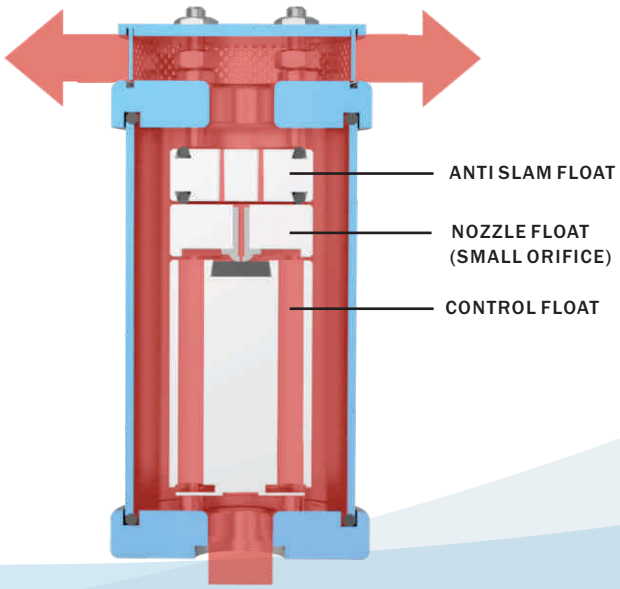
CLA-VAL

ANTI SLAM
AIR RELEASE
AND
VACUUM BREAK
AIR VALVES

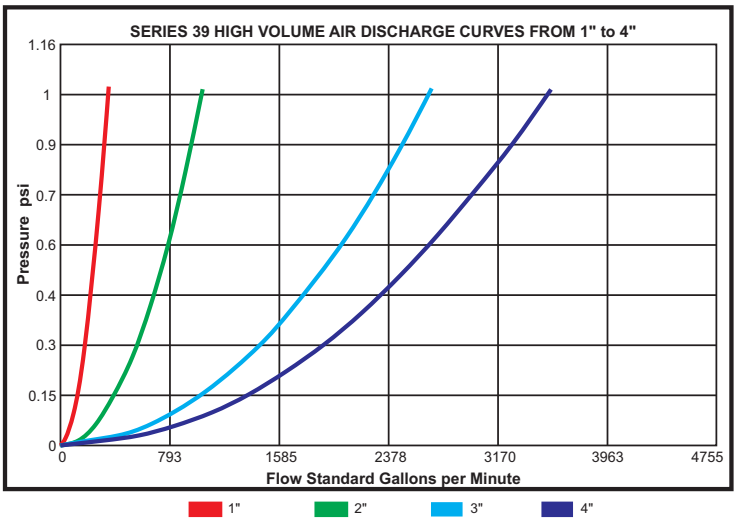
CONTENTS

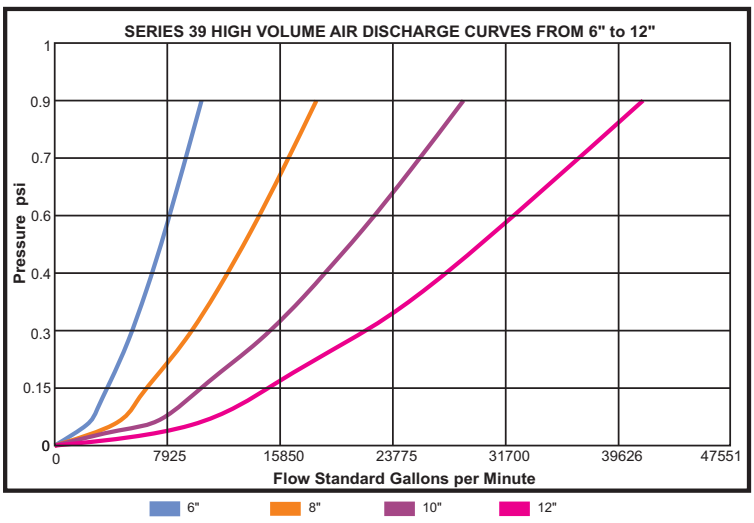
HIGH VOLUME AIR DISCHARGE

During filling of the pipeline, air passes through the air valve at the same flow rate as water in the pipeline, the floats remain in the open position allowing air to pass freely through the valve. When water enters the valve the floats are buoyed and the valve closes.



HIGH VOLUME AIR DISCHARGE CAPACITY





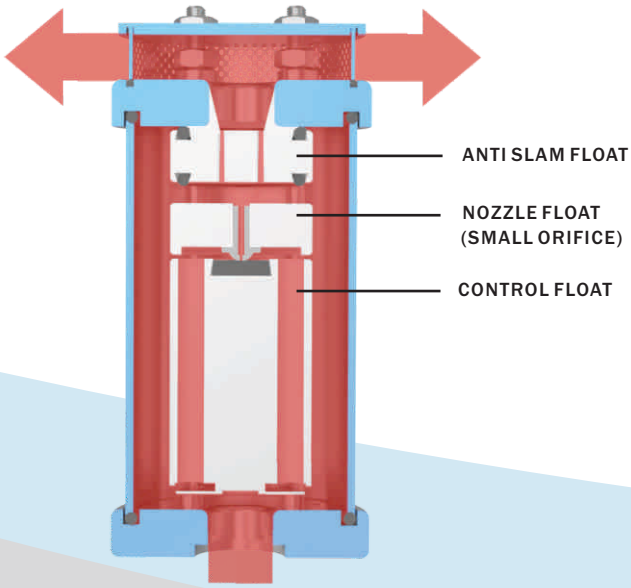
CLA-VAL

ANTI SLAM AIR DISCHARGE

During rapid filling, pump trip, rapid valve closure and other surge events. The valve will switch into anti slam mode. Switching from the larger orifice to a smaller anti slam orifice.

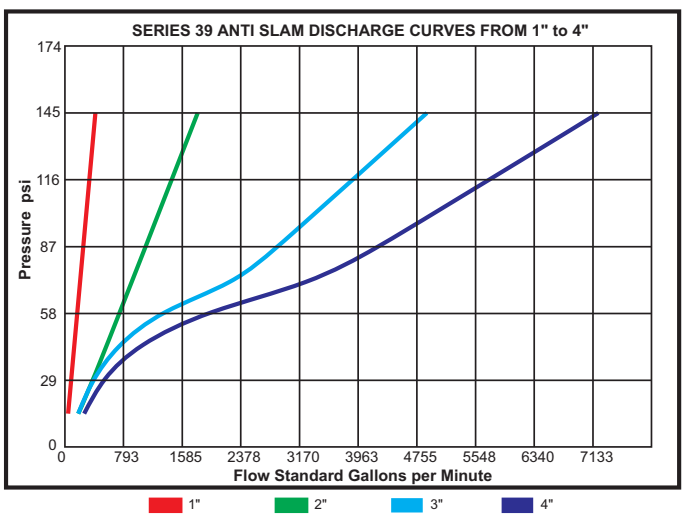
The smaller orifice will restrict the rate at which air can escape the pipeline and as a result, slow the flow rate of water through the pipeline.

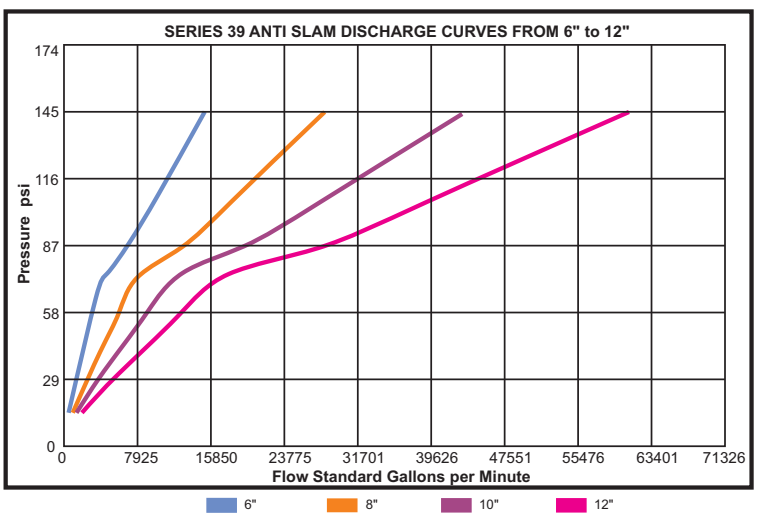
Air passes around the control float and nozzle float through the anti slam orifice to atmosphere.



ANTI SLAM AIR DISCHARGE CAPACITY

ANTI SLAM SWITCHING POINTS & INPUT DATA FOR SURGE PROGRAMS								
	1"	2"	3"	4"	6"	8"	10"	12"
Anti-Shock Orifice Size (inches)	0.16	0.35	0.55	0.67	1	1.34	1.65	2
Inlet Size (inches)	1	2	3	4	6	8	10	12
Outlet Size (inches)	1	2	3	4	6	8	10	12
Switching Pressure (psi)	1.04	1.03	1.03	1.03	0.87	0.87	0.87	0.87
Switching Velocity (ft/s)	147	109	111	111	121	121	121	121
Switching Flow (gpm)	349	1030	2679	4200	10350	18386	28737	41401

