Air release valves for potable water, raw water and municipal sewage water

Technical information for planners and operators

06/2023

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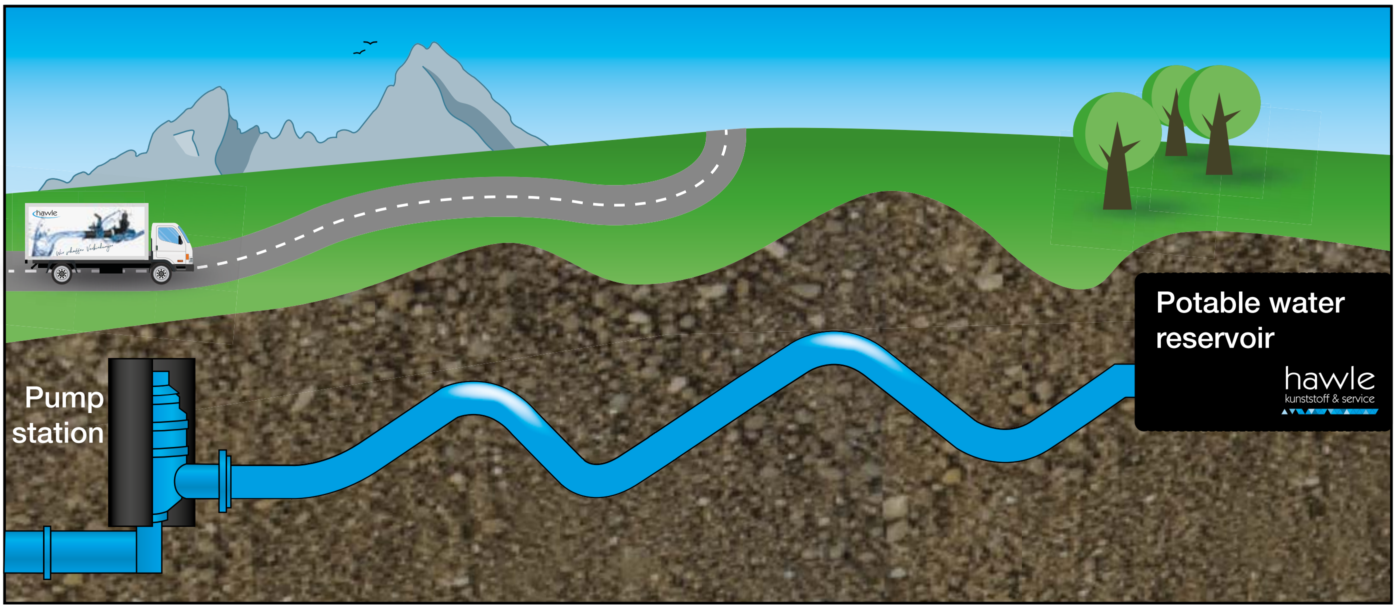
Why is air intake and air release necessary?

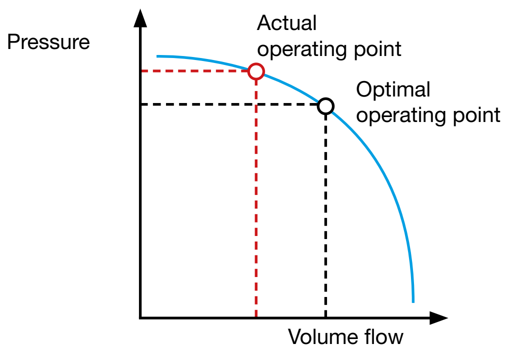
Air in the pipe system may cause numerous problems. This problem is particularly prevalent in pipelines with very low flow speeds and low pressures, as the air bubbles in the medium cannot be discharged by themselves.



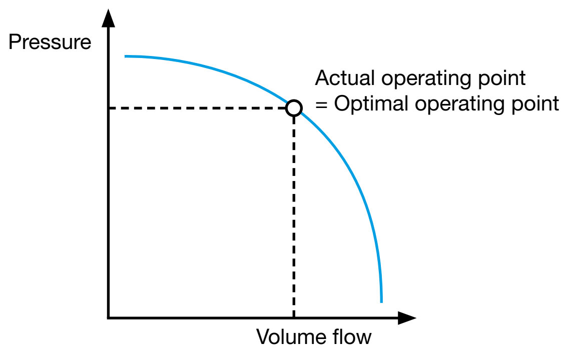
Adverse effects of air in the pipe system

- Reduction of the pumping capacity of pumps due to increased pressure loss resulting from a reduced flow cross-section
- Vibrations and heavy pressure surges due to changes in media and density at hydraulic jumps
- Turbidity due to finely distributed air in the water – "milky coloration" leads to errors or inaccuracies when measuring turbidity and volume flow measurements
- Functional errors in control valves regulated by system media – air in control circuit disrupts the control behavior
- Corrosion hazard to moist pipe surfaces not in contact with water due to compressed air
- Tendency of germs to form on moist pipe surfaces not in contact with water (no wetting with disinfectant)

Particularly in the case of pipes with pressure boosting systems, the presence of air can lead to a considerable reduction in the flow rate, as the operating point of the pump shifts as a result of the change in the system characteristics and thus the pump efficiency decreases. This can be seen from the following comparison of the sketches "Pipe system without ARV" and "Pipe system with ARV".

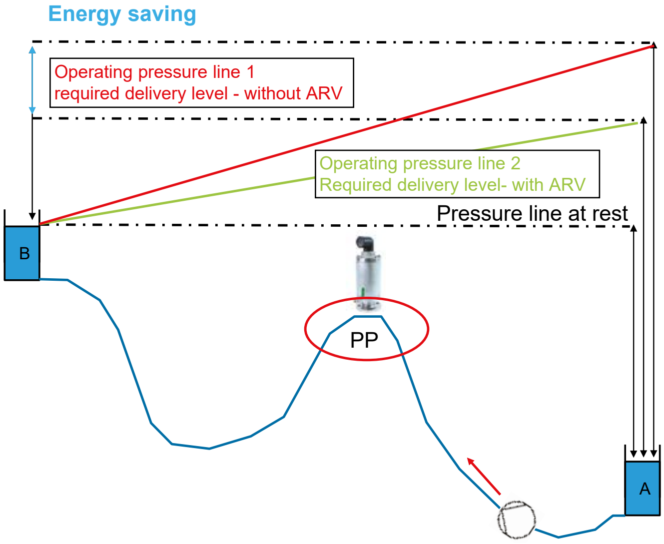


Pipe system without air release valves (pump operation)



Pipe system with ARV (pump operation)

Note:
The necessary delivery head of the pump increases due to air pockets in the piping system in order to compensate for the pressure loss at the throttle point. Due to the higher energy consumption, the ongoing operating costs increase. If the maximum flow rate of the pump has already been reached, the volume flow decreases. In an economic comparison, the additional costs of energy are usually significantly higher than the investment in necessary air release valves. Targeted ventilation ensures that the volume flow calculated on the basis of the system characteristic curve is achieved and maintained. Running costs are reduced and overall efficiency is maintained.

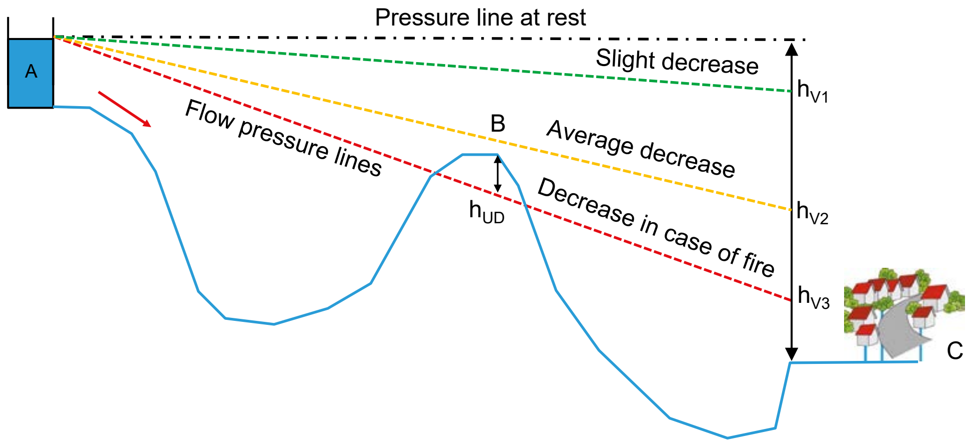


Formation of negative pressure in the pipeline

Another function of air release valves is the ventilation of pipelines to avoid negative pressures and the formation of vapor bubbles. A drop in the water column must be counteracted with vacuum-breaking technical aids. This is achieved by inflowing ambient air into the pipeline to a sufficient extent. To this end, it is crucial that the valves are correctly dimensioned. It is important to note that air always enters during air intake and must be released again afterwards. Pipe sections should therefore only be ventilated at absolutely necessary points.

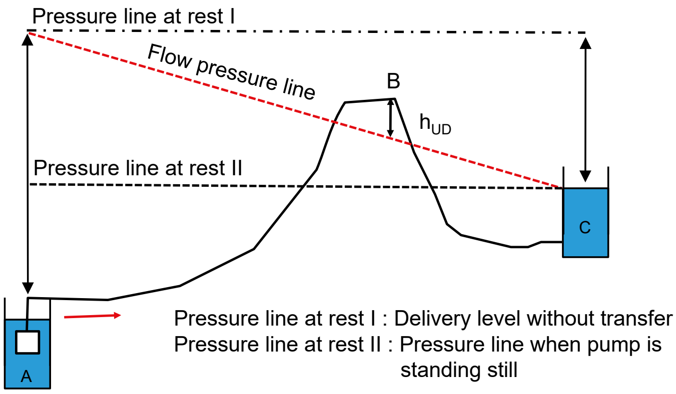
Below are two examples of the occurrence of negative pressures in pipeline systems. The first example shows a municipal utility (C), which is supplied via an elevated tank (A). As the consumption increases, the pressure loss in the piping system increases. In the course of the individual flow pressure lines, it is evident that negative pressures h_{UD} can occur at high volume flows, depending on the terrain profile and the installation of pipes – see (B) in the event of a fire. Geodetic and hydraulic peak points are particularly at risk. To the extent that this situation may affect the grid, provision should be made for the installation of a vacuum-breaking air release valve at peak point (B). If the pressure gradient is fully utilized, e.g., a burst pipe at the low point, the negative pressure h_{UD} becomes even greater and can cause a drop in the water column.

Example 1

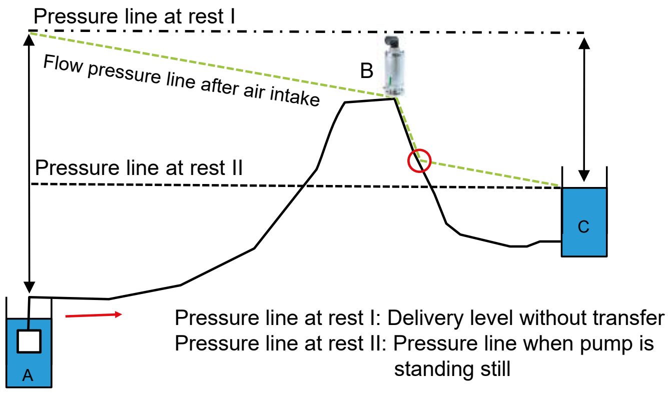


Example 2

The second example illustrates the formation of negative pressure in a different application case. It shows the pumping of water from a manhole (A) to an elevated tank (C). Due to an unfavorable terrain profile, the water has to be pumped over a steep hill. Here, too, it can be seen that with increasing flow velocity, the risk of the formation of negative pressure h_{UD} in (B) increases considerably. In this case, the flow pressure curve can fluctuate between zero decrease = static pressure line I and full utilization of the pressure gap = demonstrated flow pressure line.



When an air intake occurs at the peak point (B) by means of an air release valve, the vacuum breaks; see illustration on the right. In the steep course of the flow pressure curve between the peak point (B) and the elevated tank (C), a gravity line with an air-water mixture flow is now formed. The proportion of entrained air is smaller than the amount of water to be discharged. Consequently, the dimensioning of the air intake should correspond to the max. pump flow rate. In the section after the red circle, the line is completely filled again and the pressure is evenly reduced again as it progresses.



Caution:
The permissible negative pressure depends on the system or network. The maximum permissible limit values must be agreed with the specialist planner or operator.

