DERWENT
FLOW CONTROL

DAV-P SERIES
(PLASTIC AIR VALVES)
AIR RELEASE & VACUUM BREAK VALVES

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DAV-P SERIES
AIR RELEASE & VACUUM BREAK VALVES

GENERAL

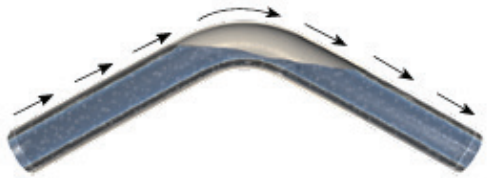
The presence of trapped air in a pressurised pipeline can have serious effects on system operation and efficiency.

As air pockets accumulate at high points, they reduce the effective cross-section of the pipeline in their location, decreasing the water flow, and increasing energy consumption required to pump the water through. Thus reducing the overall system efficiency. A pipeline with many air pockets may impose enough restriction to stop all flow ("airlocks").

The dislodge and movement of the air pockets may change suddenly the fluid velocity and cause pressure surges and pipeline ruptures.

Trapped air pockets may also accelerate corrosion in the pipe material, damage water metering devices and cause erratic, damage water metering devices and cause erratic operation of control valves.

On the other hand, when a system is being drained there is a necessity to admit atmospheric air into the pipeline in order to occupy the volume of drained water to prevent dangerous sub-atmospheric pressure in the pipeline that may bring to complete collapse of pipe-sections.



PIPELINE WITHOUT AIR RELEASE VALVES

Pressurised air my be trapped at local high points of pipeline.

- Increases head loss
- Decreases flow rate
- Increases energy consumption

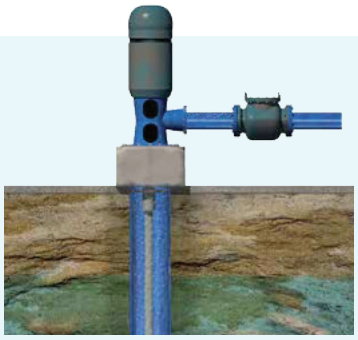
Water Draining Water Draining

PIPELINE WITHOUT KINETIC VACUUM VALVES

Sub atmosphere pressure is created due to pump shut-down or surges conditions.

- Contaminants may be sucked into the system
- Thin-walled pipes may collapse
- Vapor pockets can form

After each stoppage of deep-well (borehole) pump, the riser drains from water and should be filled with air. At start up, the water column in the pipe rises rapidly, and in the absence of an air-valve the pressurised air may be forced through the surface check valve into the main header. Additionally once the riser is full with water, the sudden increased resistance may cause pressure surges.



VERTICAL PUMP DISCHARGE WITHOUT AIR VALVE

The riser of a deep well pump is filled and drained with water when the pump is operated or stopped. Air must be admitted into and out of the riser.

- Surges in pipe column
- Entry of large volumes of air into the system
- Potential vacuum

PRIMARY SOURCES FOR AIR IN WATER-CHARGED PIPELINES

- Atmospheric air that was trapped within the pipe-system when the pipeline was filled with water. With absence of air discharge devices, this would normally accumulate at local elevated points in the system or vent through customer tapping points.

- Water at normal pressure and temperature can contain approximately 2% (by volume) of dissolved air. The water flow is subject to varying pressures and temperatures, due to the terrain slopes, variations in flow velocity caused by changing pipe diameters, partially-open valves, etc. and the dissolved air may be released from the water mass, accumulating as large pockets of air in the local peaks.

- Air may be drawn into the pipeline at start-up of deep-well pumps, by the pump suction-vortexes and through leaking joints at zones above the hydraulic gradients (negative-pressure points). Air can also be admitted into the system by air valves under sub-atmospheric pressure conditions.

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DAV-P SERIES
AIR RELEASE & VACUUM BREAK VALVES

THE TYPE AND FUNCTIONS OF AIR VALVES

KINETIC AIR/VACUUM VALVE

- Exhaust large quantities of air from the pipeline when it is filled with water, at low pipeline pressure ("kinetic" air release function)
- Admit large quantities of air into the pipe when it is drained, or when the internal pressure drops below atmospheric pressure due to transient conditions in transient conditions ("kinetic anti-vacuum function)

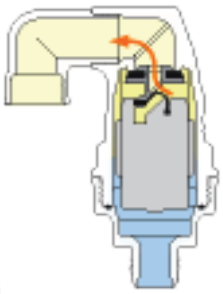
AUTOMATIC AIR RELEASE VALVES

- Release small pockets of accumulated air while the pipeline operates under pressure ("Automatic" air release function)

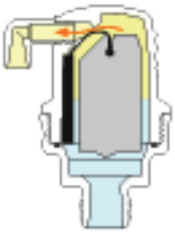
COMBINATION AIR VALVES

- A valve that perform the functions of both the "Kinetic" and "Automatic".

