" 1100mm	1,310	4,460	7,325	28,200	96,700	152,000	211,000
48" 1200mm	1,710	5,825	9,570	36,900	126,000	200,000	292,000

Low Head Loss — Power Cost Savings

Full ported valves are far more cost effective than other valve types, mainly because of lower head loss. Cone Valves are 100% full ported. There is no more head loss through the valve than there would be in an equivalent length of pipe of the same diameter. 100% full ported Cone Valves can even be pigged.

This table shows the estimated power cost over the life of a pump station. All amounts are based on $.16/kWh, four pumps running 12 hours per day over a typical pump station life of 20 years. The calculations are based on 70% efficiency with a line velocity of 16 ft/sec (4.9 m/sec). Power costs are much lower than with restricted-port valves such as the butterfly, check, gate or globe valves.

Estimated Lifetime Power Costs (USD)

Valve Diameter	Cone Valve	Gate Valve	Swing Check Valve	Butterfly Valve	Globe Valve
6" 150mm	$9,615	$10,395	$129,937	$58,905	$441,787
8" 200mm	$12,426	$16,468	$209,604	$94,321	$718,642
10" 250mm	$18,176	$25,965	$330,468	$148,710	$1,133,033
12" 300mm	$34,871	$33,855	$440,120	$118,494	$1,489,639
14" 350mm	$45,404	$41,276	$536,588	$144,466	$1,816,145
16" 400mm	$60,145	$54,677	$710,802	$191,370	$2,405,794
18" 450mm	$62,963	$69,959	$839,509	$209,877	$2,868,323
20" 500mm	$85,379	$87,121	$1,045,463	$261,365	$3,572,000
24" 600mm	$119,465	$127,090	$1,525,082	$381,270	$5,210,697
30" 750mm	$136,430	$197,725	$2,372,702	$593,175	$8,106,735
36" 900mm	$181,894	$279,836	$3,358,037	$839,509	$11,473,295
42" 1100mm	$239,093	$385,634	$4,627,617	$1,156,904	$15,811,025
48" 1200mm	$273,618	$497,487	$5,969,844	$1,492,461	$20,396,969

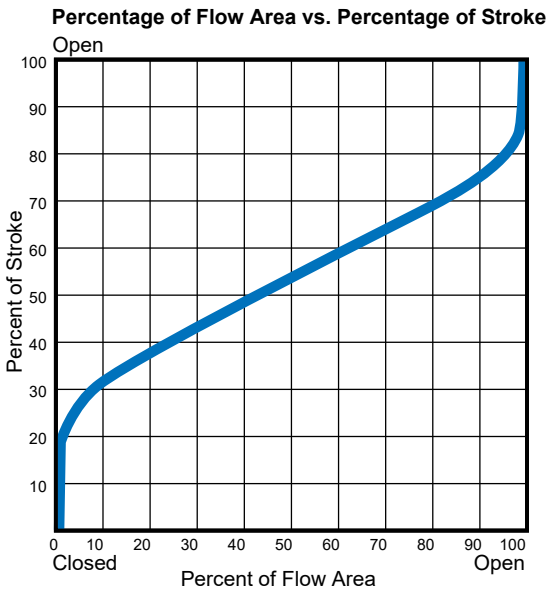
Valve Weights

Valve Size	Basic Valve		Operators							
			Manual		Air/Oil Cylinder		Hydraulic Cylinder		Motor	
	Class									
	150	300	150	300	150	300	150	300	150	300
6" 150mm	450 204	500 227	510 231	560 254	650 295	665 302	590 268	620 281	590 268	620 281
8" 200mm	800 363	900 408	890 404	960 435	1000 454	1065 483	960 435	1020 463	960 435	1020 463
10" 250mm	1100 499	1150 522	1160 526	1250 567	1370 621	1425 646	1280 581	1350 612	1280 581	1350 612
12" 300mm	1400 635	1500 680	1460 662	1590 721	1825 828	1900 862	1670 757	1770 803	1670 757	1770 803
14" 350mm	2500 1134	2800 1270	2600 1179	2850 1293	3030 1374	3100 1406	2850 1293	3000 1361	2850 1293	3000 1361
16" 400mm	3000 1361	3300 1497	3120 1415	3400 1542	3600 1633	3750 1701	3400 1542	3600 1633	3400 1542	3600 1633
18" 450mm	4000 1814	4300 1950	4190 1901	4430 2009	4470 2028	4725 2143	4350 1973	4600 2087	4350 1973	4600 2087
20" 500mm	5100 2313	5500 2495	5250 2381	5630 2554	5775 2619	6000 2722	5550 2517	5850 2654	5550 2517	5850 2654
24" 600mm	7750 3515	8000 3629	7900 3583	8300 3765	8600 3901	9100 4128	8300 3765	8750 3969	8300 3765	8750 3969
30" 750mm	12500 5670	14000 6350	12760 5788	14030 6364	14400 6532	14675 6656	13700 6214	14400 6532	13700 6214	14400 6532
36" 900mm	20000 9072	21500 9752	20150 9140	21700 9843	22075 10013	22660 10278	21250 9639	22250 10092	21250 9639	22250 10092
42" 1100mm	29750 13494	31500 14288	29900 13562	32000 14515	32700 14832	33575 15229	31500 14288	32900 14923	31500 14288	32900 14923
48" 1200mm	42000 19051	44500 20185	42300 19187	44800 20321	46500 21092	47775 21670	44700 20276	46500 21092	44700 20276	46500 21092