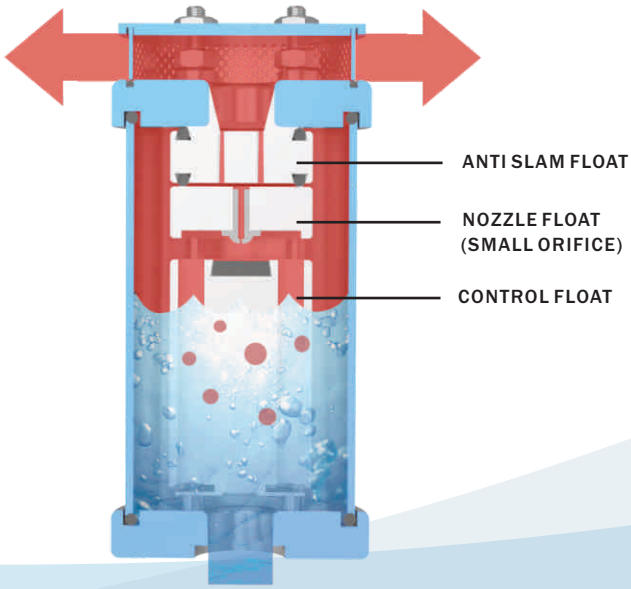




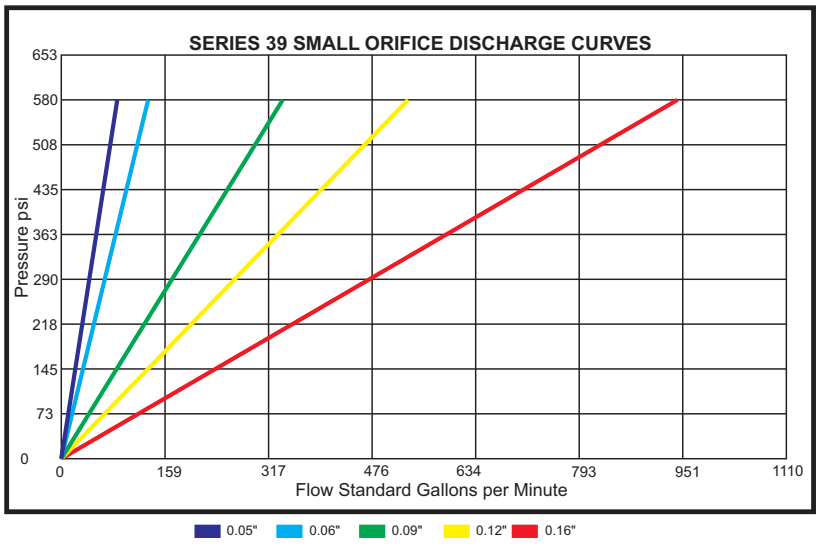
PRESSURISED AIR RELEASE

During normal operation, while the pipeline is fully charged, disentrained air will accumulate at many air valve locations.

When the quantity of air is sufficient to displace the control float, the float will drop away from the nozzle float and release the accumulated air. The control float will then buoy back into place and seal off the small orifice.



SMALL ORIFICE AIR DISCHARGE CAPACITY AND SIZES

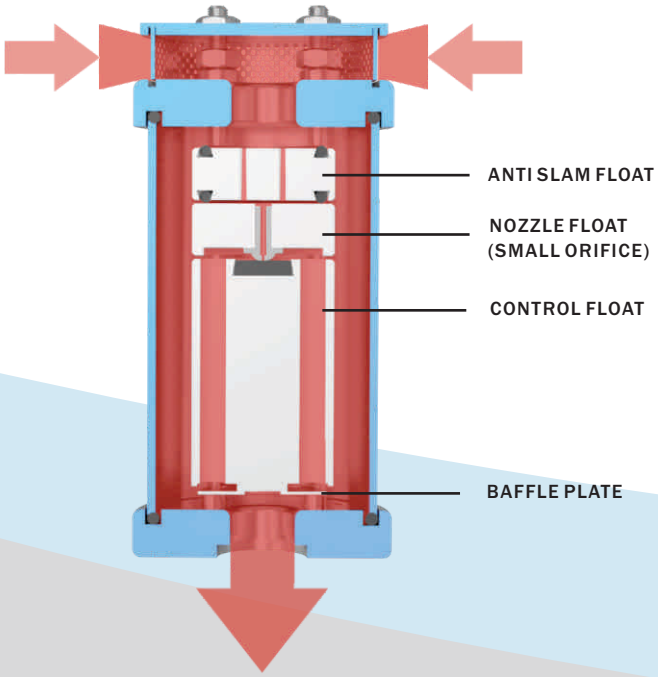


SMALL ORIFICE SIZES	
Valve Sizes	Small Orifice Size Inches
1 "	0.05
2"	0.05
3"	0.06
4"	0.06
6"	0.09
8"	0.09
10"	0.12
12"	0.16

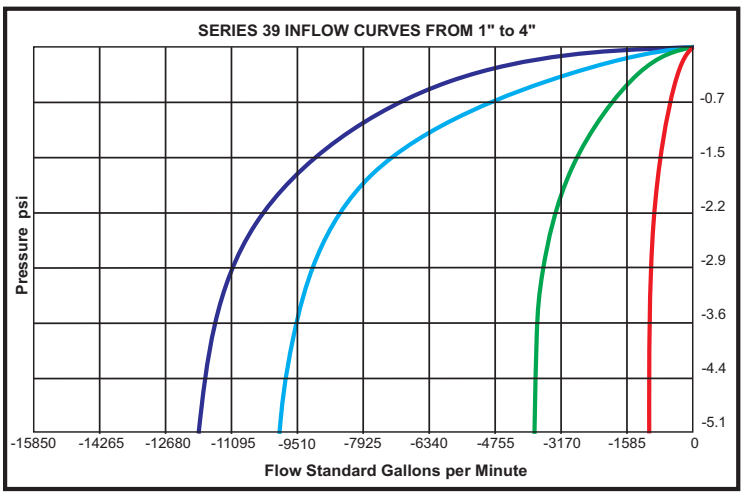
CLA-VAL

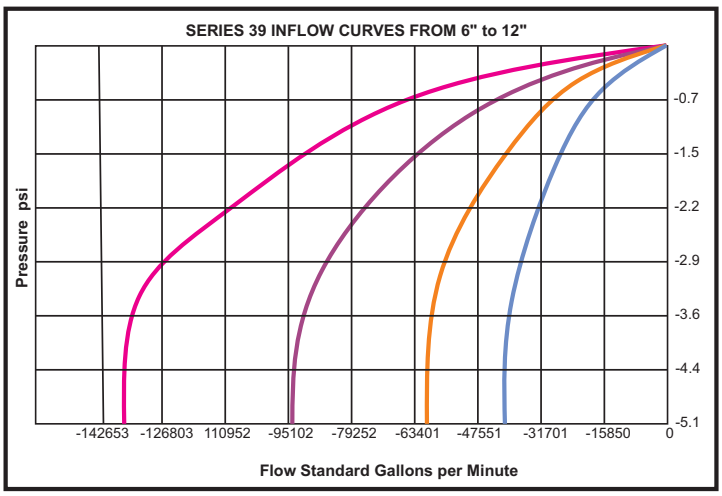
VACUUM BREAK

During draining, pump stoppage or pump trip, the floats will gravitate towards the baffle plate. Air will travel through the large orifice, past the floats and through the intake orifice into the pipeline.

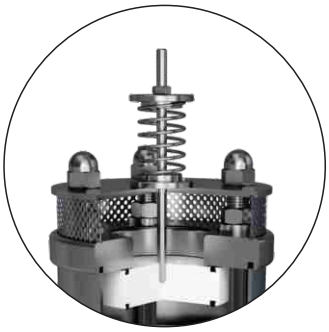


VACUUM BREAK CAPACITY



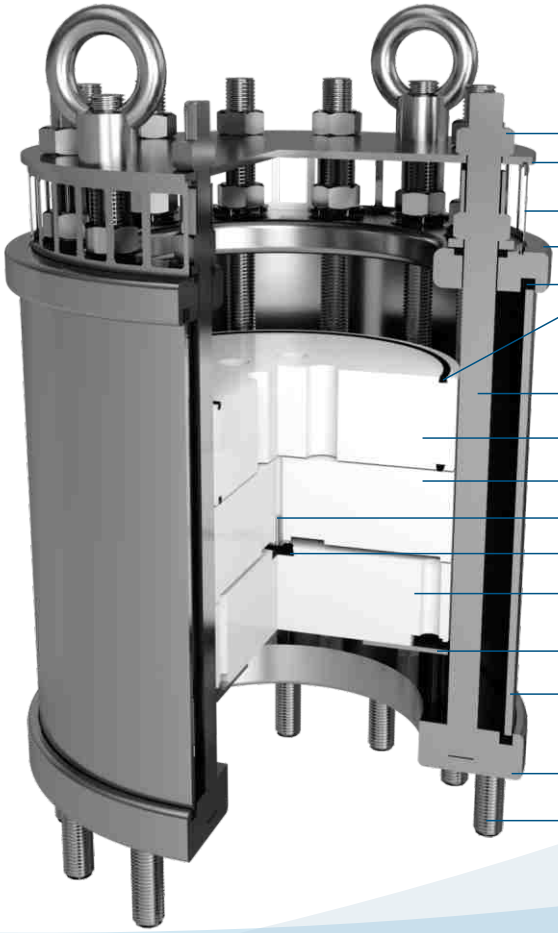


SERIES 39A
Potable water



Bias assembly
For pump station & high risk or previously identified surge areas

1" & 2" threaded
Flanged option also available



Operating Pressures
7.2 - 363 psi
7.2 - 580 psi
7.2 - 928 psi
7.2 - 1450 psi

Operating Temperatures
32 - 176°F

End Connection
Screwed NPT
Flanged studded

Double Acting with Anti Slam Orifice
(Triple acting / Three stage)

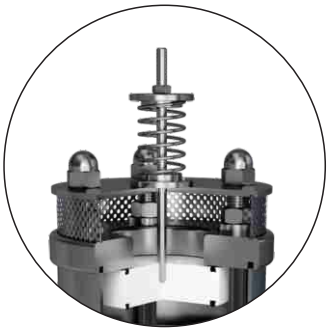
Size	Model no.	Pressure Rating	Overall Height	Overall Diameter	Weight
1"	SERIES 39A	363 psi	11.26"	3.94"	9 lbs
	SERIES 39A	580 psi	13.23"	3.94"	10 lbs
2"	SERIES 39A	363 psi	11.97"	5.12"	15 lbs
	SERIES 39A	580 psi	13.62"	5.12"	17 lbs
3"	SERIES 39A	232 psi	11.34"	7.48"	32 lbs
	SERIES 39A	363 psi	11.34"	8.27"	32 lbs
	SERIES 39A	580 psi	12.68"	8.27"	39 lbs
4"	SERIES 39A	232 psi	11.14"	9.02"	35 lbs
	SERIES 39A	363 psi	11.36"	10.00"	41 lbs
	SERIES 39A	580 psi	12.93"	10.00"	51 lbs
6"	SERIES 39A	232 psi	17.24"	11.22"	89 lbs
	SERIES 39A	363 psi	17.68"	12.52"	102 lbs
	SERIES 39A	580 psi	19.06"	12.52"	135 lbs
8"	SERIES 39A	232 psi	19.57"	13.50"	122 lbs
	SERIES 39A	363 psi	19.96"	15.00"	144 lbs
	SERIES 39A	580 psi	20.87"	15.00"	192 lbs
10"	SERIES 39A	232 psi	22.55"	16.73"	242 lbs
12"	SERIES 39A	232 psi	24.61"	20.87"	418 lbs