Possible consequences of negative pressure in the pipeline

- Damage to pipelines, gaskets and operational facilities
- Incrustations on pipe walls coming loose
- Drop in the water column
- Formation of vapor bubbles
- Aspiration of foreign particles through hairline cracks, leaks or flooded shafts with the related risk of the **formation of germs**

Hygiene

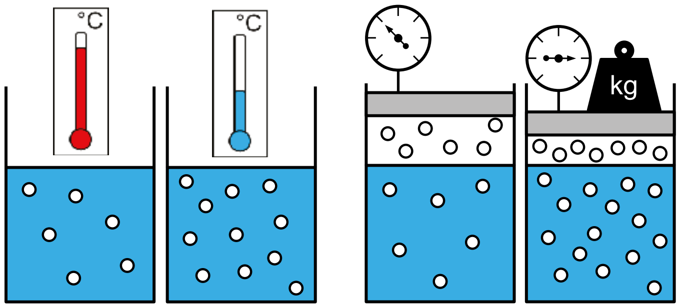
Abnormalities in water quality often originate in stagnation zones or in areas of the supply network that are not sufficiently flushed, e.g., tap lines to air release valves. In this case, the pipe must be flushed at regular intervals, unless the pipe is fitted with integrated house connections.
In general, air release valves should always be placed directly on the line. Tap lines must be avoided.

Causes of air retention

Physical causes

The proportion of air dissolved in the water is about 2 % at a temperature of 25 °C and an ambient pressure of approx. 1 bar. The dissolved air is a homogeneous mixture of different atmospheric gases, which can be released from the water by changing pressure and temperature conditions.

In this case, the following applies:
The higher the temperature or the lower the pressure, the stronger the excretion of dissolved gas from the water. The temperature fluctuation in underground pipelines is relatively low. The focus is therefore on gas separation as a result of different pressure zones, which increases proportionally with decreasing pressure. In practice, this occurs, e.g., after pressure reducing valves or in the event of cross-sectional changes.



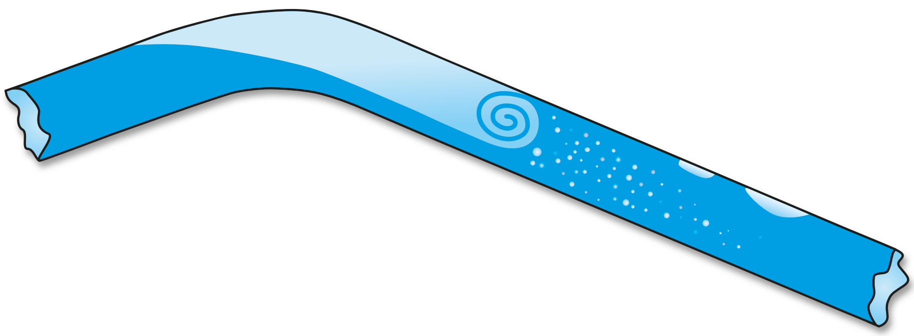
Chemical causes

In sewage systems, gas formation can occur more frequently due to biological activity (bacterial metabolism).

Air intake during operation

In addition to the physical and chemical reasons mentioned above, continuous air intake usually occurs during operation. These include without limitation:

- Entrainment of air in the inlet of containers and open sources (collecting shafts)
- Aspiration of air when a vortex forms at the inlet opening
- Free outlet and ventilated pressure gradient pipes
- Generation of turbulences at pump impellers
- Biological reactions (oxidation, metabolism)
- Air intake at damaged joints and fittings due to the formation of negative pressure
- Emptying of collection containers



Pressure surge problems

Considering the cause of damage, it can be stated that some of the pipe bursts occur due to incorrectly dimensioned air release valves during the filling of pipelines. The reason for this is excessively high flow velocities as a result of an uncontrolled air outlet from the air release valve. The quick closing of an air release valve generates a considerable pressure surge, which results from the difference in media density, the different compressibility of air and water and the kinetic energy of the water column.

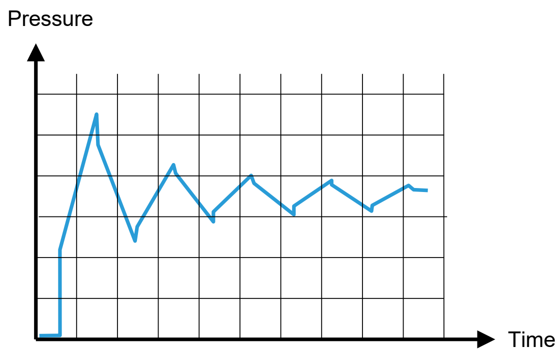
To reduce the risk of pressure surges, the German Association for Gas and Water (DVGW) recommends a maximum filling speed of c = 0.25 m/s (DVGW Memorandum W 334). When sufficiently dimensioned, venting is almost pressure-free. The recommended working range up to a maximum of 0.3 bar (relative pressure) must be observed during filling.

Causes of pressure surges

- Rapid shutdown of pumps in the event of a malfunction, e.g., power failure
- Rapid shutdown of fittings with simultaneous extraction of water
- Malfunction of control valves

Calculation of pressure surges

A pressure surge results from a sudden, sharp change in the flow speed, although it is propagated at the speed of sound of the medium. It extends in waves and flattens out over time as a result of friction in the network. The decisive factor for the speed of sound is the technical boundary parameters of the liquid and the piping material.



In particular, it is important to observe pipe sections which, in the event of a negative pressure surge, tend to fall below the vapor pressure. In the event of a short-term separation of the water column into two separate units, a significant short-term increase in pressure can be expected, which will affect the entire system.

A detailed dynamic pressure analysis performed by a specialist planner indicates the points from which a special hazard emanate.

The expected pressure surge can be approximated using the following formula:

Rule-of-thumb for calculating pressure surges

Max. pressure surge [bar] ≈ 10 x v_{pipe} [m/s]

Installation sites and correct positioning of air release valves

The size and shape of an air accumulation at the peak point is significantly influenced by three factors: the fluid properties, the pipe dimension and the pipe inclination. Three forces are acting on the air bubble itself: buoyancy force, hydrodynamic flow and pipe friction force. In the case of downhill pipe sections, the resulting force can act against the direction of flow, so that the air bubbles move upstream, or they are fixed by a state of equilibrium. The accumulation of air is prolonged as a result of the flow, which can form tube-like air sacs that expand over very long distances. As a result, further pressure losses occur due to the resulting narrowing of the cross-section.

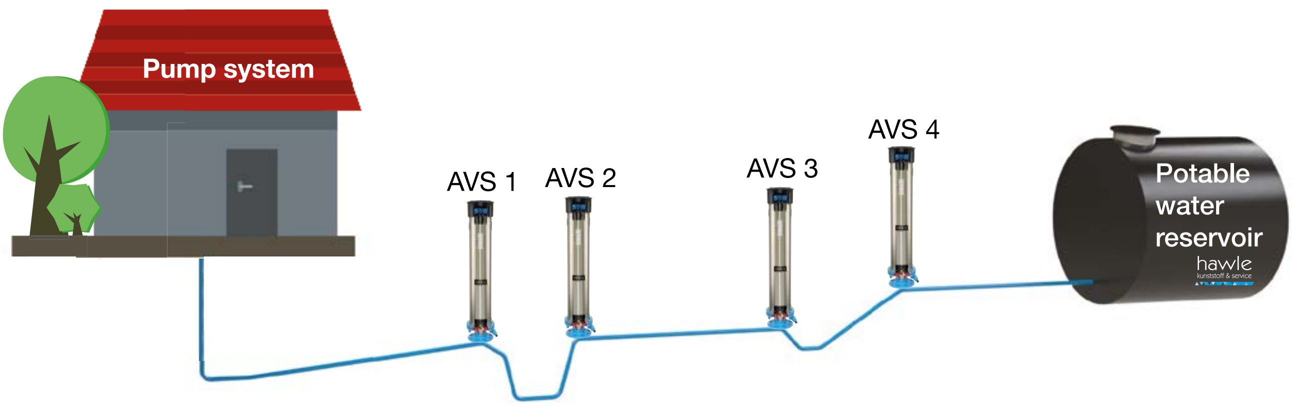
Depending on the size of the air bubbles, turbulences detach small sections and carry them along in the direction of flow. High flow velocities favor the effect of self-ventilation. Insufficient air discharge occurs especially at low flowrates, e.g., during night hours. If the basic requirements for self-venting pipelines are satisfied, measures for venting long-distance, feeder and main pipes through valves are not required. In this case, it is sufficient if the required flowrate within the pipe is achieved at least once a day. The relevant variables influencing the level of the self-venting speed v_s are the inner diameter d_i of the pipeline and the inclination of the pipeline in the respective network section.

Caution: High flow velocities will lead to considerable losses through pipe friction. As a consequence, these can lead to uneconomical grid operation, especially if they are provided by additional pump capacity.

Use of ventilation valves

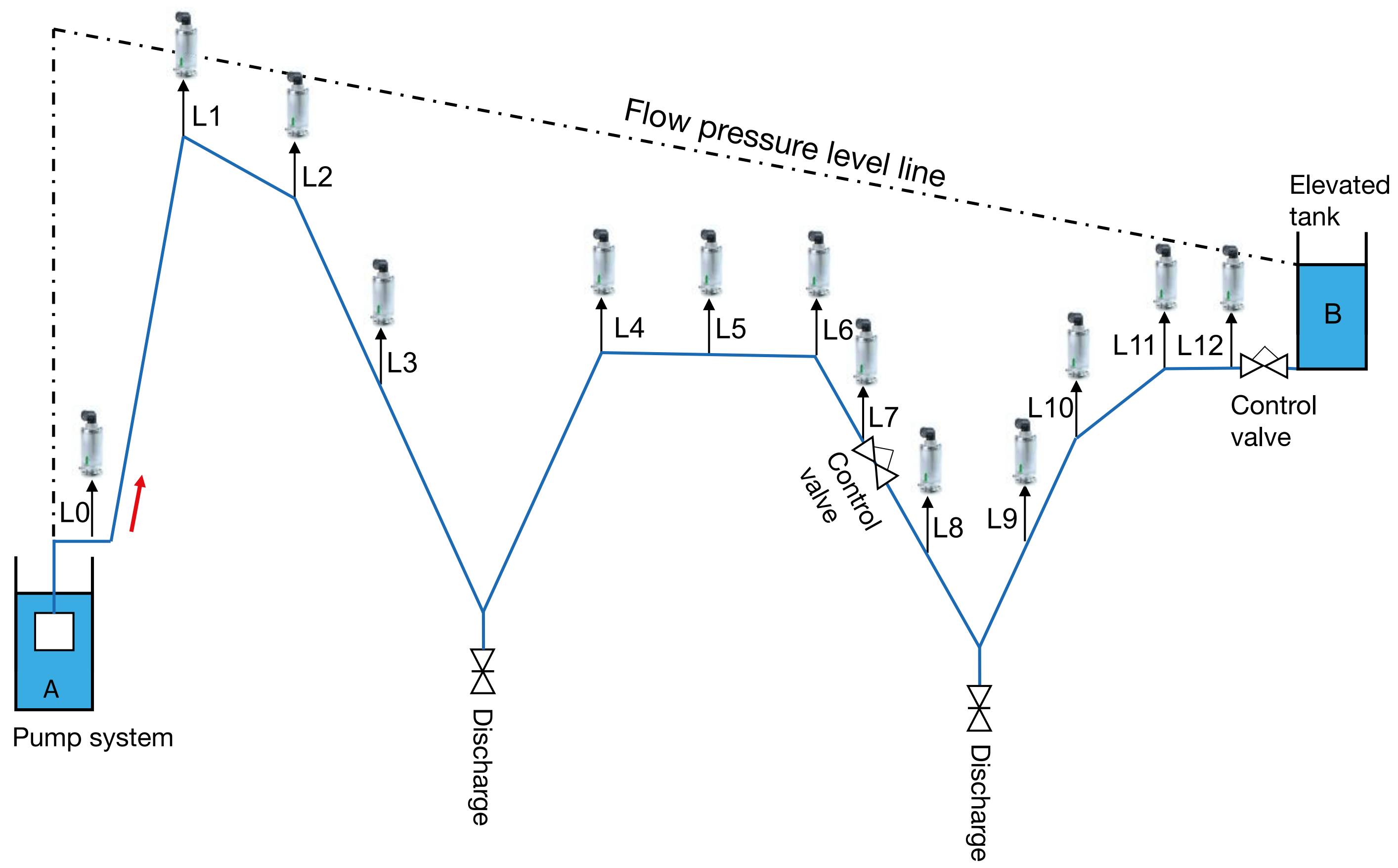
The first step is to look at the pipeline route in order to identify critical points in it. These include peak points, changes in pipe inclination in downhill sections, long slightly downhill or horizontal pipe runs.