Pounds
Kilograms

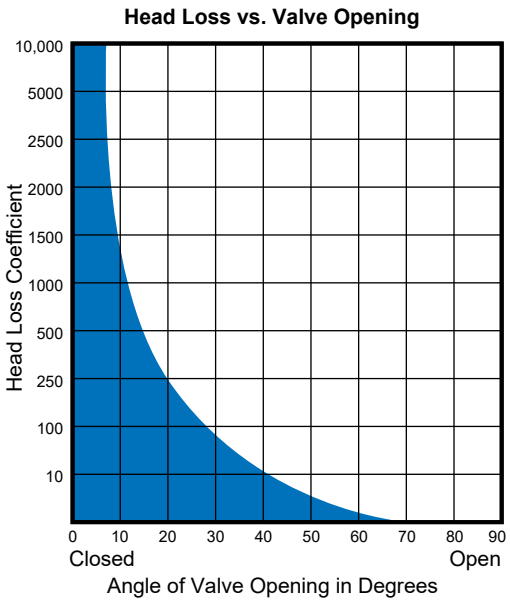
Smooth Operation Gives Precise Flow and Pressure Regulation

The smooth operating cycle of the Cone Valve is highly effective in controlling surge and water hammer while providing precise flow regulation. The operating cycle is shown below in the graph Percent of Flow Area vs Percent of Stroke. Notice that only 2% of the flow area is opened with nearly 20% of actuator stroke. This is due to the lifting of the conical plug prior to rotation.



Reduced Pressure Loss

This graph shows the head loss between 5 and 70% of the valve opening angle. This is caused by the smooth operation and long stroke of the valve actuator in rotating the valve plug. The result is precise flow and pressure control with no hunting.



Ordering

To order, simply complete the valve order code from information shown. An ordering example is shown for your reference.

Valve Style
Give valve style code as follows:

VMC	=	Metal Seated Cone Valves [1]

Valve Size
Give valve size code as follows:

6	=	6"	(150mm)	20	=	20"	(500mm)
8	=	8"	(200mm)	24	=	24"	(600mm)
10	=	10"	(250mm)	30	=	30"	(750mm)
12	=	12"	(300mm)	36	=	36"	(900mm)
14	=	14"	(350mm)	42	=	42"	(1100mm)
16	=	16"	(400mm)	48	=	48"	(1200mm)
18	=	18"	(450mm)				

Body Style
Give body style code as follows:

DS	=	Double Seat Plug - Seat in Closed Position
FS	=	Four Seat Plug - Seat in Both Open & Closed Positions

End Connection
Give end connection code as follows:

F1	=	Flanged ASME 150, Flat Faced
F2	=	Flanged ASME 300, Flat Faced

Body Material
Give body material code as follows:

DI	=	Ductile Iron

Class - AWWA C522
Give class code as follows:

150	=	Class 150
250	=	Class 250
300	=	Class 300 (F2 end connection only)

Shaft Mounting
Give shaft mounting code as follows:

H	=	Horizontal Valve Shaft (Standard)
V	=	Vertical Valve Shaft

Body/Plug Seat Material
Give body/plug seat material code as follows:

ML	=	Monel

Shaft Material
Give shaft material code as follows:

S5	=	17-4PH Stainless Steel

Options
Give option code as follows:

DTR	=	DeZURIK Standard Certified Production Hydrostatic Shell & Seat Test Report

Ordering Example:
VMC,12,DS,F1,DI,150,H,ML-S5*actuator

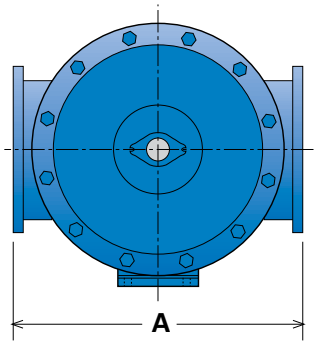
NOTE: 1. Mounting feet position must be specified as setup text on the order.