Larger sizes are available on request up to 20”

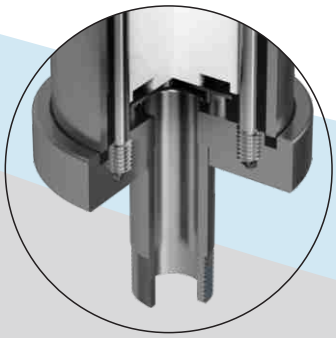
CLA-VAL

SERIES 39B

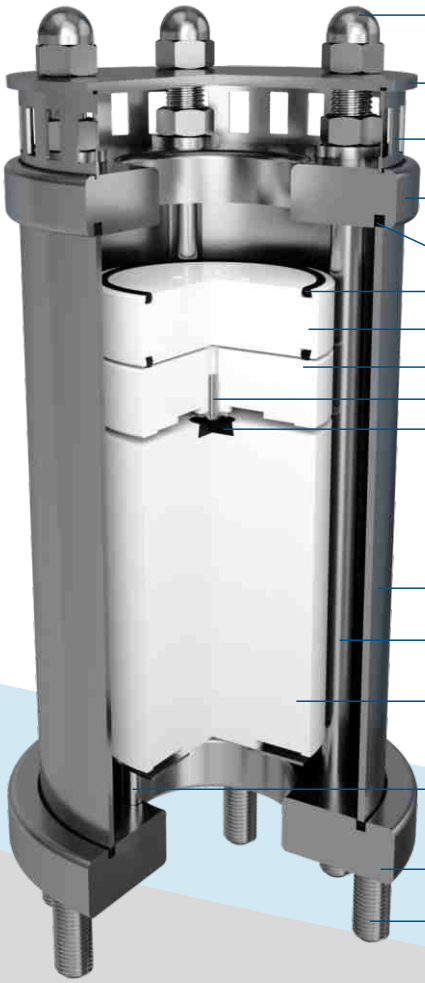
Grey water, treated sewage, stormwater, low pressure



Bias assembly
For pump station & high risk or previously identified surge areas



1" & 2" threaded
Flanged option also available



Operating Pressures
2.9 - 232 psi
2.9 - 363 psi

Operating Temperatures
32 - 176°F

End Connection
Screwed NPT
Flanged studded

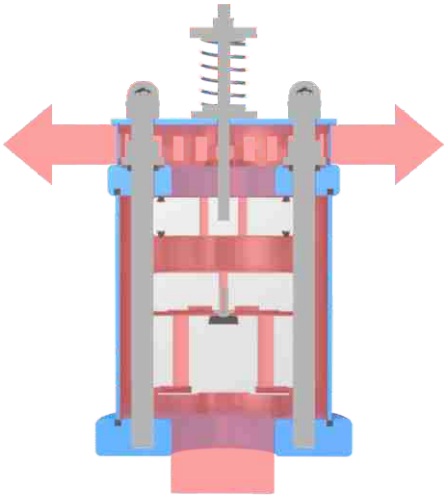
Double Acting with Anti Slam Orifice
(Triple acting / Three stage)

Size	Model no.	Pressure Rating	Overall Height	Overall Diameter	Weight
1"	SERIES 39B	363 psi	15.20"	3.94"	11 lbs
2"	SERIES 39B	363 psi	15.91"	5.12"	18 lbs
3"	SERIES 39B	232 psi	15.28"	7.48"	39 lbs
	SERIES 39B	363 psi	15.28"	8.27"	39 lbs
4"	SERIES 39B	232 psi	15.35"	9.02"	40 lbs
	SERIES 39B	363 psi	15.35"	10.00"	47 lbs
6"	SERIES 39B	232 psi	25.12"	11.22"	110 lbs
	SERIES 39B	363 psi	25.12"	12.52"	123 lbs
8"	SERIES 39B	232 psi	27.68"	13.50"	172 lbs
	SERIES 39B	363 psi	27.68"	15.00"	183 lbs
10"	SERIES 39B	232 psi	30.71"	16.73"	308 lbs
12"	SERIES 39B	232 psi	32.50"	20.87"	433 lbs

Larger sizes are available on request up to 20”

CLA-VAL

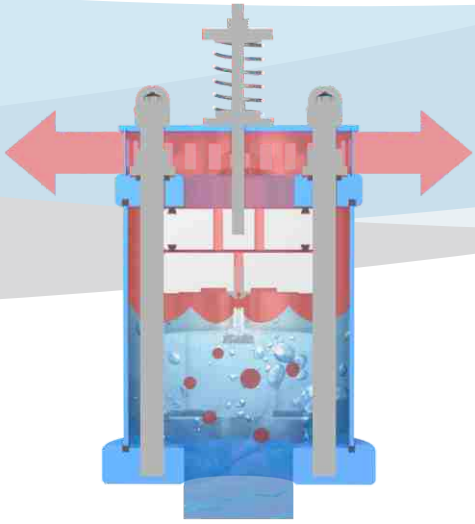
BIAS OPERATION



During normal filling, rapid filling, pump trip, rapid valve closure and other surge events. The valve is already in anti slam mode. All air is discharged in a controlled manner through the smaller anti slam orifice.

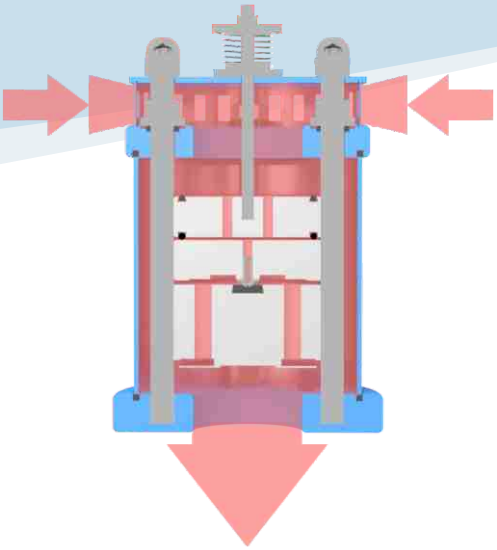
The smaller orifice will restrict the rate at which air can escape the pipeline controlling the flowrate of water through the pipeline. Eliminating the need to switch to anti slam in high risk areas.

Air passes around the control float and nozzle float through the anti slam orifice to atmosphere.



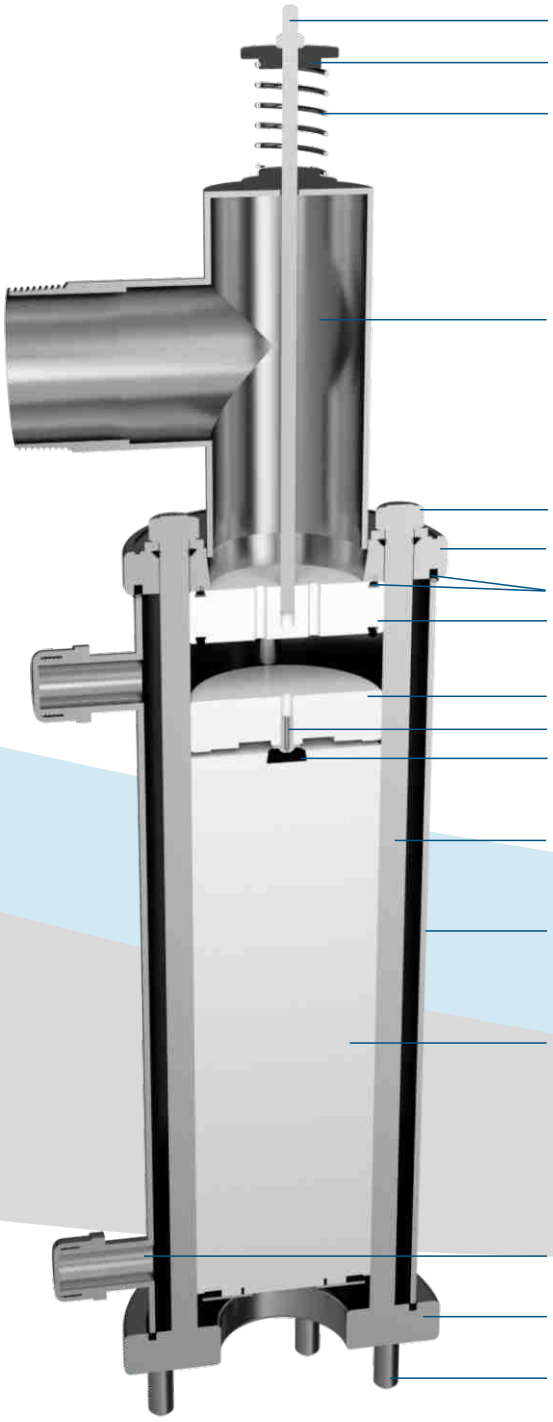
During normal operation, while the pipeline is fully charged, disentrained air will accumulate at many air valve locations.

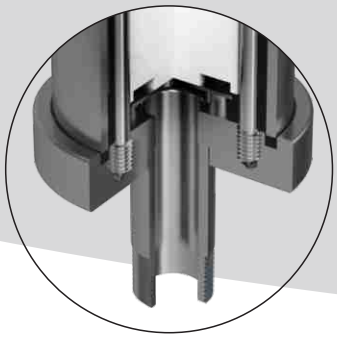
When the quantity of air is sufficient to displace the control float, the float will drop away from the nozzle float and release the accumulated air. The control float will then buoy back into place and seal off the small orifice.



During the draining, pump stoppage or pump trip, the spring will collapse as the control float and nozzle float will gravitate towards the baffle plate. Air will travel through the large orifice, past the floats and through the intake orifice into the pipeline. Once the negative differential in the pipe returns to atmosphere the spring will return to its original position.

