ASVIN AIR VALVES

ASIAN INDUSTRIAL VALVES AND INSTRUMENTS

CHENNAI – 600037

ASVIN AIR VALVE

INTRODUCTION

ASVIN air valve is a hydro-mechanical device designed to automatically discharge air and water gases or permit air during the filling, draining, or normal operation of water piping systems. The safety and efficiency of a piping system depend on the proper release of air and water gases from the piping system.

` Water contains approximately 2% dissolved air or gas at typical conditions (1 bar) however it can contain even more, depending on the water pressure and temperature in the piping system. water systems tend to have more dissolved air and gases due to its nature. Dissolved air and sewage gases tend to come out of solutions in the pipeline system where turbulence, hydraulic changes, and other pressure variation phenomena take place, like pumps, meters, bends, and so on. Once out of liquid, air and gases will not immediately dissolve and will gradually accumulate in pockets at high points within the piping system.

As air pockets accumulate at high points, it reduces the effective cross-section of the piping system in that location, which decreases the liquid flow, and increases energy required to pump water through, which in turn, reduces the overall system efficiency. Also, air bubbles and soluted air can trigger cavitation- the formation of vacuous cavities which subsequently erode and wear the pump and/or pipe components. The movement of these air pockets tends to cause pressure surges and pipeline ruptures. Aside from the fact that trapped air can promote corrosion in the pipe internal surface, damage water meters, malfunction valves and increase vibration in the system.

On the other hand, while draining a piping system or having a transient, it is crucial to admit air into the piping system in order to occupy the volume of drained or moving liquid in order to avoid negative pressure (vacuum) in the pipeline which in turn can lead to buckling. Thus, air valve helps preventing vacuum conditions.

ASVIN air valves are designed for efficient discharge and admit of air in water pipelines and other places where trapped air could harm the system's operation and efficiency.

APPLICATION

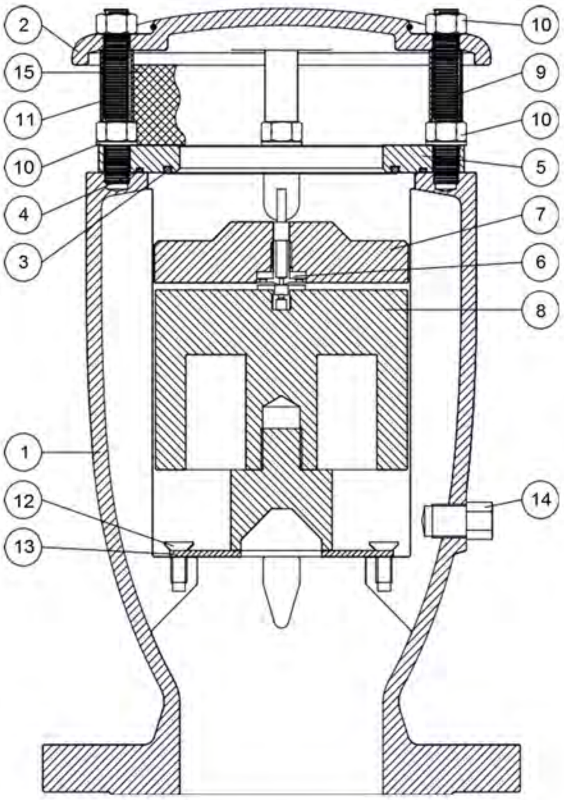
Main Transmission pipe line water Distribution network Water treatment plants Sea water desalination plants Dams Industrial plants

