

AODDampener™

POWERED BY **BLACOH**



Installation and Operation Manual

The AODDampener™ is designed specifically to handle the large pressure pulses that air operated double diaphragm pumps produce. The automatic valve on the AODDampener adjusts the charge in the air chamber to compensate for varying conditions in the discharge piping system, maximizing the reduction in pulsation. When sized correctly and properly installed the AODDampener will greatly reduce the damaging effects of pressure variations and improve the efficiency of transferring fluids.

All dampeners manufactured by BLACOH use pressure bodies made in the USA to ensure quality. Prior to shipment, each and every dampener is factory pressure tested to assure proper function and leak-free operation.

Table of Contents

SAFETY Warnings 2

 Safety Symbols2

 General Safety2

 Equipment Misuse Hazard2

GENERAL Information 3

 Must Read Before Installation3

 Installation Notes.....3

 ATEX Standard3

 Temperature Limits.....3

 Maintenance.....3

Installation & Operation Instructions: AODDAMPENER™ Models..... 4

 Installation for Pump Discharge Pulsation4

 Maintenance and Repair5

 Replacement Kits and Tools5

 Diaphragm Replacement.....5

 Exploded View10

Manufacturer’s Limited Warranty & Return Policy.....11

MODEL Specifications & Installation Information

Installation Date _____

Model No.	Serial No.	Pump Area and Number
Purchased From	Contact	Phone
		Email

SAFETY Warnings

Dampeners should only be installed, operated and repaired by experienced and trained professional mechanics. Read and observe all instructions and safety warnings in this Manual before installing, operating or repairing dampeners.

Safety Symbols

The following symbols indicate cautions, warnings and notes that must be observed for safe and satisfactory installation, operation and maintenance of dampener.



WARNINGS

Danger of serious injury or death could occur if these warnings are ignored.



CAUTIONS

Equipment damage, injury or death could occur if these cautions are not observed.



NOTES

Special instructions for safe and satisfactory installation, operation and maintenance.

General Safety ⚠ CAUTION!

- Observe all safety symbols in installation and operation instructions.
- The internal dampener pressure will equal the maximum fluid pressure of the system in which it is installed.
- DO NOT** exceed maximum allowable working pressure (MAWP) specified on dampener serial tag or marked on dampener. If missing, **DO NOT** use dampener without consulting distributor or factory for maximum pressure rating.
- Always make sure safety shutoff valves, regulators, pressure relief valves, gauges, etc. are working properly before starting system or assembly.
- Verify dampener model received against purchase order and shipper.
- Before starting a system or assembly make certain the discharge point of the piping system is clear and safe, and all persons have been warned to stand clear.
- DO NOT** put your face or body near dampener when the system or assembly is operating or dampener is pressurized.
- DO NOT** operate a dampener that is leaking, damaged, corroded or otherwise unable to contain internal fluid, air or gas pressure.
- DO NOT** pump incompatible fluids through dampener. Consult distributor or factory if you are not sure of the compatibility of system fluids with dampener materials.
- AODDampener models are designed to operate with compressed air **only**. Other compressed gases have not been tested and may be unsafe to use. **DO NOT USE OXYGEN.**
- Always shut off air supply, remove internal dampener pressure and shut dampener isolation valve before performing dampener maintenance or repair.
- Remove all pressure from dampener AND pumping system before disassembly, removal or maintenance.
- Static spark can cause an explosion resulting in severe injury or death. Ground dampeners and pumping system when pumping flammable fluids or operating in flammable environments.**

Equipment Misuse Hazard ⚠ CAUTION!

General Safety

DO NOT misuse dampener, including but not limited to over-pressurization, modification of parts, using incompatible chemicals, or operating with worn or damaged parts. **DO NOT** use any gases other than compressed air to charge dampener. **DO NOT USE OXYGEN.** Any misuse could result in serious bodily injury, death, fire, explosion or property damage.

Over-Pressurization

Never exceed the maximum pressure rating for the dampener model being used. Maximum allowable working pressure (MAWP) is specified on dampener serial tag or marked on dampener. Maximum allowable working pressure (MAWP) is rated at 70°F (21°C).

Temperature Limits

DO NOT exceed the operating temperature limits for the body and/or diaphragm materials being used. Excessive temperature will result in dampener failure. For temperature limits, refer to the "Temperature Limits" section of this Manual. Temperature limits are stated at zero psi/bar.

Installation and Startup Hazards

Install dampener before charging or pressurizing. **DO NOT** start system or assembly without first charging or pressurizing dampener. Failure to charge may result in damage to the PTFE diaphragm.

Temperature & Pressure Hazard

Temperature and pressure reduce the strength and chemical resistance of plastic, metal, elastomers and PTFE.