Kinetic
Air Valve



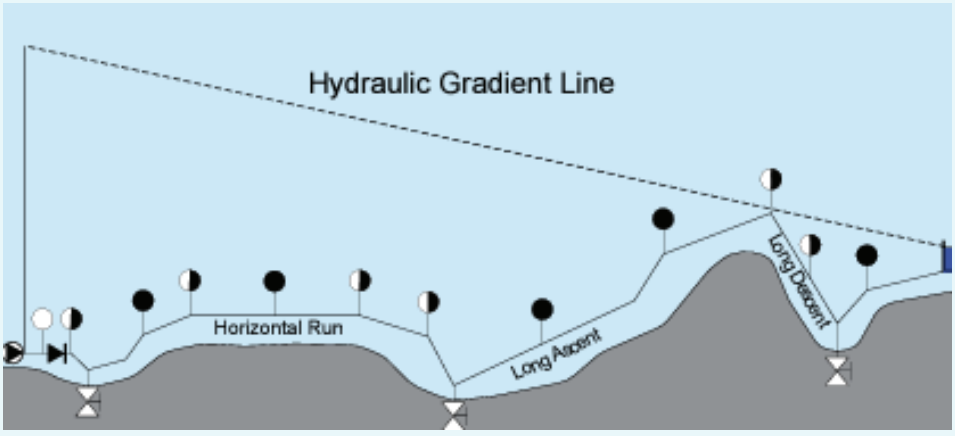
Combination
Air Valve

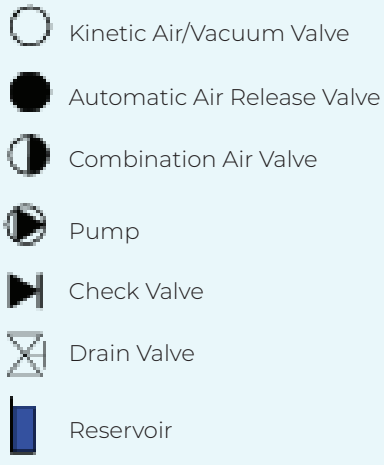


Automatic
Air Valve

AIR VALVE LOCATIONS ALONG A PIPELINE

1. High points (relative to hydraulic gradient line).
2. Increase in a downward slope.
3. On uniform, long pipe sections: horizontal run, long descents. Air valves should also be located at even spaces of few hundreds of meters (500 to 1000), as determined by collapse-potential of the pipeline under negative pressure.
4. When the flow velocity is very low, air pockets may accumulate in each local peak, even in small ones, and in steep downhill slopes. It is recommended to eliminate these restrictions by installing air release valves.
5. On the discharge side of deep-well pumps and vertical turbine pumps.
6. Both sides of canal and bridge crossings.
7. Both sides of check valves, isolating valves and any device that may accumulate on one side while vacuum may be created on the other side.
8. Downstream of a pressure reducing device
9. At any point where the air may accumulate due to local pressure change.
10. At any point where sub-atmospheric conditions may occur during normal or transient conditions.





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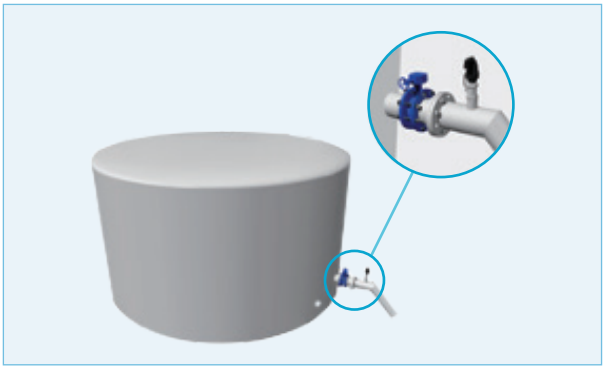
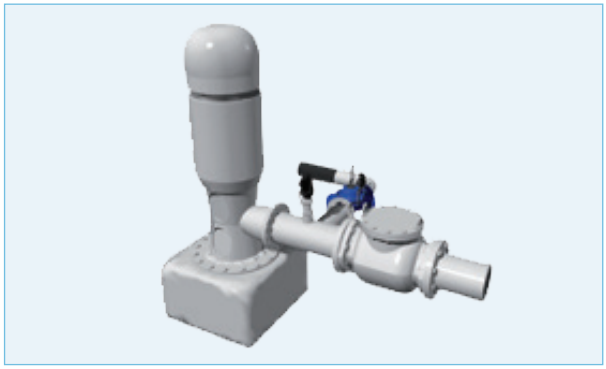
DAV-P SERIES
AIR RELEASE & VACUUM BREAK VALVES

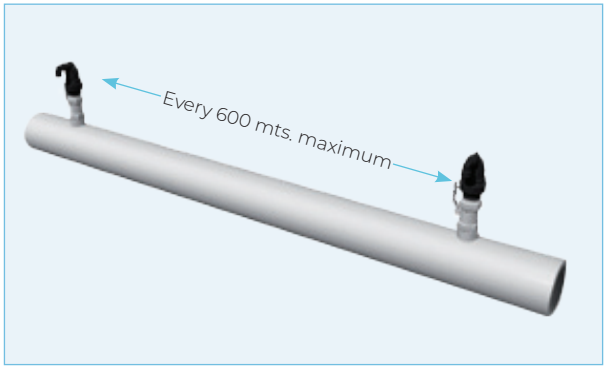


Outlet of reservoir, downstream of the check valve.