Combined air intake and release valves: suitable for both for start-up air release, as well as for in-service ventilation and for air intake, e.g. the HaVent® air valve. The HaVent® air valve also has an integrated vacuum-breaking air-intake function.



Schematic overview of installation sites

- at each geodetic peak point (L1, L4): combined air valve
- at each hydraulic peak point
  - gradient change in downhill line sections (L2, L6): combined air valve
  - gradient change in uphill line sections (L10, L11): combined air valve, vacuum-breaking function essential
- on long pipe runs (800 m - 1,000 m)
  - uphill line sections (L9): combined air valve, vacuum-breaking function essential
  - downhill line sections (L3): combined air valve
  - horizontal line sections (L5): to be avoided, if possible; if an air release valve is required, “air release only” or a combined air valve
- for control valves:
  - in front of control valves regulated by system media (L7, L12): “air release only” air release (to protect regulation by means of system media)
  - after control valves (L8): combined air valve
- after pumps (L0): combined air valve, vacuum-breaking function essential

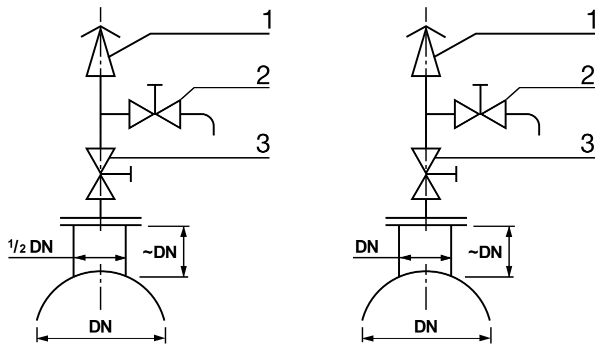


Installation information

Fittings for air release and air intake for pipelines should be integrated directly, if possible, and must be placed vertically on the line. Long tap lines should be avoided, as they negatively affect the air release function and require frequent flushing to exchange the water for hygienic purposes. In addition, insufficient pipe cover depth presents the risk of frost damage. To prevent such damage, adequate insulation must be provided. The exit of the air release valve at the outlet must be directly connected to the atmosphere. Any downstream line parts, e.g. for discharging splashing water, must be sufficiently dimensioned to ensure an atmospheric connection.

Vent cap

To allow the air to be directed toward the **air release valve (1)**, the vent cap must be sufficiently dimensioned. The DVGW (German Association for Gas and Water) Memorandum W 334 provides for two stages to dimension the vent cap. A distinction is made for pipelines of less than DN 600 and for pipelines greater than DN 600. For maintenance work, a **shut-off mechanism (3)**, e.g., a gate valve, etc., must always be provided to allow for the installation and dismantling of the air release valve without interruption of the operation. The dimensions of the vent cap are indicated in the drawing.
Caution: After shutdown, one of the air release valves may still be under pressure. Means for a targeted **pressure relief (2)**, e.g., a ball valve, must always be provided for safety reasons.



< DN 600:	≥ DN 600:
Height: 1 x DN Ø: ½ x DN	Height: ≥ 600 mm Ø: DN 600

Peak points

For physical reasons, air bubbles accumulate at the peak points. Adverse effects such as the narrowing of flow cross-sections are most pronounced in these locations. We recommend the use of combined valves, e.g., HaVent® air valves.

Change in inclination in downpipes

In downhill pipe sections with alternating negative inclinations, it is assumed that accumulated air will remain in the bending points. This is mainly true in the case of very low flow speeds, for example, at night. The use of combined valves, e.g., HaVent® air valves, is recommended.

Change in inclination in risers

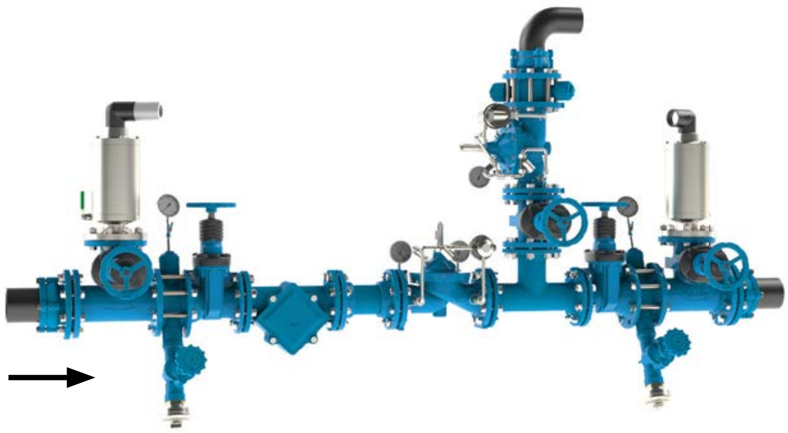
In uphill pipelines, air bubbles converge upwards to the respective apex. In sections with changing inclination (see illustration), the use of vacuum-breaking air release valves, e.g., HaVent®, is recommended, on the one hand, to remove air accumulations from the system at an early stage and, on the other hand, to protect the pipe network from damage in the event of a burst pipe or a pressure surge through targeted air-intake.

Horizontal lines

If possible, horizontal lines should be avoided. In longer, level or slightly downhill sections, the installation of purely air release valves (e.g., HaVent® "air release only") or combined air release and air intake valves at a distance of no more than 800 to 1,000 m is recommended.

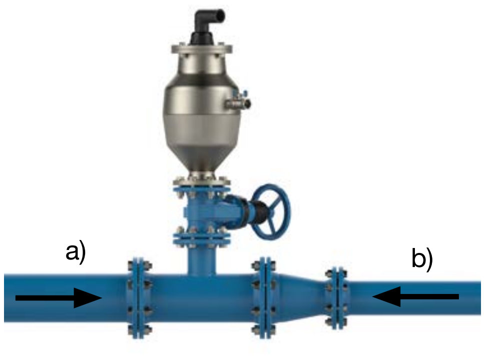
Controlled systems

In horizontal controlled systems with pressure control valves or safety valves, the inlet side must be vented completely to ensure that no air can enter into the control chamber. This may cause disruptions in control mode, in particular when using valves that are regulated by system media. For this purpose, it is sufficient to provide for a pure air release valve upstream. On the output side, a combined valve must be provided (e.g., HaVent®) in order to remove the outgassing air resulting from the pressure reduction and to reduce pressure surges in the event of a malfunction of the fittings. A safety valve can additionally protect the pipe network in the event of a malfunction of the pressure control system. In the case of a controlled system at a peak point, the use of two combined valves close to the change in pipeline inclination is recommended to protect the pipeline from pressure surges and negative pressure damage.



Before and after reductions

Before reductions or stowage orifice plates (a), air often collects in the pipe network and is not transported further. An air release valve automatically vents the accumulated air. Venting may also be necessary in the case of expansion (b) if the necessary speed for self-venting is no longer achieved.

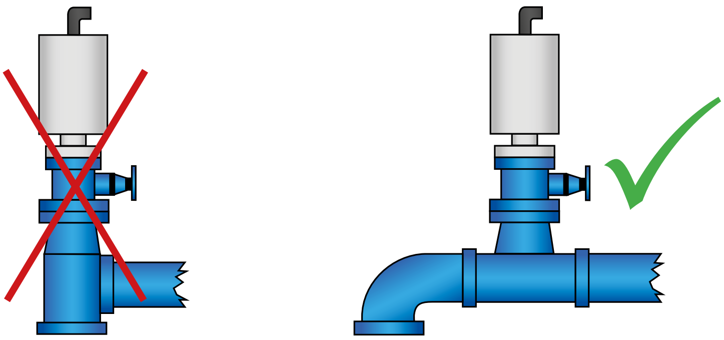


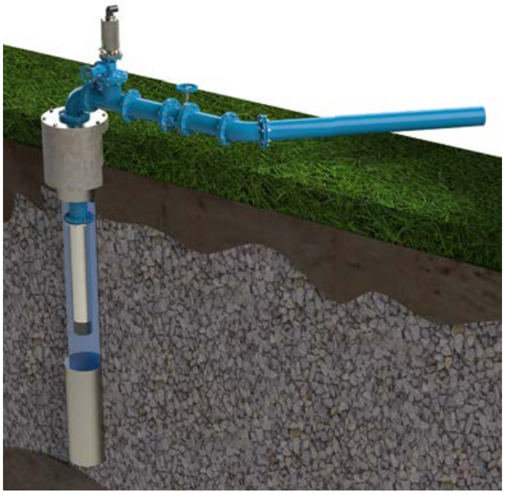
Draining and distribution devices

In the case of manual or automatic draining devices, air release valves must be provided so that the process can take place without interference. They protect the line from negative pressure in the event of an unforeseen interruption in the flow during draining.

Pressure boosting systems and pump groups

Air release valves should be installed directly in the discharge side of the pump to discharge air sucked from the pump sump as well as outgassing air as a result of turbulence on the pump impeller. The downstream pipeline system is protected against vacuums and the resulting pressure waves by the air intake function of the combined valve (e.g., HaVent®). At the head of the fountain, it is recommended to install the HaVent® with closing aid (possibly in the oxidizer version). The air release valve should be mounted at a slight offset from the riser to ensure that the valve can work optimally.

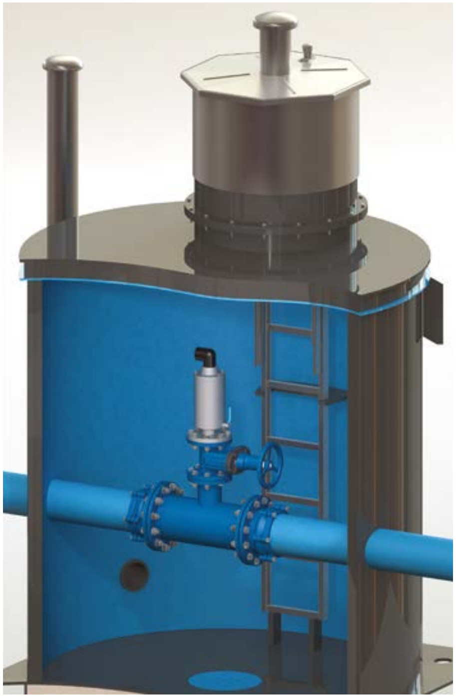




HaVent® air release valve at well head

Manhole construction

Numerous aspects must be considered for the use of air release valves in a manhole to maintain long-term, technically and hygienically flawless operation. This includes, among other things, planning an adequately dimensioned manhole to ensure that the required maintenance work can be carried out without any problems. The operating and maintenance instructions for the air release valve must be taken into account as early as the planning stage.
Drainage at the bottom of the manhole enables safe drainage in the event of water leakage from the air release valve or in the event of surface water penetration. The ventilation opening of the manhole must be designed to be generous to allow air to flow out of the well and to permit an air exchange. The air release valve is mounted on an exactly vertical T-piece. The vertical installation ensures the optimal function of the air release valve, and angle compensation seals must be used if necessary. For maintenance and repair, a **shut-off valve** must always be connected upstream. All Hawle air release valves are equipped with a sieve in the outlet opening in the standard version to prevent insects from entering.
If you have questions about a Hawle manhole construction, please contact Hawle Kunststoff & Service GmbH: **www.hawle-kunststoff.de**



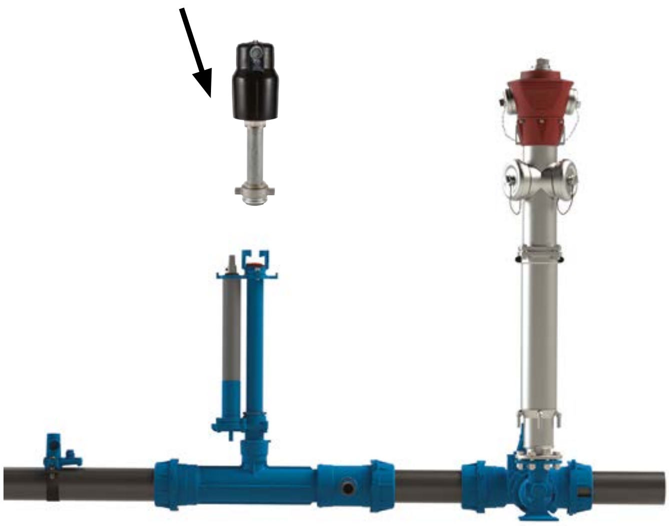
Hawle fittings well

Dimensioning of air release valves

Air intake and air release valves and fittings

In the event that the dragging power of the water is not sufficient or the air cannot escape independently, the use of air intake and air release devices becomes necessary. Corresponding DVGW (German Association for Gas and Water) information for correct installation must always be observed.