SERIES 39BWW
Sewage, slurry





2" threaded
Flanged option also available

Operating Pressures
2.9 - 232 psi

Operating Temperatures
32 - 176°F

End Connection
Screwed NPT
Flanged studded

Double Acting with Anti Slam Orifice
(Triple acting / Three stage)

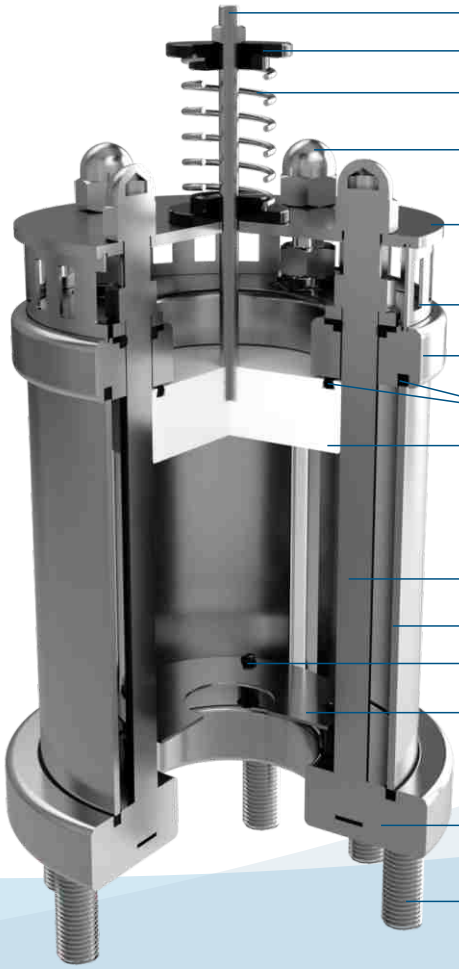
Size	Model no.	Pressure Rating	Overall Height	Overall Diameter	Weight
2"	SERIES 39BWW	232 psi	26.6"	5.98"	27 lbs
3"	SERIES 39BWW	232 psi	31.4"	7.48"	51 lbs
4"	SERIES 39BWW	232 psi	31.8"	9.02"	60 lbs
6"	SERIES 39BWW	232 psi	44.2"	11.22"	166 lbs
8"	SERIES 39BWW	232 psi	51.1"	13.50"	287 lbs
10"	SERIES 39BWW	232 psi	54.2"	16.73"	462 lbs
12"	SERIES 39BWW	232 psi	57.6"	20.87"	638 lbs

Larger sizes are available on request up to 20”

SERIES 39Av

Potable water, grey water, treated sewage, stormwater, low pressure, sewage, slurry

1" & 2" threaded
Flanged option also available



Operating Pressures
0 - 232 psi
0 - 363 psi
0 - 580 psi

Operating Temperatures
32 - 176°F

End Connection
Screwed NPT
Flanged studded

Single Acting Vacuum Break Only

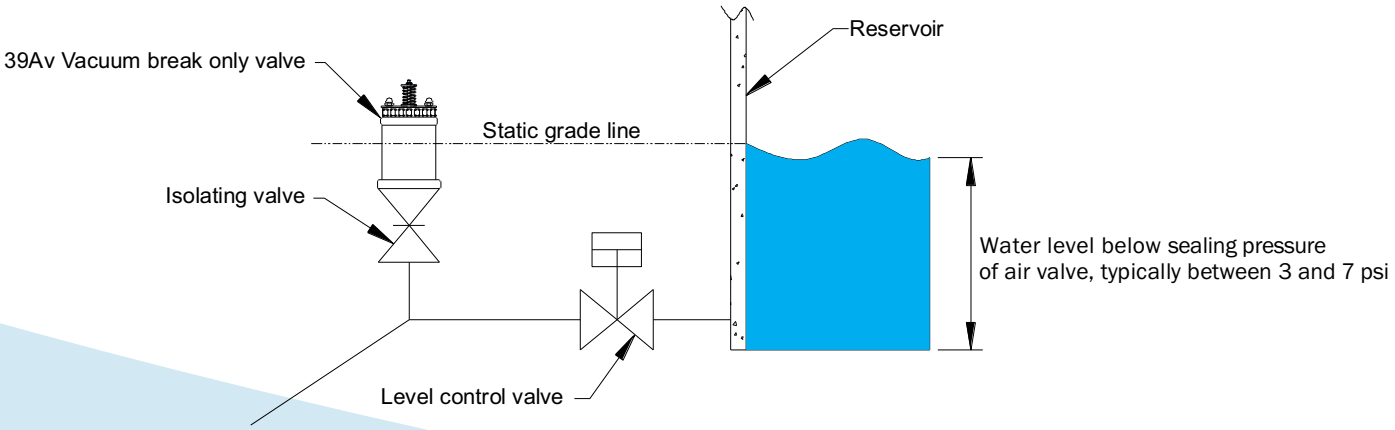
Size	Model no.	Pressure Rating	Overall Height	Overall Diameter	Weight
1"	SERIES 39Av	363 psi	12.74"	3.94"	9 lbs
	SERIES 39Av	580 psi	12.74"	3.94"	10 lbs
2"	SERIES 39Av	363 psi	13.03"	5.12"	15 lbs
	SERIES 39Av	580 psi	13.03"	5.12"	17 lbs
3"	SERIES 39Av	232 psi	13.46"	7.48"	32 lbs
	SERIES 39Av	363 psi	13.46"	8.27"	32 lbs
	SERIES 39Av	580 psi	13.46"	8.27"	39 lbs
4"	SERIES 39Av	232 psi	13.46"	9.02"	35 lbs
	SERIES 39Av	363 psi	13.46"	10.00"	41 lbs
	SERIES 39Av	580 psi	13.46"	10.00"	51 lbs
6"	SERIES 39Av	232 psi	19.84"	11.22"	89 lbs
	SERIES 39Av	363 psi	19.84"	12.52"	102 lbs
	SERIES 39Av	580 psi	19.84"	12.52"	135 lbs
8"	SERIES 39Av	232 psi	20.91"	13.50"	122 lbs
	SERIES 39Av	363 psi	20.91"	15.00"	144 lbs
	SERIES 39Av	580 psi	20.91"	15.00"	192 lbs
10"	SERIES 39Av	232 psi	24.09"	16.73"	242 lbs
12"	SERIES 39Av	232 psi	26.14"	20.87"	418 lbs

CLA-VAL

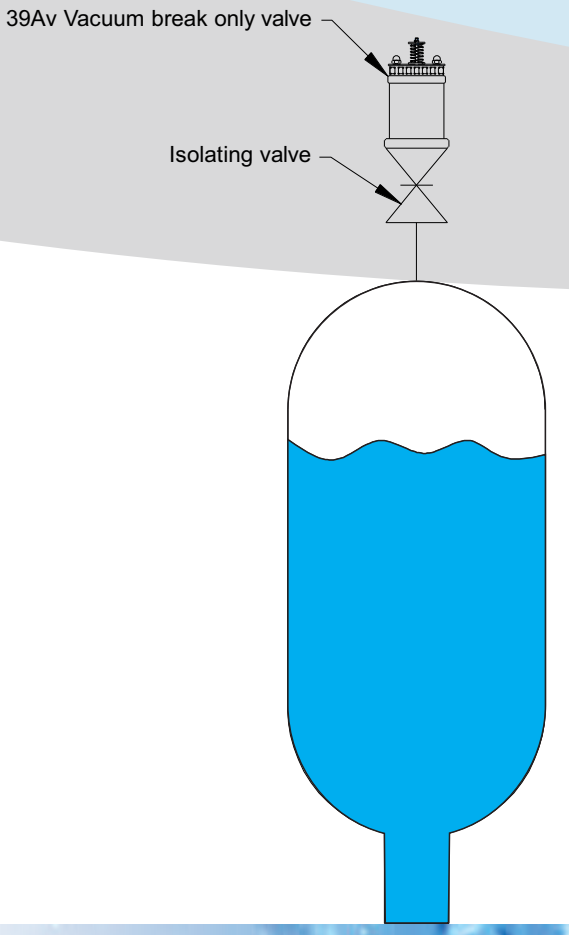
VACUUM BREAK ONLY OPERATION

Vacuum break only valves are used in specific applications and should only be considered when they meet the criteria for using them.

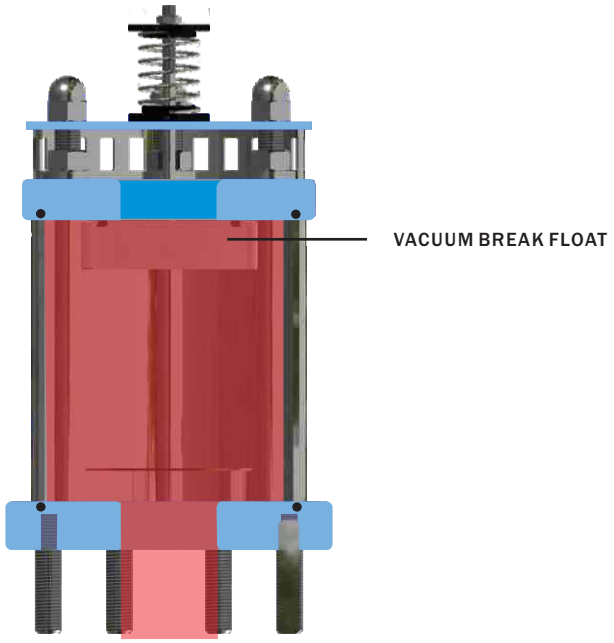
The first and most common place where these valves are used, is next to reservoirs. Here, the head from the reservoir is not sufficient to seal a standard air valve. Generally, there is a level control valve, check valve etc. that should prevent water from re-entering the pipeline from the reservoir, when the pipeline is being drained for maintenance, pump shut down or pipe burst. Any accumulated air at this point, will naturally be released through the reservoir as it will become the high point.



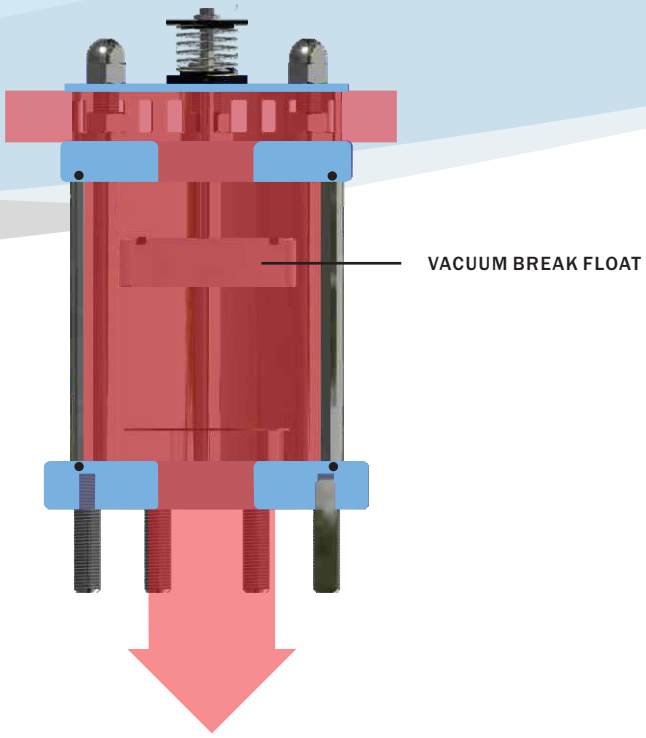
Another area where vacuum break only valves can be used, are in areas where vacuum break is required on tanks and accumulators, but where air release is not required. This is particularly useful where the medium contains either noxious smelling gases or the release of the medium vapour, may be harmful to people or the environment.