Discharge side of pumps, subsequent to a non return valve.



Discharge side of vertical turbine pumps, subsequent to a non return valve.

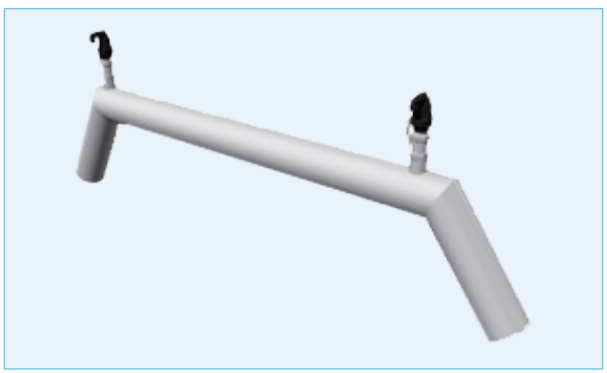


On uniform, long pipe sections: horizontal run, long descents, and long ascents

Negative Breaks: Increase a downward slope.

Downstream of a pressure reducing device.

Both sides of check valves, isolating valves or any device that may be closed.



Both sides of canal and bridge crossing.

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DAV-P SERIES
AIR RELEASE & VACUUM BREAK VALVES

SIZING PRINCIPLES

The volumetric air flow through the air valve is equal to the flow rate of the water filling or emptying the system:

For each volume of water entering the pipeline, the same volume of air must be expelled and similarly, for each volume of water drained from the system, the same volume of air should be admitted into the line.

Note: Air is a compressible media, so its density and volume vary with the pressure. The term "volumetric flow" noted above, refers to the volume of air inside the pipeline. It is smaller than the 'standard' (atmospheric pressure) air flow when the system is being charged with water, and larger than the 'standard' flow when the system is drained. The tables and charts presented in this catalogue present the standard air flow under atmospheric pressure.

The air flow velocity in the valve depends on three factors:

a. Rate of water flow, at the valve site
b. Orifice Diameter of the valve
c. Geometry of the specific valve
d. Pressure differential between the pipe and the atmosphere

The air flow-velocity through the valve can reach very high values, due to its low density. It is limited only when the velocity reaches the sonic speed, which is practically impossible for the 'kinetic' valve type, but is the normal situation in the case of the 'Automatic' valve type.

When the system's internal pressure reaches 0.89 barg, the volumetric air-flow through the orifice becomes constant (critical, sonic velocity). Increase of the pressure will not result in the increased volumetric-flow, through standard air-flow will continue to increase.

As a rule of thumb, the initial design value for air valves should allow maximal ΔH of 0.1 barg across the valve. i.e pipeline pressure which does not exceed 0.1 bar gauge-pressure while the pipe is filled, or -0.2 barg when it is drained.

However, each system must be inspected to its specific conditions, which the main once is the risk of collapse under sub-atmospheric pressures.

Too small orifice results in high air velocity that may cause:
1. Premature closure, before the water reaches the valve.
2. A mechanical slam of the float to its seating area when the water has reached the valve, local water-hammer and possible breakage of the valve.
3. Too-small air valve may cause too low sub-atmospheric pressure, which in turn may cause ingress of contaminants into the system and even pipe-collapse.

ORDERING CHART

MODEL	SIZE	MATERIALS		CONNECTION	FUNCTION	
DAV	-12	-P	Standard (Plastic Body & Cover)	-BSP	- A	Automatic
	-20	-BP	Brass Base & Plastic Cover	-NPT	- K	Kinetic
	-25	-MP	Brass Base & C.I. Cover*		- KA	Combination
	-50					

EXAMPLE	DAV, 12mm, Standard with BSP connection and Automatic function
	DAV-12-P-BSP-A

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DAV-P-A SERIES
AUTOMATIC AIR VALVES

DAV-P-A

The valve is designed for an efficient release of entrapped air from the pipeline, while the network is at normal working pressure. Due to the relatively large orifice, compared to other automatic valves in the market, it can also release the air through initial filling of a small diameter pipe, or admit air into it while it is drained.

PROPERTIES

An automatic air valve, that enables the release of dissolved air that accumulate in the pipeline. The valve will release the air at normal operation pressures of the pipeline.