Charging / Pressurization

Charge or pressurize dampener with clean compressed air only. **DO NOT USE OXYGEN.**

Dampener Diaphragm Failure

AODDampener models utilize a PTFE diaphragm to separate system fluid from the air supply. When failure occurs, system fluid may be expelled from the air valve. Always perform preventive maintenance and replace diaphragm before excessive wear occurs.

Maintenance Hazards

Never overtighten fasteners. This may cause leakage of system fluid and damage to dampener body. Bolts should not be reused as re-torquing reduces bolt strength. **After dampener maintenance or disassembly, use new fasteners and torque fasteners according to specification on dampener tag. If missing, consult distributor or factory for torque specifications.**

GENERAL Information



For safe and satisfactory operation of dampener read all safety warnings, caution statements and this complete Manual before installation, startup, operation or maintenance.

Must Read Before Installation



DO NOT use Oxygen to charge dampener. Use clean compressed air only.



DO NOT exceed maximum allowable working pressure (MAWP) specified on dampener serial tag or marked on dampener.



Turn pump off and remove all pressure from system prior to dampener installation.



Always wear safety glasses and other appropriate safety equipment when installing, charging or repairing dampener.



Danger of static spark! Grounding precautions must be considered when dampener is used in flammable or explosive environments.



ATEX models must be grounded (earthed) before operation.



DO NOT operate a dampener that is leaking, damaged, corroded or otherwise unable to contain internal fluid, air or gas pressure.



Temperature, pressure and chemicals affect the strength of plastic, elastomer and metal components.



Due to the nature of the material, PTFE diaphragm will *cold flow*. Prior to installation, tighten bolts to torque specification on dampener tag.

Installation Notes



Dampening of flow pulsations can only be effective if a minimum of 5 to 10 psi (0.4 to 0.7 bar) back pressure downstream of dampener is available. A Blacoh back pressure valve may be required downstream of dampener, except when dampener is used as an inlet stabilizer for the inlet side of the pump.



It is recommended that a Blacoh pressure relief valve be installed in all pump systems to ensure compliance with pressure limits on system equipment.



To avoid possible damage to diaphragm from a system pressure test, prior to test dampener must be equipped with a constant source of compressed air with pressure equal to or greater than system test pressure.



Install dampener inline as close to the pump discharge/inlet or quick closing valve as possible. Dampener installation should be no more than ten pipe diameters from pump discharge/inlet or quick closing valve.



It is recommended that an isolation valve be installed between the dampener and system piping.

ATEX Standard



Certain models made for the European market are intended for use in potentially explosive atmospheres and meet the requirements of ATEX directive 2014/34/EU. These models have the AT designation at the end of the part number, comply with ISO 80079-36, and have an ATEX rating of II 2GD Ex h IIB T4 Gb Db. AT models have a grounding lug and must be grounded (earthed) before operation.

Temperature Limits



Operating temperatures are based on the maximum temperature of the wetted dampener components only. Non-wetted dampener components may have a lower temperature limit. Temperature and certain chemicals may reduce the maximum allowable working pressure (MAWP) of the dampener.

Material	Temperature Limit	
PTFE Diaphragm	+40°F to +220°F	(+4°C to +104°C)
Buna-N	+10°F to +180°F	(-12°C to +82°C)

Maintenance



Remove all pressure from dampener AND pumping system before disassembly, removal or maintenance.

Dampeners require very little maintenance.

PTFE diaphragm replacement should be part of a preventive maintenance program. As with any pumping system, wear is dependent on many factors including material, temperature, chemicals, fluid abrasiveness and system design. This suggested maintenance program may need to be adjusted according to specific applications.

Periodic inspection of the dampener and fasteners should be conducted to visually check for signs of over-pressurization, fatigue, stress or corrosion. Body housings and fasteners must be replaced at first indication of deterioration.



CAUTION! Replace nut and bolt fasteners at each reassembly with fasteners of equal grade/strength value. DO NOT reuse old nuts and bolts.

After the initial torque of fasteners, bolts may lose strength when re-torqued. Failure to replace both nuts and bolts upon each vessel reassembly will void the product warranty given by the manufacturer and the manufacturer will have no liability whatsoever for any vessel failure or malfunction.

Where dampeners are used in corrosive environments, nut and bolt fasteners should be regularly inspected and replaced with nut and bolt fasteners of equal grade/strength value if corrosion is observed. Failure to conduct such regular inspections and replacement will void the product warranty given by the manufacturer and the manufacturer will have no liability whatsoever for any vessel failure or malfunction.

- ✦ **IMPORTANT!** After maintenance or disassembly, use new fasteners and torque fasteners according to specification on dampener tag. If missing, consult distributor or factory for specifications.
- ❗ **DO NOT** use dampener if the fasteners (nuts and bolts) are corroded. Check for fastener corrosion frequently, especially in atmospheres containing salt or corrosive chemicals, or if dampener leakage has occurred.