Specification

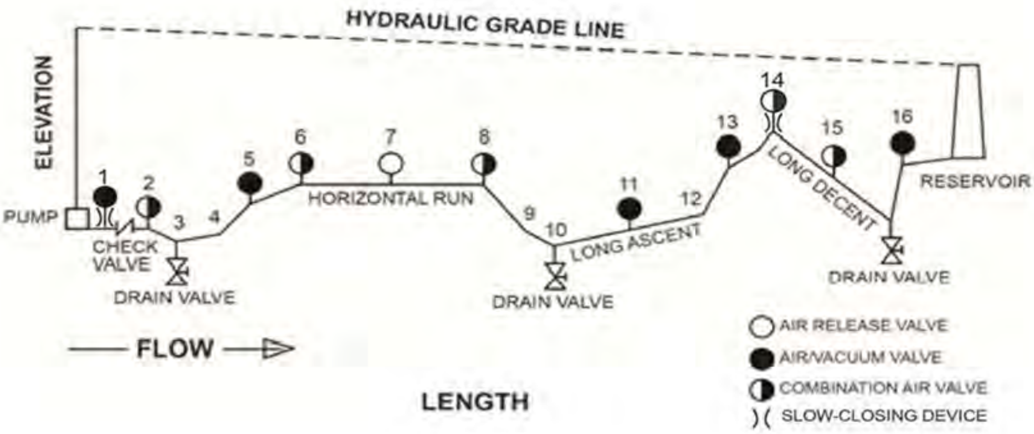
- Sealing system: resilient seated
- Single-chamber & double-chamber air valves in compact design
- Double orifice type with a large orifice for automatic ventilation of the pipeline and a smaller orifice for automatic release of air pockets during operation under pressure
- Triple function Air Valve
- Corrosion-proof due to stainless steel inner parts and float can be of plastic or stainless steel
- High discharge capacity up to sonic velocity due to stabilized floater
- Safe and reliable operation even at high air-release velocities
- All operating components are made of specially selected, corrosion-resistant materials
- Can be mounted with isolating valve with hand lever
- Minimum operation pressure: 0.3 bar

Technical features and benefits of ASVIN air valves

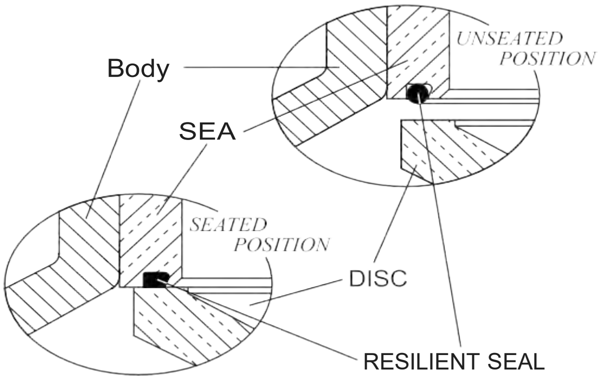
- Single chamber full bore body, PN 40 bar rated, provided with internal ribs for consistent and accurate guiding of the mobile block.
- Aerodynamic deflector in stainless steel to avoid premature closures.
- Mobile block composed of a cylindrical float and upper disk in solid polypropylene, joined together by ASVIN air release system in AISI 316 The solid cylindrical floats, obtained by CNC machining, avoid deformations and ensure a great sliding precision inside the body processed ribs and a perfectly vertical thrust.
- Nozzle and gasket holder, part of ASVIN air release system, entirely made in AISI 316 and designed with gasket compression control to prevent aging process and consequent leakage during working conditions.
- Maintenance can be easily performed from the top, without removing the air valve from thepipe.
- Cover in ductile and screen in stainless steel as a standard execution to prevent the entrance of insects.

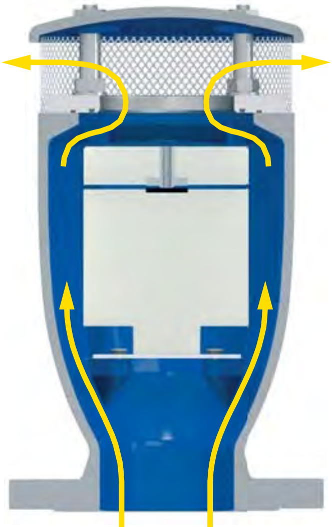


SL NO	Component	Material
1	Body	Monel/SS/CI
2	Cap	Monel/SS/CI
3	O-ring	NBR/EPDM/Viton/Silicone
4	O-ring	NBR/EPDM/Viton/Silicone
5	Seat	AISI 304/AISI 316
6	Nozzle subset	AISI 316
7	Upper flat	AISI 316
8	Float	AISI 316
9	Studs	AISI 304/AISI 316
10	Nuts	AISI 304/AISI 316
11	Spacers	AISI 304/AISI 316
12	Screws	AISI 304/AISI 316
13	Deflector	AISI 304/AISI 316
14	Drain valve	AISI 304/AISI 316
15	Screen	AISI 304



