AUTOMAT

Manual For Selection of Air Release Cum Vacuum Relief Valves

Contents

Guidelines for using Air Release cum Vacuum Relief and Continuous Acting Air Release Valves

Air usually gets entrapped in water pipeline systems. This could eventually cause blockages, water hammer and other undesirable effects. These problems, including vacuum formation within the lines, hinder the system's functionality. This may also cause equipment and line damage. We have prepared a comprehensive guide for application and selection of double acting (air release cum vacuum relief) and continuous acting (continuous air release during system operation) air valves. This information will help in selection and designing of trouble free system.

Why Air Release cum Vacuum Relief valves are needed?

Air release feature allows air to escape from the pipeline during start up, and prevents:

- Air restriction (air locks) in pipelines, which can partially or completely block water flow.
- Water hammer caused by large air masses which would otherwise remain in the pipe during and after startup.
- Inaccurate flow meter readings.
- Explosive condition from air being compressed by water.

Vacuum relief feature allows air to enter the pipelines during valve closure or system shutdown. This minimizes.

- Collapse of mainline & sub main pipes due to vacuum.
- Back siphon age of dirt into emitters. Vacuum relief can reduce this problem, but in some configuration may not eliminate it.
- Water hammer caused by sudden reversal of flow can occur if negative pressure (vacuum) exists in downstream of a valve that was just closed.

Why Continuous Acting Air Release Valves are also needed?

Standard air release/vacuum relief valves are either fully open or fully closed but they remain closed once the pipeline is under pressure. A continuous air release valve will allow air to escape, which remains in pipeline or which enters the pipeline after startup.

Standard air release valves are also incapable of removing of all the air in the pipeline at startup. Air can also enter the pipeline after startup via:

- Fertilizer injectors that continue to operate after all the fertilizer has been injected.
- Leaky pump suction fittings.
- Falling water level in wells.
- Air vortexing in reservoirs or canal at the pump suction.

Regardless of the source, air in pipelines causes both water hammer problems and flow blockage.

Selection of Air Valve

The selection of Air Valve is important to evaluate between the actual & published performance. Apart from questions of leakage and durability of air vents there are following questions that should be considered when determining the size of air valve:

- How much is the air flow ?
- What is the pressure of the flow?

If a standard valve closes before the specified discharge of air flow, then it should not be used.

Table 1 gives minimum requirement of air and corresponding pressure pertaining to irrigation systems.

	Valve type					
	Air Release		Vacuum Relief		Continuous Air Release	
	PSI	KPA	PSI	KPA	PSI	KPA
Pressure at rated flow	2	14	-1	-7	15	103

PVC Nominal Diameter		Air Release		Vacuum Relief		Continuous Air Release	
IN.	MM	CFM	LPS	CFM	LPS	CFM	LPS
1	25	5	2	2	1	.02	0
2	51	16	8	8	4	1	0
3	76	35	17	18	8	2	1
4	102	60	28	30	14	3	1
5	127	90	42	45	21	5	2
6	152	130	61	65	31	6	3
8	203	220	104	110	52	11	5
10	254	340	160	170	80	17	8
12	305	480	227	240	113	24	11
15	381	690	326	345	163	35	16
18	457	1030	486	515	243	51	24
21	533	1430	675	715	337	71	34
24	610	1800	850	900	425	90	43

Note: When an air release cum vacuum relief valve is installed at the peak of a hill, water has the potential of flowing downhill both ways upon system depressurization. In this situation the size of the air release cum vacuum relief valve should be twice the actual pipe line size to relieve the increased vacuum created.

Example of Air Valve Selection

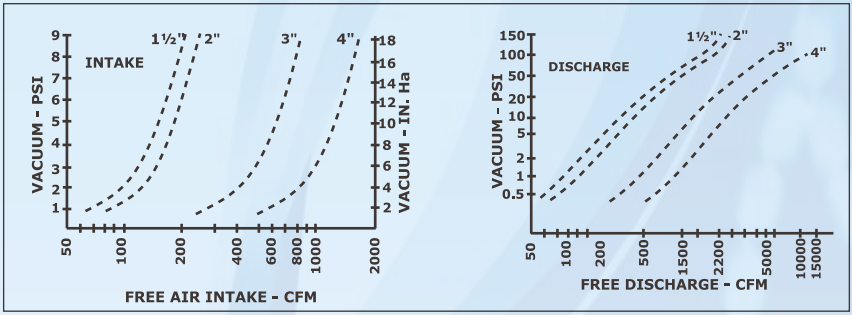
Using table 1 and HT -90 ARV characteristics graph (on page 7), determine whether the given air valve meet the minimum requirements.

