

 **A.R.I. VB-060****SPRING-LOADED VACUUM BREAKER**

The following is a step-by-step narrated description of the A.R.I. VB-060 Spring-Loaded Vacuum Breaker installation, operation and maintenance processes.

The VB-060 Spring-Loaded Vacuum Breaker is a normally closed full bore vacuum breaker which is designed to open fully to allow the intake of air into the pipeline or system when vacuum conditions occur, thus protecting the pipeline.

Negative pressure (vacuum) conditions are caused by sudden shutoff of pumps, pipe ruptures or rapid draining of the pipeline. The VB-060 can be installed both on potable water lines and on wastewater lines.



TABLE OF CONTENTS

| | |
|---|----|
| 1. SAFETY INSTRUCTIONS..... | 3 |
| 2. INSTALLATION | 6 |
| 3. OPERATION | 9 |
| 4. TROUBLESHOOTING | 9 |
| 5. PERIODIC MAINTENANCE | 10 |
| 5.1. Preparation | 10 |
| 5.2. Maintenance – See drawing on Section 5 of this document..... | 11 |
| 5. ASSEMBLY BOM TABLE AND DRAWING..... | 12 |

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1. SAFETY INSTRUCTIONS

General

1. Aquestia products always operate as components in a larger system. It is essential for the system designers, installers, operators and maintenance personnel to comply with all the relevant safety standards.
2. Installation, operation or maintenance of the product should be done only by qualified workers, technicians and/or contractors using only good engineering practices, complying with and observing all conventional safety instructions in order to minimize risk and/or danger and/or hazard to workers, the public or to property in the vicinity in accordance with all relevant local standards.
3. Extra safety considerations should be taken with hot and hazardous liquids or in hazardous environments' applications to avoid bodily/physical harm and damage to public or private property.
4. All individuals installing operating and/or handling the products including all workers should at all times adhere with the occupational safety and health (OSH) instructions and wear safety helmets, goggles, gloves, and any other personal safety equipment required by the local standards and regulations.
5. Use only appropriate standard tools and equipment operated by qualified operators when installing, operating and maintaining the product.
6. Prior to installation, operation, maintenance or any other type of action carried out on the product, read carefully the safety, installation and operation instructions of the product.
7. **Please note:**
 - Pressurized fluid and/or gas may be discharged from the product without prior warning. Make sure that the product's outlet port is not directed toward electrical elements (pumps) or people.
 - The pressurized fluid and/or gas that can be discharged from the product may create high noise levels. Take this into consideration when installing the product in areas sensitive to noise.
8. Always open and close valves slowly and gradually.
9. Please note that the maximum working pressure indicated at the product's specifications table doesn't include pressure changes caused by water hammer and pressure surge effects. Use the product only according to its designated pressure rate specifications.
10. Use the product only for its intended use as designed by Aquestia. Any misuse of the product may lead to undesired damages and may affect your warranty coverage. Please consult with A.R.I. prior to any non-regular use of this product and make no change or modification to the product without a prior written consent to be provided by Aquestia at Aquestia's sole discretion.
11. Please note that Aquestia shall **NOT** assume any liability with respect to any damage losses and/or expenses caused to any person and/or property whatsoever unless the product has been duly installed and thereafter maintained in strict compliance with its designated maintenance Instructions and/or any other installation and operation manuals provided by A.R.I. for the product and/or applicable ordinances and/or codes.

Handling

1. Shipping and handling the product must be done in a safe and stable manner and in accordance with the relevant standards and regulations.
2. Storage should be in the original delivery crates or cases. Storage should be off the ground in a clean, dry indoor area.
3. For lifting and positioning the product, use only approved lifting equipment operated by authorized employees and contractors.
4. Prior to the installation visually verify that the product was not damaged during shipment to the installation site.

Installation

1. Install the product according to the detailed Installation Instructions provided with it by Aquestia and according to the description given in this manual.
2. The user should install a manual Isolation Valve under the product's inlet port.
3. In all installation sites the user should enable good visibility and verify that the work and auxiliary equipment used are done in accordance with the relevant local authorized standards. Extra safety considerations should be taken on hazardous environment sites.
4. Check and re-tighten the bolts connecting the product to the pipeline during commissioning and before operating the product for the first time.

Commissioning and operation

1. Read carefully the operation instructions prior to any attempt to operate the product.
2. Observe the safety stickers on the product and never perform any operation contradicting the instructions given.
3. In order to achieve maximum performance and smooth operation of the product it is crucial to perform the startup and first operation procedures exactly as described in this manual.
4. In cases where formal commissioning procedure is required it should be done by an authorized Aquestia technician prior to the first operation of the product.