VACUUM BREAK ONLY OPERATION

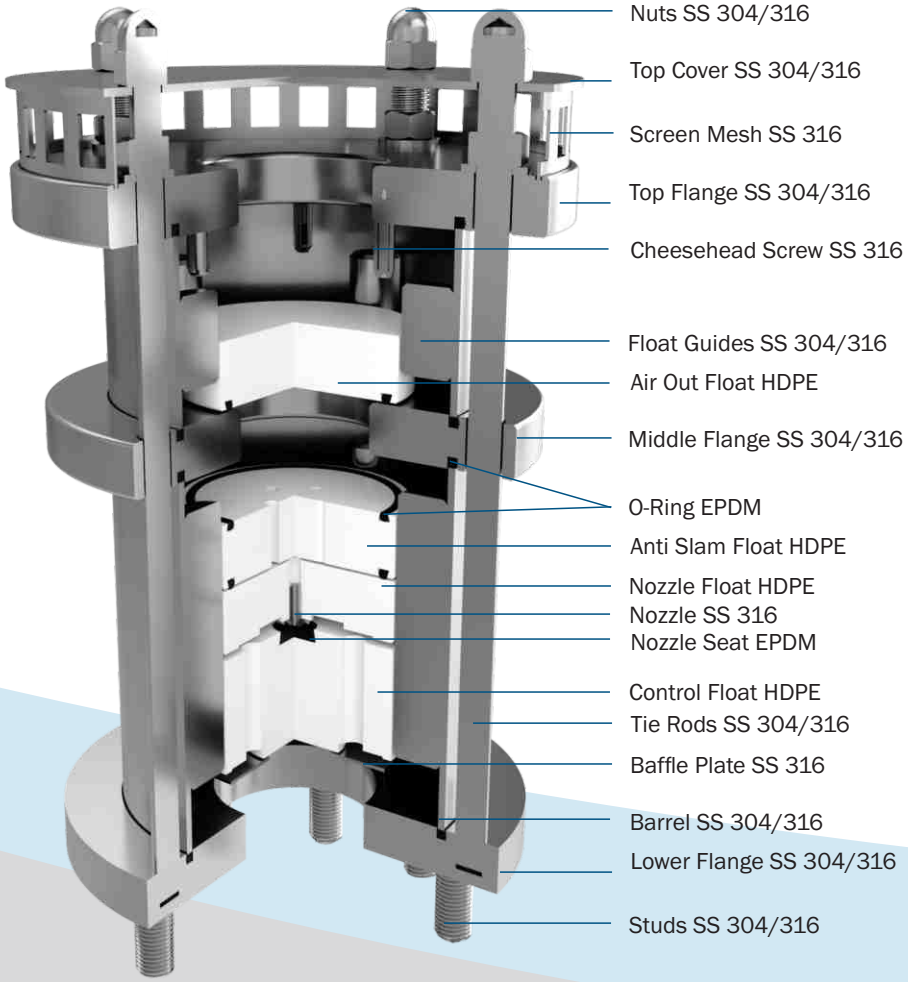


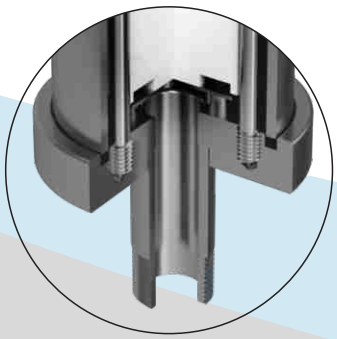
In normal operation, the SERIES 39Av is in the closed position. This prevents any air from being released from the pipeline. The valve will remain in the closed position, until such time as a negative differential pressure begins to form in the pipeline.



When a negative differential pressure forms in the pipeline, the greater atmospheric pressure causes the vacuum break float to open and air rushes into the pipeline, thereby preventing the formation of a negative cavity.

SERIES 39Aa
Potable water





1" & 2" threaded
Flanged option also available

Operating Pressures
7.2 - 232 psi
7.2 - 363 psi
7.2 - 580 psi

Operating Temperatures
32 - 176°F

End Connection
Screwed NPT
Flanged studded

Single Acting Air Out Only

Size	Model no.	Pressure Rating	Overall Height	Overall Diameter	Weight
1"	SERIES 39Aa	363 psi	10.83"	5.51"	31 lbs
2"	SERIES 39Aa	363 psi	12.00"	6.97"	36 lbs
3"	SERIES 39Aa	232 psi	14.96"	9.65"	49 lbs
	SERIES 39Aa	363 psi	14.96"	9.65"	49 lbs
4"	SERIES 39Aa	232 psi	15.56"	9.65"	70 lbs
	SERIES 39Aa	363 psi	15.56"	9.65"	80 lbs
6"	SERIES 39Aa	232 psi	23.62"	14.57"	198 lbs
	SERIES 39Aa	363 psi	23.62"	14.57"	220 lbs
8"	SERIES 39Aa	232 psi	27.36"	16.54"	249 lbs
	SERIES 39Aa	363 psi	27.36"	16.54"	264 lbs

Larger sizes are available on request up to 20”

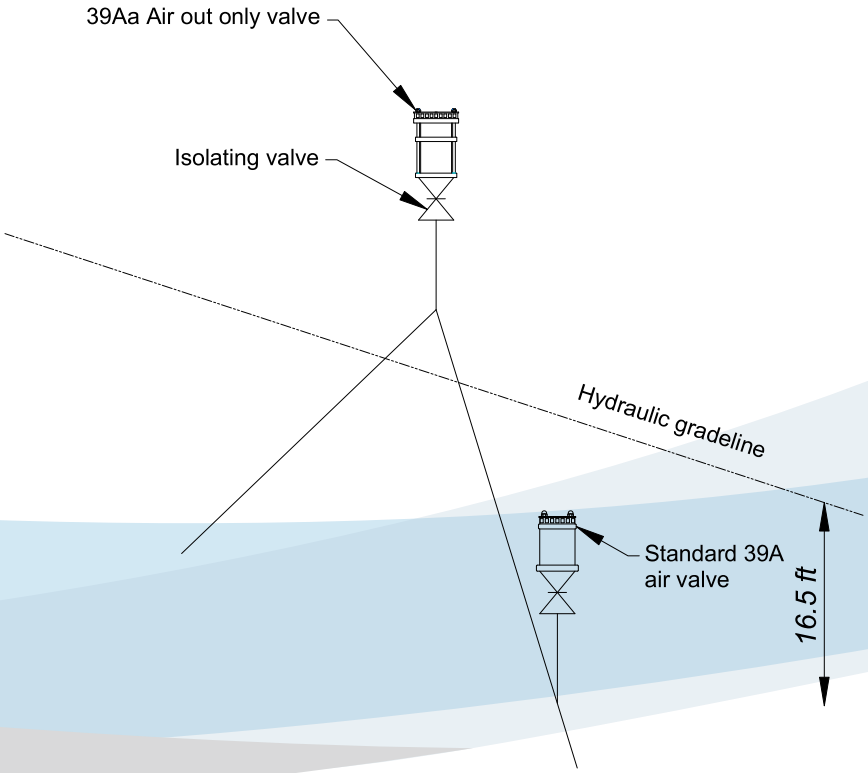
AIR OUT ONLY OPERATION

The 39Aa air out only valve is a specialised valve that should only be used in specific applications or locations. By removing the vacuum break function from a standard air valve, problems will arise with the draining of pipelines and could cause your pipeline to collapse under vacuum conditions.

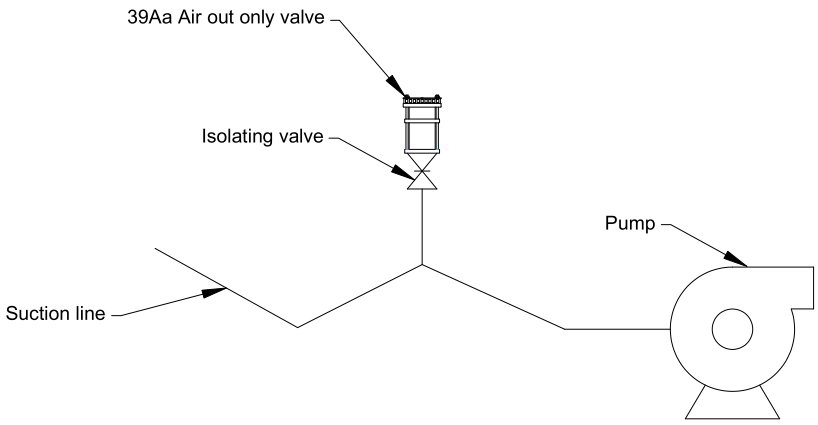
Air out only valves are used in siphon locations. These are locations where the medium is pumped to a point above the hydraulic grade line of the pipeline and thereafter gravity fed to the end of the pipeline, relying on a siphon to maintain flow.

The 39Aa air out only valve is placed at the point of the siphon, by preventing the inlet of air, the siphon is maintained. By allowing air to escape at this point is also beneficial to ensure that the siphon is maintained.

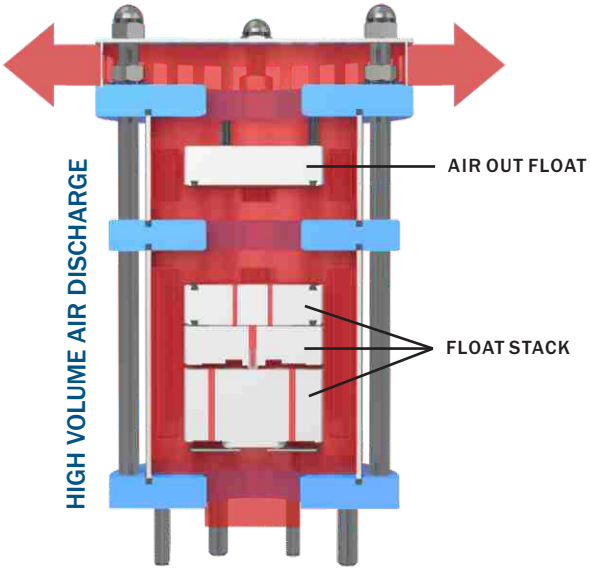
In many cases a normal triple acting valve such as the 39A is placed 16.5ft below the hydraulic intersection point. This allows for vacuum breaking to take place to assist with normal draining etc.