Installation & Operation Instructions: AODDAMPENER™ Models

- ❗ **AODDampener automatic dampener models are designed specifically for use with air operated diaphragm pumps, and are not recommended for use as Inlet Stabilizers at pump inlets or as Surge Suppressors at quick closing valves. Use Inlet Stabilizer models on the inlet side of pumps and metal Surge Suppressors for water hammer or quick closing valve applications. Consult factory for options.**
- ❗ **ATEX models must be grounded (earthed) before operation.**
- ✦ Turn pump off and remove all pressure from system prior to dampener installation.
- ✦ Remove all pressure from dampener AND pumping system before disassembly, removal or maintenance.
- ✦ Equip dampener with constant source of clean compressed air. **DO NOT USE OXYGEN.**
- ✦ **DO NOT exceed 150 psi (10.3 bar) maximum allowable working pressure (MAWP). Check maximum pressure rating specified on dampener.** If missing, consult distributor or factory for specifications.
- ✦ Always wear safety glasses and other appropriate safety equipment when installing, charging or repairing dampener.
- ✦ Read and observe all safety warnings and instructions in this Manual before installation, operation or repair.
- ✦ **IMPORTANT! After maintenance or disassembly, use new fasteners and torque fasteners according to specification on dampener tag.** If missing, consult distributor or factory for specifications.
- ⚠ Before performing a system pressure test, an air line with a constant source of compressed air must be attached to dampener to avoid possible damage to diaphragms. Compressed air pressure must be equal to or greater than system test pressure.

Installation for Pump Discharge Pulsation

Read Before Installation

- ❗ Due to the nature of the material, PTFE diaphragm will *cold flow*. Prior to installation, tighten bolts to torque specification on dampener tag.

Step 1 — Installation Position

Install the dampener inline as close to the pump discharge as possible to absorb the pulse at its source and before any downstream equipment such as risers, valves, elbows, meters or filters. Dampener installation should be no more than ten pipe diameters from pump discharge. If using a flexible connector on the discharge side of the pump between the pump and system piping, the dampener should be installed at the pump discharge manifold. The flexible connector should be attached to the dampener's tee and system piping (Figure 1). Since pressure is equal in all directions, the dampener can be installed in a vertical, horizontal or upside-down position. A vertical installation is recommended for better drainage of the dampener. Limitations for horizontal and upside-down mounting include high specific gravity, high viscosity, settling of solid material or possible air entrapment which could result in shortened diaphragm life and/or reduced dampening performance. An isolation valve installed at the dampener inlet is suggested to assist in removal for repairs (Figure 1).

Step 2 — Air Line Connection

Supply compressed air to the dampener using a 1/4" or larger air line to ensure adequate air supply to the dampener. AODDampener models have an automatic valve with two NPT ports fitted in the non-wetted housing. Using a suitable 1/8" NPT adapter (1/4" NPT for AOD-30 models), connect the air line to the NPT inlet connection indicated by the arrow.

Attach the air line to the existing pump air supply line before any regulator used at the pump's air valve (Figure 1). The compressed air pressure to the dampener must be equal to or greater than the air pressure supplied to the pump.

Compressed air should be applied to the dampener charge port at all times for proper operation. In case the compressed air supply to the dampener is interrupted, it is recommended that a check valve be added to the compressed air supply line to prevent the charge from escaping through the air inlet while the dampener is depressurized.