Most air flows in the supply network accumulate during the filling or discharging of the pipelines. In the case of scheduled processes, e.g., commissioning, the air must be released manually. Pursuant to DVGW (German Association for Gas and Water) W 400-1, hydrants are to be used. Various manufacturers offer appropriate solutions for the automated air release at hydrants. In this case, the air release valve must be selected so as to ensure that the volume flow during release is within the recommended working range. At the same time, the air flow to be discharged corresponds to the added volume of water at a maximum filling speed of c_{max} = 0.25 m/s.



Air intake

To prevent negative pressures in the piping system, e.g., in the event of a malfunction, targeted discharge (intermittent operation, maintenance measures) and in front of long pipe sections with a negative gradient, appropriate vacuum-breaking precautions must be taken to prevent possible damage.

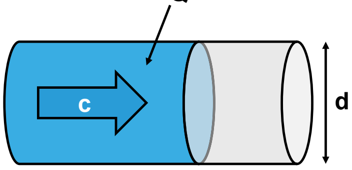
In the case of downpipes, a burst pipe at a lower point can lead to negative pressures at higher points. The air release valve should preferably be placed at the nearest higher bending point. A sufficiently dimensioned air release valve must be selected to permit the quantities in the pipe to be discharged within the maximum permitted negative pressure limit.

According to the DVGW (German Association for Gas and Water) W 334 recommendations, the relative negative pressure should be limited to a max. of 0.4 bar. However, the permissible negative pressure must always be checked on a case-by-case basis and coordinated with the operator of the network or system. To dimension the valve in the case of negative pressure, it must be ensured that the air to be taken in corresponds to the amount of water discharged. The following equation can be used for an approximate calculation.

Calculation of the volumetric flow Q in fully filled pipelines:

$$Q = \frac{\pi}{4} \cdot d^2 \cdot c$$

Q: Volume flow [m³/s]
d: Inner diameter [m]
c: Flow speed [m/s]



Examples of air intake

Peak point

Changing inclinations (uphill/downhill pipeline run)

Long uphill/downhill runs

Discharge (Torricelli's law of outflow)

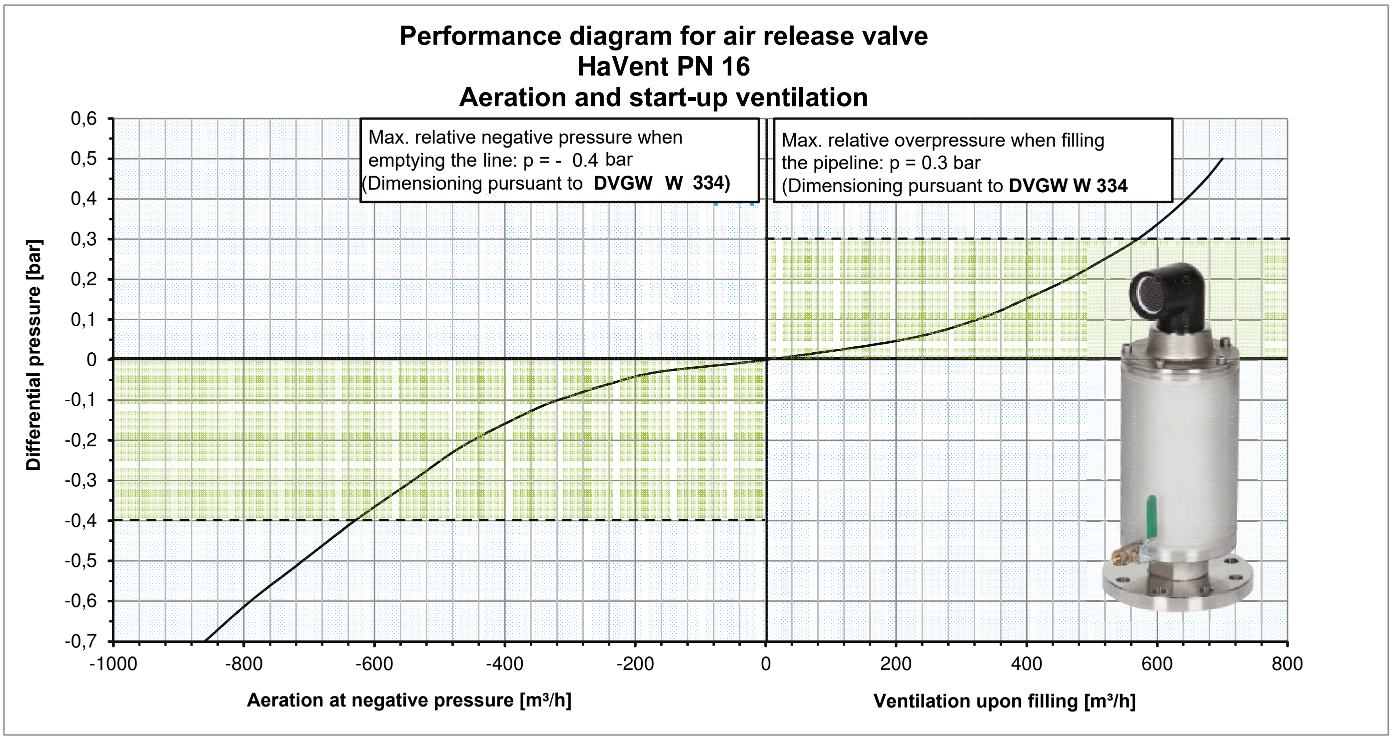
Air release valves must also be planned for scheduled discharges, which also protect the pipeline from negative pressure. Depending on the selection of the drain valve (e.g., gate valve), a sufficiently dimensioned valve must be provided for this purpose. The air flow to be taken in corresponds to the discharged volume $Q_{Drainage}$. The geodetic height Δh and the dimension of the drain valve are decisive for the flow rate. Since the theoretical calculations deviate from practice, the draining value should be reduced by a correction factor C_{Corr} = 0.6. The reason for this is the reduction of the cylindrical discharge cross-section after the outlet from the drain fitting as a result of aerodynamic influences.

$$Q_{drainage} = C_{corr} \cdot \frac{\pi}{4} \cdot d^2_{gate\ valve} \cdot \sqrt{2 \cdot g \cdot \Delta h}$$

Selection of air release valve according to performance diagrams

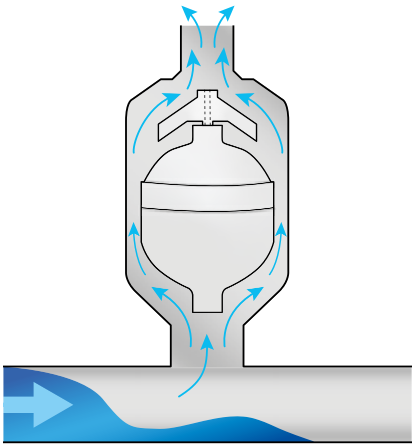
With knowledge of the maximum volume flow Q and the maximum permissible negative pressure difference, a suitable ventilation valve can be selected on the basis of design diagrams. For design, the recommended working areas according to DVGW (German Association for Gas and Water) W 334 are colored green. Technical function is also possible outside this area. However, outside the recommended working areas, damage due to negative pressure, on the one hand, and damage caused by overpressure on the other hand, are possible.

At very high venting speeds, the functional fittings can close automatically as a result of aerodynamic effects, which may lead to high pressure surges. Therefore, it is always important to maintain the limit filling speed of c = 0.25 m/s during filling the pipeline. Details can be found in the DVGW (German Association for Gas and Water) Memorandum W 334.



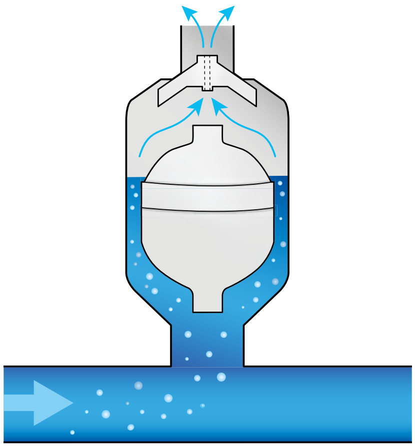
Functions of air intake and air release valves

Task 1:
Filling of the pipeline:
Start-up air release



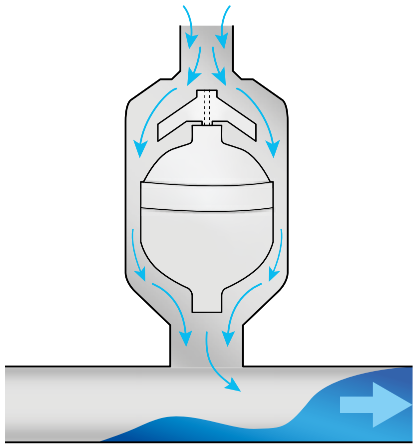
The objective is to release large air flows

Task 2:
Line in operation:
In-service ventilation



The objective is to release minor air flows under operating pressure

Task 3:
Discharge of the pipeline:
Air intake



The objective is to take in large air flows for aeration

Selection of valves

The design and valve size depends not only on the air volume flow to be discharged or supplied, but also on the intended use and location. It is important to select the right air release valve. In principle, a distinction is made between system, underground and manhole installation as well as between the different media of potable water, raw water and sewage. In addition, the pressure rating plays an important role.

Hawle valve types

Single-orifice plastic valves

987-01
Air valve 1"
for potable water

Air intake and air release of minor air flows

• Max. air release capacity:	7.8 m^3/h
• Venting and ventilation cross-section:	1.77 mm^2
• Operating range:	0.8 - 16 bar or 0.1 - 6 bar
• Connection:	internal thread 1"

Special function on request:
- Only for air intake or air release

Double-orifice plastic valves

Double-orifice plastic valves are used for releasing minor air flow from the pipeline or containers at operating pressures of up to 16 bar. Also available in a set for underground installation (992-02).

987-02
Air release valve 2”
for potable water

In-service ventilation of pipelines
Air release during filling – Air intake during discharge

- Max. air release capacity: 190 m³/h
- Venting and ventilation cross-section: 960 mm²
- Cross-section for in-service ventilation: 2 mm²
- Operating range: 1.0 - 16 bar or 0.1 - 6 bar
- Connection: internal thread 2", flange DN 50, DN 80

Special function on request:
- Only for air intake or air release

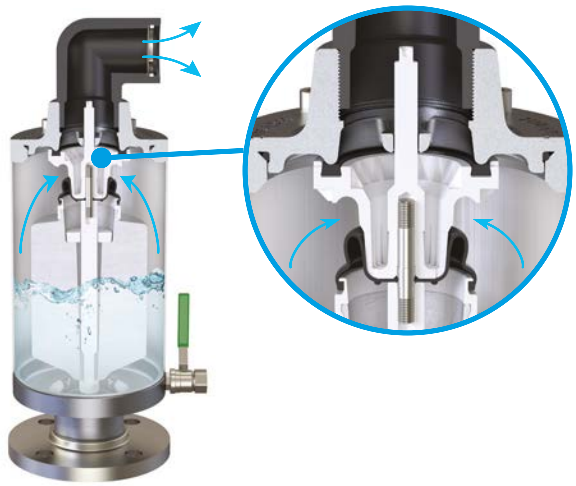
Combined valves with roll-on membrane technology

Hawle air release and air intake valves with their unique roll-on membrane technology are combined air release and intake valves. They are ideally suited for venting large volumes of air during filling as well as for in-service ventilation. They are also suitable for ventilating large amounts of air in the case of negative pressure. Valves of this type provide a very high air release capacity even under operating pressure.

Due to the roll-on membrane technology, the size of the opening can be gradually adapted and in proportion to the quantity of air in the pipe. The sealing device with a roll-on membrane has a pressure shock-absorbing property due to the large cross section during operation. The following Hawle valves are equipped with this tried-and-tested roll-on membrane technology.