Determine the air Flow and pressure on a 6" diameter PVC Pipe Line and a 2" HT-90 Air & Vacuum Relief Valve, using table 1.

Compare those numbers to the 2" HT-90 ARV Flow characteristics at the same pressure. If the air release valve performance is equal to or greater than the requirement, then the air release valve is safe to use.

	Requirements*		Valve Performance**	
Valve type	Air Flow (CFM)	Pressure (PSI)	Air Flow (CFM)	Pressure (PSI)
Air Release	130	2	200	2
Vacuum Relief	-60	-1	-80	-1

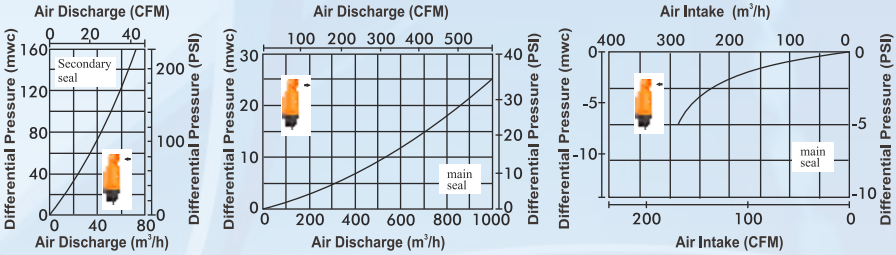
Performance Curve of Air Release cum Vacuum Relief Valves



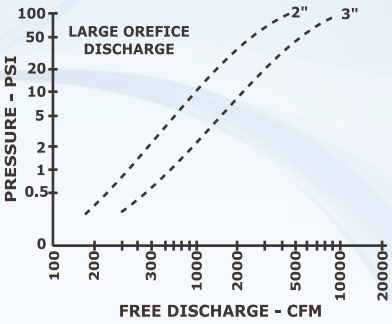
Vaccum Relief

Air Release

Performance Curve of Plastic Continuous Acting Air Release cum Vacuum Relief Valves



Performance Curve of Aluminum Continuous Acting Air Release cum Vacuum Relief Valves



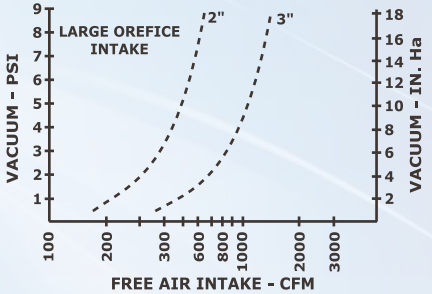


Table 2.Air Valves Location Points

Location	Valve type	
	Air Release/ Vacuum Relief	Continuous Air Release
Every 1320 feet (400m)	✓	✓
At all high points	✓	✓
Upstream of pump check valves	✓	
On filter backflush manifolds (at the downturn)	✓	
On filter inflow manifolds (at the downstream end		✓
At all points where a pipe begins to slope downhill	✓	✓
At the end of all mainlines	✓	
Downstream of any entrainment point		✓
Immediately downstream of the inlet valve to any pipe supplied by a canal or reservoir (If the pipeline slopes downhill)	✓	✓
Down stream of an on/off control valve	✓	
Upstream of an on/off control valve		✓

Continuous air release valves cannot remove air unless the air is at the top of the pipeline. This has important implications for irrigation system installation:

a. Elbows, valves and propeller meters will cause air to mix throughout the flow stream, so continuous air release valves located close to these points will be ineffective.

The air valves must be located far enough downstream so that the air has had an opportunity to reach the top of the pipeline.

See table 3 on page 9, minimum distances between points of turbulence and continuous Air release Valve.

b. The riser pipe which connects the Air Vent to the pipeline should have a large diameter base where connected to the pipeline. The larger the connection, the chance of an Air Bubble entering the riser may increase.

c. The riser pipe must be connected to the top of the pipeline. The picture 1on page 9 shows how to make the connection if the Airvent must be offset from the pipeline.