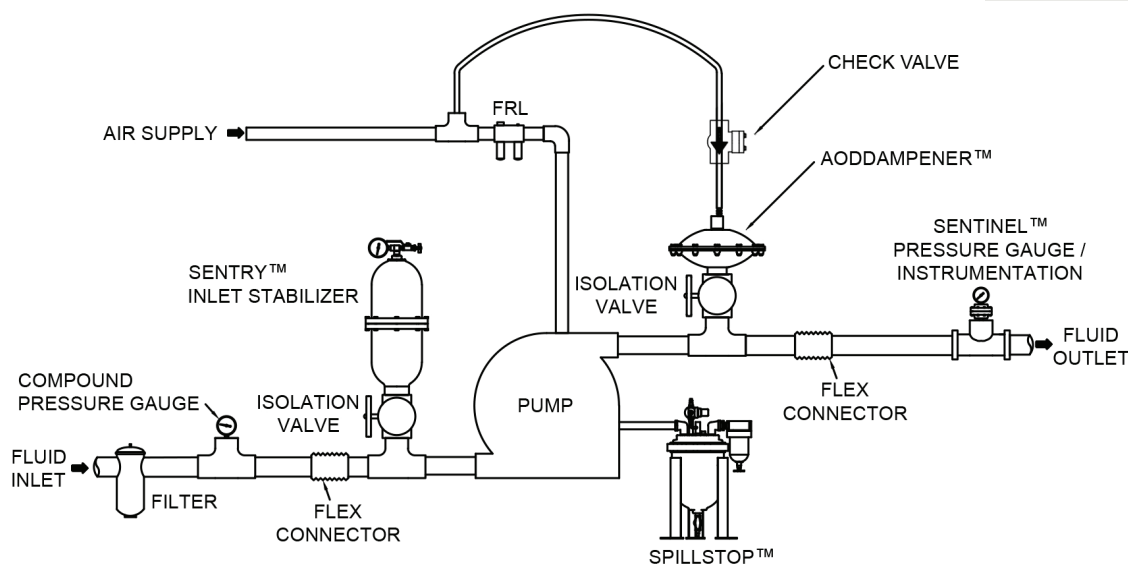
- ❗ The exhaust port in the automatic valve is supplied with a muffler. Dampener will not operate if the exhaust port is blocked or, if an air supply is attached to that port.
- ⚠ If a diaphragm failure occurs, it is possible for the pumped product to enter the dampener air chamber and into the compressed air line. It is recommended that a one-way check valve be installed at the air connection to prevent backflow of product.
- ⚠ If a diaphragm failure occurs, it is possible for the pumped product to enter the dampener air chamber and be expelled from the dampener exhaust. It is recommended that the exhaust be plumbed to a safe area or to a Blacoh SPILLSTOP™ unit if the dampener location and/or the nature of the pumped product presents a hazard.

Step 3 — Startup

- ❗ To avoid damage to diaphragms, DO NOT start the pump before compressed air is supplied to dampener.

Prior to starting the pump, dampener must have the air supply connected and available to the dampener to avoid possible damage to diaphragms. Once the air supply connection is complete, the dampener is fully functional and will operate automatically when the pump is started.

Figure 1



Maintenance and Repair

Read Before Installation

- ❗ DO NOT use dampener if the fasteners (nuts and bolts) are corroded. Check for fastener corrosion frequently, especially in atmospheres containing salt or corrosive chemicals, or if dampener leakage has occurred.
- ❗ Regularly inspect compressed air line for damage. If compressed air to dampener is reduced or stopped, diaphragm failure will occur.

Replacement Kits and Tools

Diaphragm replacement kits include all parts necessary for replacement, including hardware and O-rings. The O-Ring Installation Tool is intended solely for use when installing O-rings in the automatic valve on the non-wetted housing of the AODDampener to ensure proper O-ring placement on reassembly.

AODDampener Model	AOD-10 (1")	AOD-15 (1.5")	AOD-20 (2")	AOD-30 (3")
PTFE Diaphragm Kit	AOD-10-100	AOD-15-100	AOD-20-100	AOD-30-100
PTFE Diaphragm Kit, ATEX	AOD-10-100-AT	AOD-15-100-AT	AOD-20-100-AT	AOD-30-100-AT
O-Ring Installation Tool	AD10-032	AD00-032	AD00-032	AD30-032

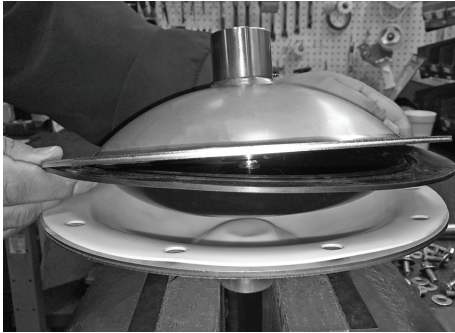
Diaphragm Replacement

Disassembly

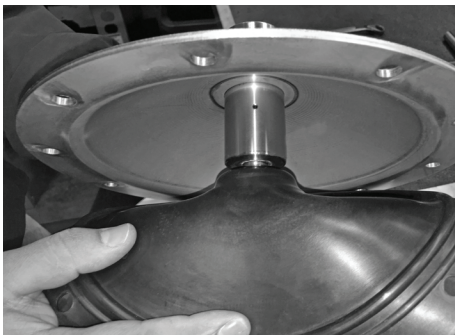
1. Turn pump off and allow system pressure to drop to zero pressure. Disconnect compressed air line to dampener.

- ⚠ Pump must be turned off and system pressure must be zero prior to dampener disassembly. In systems with a static head pressure, it is not sufficient to simply isolate the dampener. To prevent damage to the PTFE diaphragm, fluid system pressure must be relieved prior to removing charge pressure from dampener.