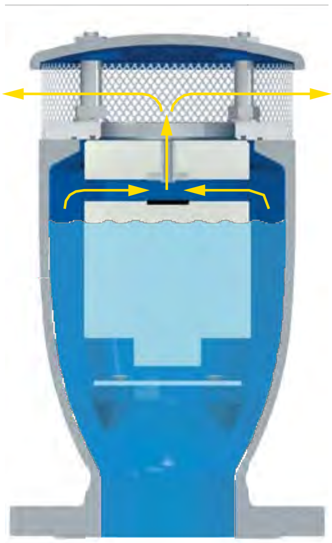
SEAT DETAILS





Discharge of large volumes of air

During the pipe filling it is necessary to discharge air as water flows in The Aerodynamic full port body and deflector, will make sure to avoid premature closures of the mobile block during this phase.



Air release during working conditions

During operation the air produced by the pipeline is accumulated in the upper part of the air valve. Little by little it is compressed and the pressure arrives to water pressure, therefore its volume increases pushing the water level downwards allowing the air release through the nozzle.

Entrance of large volumes of air

During pipeline draining, or pipe bursts, it is necessary to bring in as much air as the quantity of outflowing water to avoid negative pressure and serious damages of the pipeline, and to the entire system.

Theory, Application and Sizing of ASVIN Air Valves

$$V = (2\,g\,H / K)^{1/2}$$

where:

- v = Flow Velocity, ft/sec
- g = gravity, 32.2 ft/sec
- H = Change in Elevation, ft
- K = Resistance coefficient, Dimensionless
  = fL/d+2.5
  (the 2.5 represents entrance, exit, and some piping losses)
- f = friction factor of pipe (iron = .019, steel = .013, plastic = .007)
- L = Change in Station Points (length of run), ft.
- d = pipe ID, ft.

The gravity flow due to slope is calculated for every pipe segment. For stations where there is a change in up slope or down slope, the difference between the upstream and downstream flows is used for sizing because the upper segment feeds the lower segment and helps prevent a vacuum from forming.

When steel or any collapsible pipe is used, it is important to determine if there is a risk of pipeline collapse due to the formation of a negative pressure. The following equation finds the external collapse pressure of thin wall steel pipe using a safety factor of 4. A safety factor of 4 is recommended to take into account variances in pipe construction, variances in bury conditions, and possible dynamic loads.

$$P = 16{,}250{,}000 * (T / D)^3$$

where:

- P = Collapse Pressure, psi.
- T = Pipe Thickness, in.
- D = Pipe Diameter, in.

Collapse may also be a concern on large diameter plastic or ductile iron pipe. The pipe manufacturer should be consulted to provide maximum external collapse pressures.

The air valve should be capable of admitting the flow due to slope without exceeding the lower of the calculated pipe collapse pressure or 5 PSI (35 kPa). 5 PSI (35 kPa) is used for sizing to remain safely below the limiting sonic pressure drop of 7 PSI (48 kPa). Manufacturers provide capacity curves for theirvalves which can be used to select the proper size. The capacity of an Air/Vacuum Valve can be estimated using:

$$q = 678 * Y * d^2 * C * [DP * P1 / (T1 * Sg)]^{1/2}$$

where:

- q = Air Flow, SCFM
- Y = Expansion Factor
  .79 (for vacuum sizing)
  .85 (for exhaust sizing at 5 psi)
  .93 (for exhaust sizing at 2 psi)
- d = Valve diameter, in
- Dp = Delta Pressure, psi
  The lower of 5 psi or pipe collapse pressure (for vacuum sizing)2 or 5 psi (for exhaust sizing)

P1	=	Inlet Pressure, psia 14.7 (for vacuum sizing) 16.7 or 19.7 psia (for exhaust sizing at 2 or 5 psi)T1
	=	Inlet Temperature = 520 Rankine
Sg	=	Specific Gravity = 1 for air
C	=	Discharge Coefficient = 0.6 for square edge orifice