Maintenance

Before any maintenance or non-regular operation please read the following:

1. Servicing the product should be done only by qualified technicians for this type of work.
2. Make sure that you know the exact type of the system's fluid. Act accordingly and comply with all the relevant standards and regulations set for handling this type of fluid.
3. Before disconnecting the product from the system and before releasing the residual pressure do **NOT**:
 - loosen or unscrew the product bolts;
 - remove any protection cover;
 - open any service port.
4. Before any maintenance or non-regular operation shut off the Isolation valve and release the residual pressure:
 - A. For air valves with pressure release outlet, slowly open the pressure release plug or the ball valve and make sure that all pressure is released. Please note that some air release valves, especially the waste water models, may contain significant volume of compressed gas with accumulated energy!
 - B. For air valves without a pressure release outlet, slowly unscrew the flange bolts until all the pressure is released from the valve.
5. Make sure the air valve is empty of all liquid prior to commencing maintenance.
6. Remove the product from the line only after ensuring that internal pressure has been released.
7. Place warning signs around the work area as required by the local standards and procedures.
8. Inspect the product's safety stickers and replace any damaged or faded sticker.
9. Manual cleaning of the product and/or its components using high water pressure or steam should be performed in accordance with its specific cleaning instructions, the local standards and regulations and without endangering the operator or the vicinity
10. Manual cleaning of product and/or its components using acid or other chemical agents should be performed in accordance with the specific cleaning instructions, the relevant safety instructions for using that chemical as given by its supplier, the local standards and regulations and without endangering the operator or his vicinity.
11. For products used in potable water systems if it is required to disinfect the product, do so according to the local water authority standards and regulations before putting the product into service.

Before returning to regular operation

1. Re-assemble any protection covers or protection mechanisms removed during service or maintenance operations.
2. Make sure that all the tools, ladders, lifting devices, etc. used during the maintenance procedures are taken away from the product area and stored.
3. Remove grease and fat material residues in order to avoid slipping.
4. In order to return the product to regular operation, follow the First Start-up Operation instructions as detailed in your user manual.

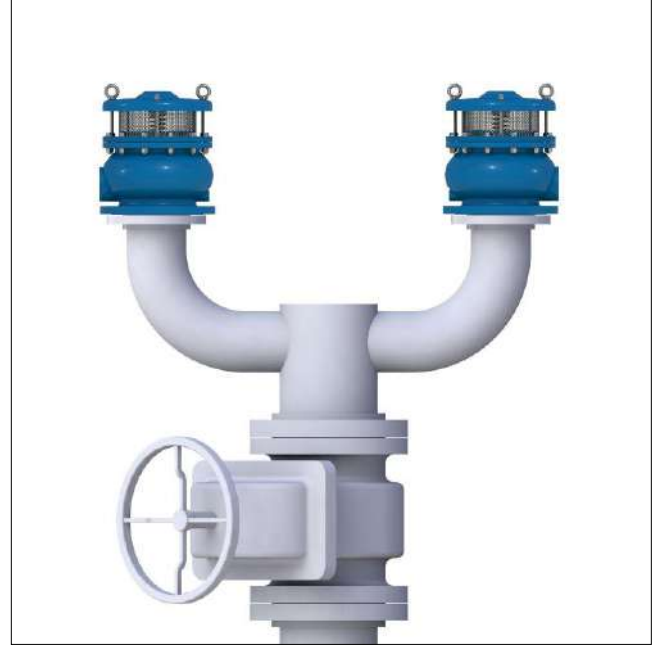
2. INSTALLATION

Important: Before performing any work on the air valve make sure that all workers on site are familiar with the safety instructions and the relevant local and general safety instructions and work regulations.

2.1. Installation Recommendations



Single Vacuum Breaker on an Isolating Valve at 45° to Air Valve outlet



Two Vacuum Breakers on a shared Isolating Valve. The outlets face outward and the Isolating Valve at 45° to Air Valve outlets



Two Vacuum Breakers on an Air Trap with separate Isolating Valves. The outlets face outward and the Isolating Valves at 45° to Air Valve outlets



Underground Installations

In case of installation in an underground chamber, a vent pipe must be installed with a diameter equal to or greater than the Vacuum Breaker. The vent outlet must have a mesh screen to prevent entry of animals or objects.