Picture 1. Proper connection using an offset riser

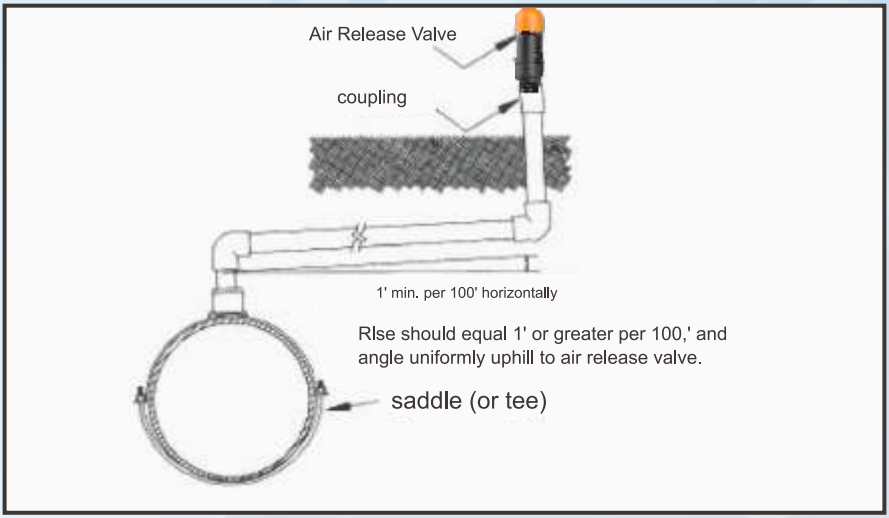
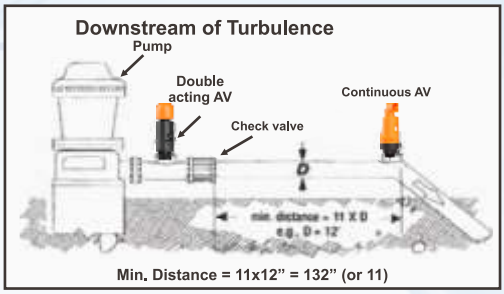


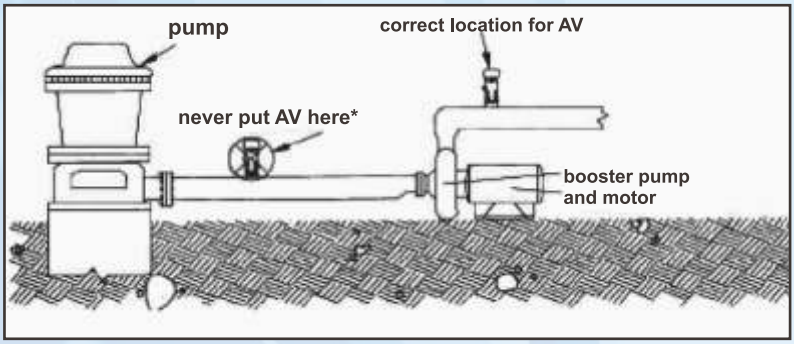
Table 3. Minimum Distance Downstream of Turbulence to Locate Continuous Acting Air Release Valve.

Pipe Diameter		Distance	
in.	mm	ft.	mm
1	25	1	0.3
2	51	2	0.6
3	76	3	0.9
4	102	4	1.2
5	127	5	1.5
6	152	6	1.7
8	203	7	2.3
10	254	9	2.8
12	305	11	3.3
15	381	13	4
18	457	16	4.9
21	533	19	5.7
24	610	21	6.4

Air Release Valve placement downstream of turbulence (See table 3)

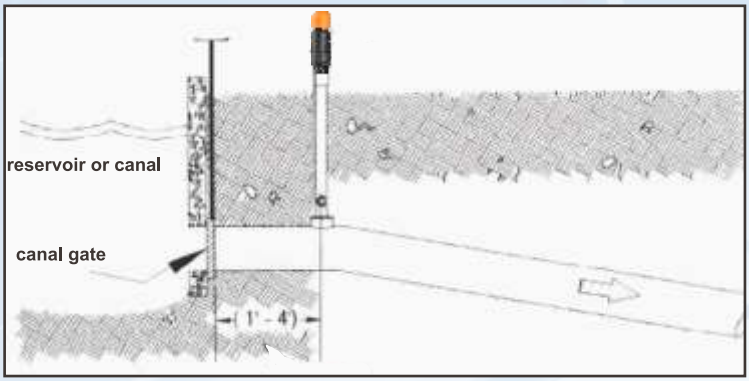


Air Release Valve placement for pumps in series



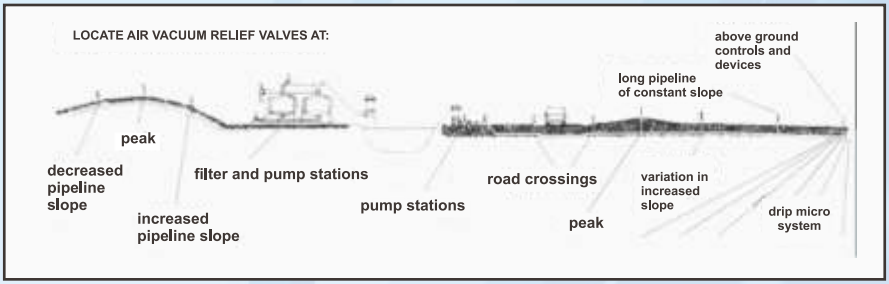
*Never place an air valve between two adjacent pumps in a series, unless the first (source) pump exerts a positive pressure on the second pump