The air valve should also be sized for exhausting air during filling of the system. The flow rate used for venting should be the fill rate of the system. The fill rate may be the flow rate from a single pump in a multiple pump system. If there is only one pump in the system, then special filling provisions should be taken such as the use of a smaller pump for filling or the ability to throttle the flow from the pump to achieve a fill rate in the range of (0.3 to 0.6 M/sec). Higher fill rates may cause surges in theline and Slow Closing Devices should be used to reduce the surges within Air/Vacuum or Combination Valves.

If a fill rate is not given, the Air/Vacuum Valve will be sized for the design flow rate which may cause the valve to be oversized. The differential pressure used for sizing the Air/Vacuum Valve varies. 2 PSI will be used in most cases. When the valve is equipped with a Slow Closing Device, the differential pressure may be as high as 5 PSI. Higher differentials are not used because the possibility of water reaching the Air/Vacuum Valve with excessive fluid velocities and to eliminate the noise associated with sonic velocities.

The final Air/Vacuum Valve size must have a capacity greater than both the required exhausting and admitting requirements.

AIR RELEASE VALVE SIZING – UNDER LINE PRESSURE

The Capacity of releasing air under line pressure through an air Release valve can be estimated by using the air / vacuum valve formula except P1 will equal the operating pressure in the line. The differential pressure (DP) is limited by sonic velocity to about 0.47 * P1. The corresponding expansion factor (Y) is 0.71.

$$\mathbf{q = 330.7 * d^2 * C * P1 / (T1 * Sg)^{1/2}}$$

Where :

q	=	Air Flow, SCFM
d	=	Orifice diameter, in
P1	=	Pipeline pressure, psia
T1	=	Inlet temperature = 520R
Sg	=	Specific Gravity = 1 for air
C	=	Discharge Coefficient = 0.6 for square edge orifice

It is difficult to determine in advance the amount of entrapped air which must be released from a given system. Based on water containing 2% air (7), the maximum flow rate can be used to compute a nominal venting capacity.

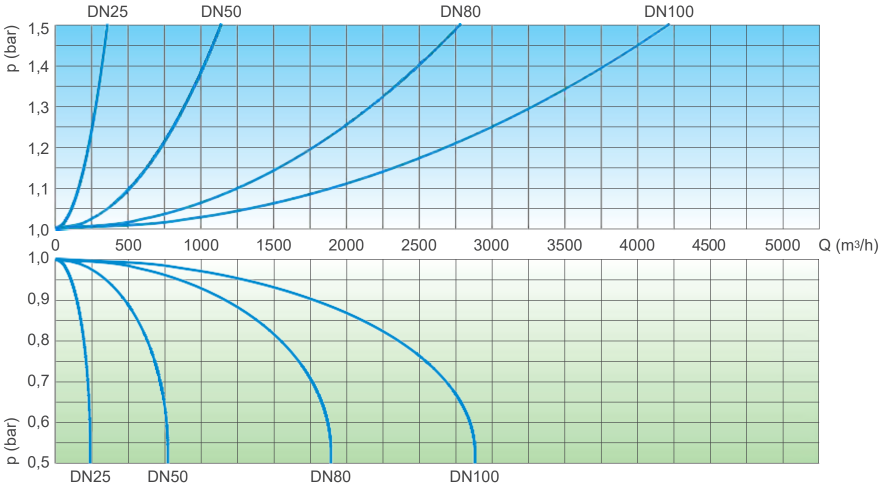
$$\mathbf{q = Q * (0.13\ cu\ ft/gal) * 0.02}$$

where:

q	=	Air Flow, SCFM
Q	=	System Flow Rate, GPM

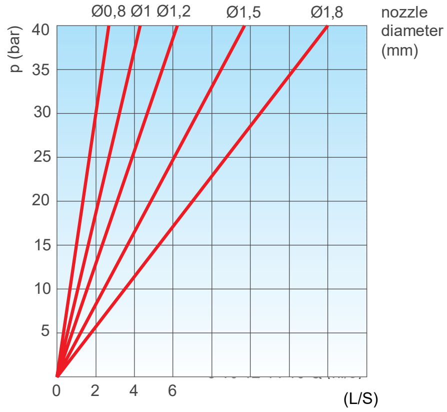
Air flow performance charts

AIR DISCHARGE DURING PIPE FILLING (Upto DIN 100)