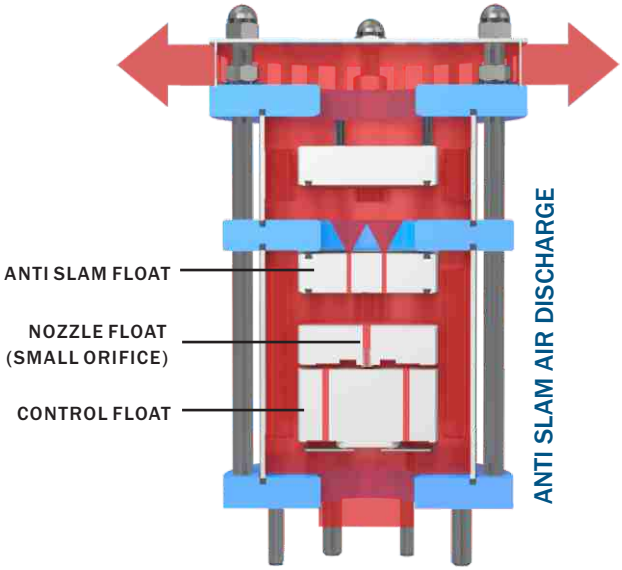
Another application where the 39Aa air out only valve can be used, is on pump suction lines. This allows the valve to expel air and allow for efficient pump priming. The 39Aa also minimises air been drawn through the pump and into the main line.



AIR OUT ONLY OPERATION



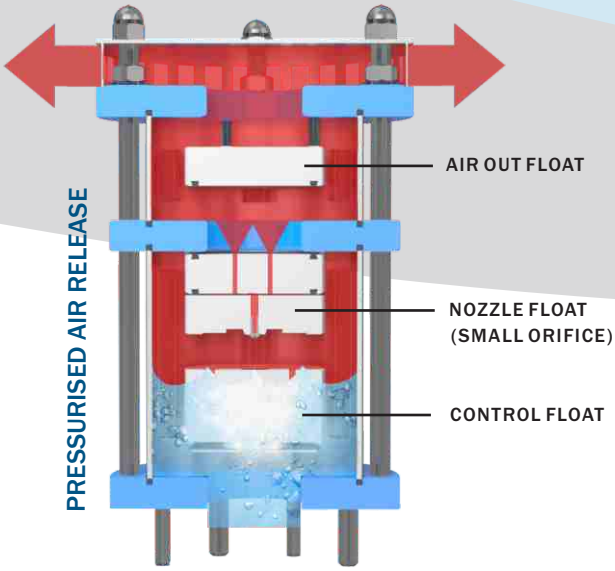
During filling of the pipeline, air passes through the air valve at the same flow rate as water in the pipeline. The air out float is lifted, while the float stack remains unaffected in the open position. This allows air to pass freely through the valve. When water enters the valve, the floats are buoyed and the valve closes.



When rapid filling, pump trip, rapid valve closure or other surge events occur. The valve will switch into anti slam mode. Switching from the larger orifice to a smaller anti slam orifice.

The smaller orifice will restrict the rate at which air can escape the pipeline and as a result slow the flow rate of water through the pipeline.

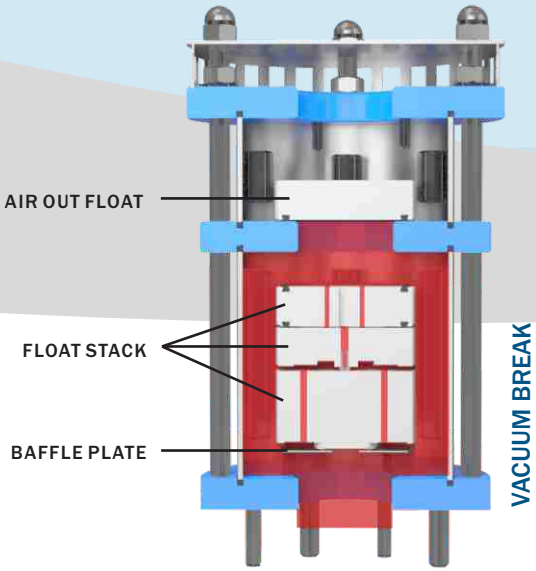
Air passes around the control float and nozzle float through the anti slam orifices, lifting the air out float and releasing to atmosphere.



During normal operation, while the pipeline is fully charged, disentrained air will accumulate at many air valve locations.

When the quantity of air is sufficient to displace the control float, the float will drop away from the nozzle float and release the accumulated air. The control float will then buoy back into place and seal off the small orifice.

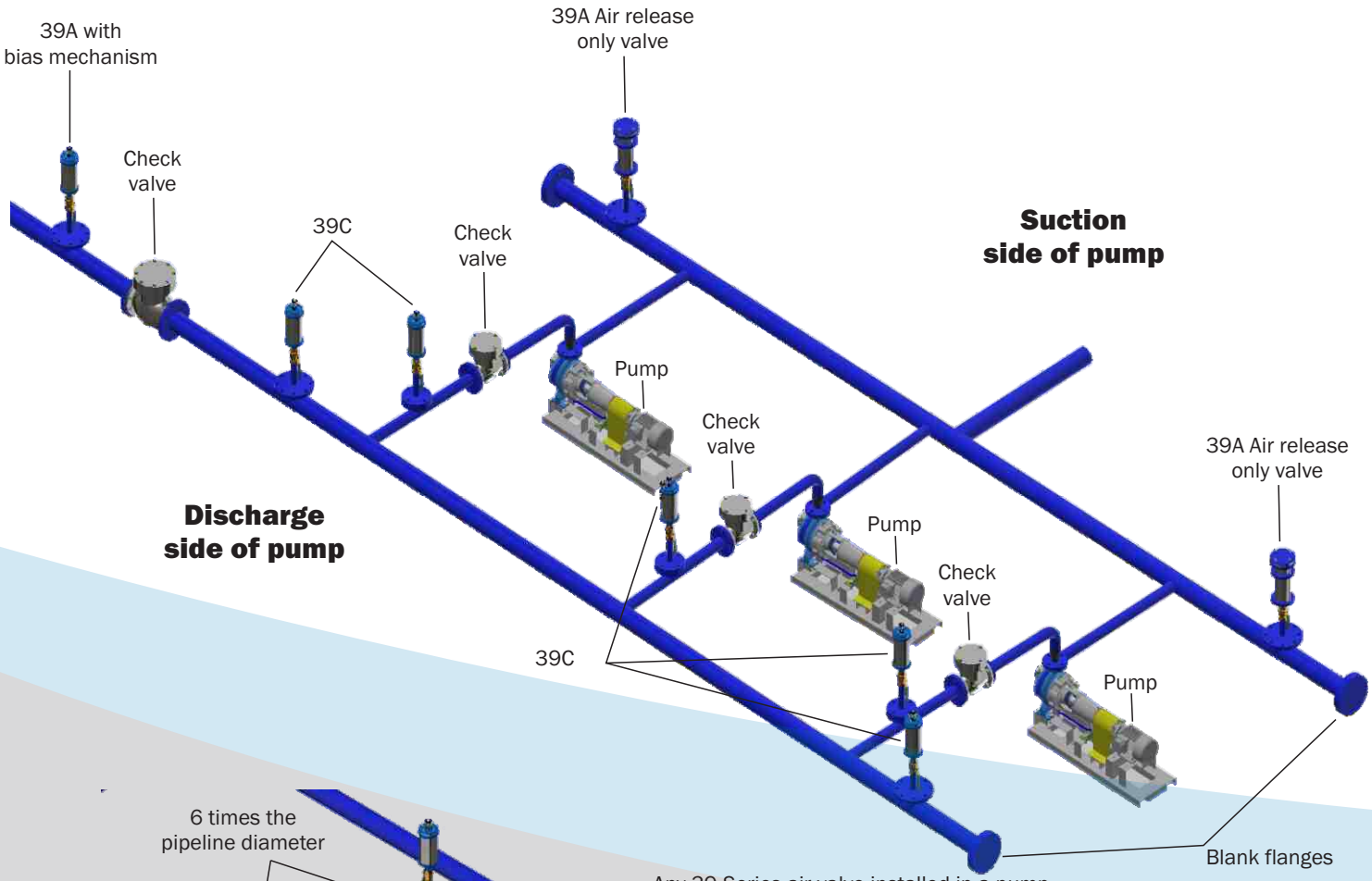
The air out float will flutter open to release the air without rising too much.

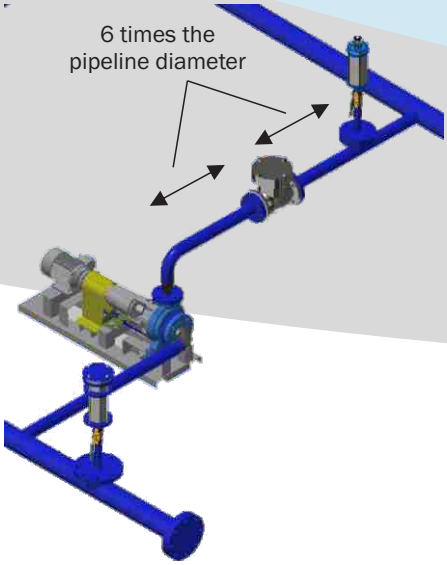


Should a negative differential pressure occur, the air out float will close preventing air from entering the pipeline.