2.2. Conventions and Measurements

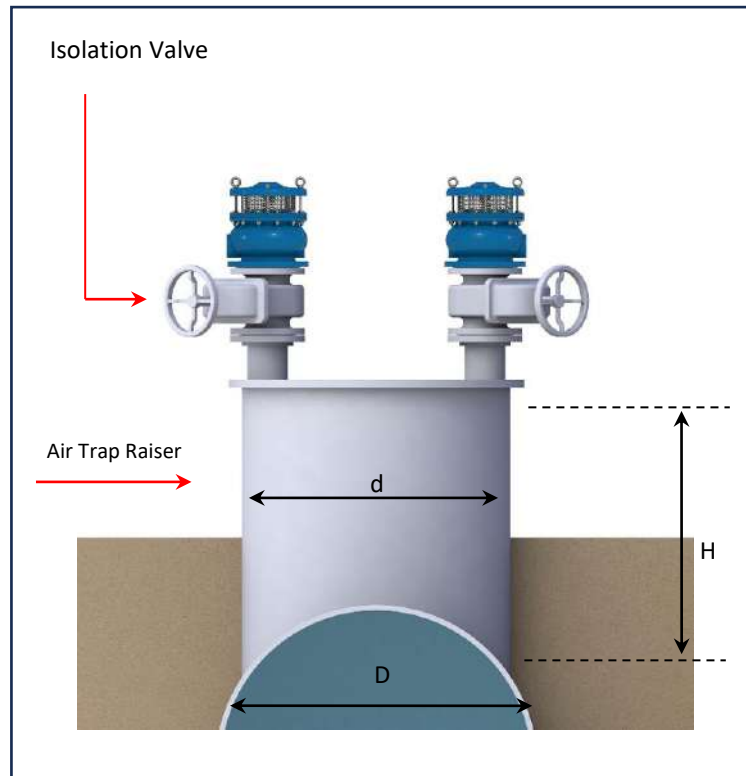
This paragraph presents and explains the terms and measurements used for the Installation process.

D = Diameter of pipeline

d = diameter of riser

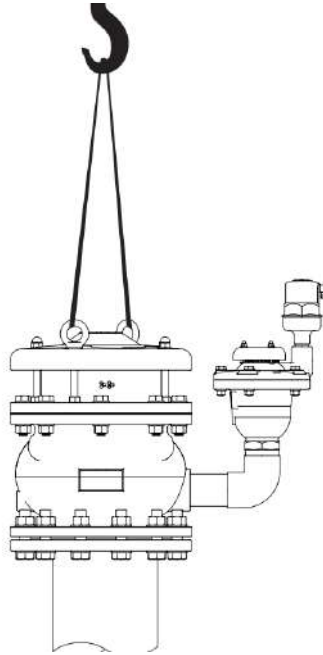
H = Height of riser on the pipeline
(Measured from crown of pipeline)

- For pipelines up to 12" (300mm) in diameter (D), the Air Trap diameter (d) should be the same as the pipeline diameter.
- For larger pipelines of up to 60" (1500mm) in diameter (D), the Air Trap diameter (d) should be 60% of the pipeline diameter.
- For larger than 60" (1500mm) pipelines (D), the Air Trap diameter (d) should be 35% of the pipeline diameter.
- The Air Trap length (H) should allow easy access to the air valve from below and should be at least 6" (150mm).



2.3. Installation Instructions

1. Flush the system before installing the vacuum breaker to avoid any debris or sharp objects getting into it.
2. Carefully remove the vacuum breaker from the shipping package. Unload all vacuum breakers carefully to a sturdy level surface taking care not to drop them.



3. Install an isolating valve below the vacuum breaker, connected by a riser to the crown of the pipe.
4. The VB-060 Vacuum Breaker should be installed vertically on a riser on the crown of the pipeline. The riser diameter must be of an equal or greater diameter than the vacuum breaker.
5. Mount the vacuum breaker carefully on the rubber gaskets of the isolating valve.
6. Place washers on each of the bolts & nuts that connect the vacuum breaker flange to the isolating valve flange.
7. Tighten all the bolts and nuts using the crossover method.
 - a. The closure tightness of the bolts and nuts shall be according to the standard torque for their specific size.
 - b. Use ring wrench keys for the closing and opening of all bolts of the vacuum breaker (including the flange bolts).

3. OPERATION

The VB-060 valve is designed to prevent vacuum conditions from occurring in pipelines. After a power failure or rapid draining of the system, a vacuum condition often occurs in a pipeline.