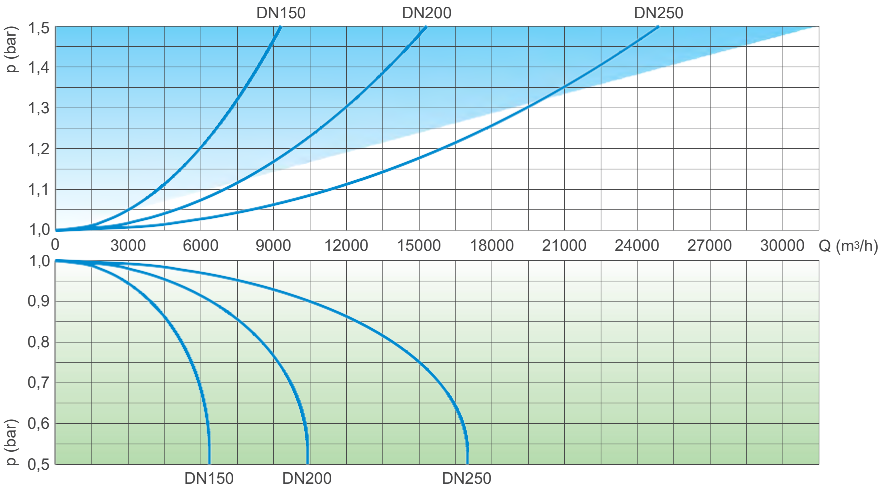


AIR ENTRANCE DURING PIPE DRAINING (Upto DIN 100)

AIR RELEASE DURING WORKING CONDITIONS

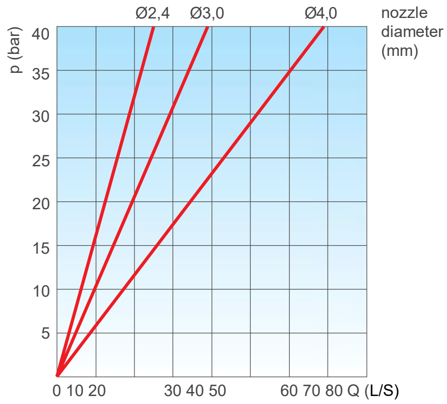


AIR DISCHARGE DURING PIPE FILLING (Higher Size)



AIR ENTRANCE DURING PIPE DRAINING (Higher Size)

AIR RELEASE DURING WORKING CONDITIONS



Working conditions

Pressure ratings:

- DIN, ANSI
 (Upto 40 bar)

Temperature max. 60°C.

Standard

Designed in compliance with:

- EN-1074/4
- AS 4956
  AS 4020
- AWWA C-512.

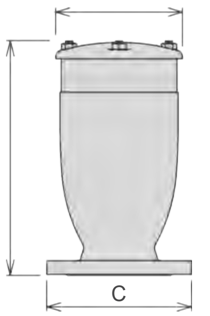
Connections

Threaded:
- BSP – F / BSPT - F
- NPT.

Flanges
- AS 4087 PN 16
- AS 4087 PN 35
- ANSI B16.5
- BIS

Weights and dimensions

CONNECTION NB	A mm	B mm	C mm		Weight Kg
Threaded 25	117	240	-	-	4,0
Threaded 50	141	295	-	-	7,5
Flanged 50	141	305	165	-	9,5
Flanged 80	172	315	210	205	13,8
Flanged 100	206	370	235	220	21,7
Flanged 150	285	515	305	285	44,5
Flanged 200	380	625	375	340	85,0
Flanged 250	440	785	450	-	134,0



Flanged

Screwed

Sizing Guide Air Vacuum Valves for Water

Air Vacuum Valve Sizing Guide - Combination Air Vacuum Valves - Vacuum Breaker Valves

1. Determine the smallest valve size capable of exhausting air equal to the filling rate of the pipeline in CFS while not exceeding a pressure differential of 2 psi across the valve orifice. (Based on pump capacity)

   The following formula is recommended to calculate the rate of flow in CFS for filling the pipeline.