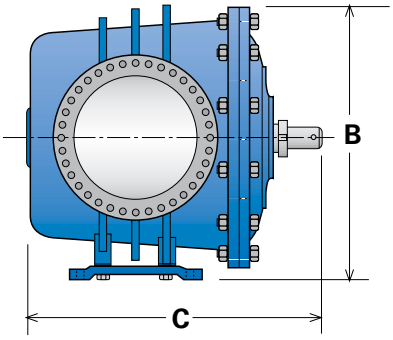
Dimensions

Basic Valve

Valve Size	A		B		C	
	Class					
	150	300	150	300	150	300
6" 150mm	16.5 419	20.0 508	17.0 432	17.0 432	17.5 445	17.5 445
8" 200mm	21.5 546	25.0 635	21.7 552	21.7 552	22.5 572	22.5 572
10" 250mm	26.0 660	30.5 775	27.0 686	27.0 686	25.1 638	25.0 635
12" 300mm	28.0 711	32.5 826	29.1 740	29.1 740	26.5 673	26.5 673
14" 350mm	33.0 838	40.0 1016	31.4 797	31.4 797	30.1 765	30.1 765
16" 400mm	37.5 953	44.0 1118	36.1 918	36.1 918	33.2 845	33.0 838
18" 450mm	41.7 1060	48.0 1219	40.0 1016	40.0 1016	37.5 953	37.5 953
20" 500mm	47.0 1194	51.0 1295	43.2 1099	43.2 1099	40.1 1019	40.0 1016
24" 600mm	56.0 1422	60.0 1524	51.4 1305	51.4 1305	56.6 1438	46.6 1184
30" 750mm	64.0 1626	72.0 1829	62.5 1588	62.5 1588	55.1 1400	55.1 1400
36" 900mm	77.5 1969	85.5 2172	74.5 1892	74.5 1892	62.9 1597	62.9 1597
42" 1100mm	89.0 2261	96.0 2438	84.2 2140	84.2 2140	72.2 1835	72.0 1829
48" 1200mm	102.0 2591	112.0 2845	98.7 2508	98.7 2508	83.2 2115	83.2 2115

Inch
Millimeter

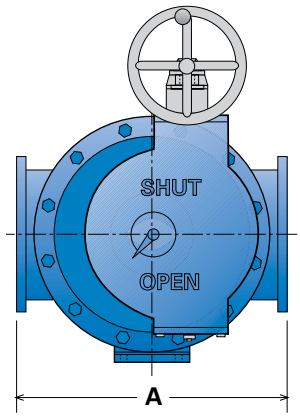


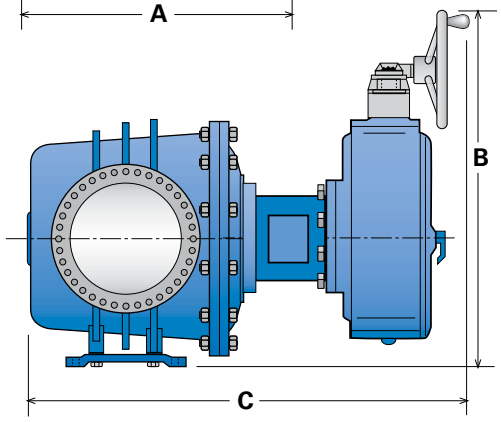


Manual Operator

Valve Size	A		B		C	
	Class					
	150	300	150	300	150	300
6" 150mm	16.5 419	20.0 508	37.9 962	37.9 962	39.5 1003	39.5 1003
8" 200mm	21.5 546	25.0 635	39.9 1013	39.9 1013	44.5 1130	44.5 1130
10" 250mm	26.0 660	30.5 775	42.4 1076	42.4 1076	47.1 1197	47.1 1197
12" 300mm	28.0 711	32.5 826	43.4 1102	51.2 1302	48.5 1232	60.5 1537
14" 350mm	33.0 838	40.0 1016	44.9 1140	52.7 1340	52.1 1324	64.1 1629
16" 400mm	37.5 953	44.0 1118	57.7 1467	63.5 1613	67.2 1708	73.5 1867
18" 450mm	41.7 1060	48.0 1219	59.7 1518	65.5 1664	71.5 1816	77.7 1975
20" 500mm	47.0 1194	51.0 1295	61.7 1568	67.5 1715	74.1 1883	80.4 2042
24" 600mm	56.0 1422	60.0 1524	71.5 1816	71.5 1816	86.9 2207	86.9 2207
30" 750mm	64.0 1626	72.0 1829	78.0 1981	76.7 1949	97.0 2464	99.5 2527
36" 900mm	77.5 1969	85.5 2172	87.7 2229	101.0 2565	107.4 2727	115.5 2934
42" 1100mm	89.0 2261	96.0 2438	107.0 2718	107.0 2718	124.9 3172	124.9 3172
48" 1200mm	102.0 2591	112.0 2845	122.5 3112	122.5 3112	135.9 3451	131.5 3340