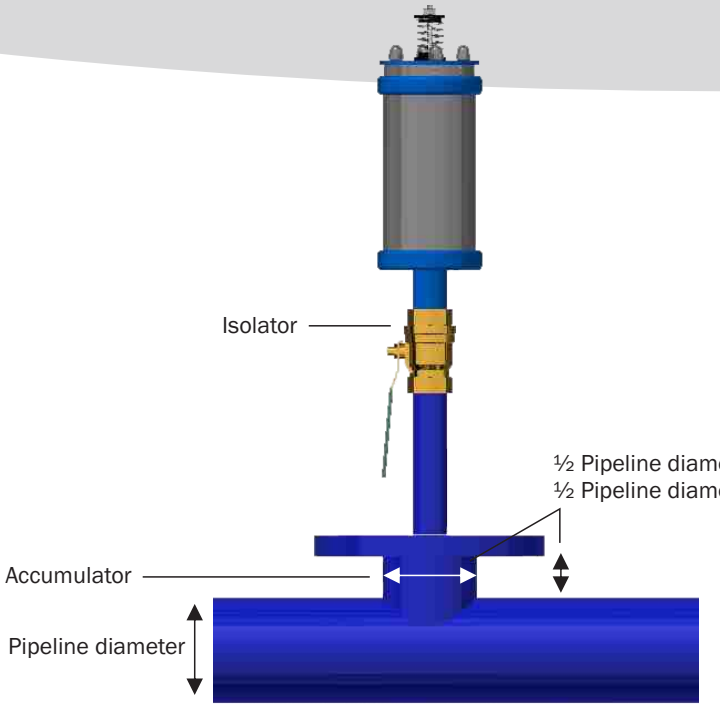
The float stack will drop down and settle on the baffle plate and the valve will remain inactive until such time as air is needed to be released.

TYPICAL PUMP STATION LAYOUT





Any 39 Series air valve installed in a pump station or close to any source of vibration should be fitted with a bias mechanism
Air valves within the pump station should preferably be SERIES 39C



PUMP STATION AIR VALVES

Air valves in pump stations have two major functions, to release air and to break vacuum.

Due to the amount of turbulence that occurs in a pump station, air is released from solution. The purpose of the air valve is to release as much air as possible, thereby preventing the air from causing problems in the pipeline.

The same valves also provide vacuum break protection to the pipeline and components when the pumps are shut down, or under pump trip conditions.

The 39 Series anti slam valves offer an additional feature. By controlling the release of air through the anti slam floats, they reduce mass oscillation in short sections typically found in a pump station.

Pump stations call for special air valves

On the suction side of the pumps, air valves are usually air out only valves. These valves allow the suction lines to run full by releasing the air out of the pipeline. However, they do not allow air back into the pipeline that can jeopardize the prime of the pump.

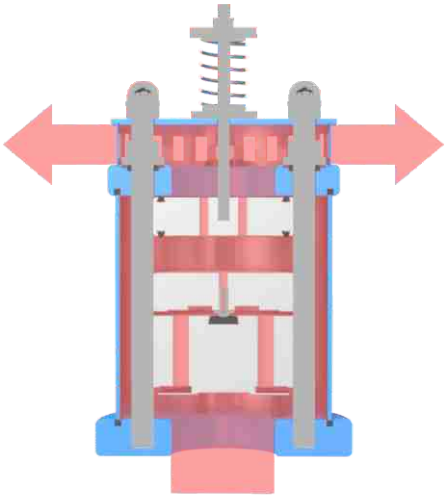
On the discharge side of the pump, we recommend the use of SERIES 39C. The 39C offers two distinct advantages.

- They offer instant control of air release though the anti slam orifice. This helps control surge as pumps are often the source of surge and water hammer.
- The bias mechanism helps the air valve cope with vibration, this limits the amount of leakage that is associated with air valves in pump stations.

Guidelines to Follow

- Air valves should be installed at least 6 times the pipeline diameter away from the pumps and check valves.
- In centrifugal pump stations, air valves are generally placed after check valves when installed.
- In Turbine and Submersible pump applications, air valves are placed before and after the check valve where possible. If only one option is possible, we recommend that this air valve be placed before the check valve.
- If there are blank flanges installed on the pipeline, a 39C air valve should be installed close to these blank flanges.
- Where possible, air valves should be fitted with accumulators with dimensions of a minimum, half the pipeline diameter in height and half the pipeline diameter in width. In smaller systems, equal tees may be more cost effective.

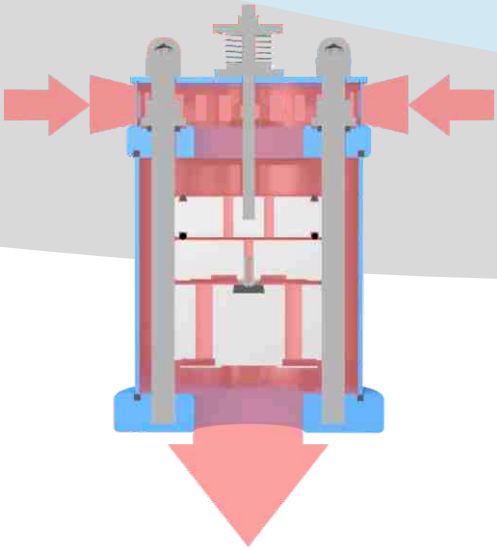
SERIES 39C OPERATION



During normal filling, rapid filling, pump trip, rapid valve closure and other surge events. The valve is already in anti slam mode. All air is discharged in a controlled manner through the smaller anti slam orifice.

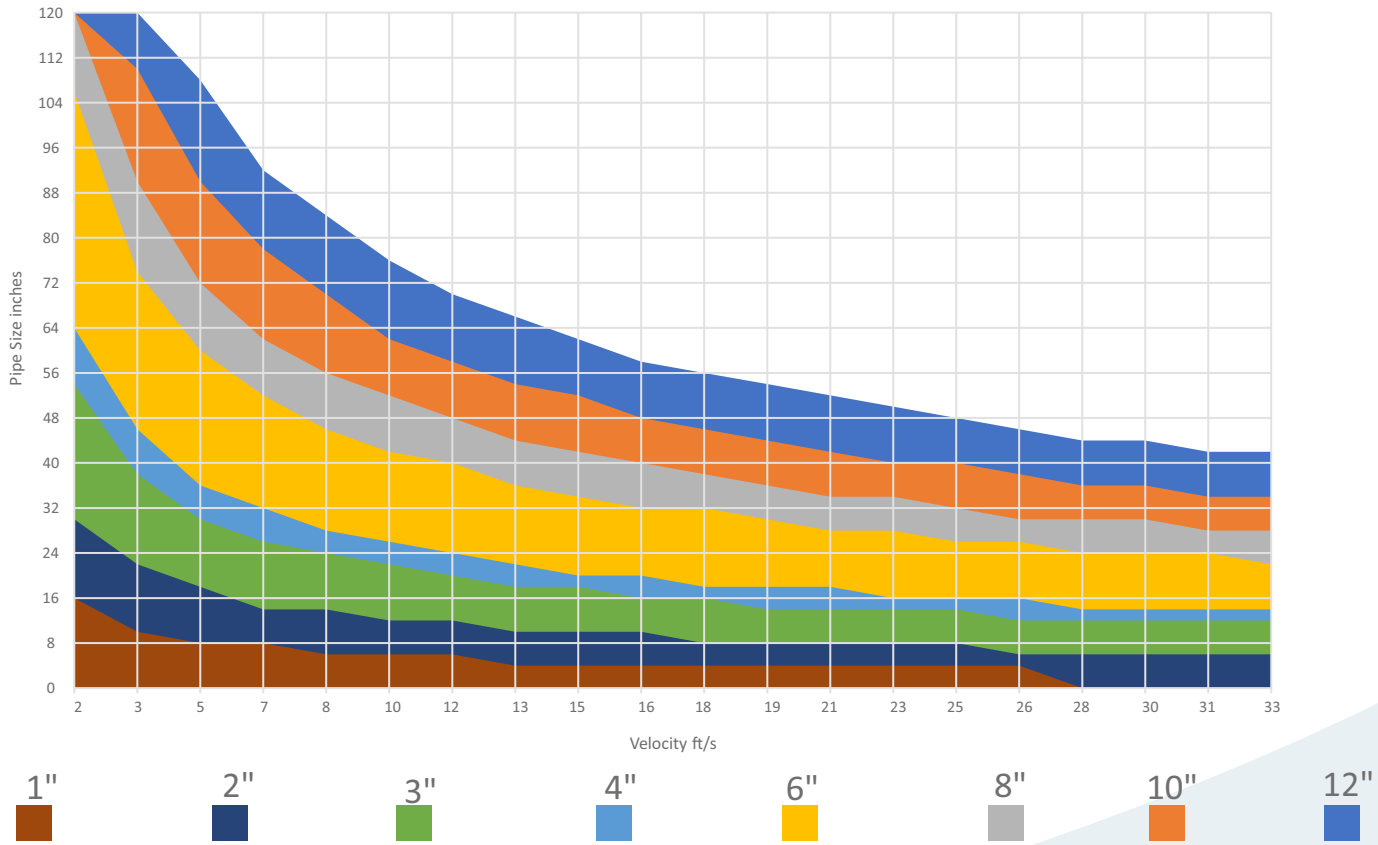
The smaller orifice will restrict the rate at which air can escape the pipeline controlling the flowrate of water through the pipeline. Eliminating the need to switch to anti slam in high risk areas.

Air passes around the control float and nozzle float through the anti slam orifice to atmosphere.



During the draining, pump stoppage or pump trip, the spring will collapse as the control float and nozzle float will gravitate towards the baffle plate. Air will travel through the large orifice, past the floats and through the intake orifice into the pipeline. Once the negative differential in the pipe returns to atmosphere the spring will return to its original position.

VALVE SIZING



How To Use the Chart

Select pipe size and velocity, use either maximum flow velocity or calculate drainage velocity based on drainage or expected potential rupture. Where the pipe size and velocity intersect there will be a colour band, match the colour band to the valve size in the legend below. This will give you the valve size of a valve capable of drawing in sufficient air to match the drainage rate. All values are based on maintaining a minimum negative pressure of 5 psi in the pipeline pressure. It is not good practice to allow the negative pressure drop below 8.5 psi negative differential in the pipeline. Be aware when sizing that the upper part of the band is closer to the minimum negative differential of 5 psi and the lower part closer to 1.5 psi negative differential pressure. If you are quite close to the higher part of the band, one should then switch to the next size of valve to assure the safety of the pipeline.