   Flow in (CFS) $= \frac{\mathbf{GPM}}{\mathbf{448.83}}$

   Where : CFS – Cubic feet per second
   GPM – Gallons per minute

2. Determine the smallest valve size capable of admitting air equal to the potential flow in CFS while not exceeding a pressure differential of 5 psi across the valve orifice. (Based on gravity flow).

   The following formula should be used to calculate the rate of flow in CFS that can occur within the pipeline under gravity flow conditions.(During Initial Filling • During Intentional Draining • During A Pipeline Rupture)

   $\mathbf{Q = 0.0007872\ C\ \sqrt{SD^5}}$

   Where: Q – Flow of water in cubic feet per second
   C – Coefficient in chezy's formula – 110
   S - Slope in feet per foot of length
   D – inside pipe diameter in inches

3. If thin wall pipe is being used, the risk of pipeline collapse due to the formation of vacuum must be considered.
   he following formula may be used to calculate the collapsing pressure of thin walled cylindrical steel pipe using a safety. Factor of four

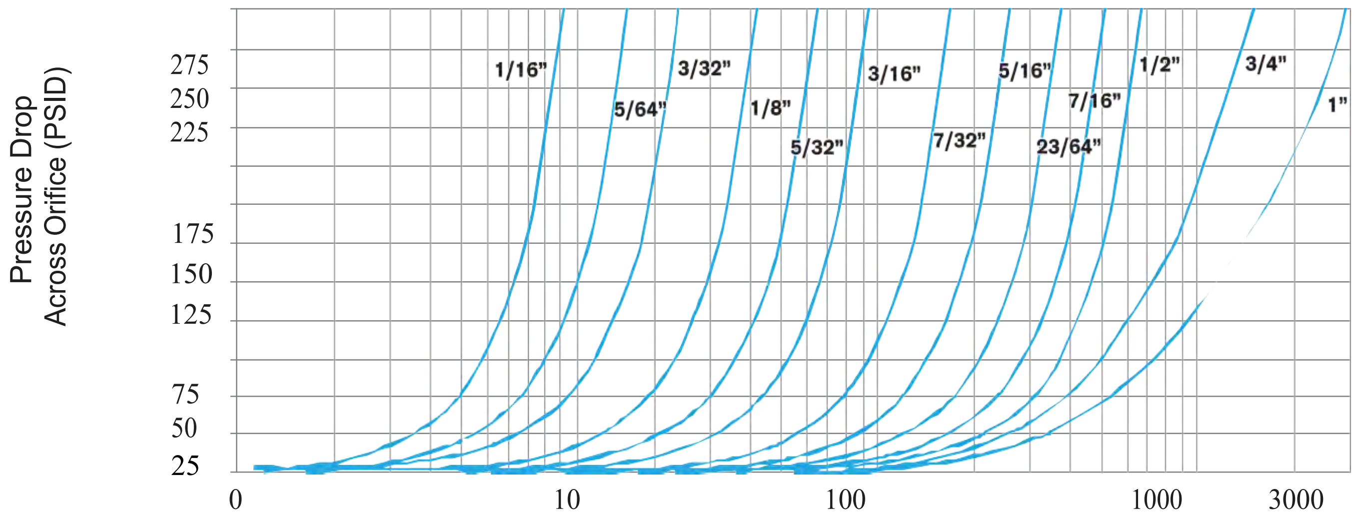
   $\mathbf{P} = \mathbf{12{,}500{,}00}\left(\frac{T}{D}\right)^3$

   Where : P – Collapsing Pressure in psi
   T – Thickness of pipe in inches
   D – Inside diameter of pipe in inches

4. Determine the smallest valve size capable of admitting the required air in CFS without exceeding the collapsing pressure or 5 psi, whichever is less. Do not exceed a pressure differential greater than 5 psi.