The float is made of naturally-buoyant material (specific weight lower than 1).

The float activates a sealing stripe, that closes the outlet when the water will fill the valve body.

On accumulation of air in the valve, loss of buoyancy causes the float to drop and to pull the strip, thus opening of the air outlet.

The hydraulic sealing of the orifice will provide a drip-tight closure at a pressure of 2mwc (3psi).

OPERATION

Releasing entrained air from the pipeline. Small quantities of diluted air accumulate in high peaks of pipeline and in the peak of the valve.

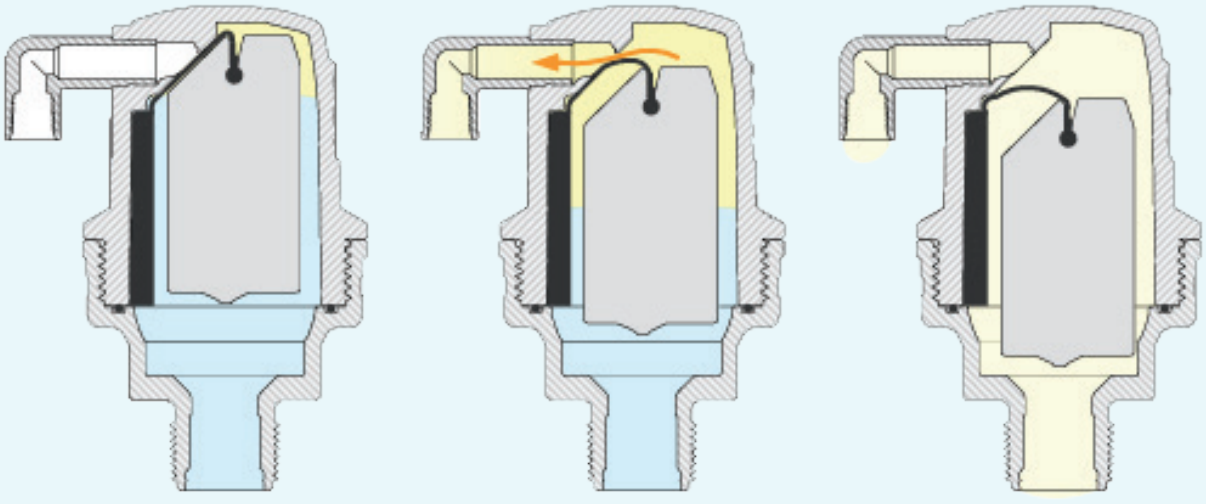
The pressurised air expels the water, the descending water level moves the main float with it. At a certain position the main float pulls down the small seal, that partially opens the nozzle.

The pressurised air can escape, the level rises and the nozzle re-closes

TECHNICAL SPECIFICATIONS

- Operating pressure 0.2 to 16 bars / 3 to 240 psi
- Maximum water temperature for continuous operation: 60ºC
- Maximum water temperature for intermittent operation: 80ºC
- 1/2", 3/4", 1" BSP or NPT threaded base - as per the customers choice
- Structure materials: Cover: GRP (UV resistant), Base: GRP or Brass
- Internal parts: corrosion resistant, reinforced plastic materials and synthetic rubber
- The valve allows the discharge of 28m $^{3}/_{h}$ / 17 CFM of air at pipe pressure of 1.0 bar / 15 psi, when fully-open

PRINCIPLES OF OPERATION



Pipe is full of water.

Dissolved air is accumulated in the valve, released when the float drops down.

Pipe is aerated.

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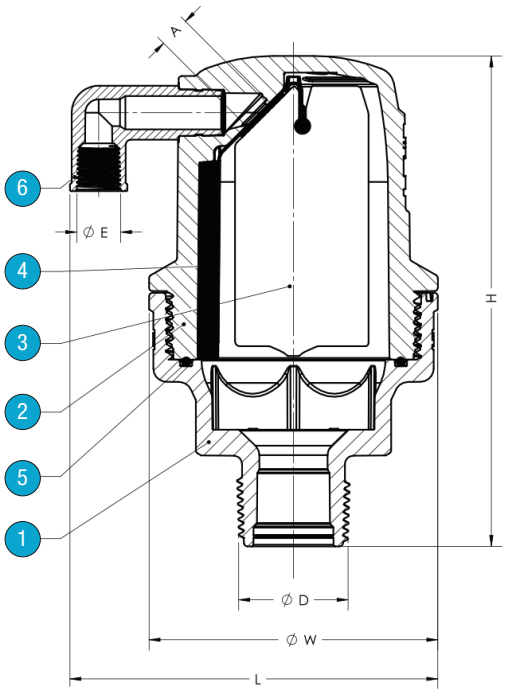
DAV-P-A SERIES
AUTOMATIC AIR VALVES