HaVent®: Start-up air release
Valve open

HaVent®: Valve closed
Roll-on membrane closed



HaVent®: In-service ventilation
Roll-on membrane partly open

HaVent® air valve

987-00
HaVent® air valve
for potable water

The HaVent® air release valve with its unique roll-on membrane technology is ideally suited for start-up air release, the release of large air flows under operating pressure and for the intake of large air flows. The air release valve operates continuously from 0 to 16 bar and seals perfectly even when depressurized. No minimum response pressure is required. Depending on the application, a closing aid must be installed in the air release valve. The sealing principle with the roll-on membrane also has a shock-absorbing property. The integrated ball valve serves to relieve pressure and for sampling. The air release valve has a vacuum-breaking air-intake function.

- Max. air release capacity: 700 m³/h
- Max. venting and ventilation cross-section: 1,500 mm²
- Max. cross-section for in-service ventilation: 200 mm²
- Operating range: 0 - 16 bar
- Vacuum breaker
- Connection: internal thread 2", flange DN 50, DN 80, DN 100

Special functions (on request):
- With closing aid for quick closing during air release, e.g., for well lines between the pump and water treatment station, elevated tanks or pure water container, well head for releasing air from pressure lines
- Air release only or air intake only (minimum operating pressure: 0.2 bar)
- Outlet elbow 2” external thread for connecting an exhaust air line
- Oxidizer version
- PN 25 - Version without roll-on membrane 987-03

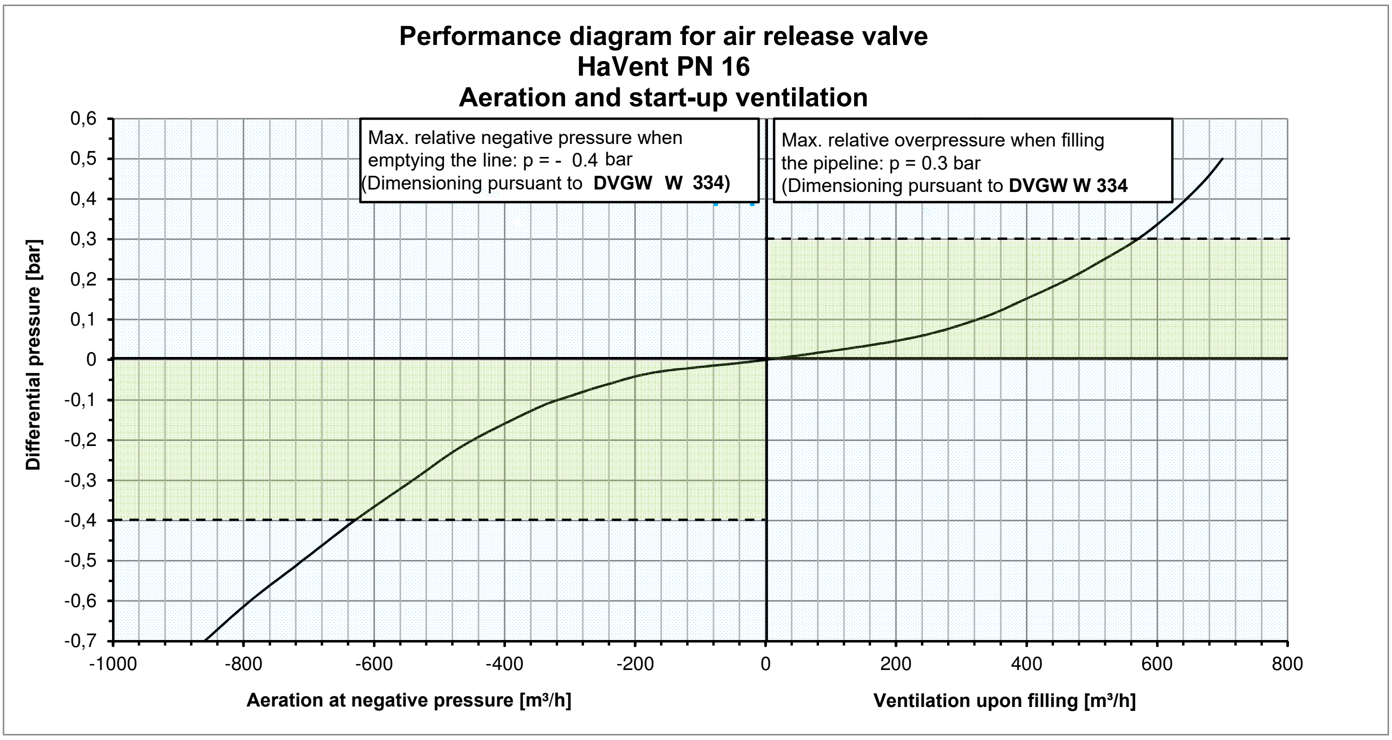
987-00
HaVent® PN 16

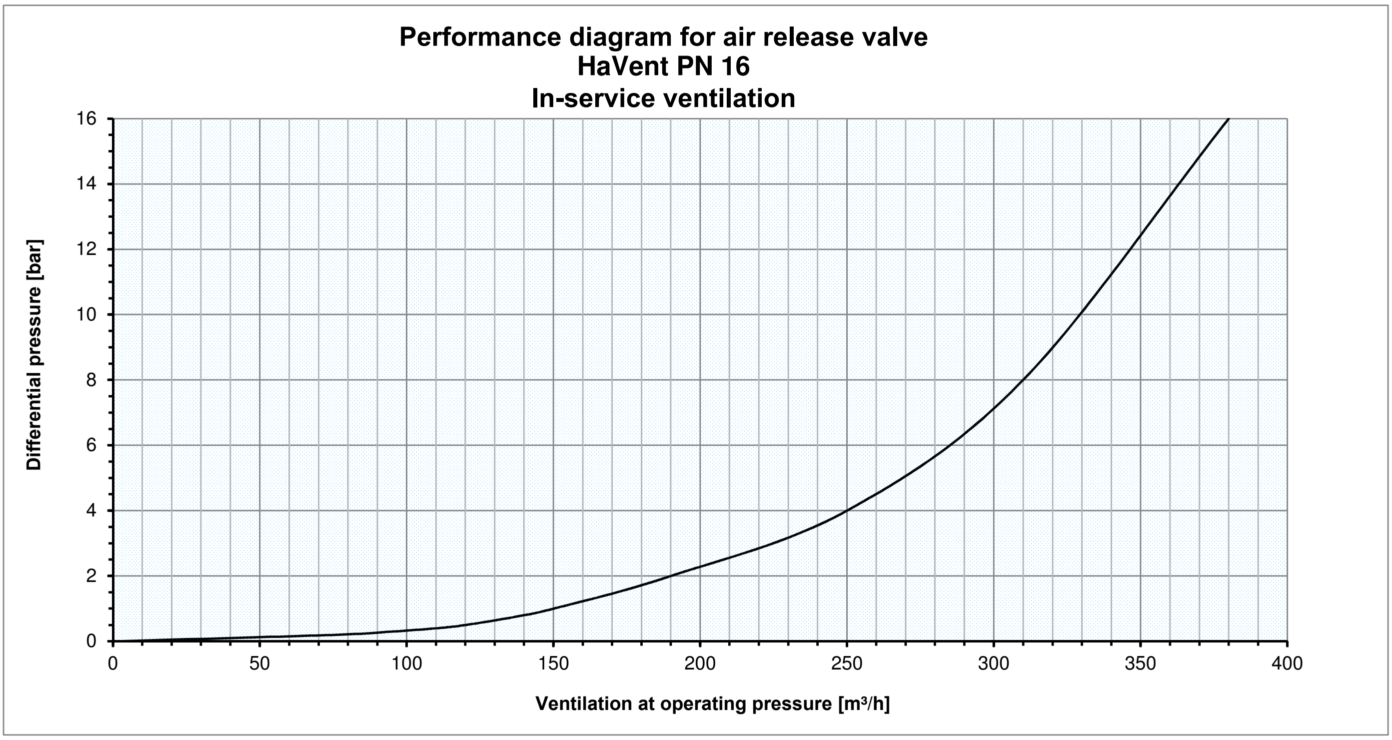
987-03
HaVent® PN 25

HaVent®
Oxidizer version

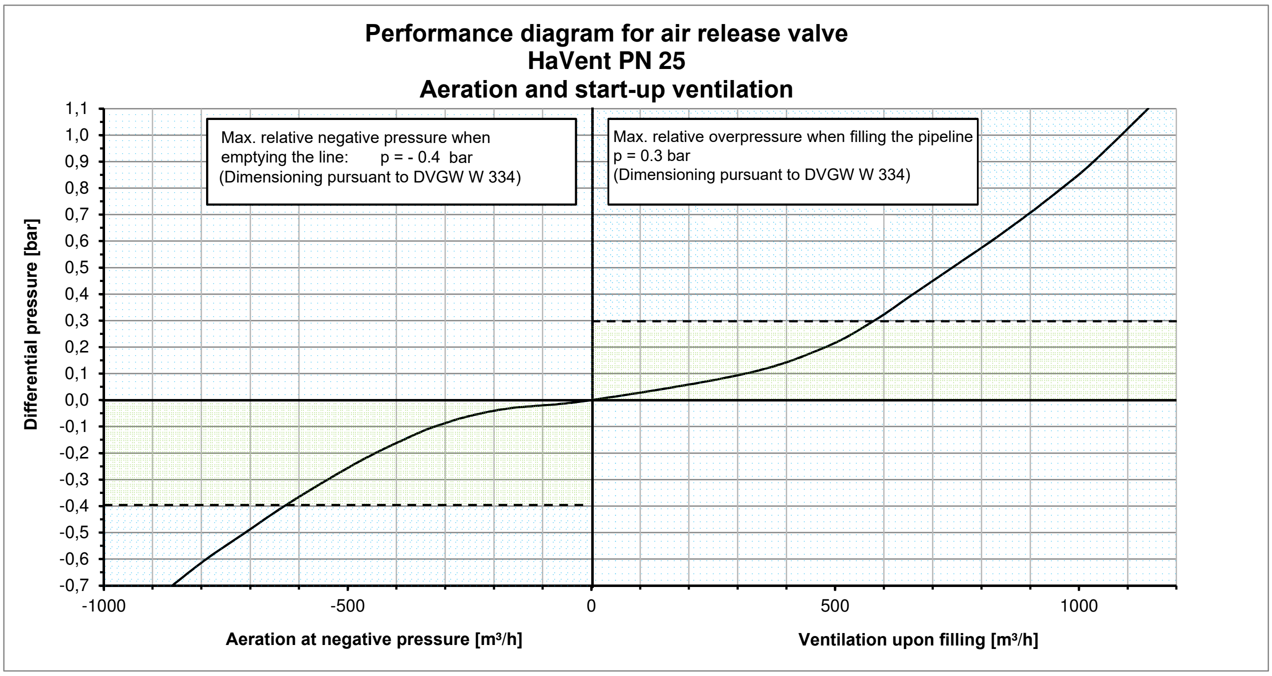
HaVent®
“air release only” version

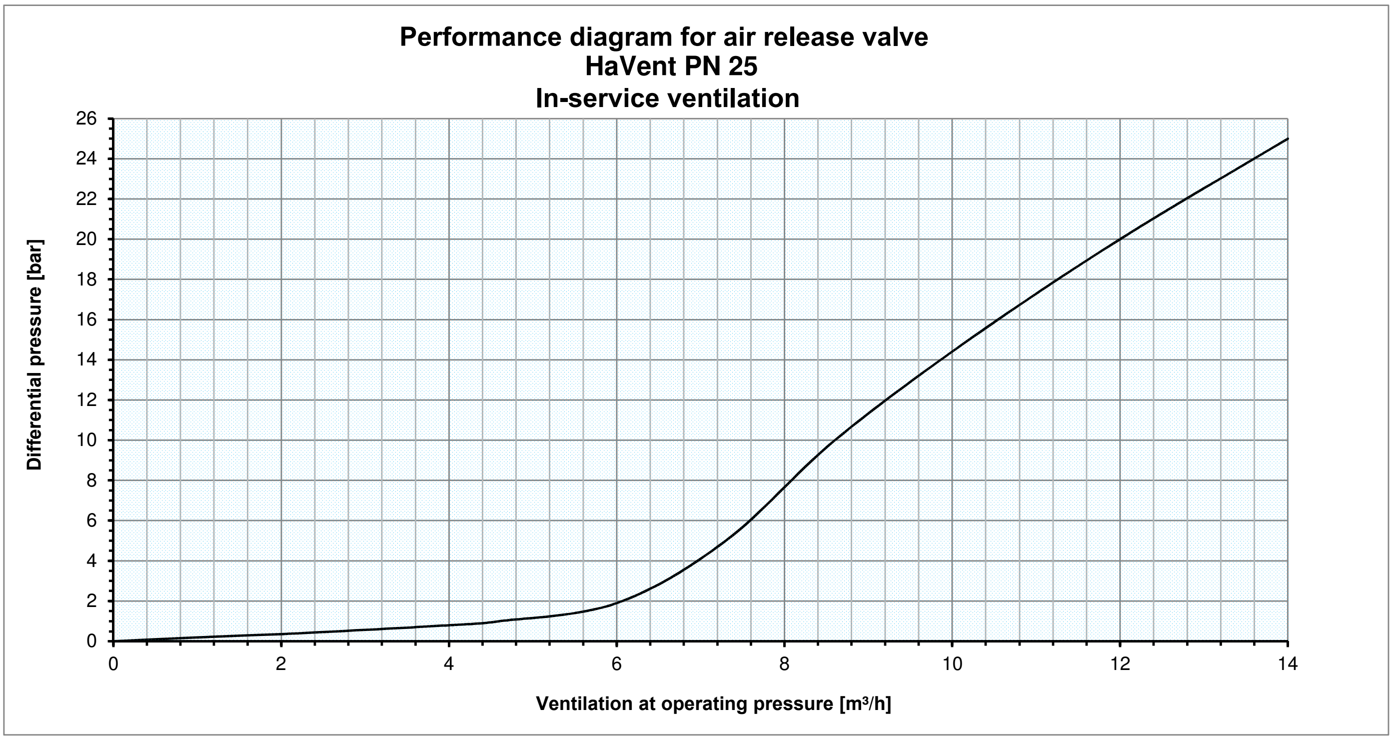
987-00
HaVent® air valve
for potable water PN 16