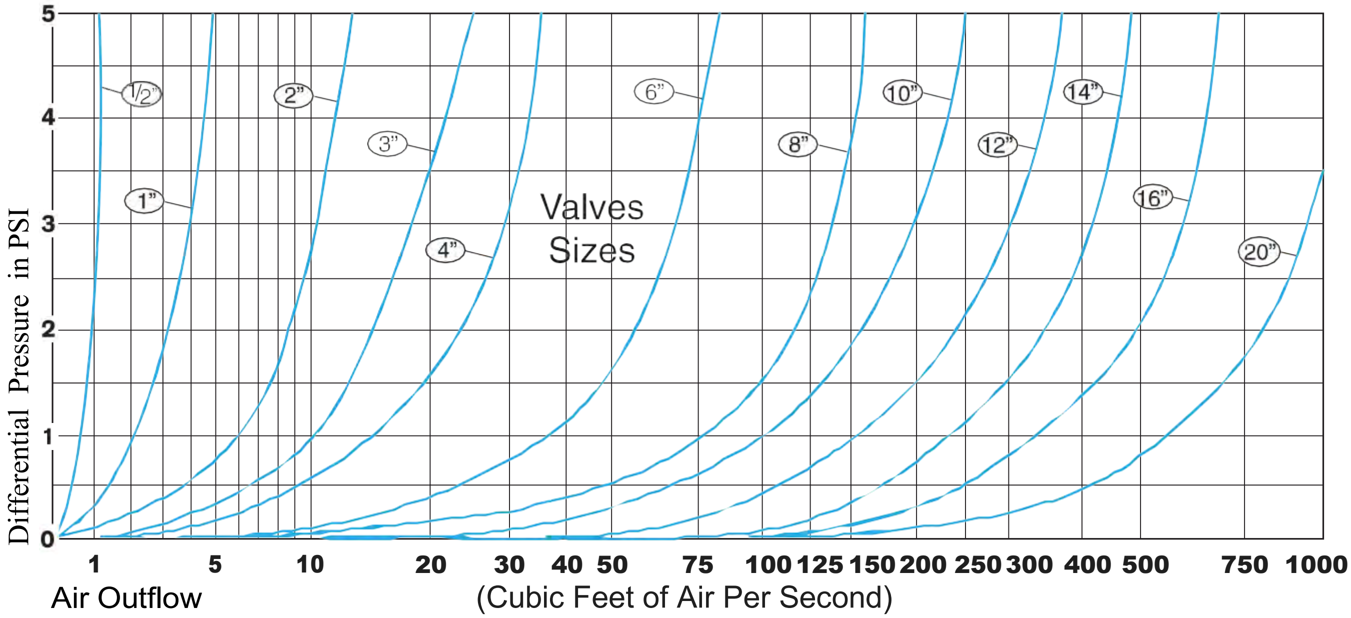
5. Finally, compare the valve size determined. If they differ, always select the large valve size.