MATERIAL SPECIFICATIONS & PARTS LIST

NO.	DESCRIPTION	MATERIAL
1	Base	Glass Reinforced Nylon Optional : Brass
2	Cover	Glass Reinforced Nylon
3	Float	Foamed Polypropylene
4	Seal	Silicon
5	O Ring	NBR
6	Drainage Elbow	Polypropylene

DIMENSIONAL DRAWING

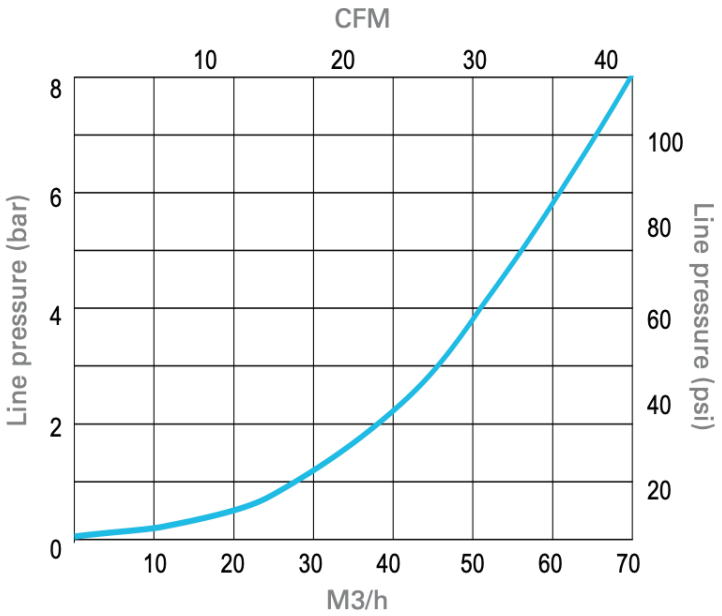


DIMENSIONS (MM)

DN	H	W	D	A	L	E	WEIGHT
12	147	86	1/2" BSP	12.85mm²	110	1/4" BSP	0.40
20	147	86	3/4" BSP	12.85mm²	110	1/4" BSP	0.40
25	147	86	1" BSP	12.85mm²	110	1/4" BSP	0.40

PERFORMANCE

☐ Discharge data (free air flow)



DAV-P-K SERIES
KINETIC VALVES

DAV-P-K

The valve is designed for efficient discharge and intake of air in water transport systems, filtering systems, containers, and other places where confined air could impair the system's operation.

The valve is appropriate for:

- Expelling the air at high flow velocity during the initial filling of the system.
- Introducing large quantities of air when the pipe drains, maintaining atmospheric pressures in the pipe and preventing collapse and cavitation damage to the conduits.

PROPERTIES

Leak proof sealing at all conditions, including low system pressure. The aerodynamic design of the float provides air flow at a very high velocity. The float does not close before the water has reached the valve. Threaded outlet elbow allows various possibilities of drain connection. The valve design contains a very limited number of parts, allowing easy dismantling for maintenance.

OPERATION

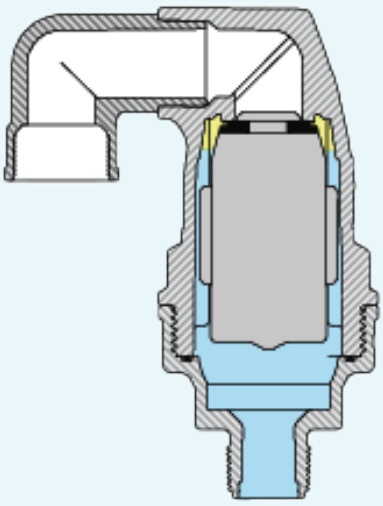
The DAV-P-K valve has two models of operation:

Discharge of large quantities of air at a high flow velocity when the conduit is being filled. When the water arrives to the valve, the float rises up and closes the outlet. Introduction of air into the pipeline when the internal pressure is sub-atmospheric. The pressure difference forces the float to drop to "opened" position, allowing large volumes of air to flow into the pipe.

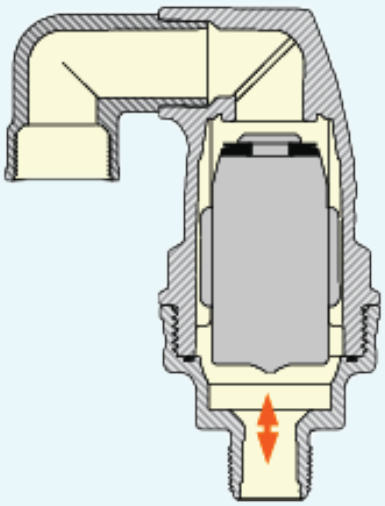
TECHNICAL SPECIFICATIONS

- Operating pressure 0.2 to 16 bars / 3 to 240 psi
- Maximum water temperature for continuous operation: 60ºC
- Maximum water temperature for intermittent operation: 80ºC
- 1/2", 3/4", 1" BSP or NPT threaded base - as per the customers choice
- Structure materials: Cover: GRP (UV resistant), Base: GRP or Brass
- Internal parts: corrosion resistant, reinforced plastic materials and synthetic rubber
- At pipe pressure of 0.5 bar / 7 psi:
  - The 50mm valve allows the discharge of 700m³/h / 410 CFM of air
  - the 25mm valve allows the discharge of 100m³/h / 60 CFM of air

PRINCIPLES OF OPERATION



Pipe is full of water.