The pressure differential between the inside vacuum and the atmosphere will cause a downward force on the sealing disc. At vacuum pressures greater than 0.02 bar, the vacuum will compress the spring and move downward, allowing the free flow of air into the pipeline to eliminate vacuum.

When positive pressure is restored in the pipeline, the spring will extend upward, lifting the float and sealing the valve tightly.

4. TROUBLESHOOTING

| PROBLEM | SOLUTION |
|------------------------------------|--|
| Valve Leakage | Check gaskets and flange bolts for tightness. Disassemble and inspect sealing surfaces for debris or damage. If the Disc Seal is damaged, then a new seal should be installed. |
| Valve Does Not Allow Intake of Air | Verify that seal end drops away from the valve body. Verify that pipeline is at a vacuum condition greater than minus 0.25 psig. Verify that isolation valve is open and there is no line blockage downstream. Verify that the Spring is intact. Disassemble and inspect as necessary. |

5. PERIODIC MAINTENANCE

Please note that the periodic maintenance of the vacuum breaker is an integral part of the proper pipeline maintenance regime; it should be maintained at least once a year in accordance with the quality and composition of the fluid in the system.

Important: Before performing any work on the vacuum breaker, make sure that all workers on site are familiar with the Safety Instructions section of this document and with all the relevant local and general safety instructions, standards and work regulations.

5.1. Preparation

5.1.1. Required tools and materials:

- 8mm ring wrench key
- 9/16" ring wrench key

5.1.2. Releasing Pressure

- Shut the isolating valve located on the riser under the vacuum breaker.
- Carefully release the pressure and drain the vacuum breaker.
- Important: Discard liquid to comply with local regulations.

5.2. Maintenance – See drawing on Section 5 of this document

Disassembly.

WARNING: The pipeline must be drained and the valve relieved of pressure before commencing disassembly.

1. Completely unscrew and remove all the cover Bolts, Washers, and Nuts (11) - place them in a secure area.
2. Attach a metal cable through the 2 Lifting Rings and lift the entire Cover Assembly (1-17) out from the valve Body (19).
3. Place the Cover Assembly on a clean flat working area.
4. Unscrew the Domed Nuts and Washers (2) and Lifting Rings, lift-up and remove the Screen Cover (1) and Screen (4).
5. Measure and write down (for Reassembly) the distance from the top of the Guide Rod (8) to the top part of the upper Nut (5).
6. Unscrew the two Nuts from the threaded end of the Guide Rod. Remove the Spring Lock (6) and Spring (7). Check for wear or cracks on the Spring. Replace the Spring, if necessary.
7. Lift-up the remaining Cover Assembly from the Guide Rod (8) and Disc Assembly (14 – 17) and place it to the side.
8. Place the Disc and connected Guide Rod on its side. Examine the Disc Seal (16) for wear and tear. Heavy mineral deposits should be removed using fine sand paper.
9. For replacing the Disc Seal, unscrew the Disc Bolts (14) and remove the Seal Retainer (15).
10. Replace the Disc Seal, return the Seal Retainer to its place and tighten by screwing the Retainer Bolts into the Disc.

Reassembly

All parts must be clean before reassembly.

1. Place the remaining Cover Assembly on the Disc Assembly (14 – 17).
2. Place the Spring Lock (6) on to the Guide Rod (8) and screw on the two Nuts (5) until the distance from the top of the Guide Rod to the upper part of the upper Nut is the same as that measured in Disassembly Step 5.
3. Place the Screen (4) on the Cover (12), attach the Screen Cover (1) and tighten with the Domed Nuts and Washers (2).
4. Lift the Cover Assembly (1-17) by running a metal cable through the Lifting Rings and lift it onto the valve Body (19).
5. Tighten the Cover Bolts, Nuts & Washers (11) to the Body using the crossover method with standard flange bolt torques.
6. Recharge the pipeline and check for leaks.

5. ASSEMBLY BOM TABLE AND DRAWING

| No. | Part |
|-----|--------------------|
| 1 | Screen Cover |
| 2 | Domed Nut & Washer |
| 3 | Lifting Ring |
| 4 | Screen |
| 5 | Nut |
| 6 | Spring Lock |
| 7 | Spring |
| 8 | Guide Rod |
| 9 | Threaded Rod |
| 10 | Cover Bearing |
| 11 | Bolt, Nut & Washer |
| 12 | Cover |
| 13 | Circlip |
| 14 | Retainer Bolts |
| 15 | Retainer |
| 16 | Seal |
| 17 | Disc |
| 18 | O-ring |
| 19 | Body |