987-03
HaVent® air valve
for potable water PN 25





Air valve set for potable water for underground installation

992-00 | 993-00
HaVent® air valve set for potable water

The air valve set consists of a shaft made of stainless steel or PE with a shut off mechanism and the HaVent® air valve. Due to its compact build, the AVS (air valve set) replaces complex, high-maintenance manhole constructions. All maintenance works can be carried out from the ground surface. This eliminates all hazards related to entering manholes. The air release valve operates continuously from 0 to 16 bar and seals perfectly even when depressurized. Depending on the application, a closing aid must be installed in the air release valve. The sealing principle with the roll-on membrane also has a shock-absorbing property. Due to its great air intake capacity, the AVS offers in addition effective vacuum protection. The AVS can also be shortened by 100 mm at the marked points to adapt to changes in altitude in the construction. The AVS 993-00 is also extendable.

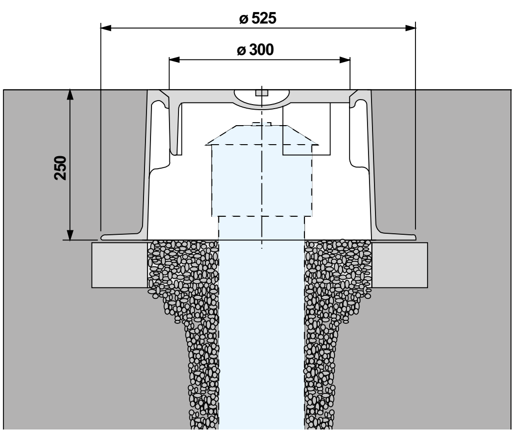
- Max. air release capacity: 770 m^3/h (992-00), 700m^3/h (993-00)
- Max. size of the opening: 1,500 mm^2
- Max. cross-section for in-service ventilation: 200 mm^2
- Operating range: 0 - 16 bar
- Vacuum breaker
- Pipe cover depth: 1.00 m, 1.25 m, 1.50 m, 1.75 m
- Connection: Flange DN 50, DN 80 and BAIO®-spigot end DN 80
- Also available in PN 25 (992-01): Manhole: stainless steel, version without roll-on membrane, flange DN 50, DN 80

Special functions (on request):
- With closing aid for fast closing during air release, e.g., for well lines between the pump and water treatment station, elevated tanks or pure water containers, well head for releasing the air from pressure lines
- Air release only or air intake only (minimum operating pressure: 0.2 bar)
- Installation in groundwater sector
- Installation in high water sector

993-00 air valve set made of PE with HaVent®

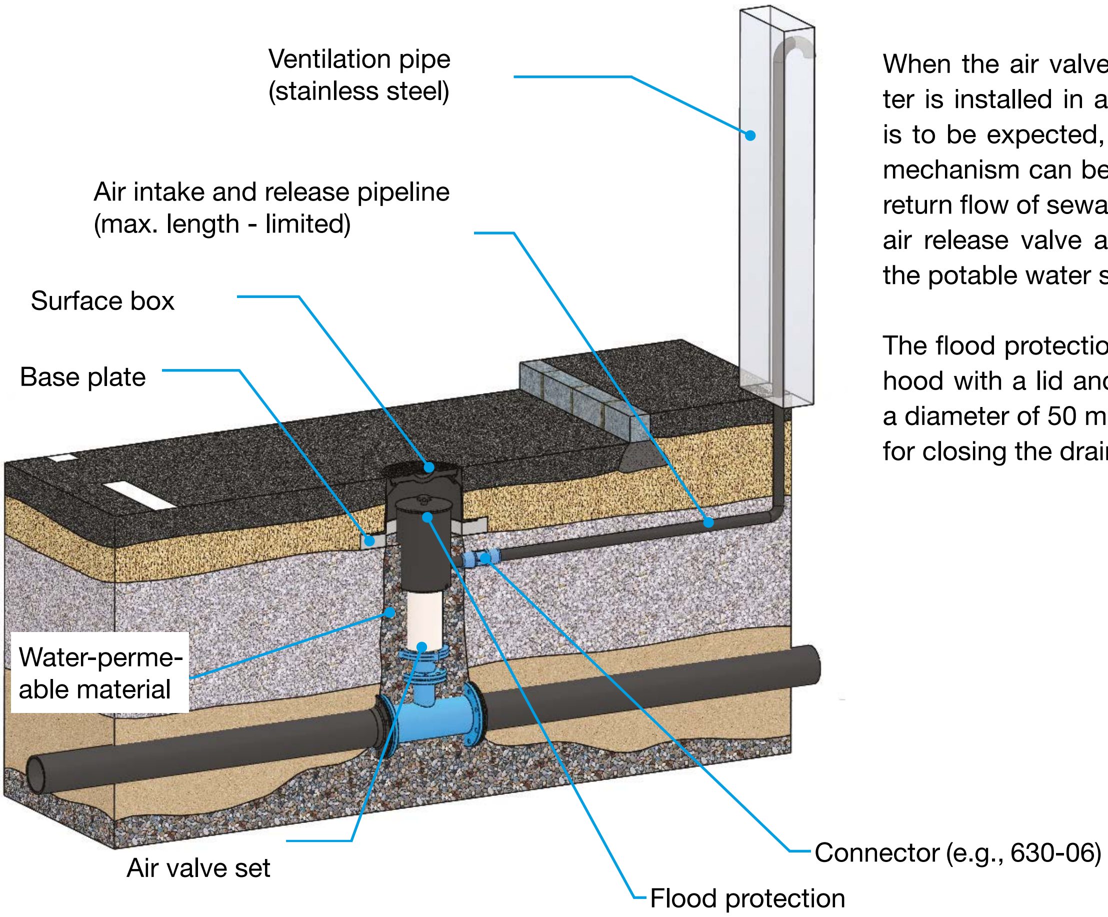
Installation instructions:

To prevent rainwater from entering, the standpipe must be surrounded with a seepage pack made of rolled gravel from the pipeline to the hood. As far as the surface box is concerned, sufficient air intake and air release must be ensured, e.g., by means of a Hawle surface box 211-00.



992-00 air valve set made of stainless steel with HaVent®

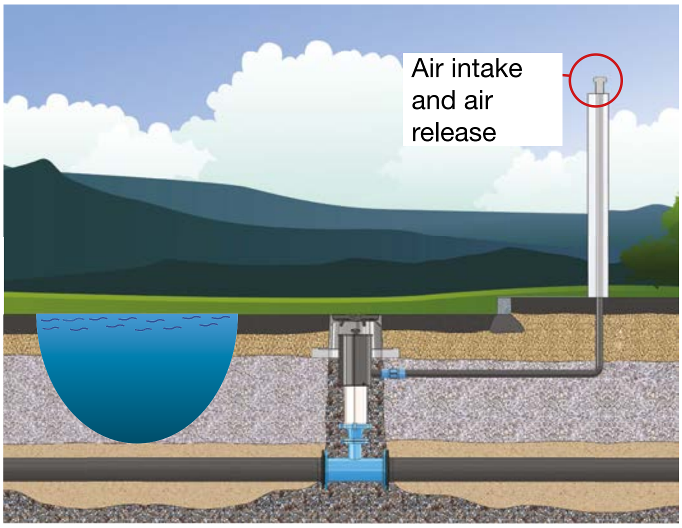
Flood protection for air valve set for potable water (992-08)



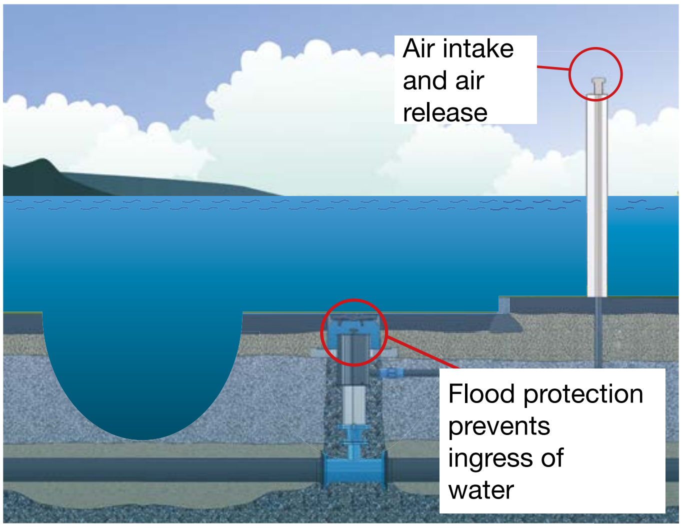
When the air valve set for potable water is installed in areas, where flooding is to be expected, the flood protection mechanism can be used to prevent the return flow of sewage water through the air release valve and downstream into the potable water supply.

The flood protection consists of a flood hood with a lid and a drain nozzle with a diameter of 50 mm and a sealing plug for closing the drain.

Application example (a possible installation variant)



Normal installation site



Installation site flooded

Installation in groundwater sector

In the event of the ingress of rising groundwater via the draining of the AVS, there is a risk, that wastewater will be sucked into the pipe network during air intake. The drain must be closed. Particularly careful monitoring of the AVS ensures that no groundwater or rainwater can accumulate in the AVS. If necessary, the water must be removed with a hand pump. The special function "groundwater" serves to ensure that no wastewater can penetrate into the AVS when the groundwater rises. The intake and release holes are angled upwards.

Caution: In a condition of negative pressure, penetrating groundwater or rainwater may be sucked into the pipeline. This poses a risk of contamination and germination.

Risk of contamination! The “air release only” function permits preventive action by ensuring that there is no air intake in the pipeline system. The air release valve can also be retrofitted if the installation site requires it.

HaVent®
“Groundwater version”

HaVent®
“air release only”

Insulation

If the valves are mounted directly on the main line, there is little risk of frost, since the water in the valve is "heated" by the water flowing in the main line. If, exceptionally, there is a need for a staggered arrangement, i.e., installation next to the main line, the risk of frost damage increases considerably.
In this case, both the supply pipe to the valve and the valve itself must be insulated. The stainless steel valve in the AVS is protected from frost by inserting an appropriately fitted washer made of insulating material halfway up the standpipe. This frost shield (order no. 9922001050) must not close tightly to permit a continued intake and release of air.

An air release valve in manhole installation is protected from frost by lining the shaft walls and the manhole cover with insulating material (see illustration).
Free-standing air release valves, e.g., under bridges, must be insulated in a frost-proof manner, e.g., with an insulating jacket. To drain splash water, a drainage pipe must lead from the air release valve to the outside.