Pipe is aerated.

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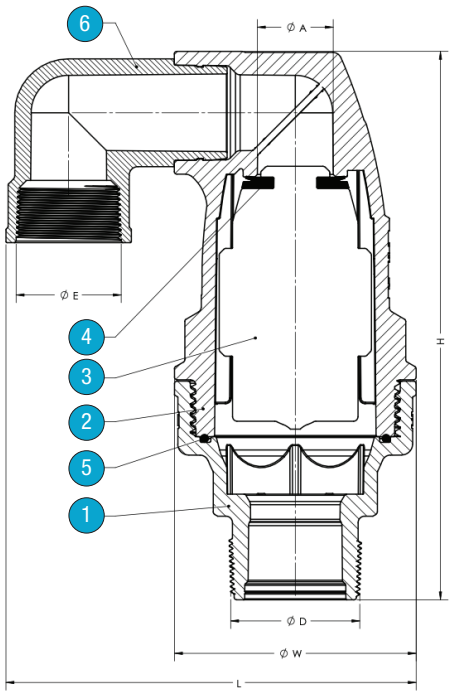
DAV-P-K SERIES
KINETIC VALVES

MATERIAL SPECIFICATIONS & PARTS LIST

NO.	DESCRIPTION	MATERIAL
1	Base	Glass Reinforced Nylon Optional : Brass
2	Bonnet	Glass Reinforced Nylon
3	Float	Foamed Polypropylene
4	Kinetic Seal	EPDM Rubber
5	O Ring	NBR
6	Drainage Elbow	Polypropylene

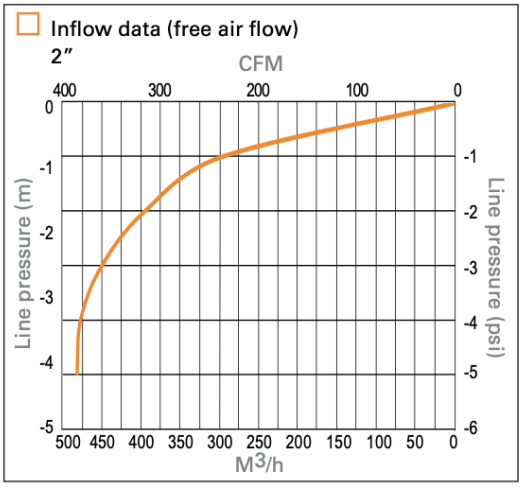
DIMENSIONAL DRAWING

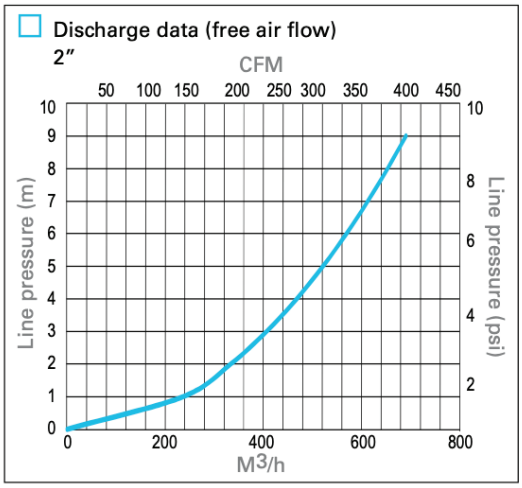


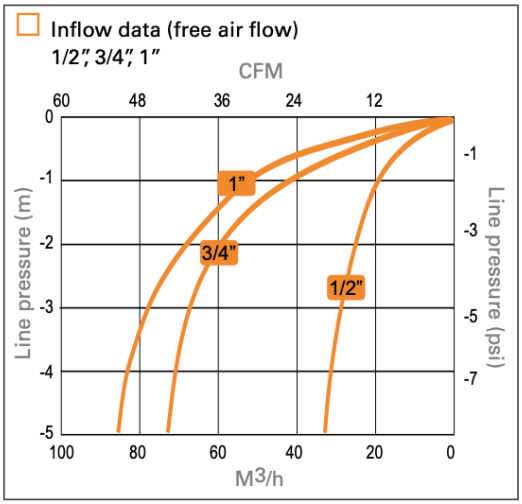
DIMENSIONS (MM)