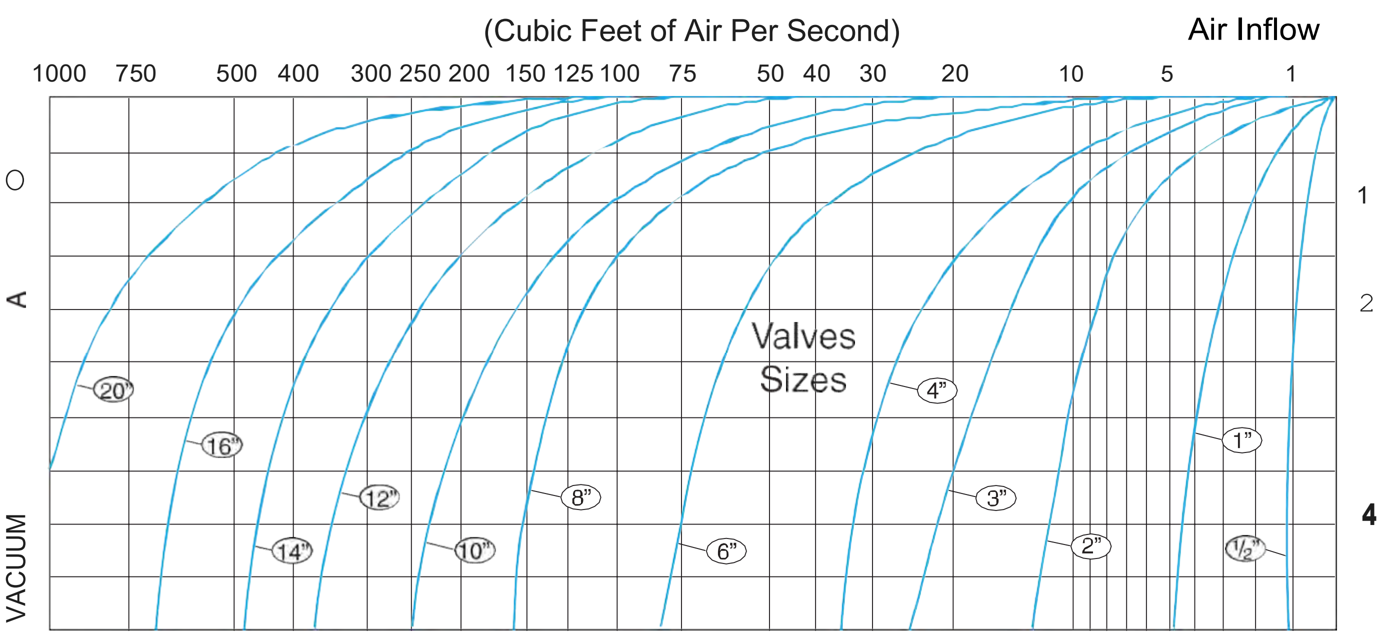
Valves Standard Orifice Sizes With Venting Capacities



Air Flow Rate (SCFM)

Air Outflow Capacities for ASVIN Air Release Valves





Capacities at 14.7 PSIA and at ambient temperature

ASVIN - RANGE OF PRODUCTS

VALVES

* SAFETY/ PRESSURE RELIEF VALVES
* THERMAL RELIEF VALVE
* ATMOSPHERIC RELIEF VALE
* PRESSURE REDUCING VALVE /STATION
* PRESSURE CUM VACUUM RELIEF VALVES
* BREATHER VALVES
* EXCESS FLOW CHECK VALES/SHUT OFF VALVES
* UNDERGROUND SAFETY VALVES FOR WATER TANK / WATER FLOW CANAL AS PER BS – 4558 : 1983
* NON – RETURN VALES /BALL VALVES
* NEEDLE VALES / MANIFOLDS / THROTTLING VALVES
* FLUSH BOTTOM VALES

INSTRUMENTS

* LEVEL GAUGES (Tubular / Reflex / Transparent)
* LEVEL INDICATORS (Magnetic/Float & Chord)
* FLOW – ELEMENTS (Orifice / Flow Nozzle / Venturies)
* ROTOMETER (BY-PASS / ONLINE)
* MANOMETERS
* LEVEL SWITCHES
* THERMOWELLS
* CONDENSING POT
* CONSTANT HEAD CHAMBER
* AIR / MOISTURE SEPARATOR

TANK EQUIPMENTS

* TANK BLANKETING VALVES
* EMERGENCY PRESSURE REFLIEF VALVES (AIR VENT)
* GAUGE HATCHES (Lock Down / Spring Loaded)
* VACUUM BREAKERS

PIPELINE EQUIPMENTS

* AIR VALVES (Air Vent / Air Release / Air Vacuum)
* STRAINERS ('T'/ 'Y' / Basket / Duplex type)
* FLAME / DETONATION ARRESTERS
* SIGHT GLASSES (Full view / Double window / Flapper/ Rotating wheel)
* RUPTURE DISC
* STEAM TRAPS / AIR TRAPS

Available with all reputed third party Inspection Agencies, Viz,
ABS, BHEL, Bax Council, Bureau Veritas, Controller of Explosives, DNV, EIL, IBR, IRS, Lloyds,
QUEST, TUV, MECON, NPC, RITES, SGS, TPL, CE, Marking etc.,

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