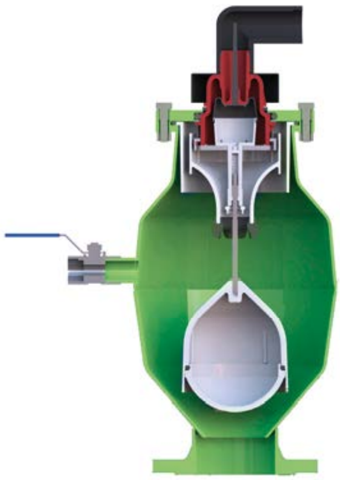
Insulation can also be useful for sewage valves. There is usually no risk of freezing in these cases. In this case, it rather serves to protect against a possible functional impairment of the valve due to deposits and hardened grease on the housing wall.

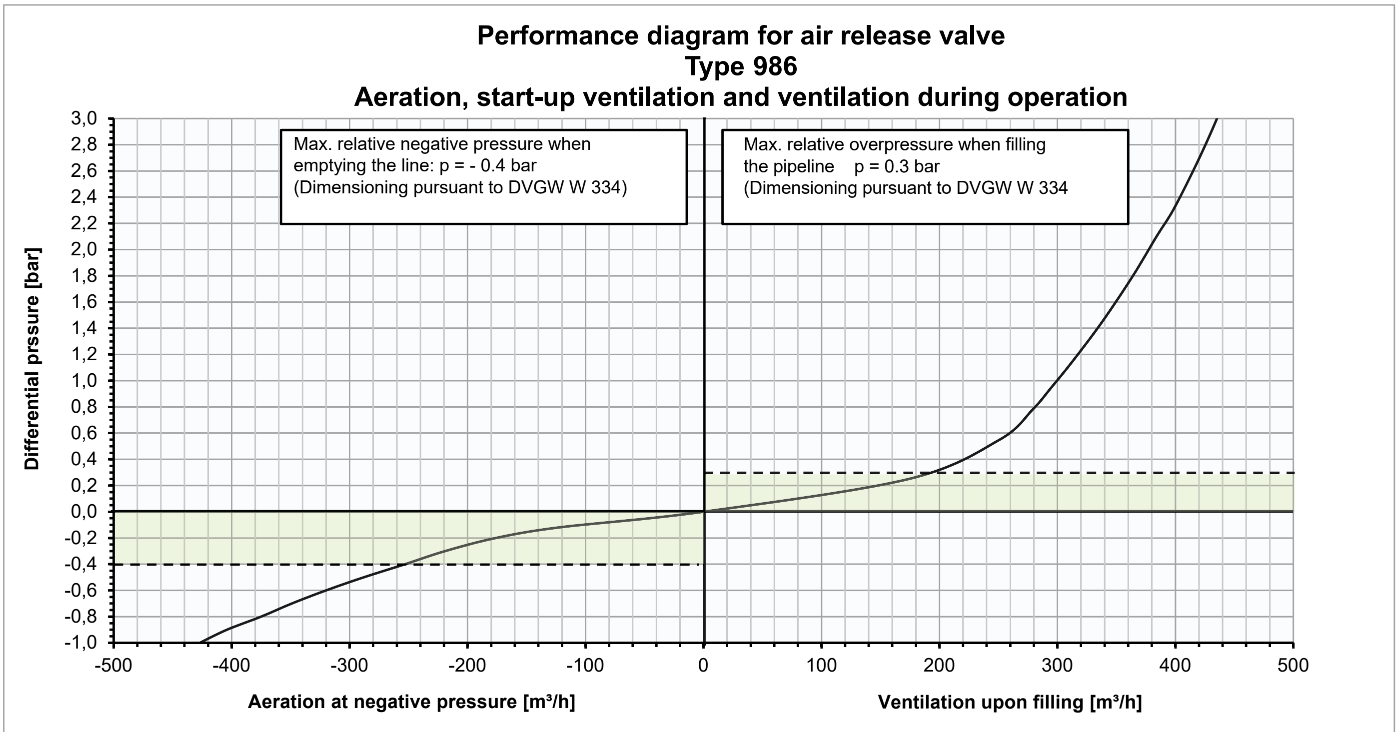
986-00
Air release valve for
raw and potable water and wastewater

The air valve 986-00 with its unique roll-on membrane technology is ideally suited for start-up air release, as well as for the release of large air flows under operating pressure and for the intake of large air flows. The valve seat is not in contact with the medium. The air release valve operates continuously from 0 to 16 bar and seals perfectly even when depressurized. The sealing principle with the roll-on membrane also has a shock-absorbing property. Due to its special design, the valve is particularly suitable for use with particle-laden raw water and for municipal wastewater. The air release valve has a flush connection.

- Max. air release capacity: 440 m³/h
- Operating range: 0 - 16 bar (infinitely variable)
- Max. venting and ventilation cross-section: 480 mm²
- Connection: internal thread 2", flange DN 50, DN 65 DN 80, DN 100, DN 150, DN 200
- Version with flange DN 80 with Storz coupling available

Special functions (on request):
- Air release only (minimum operating pressure: 0.2 bar)
- Air intake only (minimum operating pressure: 0.2 bar)
- Air release stop 986-01: for lines flushed with compressed air (minimum operating pressure: 0.2 bar)
- Exhaust air kit 986-03





986-05
Air release valve - oxidizer version PN 10
For use in water treatment on filter or oxidizer

The Hawle air release valve 986-05 “Oxidizer version” was specially designed for the treatment of potable water using filters and oxidizers. It is used in numerous water treatment plants with an above-average volume of air. To prevent the accumulation of larger air pockets and thus of disturbances in the reaction behavior of the filter or oxidizer, the introduced air must be discharged quickly.

Standard valves reach their technical limits when it comes to permanent high-frequency air release in water treatment, as these valves are designed for the intake and release of air in pipelines. To meet the high requirements for the permanent release of air, Hawle has developed the "Oxidizer version". The 986-05 air release valve has a significant impact on the release of air in the case of large volumes of air. The integrated stainless steel sleeve calms the turbulent oxygen-water mixture in the valve and thus allows it to rise evenly in the valve. Calmer operation reduces wear and tear and ensures safe working and a long service life.

When designing air release valves on quick filters in accordance with DVGW W 213-3 (e.g., oxidizer, multi-layer sand, activated carbon filter), the volume flow of air supplied to the oxidation reaction is an essential parameter. When dimensioning, please note the maximum ventilation quantity in conjunction with the operating pressure of the BEV (design diagram type 986).

Care must be taken to ensure that the effective cross-section of the container flange is not smaller than the inlet opening of the air release valve. During installation, it is imperative to pay attention to vertical installation, and if necessary, angle compensating seals must be used. In order to avoid free leakage of liquid, an exhaust air duct should be installed at the outlet elbow of the air release valve, which must be easily detachable for maintenance purposes.

Installation example: filter boiler with air release valve 986-05

Air valve set for sewage water for underground installation

985-00
Air valve set
for sewage water

The air valve set for sewage consists of a shaft made of PE with a shut off mechanism and a type 986 air valve. Due to its compact build, the AVS replaces complex, high-maintenance manhole constructions. All maintenance works can be carried out from the ground surface. This eliminates the typical hazards related to entering manholes. The air release valve with its unique roll-on membrane technology is ideally suited for start-up air release, the release of large air flows under operating pressure and for air intake. The valve seat is not in contact with the medium. The air release valve operates continuously from 0 to 16 bar and seals perfectly even when depressurized. The sealing principle with the roll-on membrane also has a shock-absorbing property.

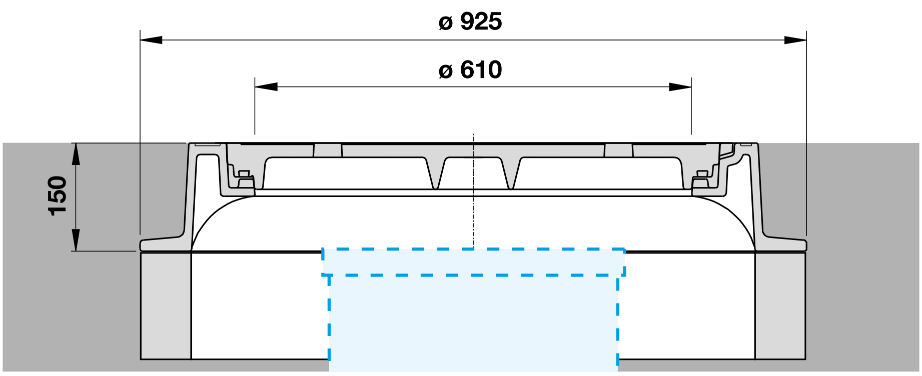
The air release valve has two flush connections that extended up to the lower edge of the plastic cover. By connecting a flushing hose, light dirt can be flushed out of the air release valve. In the event of major contamination, the air release valve can be easily removed thanks to the bayonet connection.

- Max. air release capacity: 440 m³/h
- Operating range: 0 - 16 bar (infinitely variable)
- Max. venting and ventilation cross-section: 480 mm²
- Pipe cover depth: 1.00 m, 1.25 m, 1.50 m
- Connection: flange DN 80 with threaded bolts and BAIO® spigot end DN 80

Air release valve with shut-off unit 985-01, also available without PE chamber

Special functions (on request):
- Air release only or air intake only (minimum operating pressure: 0.2 bar)
- Air release stop 986-01: for pipes flushed with compressed air (minimum operating pressure 0.2 bar)

Hawle installation recommendation:
Manhole cover 205-00 made of GJS-400 with the label "Abwasser Be- und Entlüftung“ (Sewage air intake and release). This manhole cover is equipped with the necessary air intake and air release holes. The air valve set should be installed in such a manner that the distance from the upper layer of the road surface to the upper edge of the air valve set is at least 150 mm.



Maintenance for air valve set for sewage

Maintenance intervals for the valves depend on the composition of the sewage and local conditions. Greases, in particular, collect at the peak points, float into the valve and may form deposits there.

!

The following limit values apply for the use of Hawle sewage products in municipal sewage:

Total hardness: min. 8.0° dH
pH: min. 5 to max. 9.5
Chlorides: max. 250 mg/l
Free chlorine: max. 0.3 mg/l
Sewage temperature: max. 40° C

For maintenance, the air release valve can be removed after shutting off with the 985-08 valve lifting device.

The flushing and water tapping set 985-03 permits an easy flushing of the pressure sewage line. Possible deposits can be removed or vacuumed.

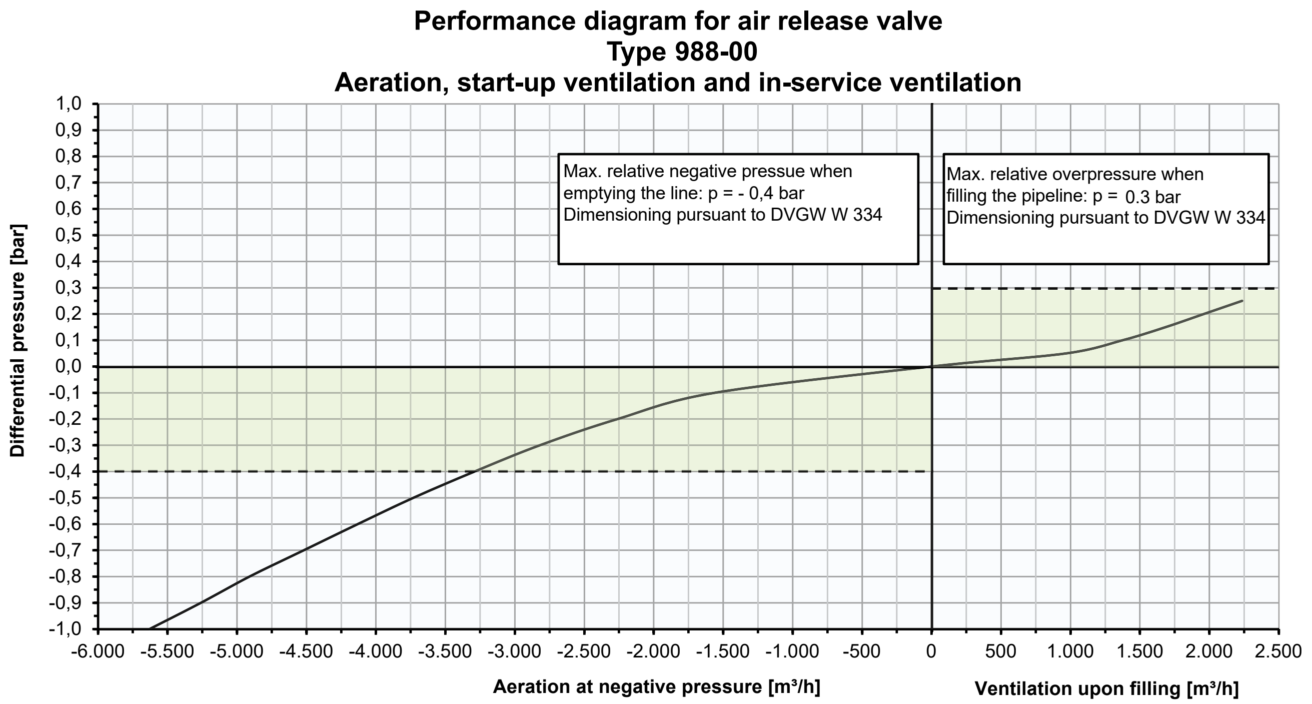
Other valves with roll-on membrane technology

988-00
Air release valve for sewage and potable water made of stainless steel
Infinitely variable combined valve for large pipelines

The 4" air release valve with a large air release cross-section and unique roll-on membrane technology is very well suited for the release of large air volumes. The valve seat is not in contact with the medium. The air release valve operates continuously from 0.2 to 16 bar. The sealing principle with the roll-on membrane also has a shock-absorbing property. A vacuum-breaking air-intake function is available.