Inch
Millimeter



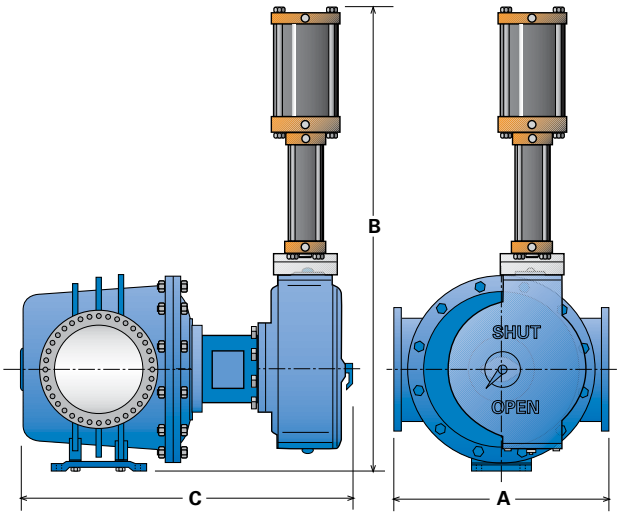


Dimensions

Air/Oil Tandem Cylinder Operator

Valve Size	A		B		C	
	Class					
	150	300	150	300	150	300
6" 150mm	16.5 419	20.0 508	54.6 1387	54.6 1387	26.7 679	26.7 679
8" 200mm	21.5 546	25.0 635	56.6 1438	56.6 1438	31.7 806	31.7 806
10" 250mm	26.0 660	30.5 775	59.1 1502	59.1 1502	34.4 873	34.4 873
12" 300mm	28.0 711	32.5 826	60.1 1527	78.9 2003	35.7 908	50.7 1289
14" 350mm	33.0 838	40.0 1016	61.6 1565	80.4 2042	39.4 1000	54.4 1381
16" 400mm	37.5 953	44.0 1118	90.2 2292	99.7 2534	57.5 1461	64.0 1626
18" 450mm	41.7 1060	48.0 1219	92.2 2343	101.7 2584	61.7 1568	68.2 1734
20" 500mm	47.0 1194	51.0 1295	94.2 2394	103.7 2635	64.4 1635	70.9 1800
24" 600mm	56.0 1422	60.0 1524	113.5 2883	113.5 2883	77.4 1965	77.4 1965
30" 750mm	64.0 1626	72.0 1829	119.5 3035	127.0 3226	85.9 2181	92.1 2340
36" 900mm	77.5 1969	85.5 2172	130.8 3321	159.2 4045	99.9 2537	110.4 2804
42" 1100mm	89.0 2261	96.0 2438	178.5 4534	178.5 4534	119.7 3042	119.7 3042
48" 1200mm	102.0 2591	112.0 2845	216.5 5499	216.5 5499	129.2 3283	129.2 3283