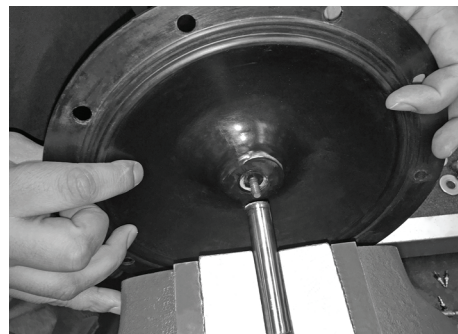
2. Close isolation valve (if installed) on dampener inlet. Dampener can be repaired in place however, the preferred method is to remove dampener from the system.
3. Remove and clean any thread sealant at the connection to the piping system.
4. There should be no residual pressure in dampener, however; slowly loosen all fasteners first to slowly release any remaining pressure before removing fasteners. Discard used fasteners. New fasteners are included in Diaphragm Replacement Kits.
 - ⚠ Replace nut and bolt fasteners at each reassembly with fasteners of equal/greater strength value. DO NOT reuse old nuts and bolts.
5. Remove the non-wetted housing and discard used PTFE diaphragm.
 - ⚠ Process liquid may be present if diaphragm failure has occurred. Always wear safety glasses and other appropriate safety equipment when disassembling dampener.



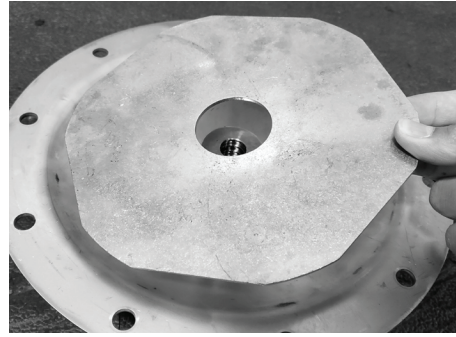
6. The backup diaphragm is attached to the air control shaft. Gently pull down on the diaphragm to slide the shaft out from the automatic valve in the non-wetted housing. If the shaft does not slide out easily, remove the muffler, insert a small screwdriver through the hole and push the top end of the shaft down. Take necessary precautions not to scratch or damage the shaft, otherwise, the automatic valve may not function properly.



7. To remove the shaft from the backup diaphragm, secure the shaft in a vise with soft jaws to protect the shaft from nicks and scratches. Hold the used backup diaphragm with two hands and gently turn it counterclockwise to unscrew it from the shaft. Discard used backup diaphragm.



8. AODDampener models are equipped with a backup plate attached to the non-wetted housing to minimize damage to the diaphragm if the dampener loses charge. The backup plate is held in place by two retaining rings. It is not necessary to remove the backup plate during disassembly, except when necessary to clean any oil residue or remove debris from the non-wetted housing. To remove the backup plate, remove the retaining ring using snap ring pliers and lift the backup plate off the housing.



O-Ring Replacement

1. There are five grooves in the automatic valve with O-ring seals installed in grooves 1, 3 and 5 (Figure 2). O-rings in the automatic valve should be replaced with each diaphragm replacement. New O-rings are included in Diaphragm Replacement Kits.
2. Secure the dampener non-wetted housing into a vise with the inside (interior) of the housing facing up.
3. Using an O-ring pick, remove old O-rings from the automatic valve and discard.

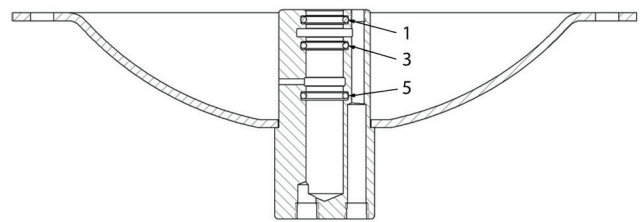
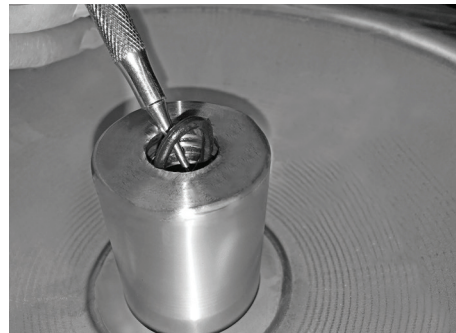
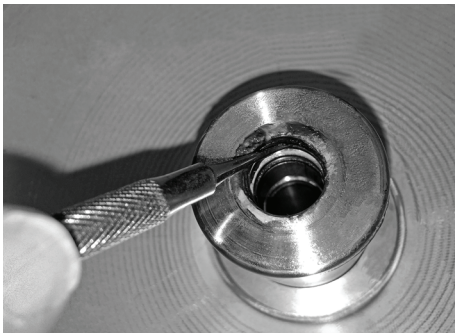


Figure 2



4. Apply a thin coat of lubricant (such as Molycote® 55 or equivalent) to new O-rings and install in grooves 5, 3 and 1 in that order (Figure 2). The automatic valve will not operate if O-rings are installed in the wrong grooves.