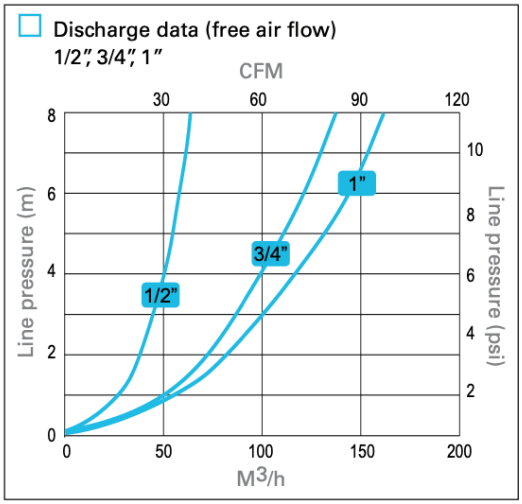
DN	H	W	D	A	L	E	WEIGHT
12	183	86	1/2" BSP	314mm²	134	3/4" BSP	0.47
20	183	86	3/4" BSP	314mm²	134	3/4" BSP	0.47
25	183	86	1" BSP	314mm²	134	3/4" BSP	0.47
50	249	110	2" BSP	908mm²	187	1 1/2" BSP	1.52

PERFORMANCE









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DAV-P-KA SERIES
COMBINATION AIR VALVES

DAV-P-KA

The valve has been designed for an efficient discharge and intake of air in water transport systems, filtering systems, containers, and other places where confined air could impair the system's operation.

The valve is appropriate for:

- Expelling the air at high flow velocity during the initial filling of the system.
- Introducing large quantities of air when the pipe drains, maintaining atmospheric pressures in the pipe and preventing collapse and cavitation damage to the conduits.
- Relieving the entrained air from the water, while the network is pressurised.

PROPERTIES

Leak proof sealing at all conditions, including low system pressure. The aerodynamic design of the float provides air flow at a very high velocity. The float does not close before the water has reached the valve. Threaded outlet elbow allows various possibilities of drain connection. The valve design contains a very limited number of parts, allowing an easy dismantling for maintenance.

OPERATION

The DAV-P-KA valve has three models of operation:

Discharge of large quantities of air at a high flow velocity when the conduit is being filled. When the water arrives to the valve, the main float rises up and closes the outlet. Introduction of air into the pipeline when the internal pressure is sub-atmospheric. The pressure difference forces the main float to drop to "opened" position, allowing the air to flow into the pipe. Releasing entrained air from the pipeline. Small quantities of diluted air accumulate in high peaks of the pipeline and in the peak of the valve. The pressurised air expels the water. The descending water level moves the main float with it. At a certain position the main float pull down the small seal, that partially opens the nozzel. The pressurised air can escape, the water level rises and the nozzle re-closes.

TECHNICAL SPECIFICATIONS

- Operating pressure 0.2 to 16 bars / 3 to 240 psi
- Maximum water temperature for continuous operation: 60ºC
- Maximum water temperature for intermittent operation: 80ºC
- 1/2", 3/4", 1" BSP or NPT threaded base - as per the customers choice
- Structure materials: Cover: GRP (UV resistant), Base: GRP or Brass
- Internal parts: corrosion resistant, reinforced plastic materials and synthetic rubber
- At pipe pressure of 0.5 bar / 7 psi:
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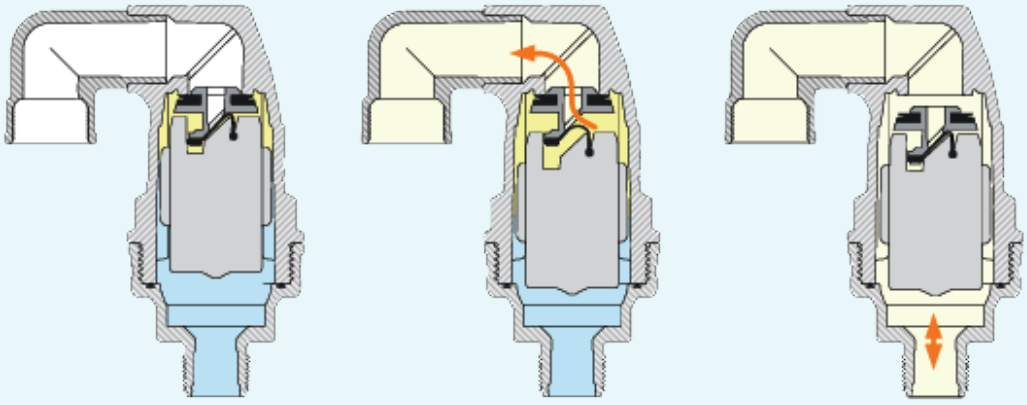
PRINCIPLES OF OPERATION



Pipe is full of water.

Dissolved air is accumulated in the valve, released when the float drops down.

Pipe is aerated.