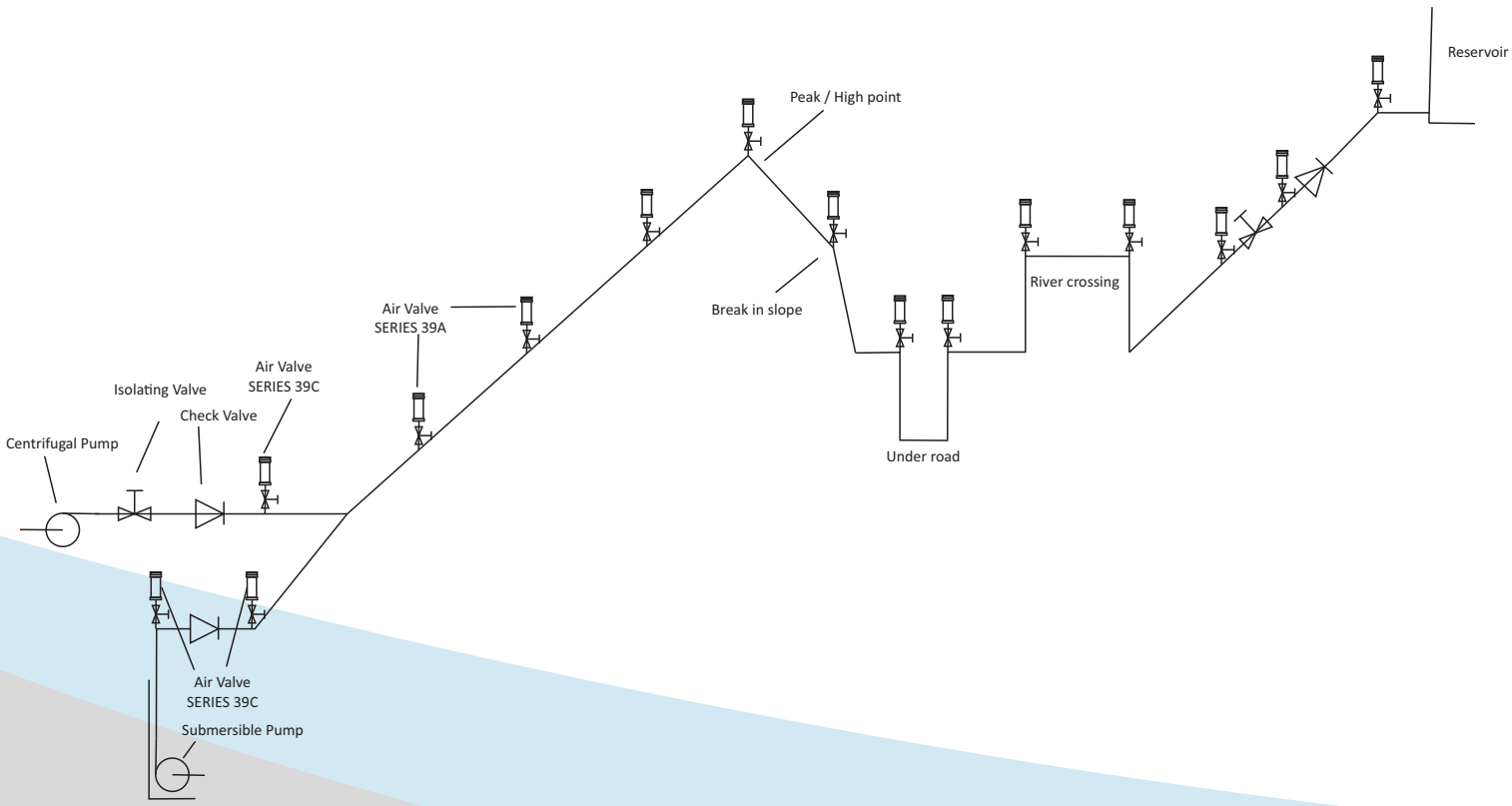
	Convert flow in gpm per second into velocity in ft/s						
Pipeline Size in inches	120	105698	211397	352328	422794	528492	704656
	112	92075	184150	306917	368300	460375	613834
	104	79391	158783	264638	317565	396956	529275
	96	67647	135294	225490	270588	338235	450980
	88	56842	113685	189474	227369	284211	378948
	80	46977	93954	156590	187908	234885	313181
	72	38051	76103	126838	152206	190257	253676
	64	30065	60131	100218	120261	150327	200436
	56	23019	46038	76729	92075	115094	153458
	48	16912	33824	56373	67647	84559	112745
	40	11744	23489	39148	46977	58721	78295
	32	7516	15033	25054	30065	37582	50109
	24	4228	8456	14093	16912	21140	28186
	16	1879	3758	6264	7516	9395	12527
	8	470	940	1566	1879	2349	3132
	4	117	235	391	470	587	783
		3	6	10	12	15	20
	Pipeline velocity in ft/s						

This table is to help you calculate your velocity, based on flow and pipe size. Select your pipe size in the left hand blue column. Run your finger to the right until you find the flow rate closest to your pipelines maximum demand rate. Drop your finger to the bottom blue column and it will give you your flow velocity in feet per second(ft/s). Should your pipe size not be available you can calculate your velocity using this calculation:

$$V = \frac{Q * 0.321}{A}$$

Where
V= Velocity ft/s
Q=flow in gpm
A= Area inches²

SIZING AND POSITIONING



Peaks/high points
The most important areas to place air valves are high points or peaks along the pipeline. Air will always rise to these points when filling and when the pipeline is operating. Water will also always drain from the peaks first when draining or in the event of a burst.

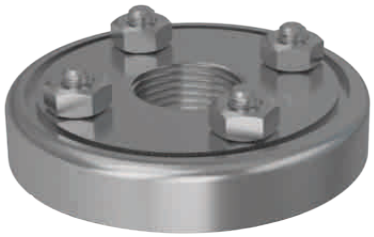
Breaks in slope
A break in slope is defined as any point where, under gravity, water will drain away from a point faster than it reaches that point causing column separation. These points can also be a point of turbulence where air can be released from solution.

Long ascending and descending sections
Air valves on long ascending and descending sections should be placed every 2000ft.

Other places where air valves should be considered
In Pump Stations
Centrifugal pumps after check valves, preferably six times the pipeline diameter away from the check valve. Turbine and submersible pumps, before and after the check valve. If only one is possible, then before the check valve in these instances. All air valves in pump stations should be of the SERIES 39C type of air valves.

Isolation and Check Valves.
Air valves should be placed with any isolation or inline check valve that will as a result of closure have water running away from the valve. The air valve should be placed on the side of the valve that water will drain from. In the case of isolation valves or check valves placed on peaks an air valve should be placed either side of the valve.

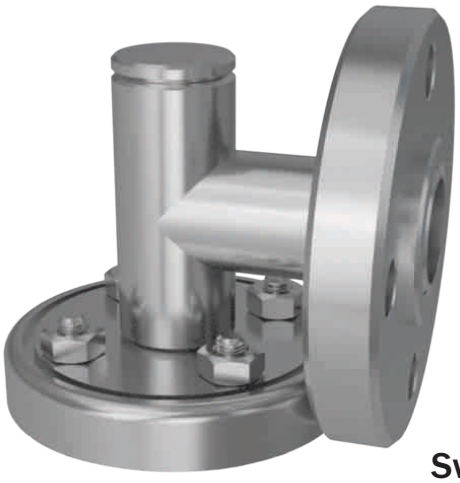
OUTLET CONNECTIONS

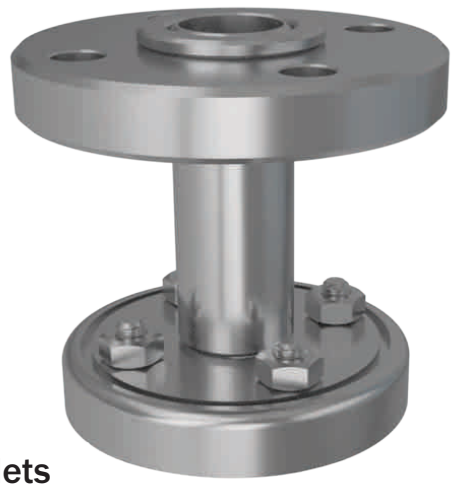


Screwed Outlet
The valve outlet is tapped to either BSP or NPT to allow connection to piping off systems.

Screwed T Outlet
The valve outlet is tapped to either BSP or NPT to allow connection to piping off systems. This type of connection can be used with controlled air release configuration.

Gooseneck Outlet
The valve outlet is fitted with a gooseneck. This is often requested in desert applications.





Swivel Outlets
Can be supplied in two formats, T outlet and straight outlet to connect to desired flanged piping.

TEST PROCEDURES

Every air valve is subjected to testing before departing the factory. Testing procedures are in accordance with, or exceed the procedures laid out in AWWA C-512-15.

Low Head Leak Test

The valve is attached to the test rig, water from an elevated tank flows under gravity into the valve buoying the floats, the floats seal once a pressure of 7.2 psi is achieved. Any excess water that has gathered during the priming of the valve is then cleared off the valve and the valve is inspected for leakages. Any sign of leakage at this point is a failure of the low head leak test.

Hydrostatic Testing

Once the valve is determined to have passed the low head leak test, it remains connected to the test rig and the pump is activated, the valve is then subjected to a pressure of 1.5 times the rated operating pressure (i.e. if the valve is rated at 363 psi it will be tested to 544 psi). Once this pressure is achieved, the valve will then be held at this pressure and be inspected for any leaking or weeping. Any evidence of leakage or weeping at the said test pressure will be cause for failure.

Additional Testing

Drop Testing

Drop testing is the test conducted to ensure that the valve will open and release disentrained air, when the valve is operating at the full rated pressure of the valve, (see pressurised air release page 3 for more information). Drop testing is governed by specific physical laws and is extensively tested during the development of the valve, to make sure the valve conforms to these necessary laws. Thereafter it is not necessary to test every valve or even every 10th valve in a run. Once the specific masses and orifice sizes are correct, the normal QC process of checking the components to the correct dimensions, ensures that the valve will breathe up to the rated pressure of the valve. As a result, this test is only performed on request or as part of a third-party test that specifically states a requirement for a drop test.

The valve is placed on the test rig and pressurised to slightly above the rated pressure of the valve. Nitrogen is then introduced into the valve at a pressure higher than the rated pressure. The valve is then slowly drained of liquid, if the valve releases air before or at the rated pressure of the valve, the valve is deemed to have passed the drop test. If air is released below the rated pressure of the valve, or does not release air at all it is deemed to have failed the test.

Failure of Testing

Any valve that fails any of the above tests, is marked and later inspected for the cause of failure. The issue is rectified and the valve is retested. No valve will be allowed to leave the factory until such time as it has successfully passed all the required testing procedures.

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