Air release valve placement downstream of a reservoir or canal

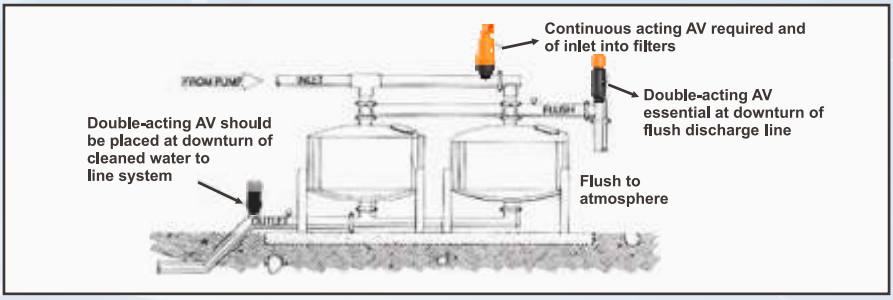


Double-Acting ARV is sufficient if placed above reservoir water level. If placed lower than water level, use a continuous-Acting ARV.

Cross section of air release valve placement



Proper placement of air release valves required on filter station



Plastic Air Release Cum Vacuum Relief Valve
¾" , 1", 2" & 3"

Specifications
• Durable, Weather Resistant and Non-corrosive. • Made of reinforced Polypropylene & Polyamide (Nylon) • Maximum working pressure : HT-88P - 100 psi HT-90P & 91P - 150 psi • Seals at 5 Psi • Available in : ¾" BSPT Male Thread Connection : HT-87 P 1" BSPT Male Thread Connection : HT-88 P 2" BSPT Male Thread Connection : HT-90 P 3" BSPT Female Thread Connection : HT-91 P

Continuous Acting Air Release Cum Vacuum Relief Valve
1" & 2"

Specifications
• Available in : 1" BSPT Thread Connection : HT-88 CP 2" BSPT Thread Connection : HT-90 CP • Manufactured Out of Durable, Weather Resistant and Non-corrosive reinforced Polyamide (Nylon) • Minimum sealing Pressure : 5 psi • Working Pressure : HT-88CP: 5-120 psi : HT-90CP: 5-224 psi • Threaded Elbow Outlet

Metal Air Release Cum Vacuum Relief Valve
¾", 1", 1½" , 2", 3" & 4"

Specifications

- Simple Design Ensures Trouble-free Performance
- Cast Aluminium Body Combines the Dual advantage of being Lightweight as well as Provides Corrosion resistance
- Synthetic Rubber Seal Assures Positive Rubber Seal Even with Low Head Applications
- Available in :

  ¾" BSPT Thread Connection : HT-87
  1" BSPT Thread Connection : HT-88
  1½" BSPT Thread Connection : HT-89
  2" BSPT Thread Connection : HT-90
  3" BSPT Thread Connection : HT-91
  4" BSPT Thread Connection : HT-92

Continuous Acting Air Release Cum Vacuum Relief Valve
2" & 3"

Specifications

- Cast Aluminium body combines light weight strength and corrosion resistance
- Available in :

  2" BSP Thread Connection HT-90C
  3" BSP Thread Connection HT-91C

Features

- Provides Continuous Air Release During System Operation
- Exhaust Large Volume of Trapped Air From Pipeline
- Promotes Full Line Capacity & Provides Vacuum Protection

Other Safety Equipments

Pressure Relief Valve 2"

HT-102CLM
(Male Threaded)

HT-102CLF
(Female Threaded)

Features	Technical Specifications
• Available in : 2" BSP Male threaded connection : HT-102CLM 2" BSP Female threaded connection : HT-102CLF • Aluminum Cover with 1½" BSP/NPT Female threaded drain port • Cover with orange color powder coating for easy visibility on unit and longer life.	• Pressure Relief Setting: 1.5 kg/cm² to 5.5 kg/cm² (20psi to 80psi) • Specify Pressure Setting: Factory set & sealed under actual hydraulic conditions. • Pressure Relief Valve comes with preset pressure from factory at 4 kg/cm² (60 psi) which can be changed in field as per requirement by using a Pressure Guage.

Application	Typical Installation
• To be installed on the header unit before the main throttle valve to protect the bursting of main & sub-main lines occurring due to development of excessive pressure / water surges	

NOTE

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