- Max. air release capacity: 2,200 m³/h
- Max. venting and ventilation cross-section: 8,150 mm²
- Infinitely variable in-service ventilation: 440 m³/h
- Vacuum breaker
- Connection: flange DN 100, DN 150, DN 200

Operating range:
- 0.2 - 16 bar (PN 16)
- 0.2 - 10 bar (DN 200 PN 10)

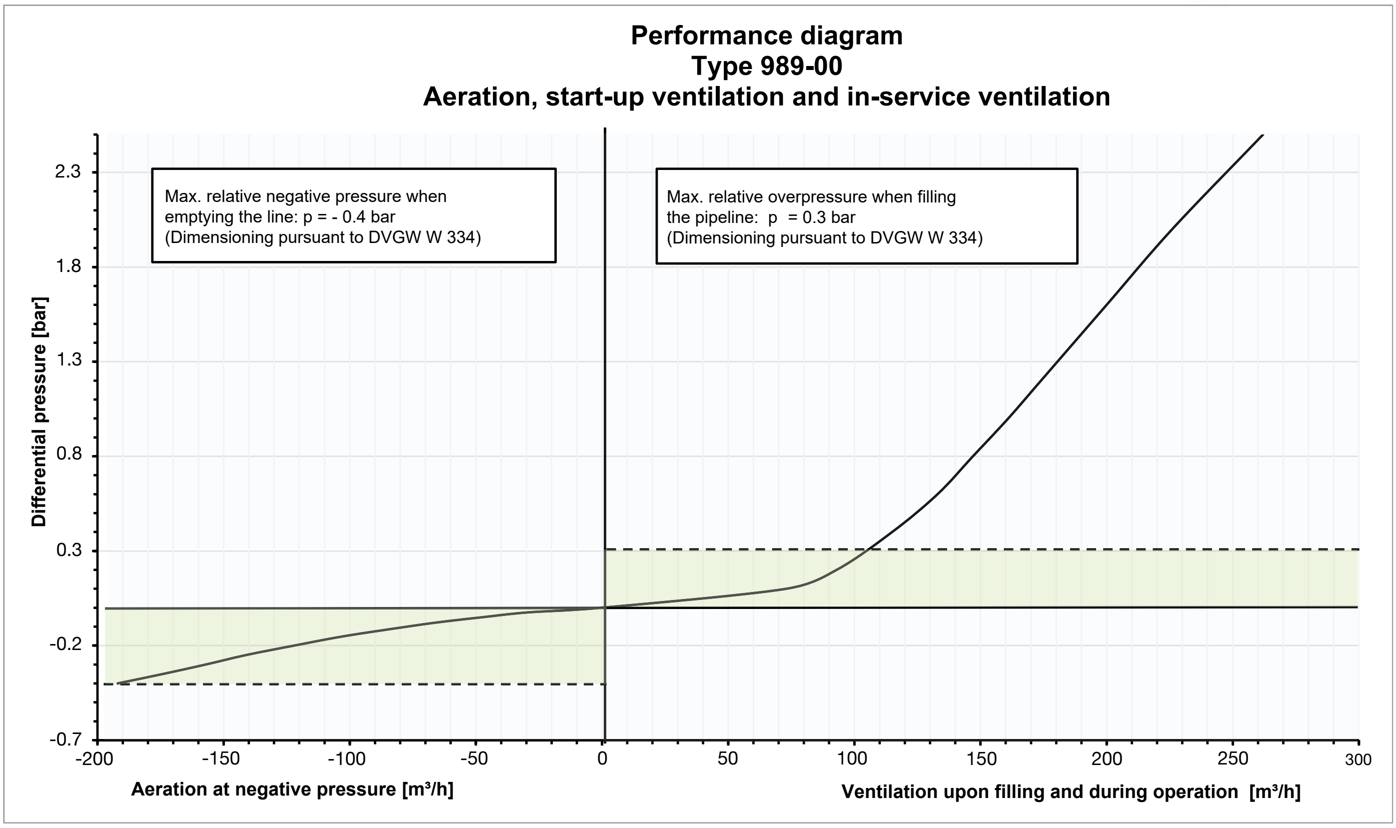


989-00
Air release valve made of plastic
for sewage PN 10

The air release valve made of plastic with its unique roll-on membrane technology is ideally suited for the intake and release of air during filling and discharging pipelines as well as for continuous in-service ventilation. The valve seat is not in contact with the medium. The air release valve operates continuously from 0 to 10 bar and seals perfectly even when depressurized. The sealing principle with the roll-on membrane also has a shock-absorbing property. The low weight of the PA air release valve ensures easy and quick installation. The profile clamp made of stainless steel also allows for the quick opening and closing of the valve in the event of maintenance or cleaning.

- Max. size of the opening: 480 mm²
- Max. air release capacity per connection:
  internal thread 3" = 260 m³/h, flange DN 50, DN 80 = 166 m³/h
- Operating range: 0 - 10 bar (infinitely variable)

Special functions (on request):
- Air release only or air intake only (minimum operating pressure: 0.2 bar)
- Exhaust air kit 986-03
- Air release stop 986-01: for pipes flushed with compressed air (minimum operating pressure 0.2 bar)
- Also available as an air valve set for underground installation



989-01
Air release valve made of stainless steel for sewage PN 10

The air release valve of stainless steel with its unique roll-on membrane technology is ideally suited for the release of large air flows under operating pressure. The valve seat is not in contact with the medium. The air release valve operates continuously from 0 to 10 bar and seals perfectly even when depressurized. The sealing principle with the roll-on membrane also has a shock-absorbing property.

- Max. venting and ventilation cross-section: 480 mm²
- Max. air release capacity: 170 m³/h
- Operating range: 0 - 10 bar (infinitely variable)
- Connection: internal thread 2", alternatively with flange on request

Pressure testing

All Hawle ventilation valves are tested in accordance with DIN EN 1074-4 before delivery. This includes a functional test at 1.1x PFA (nominal pressure) and a housing test at 1.5x PFA.

Before the pressure test of the pipeline, the air release valve (ARV) / air valve set (AVS) must be taken out of service. To do this, close the shut-off valve below the valve. Otherwise, the result may be falsified.
Air release valve: Close the shut-off valve before the valve.
AVS 992-00, AVS 992-01, AVS 992-02: Remove the ARV from the AVS – integrated barrier closes automatically.
AVS 985-00, AVS 993-00: close integrated shut-off device by giving it a half turn.
For further information on pressure testing, please see the operating and maintenance manuals.

Service and maintenance

Almost all potable water and all sewage water contain suspended solids that tend to form deposits. In the case of sewage, grease deposits and larger particles may accumulate additionally in the air valve. In order to avoid malfunctions due to contamination, air release valves must therefore be checked regularly and, if necessary, cleaned and maintained. ARVs and AVSs must be taken out of service before maintenance. Maintenance must be carried out in depressurized state. The **operating and maintenance manuals** must be observed at all times; they are available on **www.hawle.de** at **Downloads**. Please note that you require sufficient working space for maintenance on ARVs. During maintenance, it must be possible to remove the functional unit (= complete inner workings) from above. The space requirements in shafts and systems must be calculated accordingly. Hawle ensures the long-term availability of spare and wear parts as well as of functional units.

Maintenance intervals: The use of suitable materials and appropriately treated surfaces can extend the operational readiness of air release valves. Nevertheless, we recommend regular maintenance in regard to potable water (at least once per year), see Recommendations in DVGW German Association for Gas and Water W 400-3-B1 (A). The exact maintenance interval depends on the water quality. The first maintenance should be scheduled a little earlier in order to establish an empirical reference for future intervals. In the case of sewage, the maintenance intervals must be adapted to the conditions of the pipeline and the composition of the sewage.
If you are interested in a maintenance agreement for **valves for potable water**, you are of course welcome to contact Hawle Kunststoff & Service GmbH: **www.hawle-service.de**

General information

For more than 40 years, Hawle Armaturen GmbH has been covering the topic of air intake and air release for pipelines. The extensive feedback from our customers motivated us to further develop our air release valves and to launch new models on the market. As a result, we now cover a large number of applications in the potable water and sewage sector.

We will gladly assist you with the selection of valves and advise you on their function, installation and maintenance. We do not carry out accurate hydraulic calculations or pressure surge calculations. To this end, we refer to specialist planners, who have specialized in this field.

Selecting the right air release valve well in advance is important. This brochure aims to advise and support you in this process. The proposed recommendations for design and positioning are based on our experience. However, we expressly assume no responsibility or liability for the specific individual case.

In order for an air release valve to be able to carry out its work in the long term, performing maintenance at least once a year is of great importance. Air release valves are in direct contact with the environment. Regular monitoring is therefore absolutely necessary, as otherwise contamination or surface water can enter the pipeline carrying potable water via the air release valve. Contamination of the potable water supply system through defective ventilation systems cannot be ruled out.

The position of the valves must be carefully checked already at the planning stage. For installation locations in flood-plains or areas with high groundwater levels, additional structural measures are required. It is necessary to consider where valves should be omitted altogether, where flood protections or where pure air release valves should be installed.

The operator must be able at all times to find and access the valves. Maintenance specifications in the Hawle operating and maintenance instructions must be taken into account as early as the planning stage. Preference for the installation of compact air valve sets compared to accessible wells offers the long-term benefit of safe and quick maintenance.

Air release valves are one of the few automatic connection points between the pipe network and the environment, which is why they require special attention both in planning and in operation.

For more detailed information about the individual valves, please see our homepage **www.hawle.de**.
We will gladly assist you with any further questions you may have:

Hawle Application Engineering
Tel. +49 8654 / 6303-0
info@hawle.de
www.hawle.de

Source excerpt

DVGW (German Association for Gas and Water) Memorandum W 334 2007: Technische Regel Be- und Entlüften von Trinkwasseranlagen [Technical Regulation: Airing and venting drinking water systems] in German; Bonn: DVGW; 2007 | **DVGW W 400-1 (A) 2015:** Technische Regel Wasserverteilungsanlagen (TRWV) [Technical Regulation: Water conveyance systems]; Part 1: Planning; Bonn: DVGW; 2015 | **DVGW W 400-3-B1 (A) 2017:** Technische Regel Wasserverteilungsanlagen (TRWV) [Technical Rules: Water conveyance systems]; Part 3: Betrieb und Instandhaltung [Operation and maintenance]; Addendum 1: Inspektion und Wartung von Ortsnetzen [Inspection and Maintenance of municipal systems]; Bonn: DVGW; 2017 | **DVGW W 303 (A) 2005:** Technische Regel Dynamische Druckänderungen in Wasserversorgungsanlagen [Technical Regulation: Pressure changes in water supply systems]; Bonn: DVGW; 2005 | **DVGW W 213-3 (A) 2017:** Technische Regel Filtrationsverfahren zur Partikelentfernung [Technical Regulation: Filtration procedure for removing foreign particles]; Part 3: Schnellfiltration [Quick filtration]; Bonn: DVGW; 2017

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Hawle Armaturen GmbH
Liegnitzer Straße 6
83395 Freilassing
Germany

Tel.: +49 8654 6303-0
Fax: +49 8654 6303-111

info@hawle.de
www.hawle.de