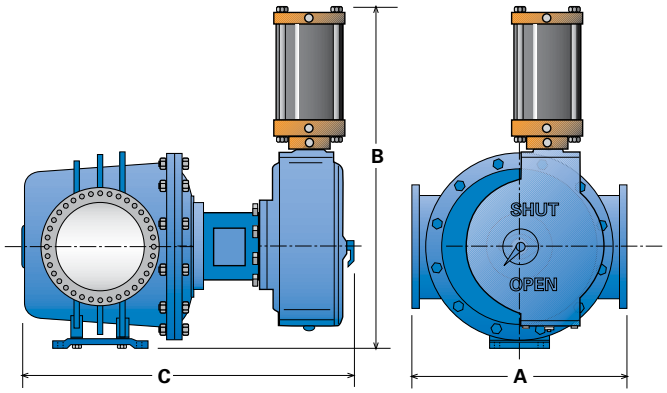
Inch
Millimeter



Hydraulic Cylinder Operator

Valve Size	A		B		C	
	Class					
	150	300	150	300	150	300
6" 150mm	16.5 419	20.0 508	39.1 994	39.1 994	26.7 679	26.7 679
8" 200mm	21.5 546	25.0 635	41.1 1045	41.1 1045	31.7 806	31.7 806
10" 250mm	26.0 660	30.5 775	43.6 1108	43.6 1108	34.4 873	34.4 873
12" 300mm	28.0 711	32.5 826	44.6 1133	63.5 1613	35.7 908	50.7 1289
14" 350mm	33.0 838	40.0 1016	46.1 1172	65.0 1651	39.4 1000	54.4 1381
16" 400mm	37.5 953	44.0 1118	67.0 1702	78.0 1981	57.5 1461	64.0 1626
18" 450mm	41.7 1060	48.0 1219	69.0 1753	80.0 2032	61.7 1568	68.2 1734
20" 500mm	47.0 1194	51.0 1295	71.0 1803	82.0 2083	64.9 1635	70.9 1800
24" 600mm	56.0 1422	60.0 1524	86.0 2184	86.0 2184	77.4 1965	77.4 1965
30" 750mm	64.0 1626	72.0 1829	92.0 2337	94.7 2407	85.9 2181	92.1 2340
36" 900mm	77.5 1969	85.5 2172	99.7 2534	127.0 3226	99.9 2537	110.4 2804
42" 1100mm	89.0 2261	96.0 2438	133.0 3378	133.0 3378	119.7 3042	119.7 3042
48" 1200mm	102.0 2591	112.0 2845	174.0 4420	174.0 4420	129.2 3283	129.2 3283

Inch
Millimeter



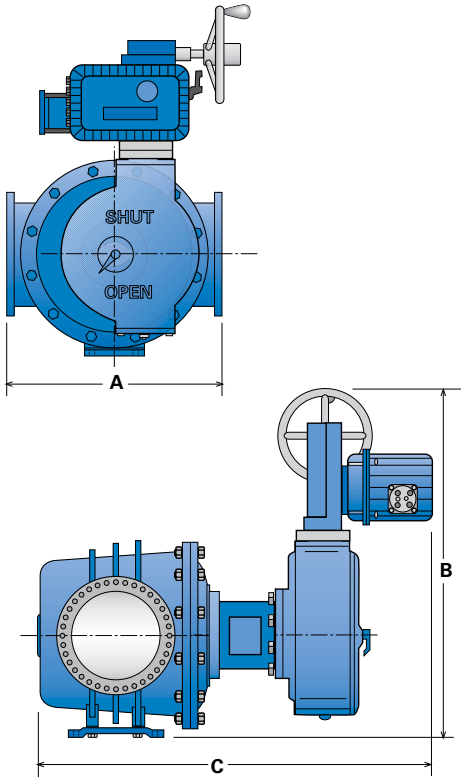
Torque unit (valve operating mechanism) complete with appropriate operator is shown in its customary vertical orientation, (perpendicular to pipeline), however, torque unit complete with operator may be rotated in any of 90° increments (parallel with pipeline) if so desired to suit installation requirements.

Dimensions

Motor Operator

Valve Size	A		B		C	
	Class					
	150	300	150	300	150	300
6" 150mm	16.5 419	20.0 508	36.6 930	36.6 930	47.7 1213	47.7 1213
8" 200mm	21.5 546	25.0 635	38.6 981	38.6 981	52.7 1340	52.7 1340
10" 250mm	26.0 660	30.5 775	41.1 1045	41.1 1045	55.4 1407	55.4 1407
12" 300mm	28.0 711	32.5 826	42.1 1070	50.0 1270	56.7 1441	68.7 1746
14" 350mm	33.0 838	40.0 1016	43.6 1108	51.5 1308	60.4 1534	72.4 1838
16" 400mm	37.5 953	44.0 1118	53.5 1359	64.2 1632	75.5 1918	82.7 2102
18" 450mm	41.7 1060	48.0 1219	55.5 1410	66.2 1683	79.7 2026	87.0 2210
20" 500mm	47.0 1194	51.0 1295	57.5 1461	68.2 1734	82.4 2092	89.6 2276
24" 600mm	56.0 1422	60.0 1524	72.2 1835	71.5 1816	96.1 2442	96.9 2461
30" 750mm	64.0 1626	72.0 1829	77.5 1969	76.0 1930	105.4 2677	107.1 2721
36" 900mm	77.5 1969	85.5 2172	81.0 2057	94.2 2394	114.9 2918	127.0 3226
42" 1100mm	89.0 2261	96.0 2438	100.2 2546	100.2 2546	132.4 3362	136.4 3464
48" 1200mm	102.0 2591	112.0 2845	115.7 2940	115.7 2940	143.4 3642	143.0 3632

Inch
Millimeter



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