Install O-Rings with O-Ring Installation Tool:



It is highly recommended that the AODDampener O-Ring Installation Tool be used to install O-rings in the automatic valve to ensure proper placement on reassembly. The tool is engineered to properly install O-rings one at a time in the correct position and is available in three sizes to fit 1" inlet models, 1.5 and 2" inlet models, and 3" inlet models. Refer to *Replacement Kits and Tools* above.

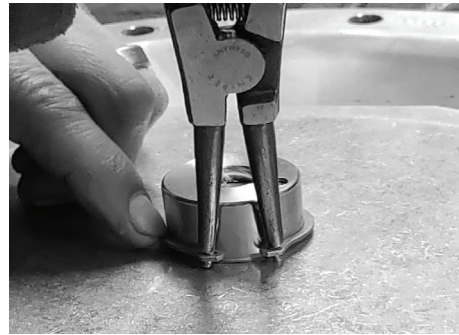
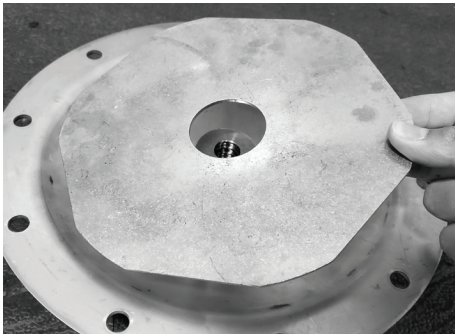
- a. Using the appropriate size O-Ring Installation Tool, insert the O-ring tool slide into the body of the tool until O-ring grooves align.
- b. Position the first O-ring into the first groove on the tool to install the O-ring in groove 5 of the automatic valve. Use your finger to cover the top of slide to prevent the O-ring from slipping out of place and push the slide forward to properly position the O-ring on the tool.
- c. With the slide held in place, insert the tool into the automatic valve until the shoulder of the tool is flush with the top of the valve. Hold the tool in place and carefully remove the slide from the tool body. Remove the entire tool from the automatic valve and confirm the O-ring is properly seated in groove 5.
- d. Reinsert the O-ring tool slide into the body of the tool until O-ring grooves align and repeat steps above to install the two remaining O-rings. Use the second groove on the tool to install the second O-ring in groove 3 of the automatic valve, and the third groove on the tool to install the third O-ring in groove 1 of the automatic valve.

Install O-Rings *without* O-Ring Installation Tool:

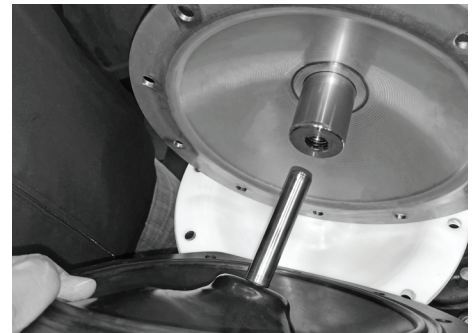
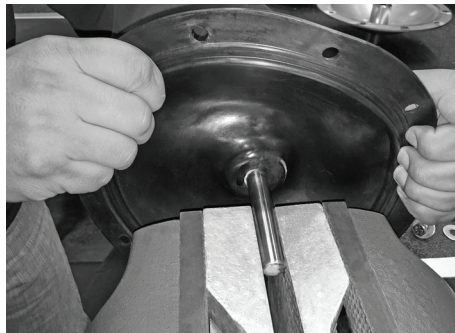
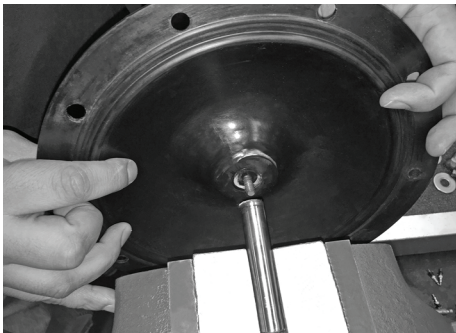
- △ Installing O-rings using a pick, or any instrument other than the specifically designed O-Ring Installation Tool, is not recommended as it may result in improper placement and/or damage to automatic valve O-rings.
- Use an O-ring pick to push the first O-ring into the automatic valve past groove 5 and then pull the O-ring back into groove 5.
 - Repeat the same process for installing the second O-ring in groove 3 and the third O-ring in groove 1.
- Inspect the automatic valve to ensure all three O-rings are properly installed in grooves 5, 3 and 1. If not, use an O-ring pick to carefully remove O-rings and discard. Repeat installation steps using new O-rings.
 - Apply a thin coat of lubricant (such as Molycote® 55 or equivalent) on the inside of the automatic valve, ensuring O-rings are adequately coated.