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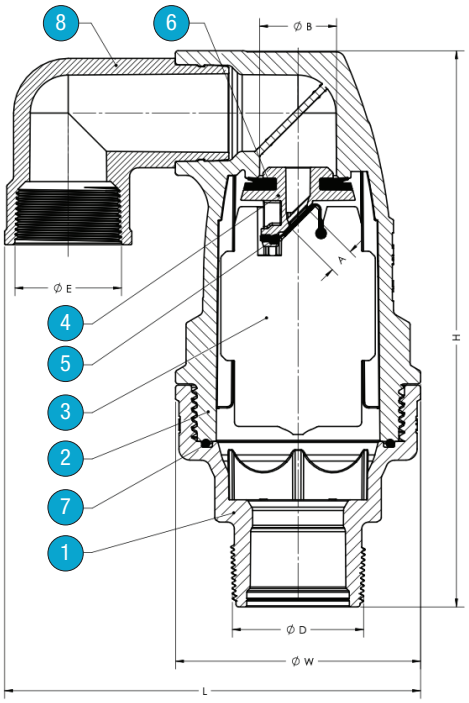
DAV-P-KA SERIES
COMBINATION AIR VALVES

MATERIAL SPECIFICATIONS & PARTS LIST

NO.	DESCRIPTION	MATERIAL
1	Base	Glass Reinforced Nylon Optional : Brass
2	Bonnet	Glass Reinforced Nylon
3	Float	Foamed Polypropylene
4	Slider	Glass Reinforced Nylon
5	Automatic Seal	Silicon
6	Kinetic Seal	EPDM Rubber
7	O Ring	NBR
8	Drainage Elbow	Polypropylene

DIMENSIONAL DRAWING



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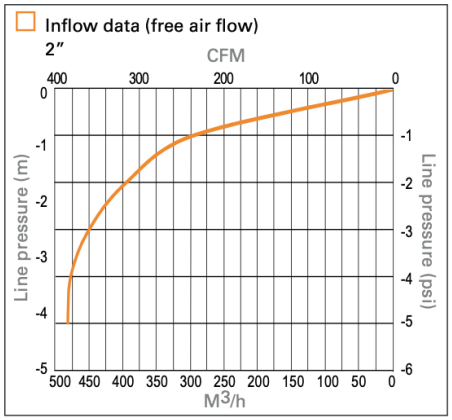
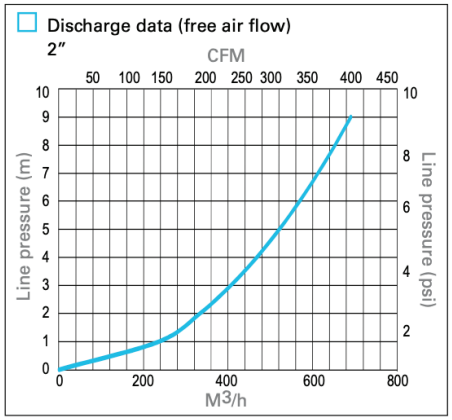
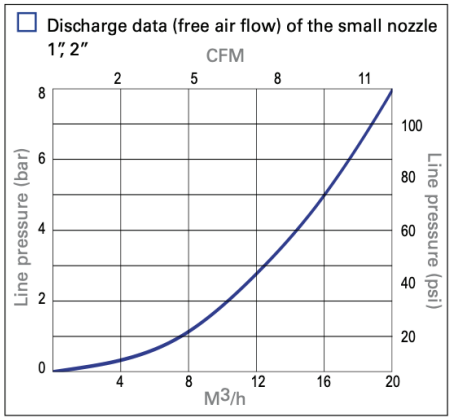
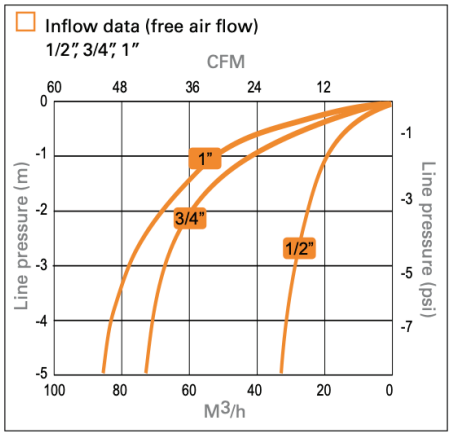
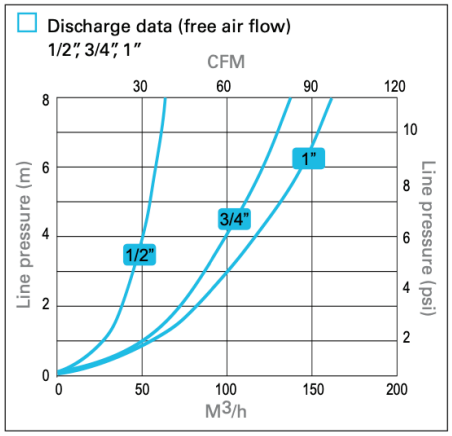
PERFORMANCE











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