

The following recommendations are based on general calculations and practical experiences from working with H-TEC ARV's in wastewater systems. This information cannot be a substitute for a precise calculation of pipe network. Responsibility or liability for the content of the proposed recommendations is excluded.

Basic detail for installation of H-TEC ARV's

- Install air release valves always on top of the pipelines (lateral connections to pipeline will clog immediately).
- Each single automatic air release valve must be equipped with an isolation device at the input connection, like knife gate valve or ball valve. Except the H-TEC ARV's with integrated shut-off (#986 ARV set for underground installation, #986 manhole free set or #986 ARV with isolation device).
- When pipe dimension is bigger than ARV connection, build ARV on top of a riser, as air trap or accumulation chamber (size of riser: $d = \text{pipe OD} / 2$).
- Read operation manual of each ARV carefully before installation.

1. Where is the right spot for an ARV?

- **On transmission and collection pipelines:**

- a) at long ascending, descending and sub-horizontal pipe sections install ARV in intervals of approx. 0.5 mile / 800m
- b) each geodetic altitude, before descending pipe section
- c) each hydraulic high point of the pipeline, before descending pipe section
- d) upstream of each pipeline reduction
- e) at the ends of overhead crossings, before descending pipe section
- f) high point of bridge crossing
- g) at the ends of underground road crossings
- h) close to dead end pipes
- i) upstream close before a knife gate valve in ascending line section
- j) downstream close after a knife gate valve in descending line section

- **At pump stations and treatment plants:**

- a) near pumps, upstream before the pump check valve
- b) before descending pipe sections
- c) upstream and downstream of sectioning or modulating devices

2. Which H-TEC Automatic Air Release Valve where?

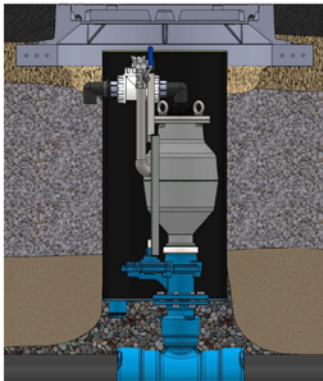
- **For new underground pipeline construction:**

#986 ARV set for underground installation



- Eliminate confined space entry, acc. to OSHA
- All maintenance can be done from street surface
- Different pipe cover depth available (3.3ft – 5.7ft)
- Including shut-off valve for isolation
- Connections to pipeline via flange or 2" FNPT
- Operating Range: 0 – 250 PSI
- Available in ss316 or epoxy powder coating

Installation on construction side:



- Connect either flange or Thread to pipeline
- Fill up trench with loose gravel until bottom of shaft
- Fill up trench completely, leave room for the air outlet into space between shaft and street surface cap
- Take care that loose gravel is situated around the PE shaft
- Install street surface cap

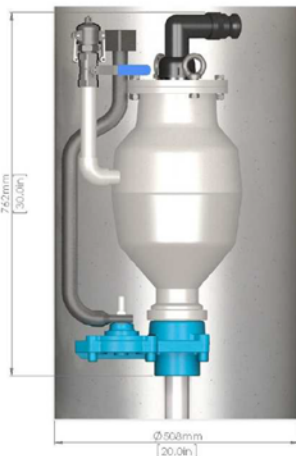
- **For rehabilitation in existing manholes:**

#986 ARV with shut-off for manhole installation



- Eliminate confined space entry, acc. to OSHA
- All maintenance can be done from street surface
- Incl. shut-off valve for isolation from the top
- Operating Range: 0 – 250 PSI
- Virtually spill prove
- Connections to pipeline via flange or 2" FNPT

Installation within existing manhole:



- Disconnect pipeline section from operation
- Eliminate old air valve and isolation valve
- Prepare for connecting 2" FNPT shut-off unit
- Install ARV acc. to H-TEC Operating Instructions Mat.No.692 (within delivery package)
- Set pipeline section under pressure and test device for proper operation

- **For above ground pipes and treatment facilities:**

#986 Automatic Air Release Valve



- Virtually spill prove
- Operating range: 0 -250 PSI
- Max. air release cap.: 260 scfm / 440m³/hr
- All mechanical parts made of corrosion-resistant materials
- Connections: 2" + 3" FNPT, 2" – 8" Flange
- Infinitely variable surge protection prevents amplified movements

Installation:



- Shut off isolation valve
- Remove old ARV from isolation valve
- Connect H-TEC ARV #986 to the existing device or create a new ARV spot by constructing air accumulation chamber with shut-off valve
- For FNPT threaded versions, the use of either 2" or 3" ss 316 double nipple is mandatory

#988 Automatic Air Release Valve F4"r



- Virtually spill prove
- Operating range: 0 -250 PSI
- Max. Air release cap.: 2,500 scfm / 4,250m²/hr
- Max. Vacuum flow: 3,000 scfm / 5,100 m²/hr
- All mechanical parts made of corrosion-resistant materials
- Flanged connections available in: 4", 6", 8"
- Infinitely variable surge protection prevents amplified movements

Installation:



- Shut off isolation valve
- Remove old ARV from isolation valve
- Connect H-TEC ARV #988 to the existing device or create a new ARV spot by constructing air accumulation chamber with shut-off valve

3. Sizing of H-TEC Automatic Air Release Valve?

Task A: Release during filling of a pipeline (discontinuously)

To avoid water hammers more than 40 psi according to Joukowski-equation flow rate in the pipeline during filling should not exceed 0,8 ft/s and the flow volume depending on the diameter of the pipeline must be taken away by the Air Valve at this flow rate.

The propagation rate of the pressure surges in the pipeline is assumed to be $a = 3900$ ft/s.

The maximum flow rate in the free flow cross section of the Air Valve is limited to $v = 65$ ft/s, since an excessive flow rate of the air might tear along the float of the Air Valve, thus closing the valve before the end of the filling process .

Task B: Aeration during drainage of a pipeline (discontinuously)

The necessary amount of aeration depends on assumed drainage capacity. Considering to an acceptable negative pressure of maximum 5 psi the dimension of Air Valves can be calculated.

Task C: Release during normal operation (continuously)

By using a sufficiently dimensioned ventilation chamber a normal continuously operating system does not require any special dimensioning of the Air Valve. It only should be taken into account that the maximum possible working pressure of the Air Valve goes along with the maximum operating pressure of the pipeline system.

Sizing Air Release Valve #986 and #988

Considering the maximum flow rate of 0,8 ft/s and above mentioned performance:

one Automatic Air Valve Model# 986 is recommended for pipelines up to a nominal diameter of 24 inch (600 mm), and

one Automatic Air Valve #988 is recommended up to a nominal diameter of 48 inch (1200 mm).

It is possible to double up the volume of capacity of an air release valve position by adapting another Automatic Air Valve parallel to the same point of installation, thus allow to exceed the above mentioned recommended pipeline od per arv model#.