Reassembly

- If removed on disassembly, reinstall the backup plate. Clean and dry the internal housing surface, taking particular care to ensure the flange area is completely clean and dry. Slide the backup plate onto the non-wetted housing until it rests on the retaining ring. Reinstall the retaining ring using snap ring pliers.



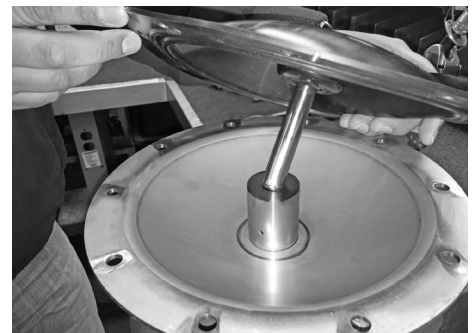
- There are no special tools required to install the new backup diaphragm. Secure the shaft in a vise with soft jaws. Apply medium strength thread locker (Loctite® 243 or equivalent) to the threads on the new backup diaphragm. Gently screw the diaphragm threads into the shaft with two hands and stop when hand tight. Remove the diaphragm and shaft from the vise, and insert the shaft into the automatic valve.



- Before proceeding with reassembly, test the automatic valve to ensure proper operation.

△ **IMPORTANT!** When replacing dampener diaphragms the automatic valve must be tested for proper function before dampener is reassembled.

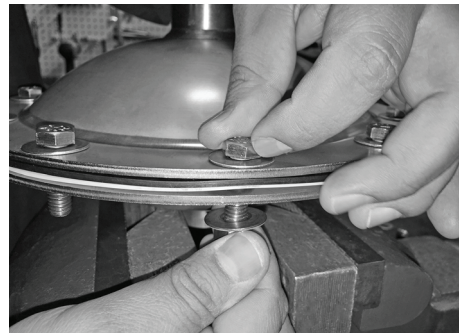
- With air off, attach a compressed air line to the air inlet port on the top of the dampener.
- Place the non-wetted housing in a vise with soft jaws.
- Push the diaphragm and shaft into the automatic valve until it stops. Turn on air supply. Compressed air should now be flowing into the air chamber. If there is no air flow, one or more O-rings are installed in the wrong groove.
- Pull the shaft part way out of the automatic valve. Compressed air should stop flowing. If air flow does not stop, one or more O-rings are installed in the wrong groove.
- Remove the compressed air line from the dampener, and the non-wetted housing from the vise.



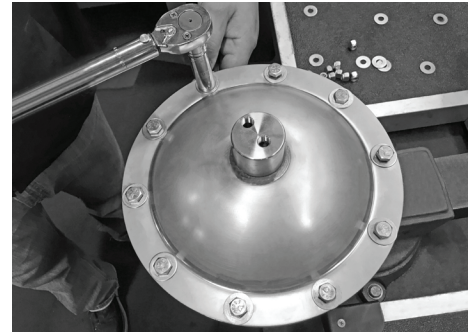
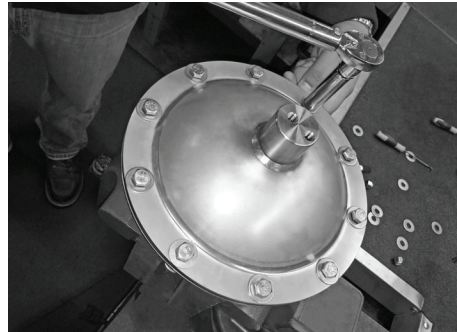
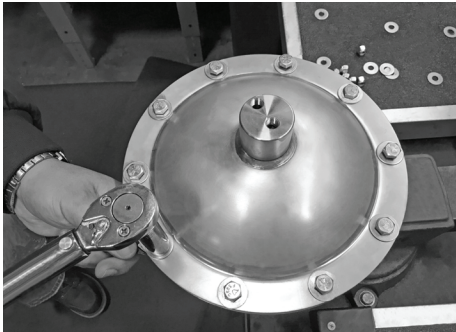
4. Place the wetted housing in a vise with soft jaws. Clean and dry the internal housing surface, taking particular care to ensure the flange area is completely clean and dry.
5. Place the PTFE diaphragm in the wetted housing with the dome (convex) side down. Place the non-wetted housing and diaphragm sub-assembly onto the wetted housing with bolt holes aligned. Ensure the diaphragms fit together snugly to minimize any air between them.



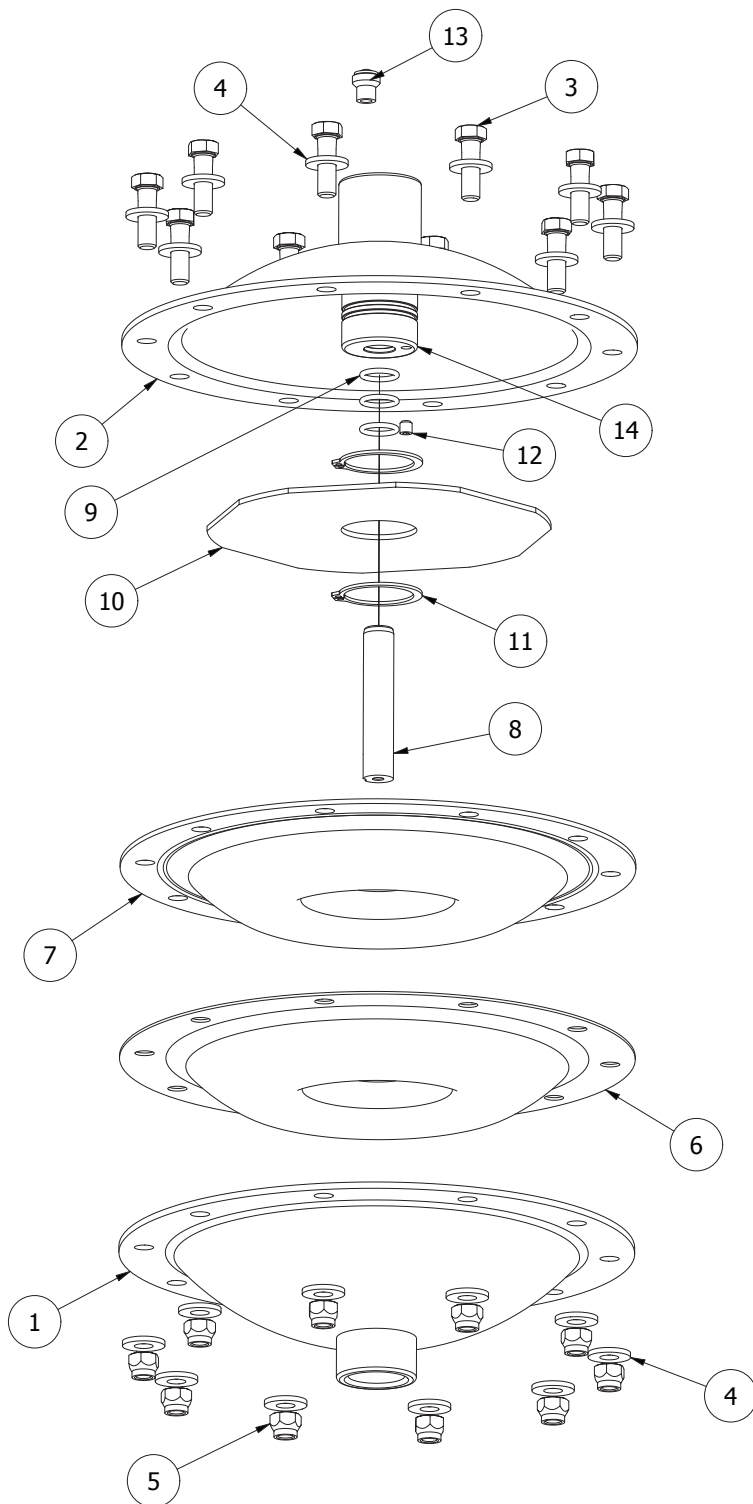
6. Insert bolts with flat washers through the top side. Attach flat washers and lock nuts on the bottom side for each bolt. Lubricate bolt threads with anti-seize compound or oil before installing nuts to prevent galling.



7. Torque bolts in a star pattern according to the following torque specifications:
 - AOD-10, 1" inlet model, (10) 3/8" bolts – **17 ft-lb / 23 Nm**
 - AOD-15 and AOD-20, 1.5" and 2" inlet models, (12) 7/16" bolts – **30 ft-lb / 40 Nm**
 - AOD-30, 3" inlet model, (24) 7/16" bolts – **27 ft-lb / 36 Nm**



Exploded View



Item	Description
1	Wetted Housing
2	Non-wetted Housing
3	Bolt
4	Washer
5	Nut
6	PTFE Diaphragm
7	Backup Diaphragm
8	Air Control Shaft
9	O-Ring
10	Backup Plate
11	Retaining Ring
12	Plug
13	Muffler
14	Automatic Valve

Manufacturer's Limited Warranty & Return Policy

Details regarding warranty and return policy are available on Blacoh's website at www.Blacoh.com

BLACOHTM
I N D U S T R I E S

BLACOH
FLUID CONTROL

BLACOH
SURGE CONTROL

BLACOH
I N D U S T R I E S GmbH