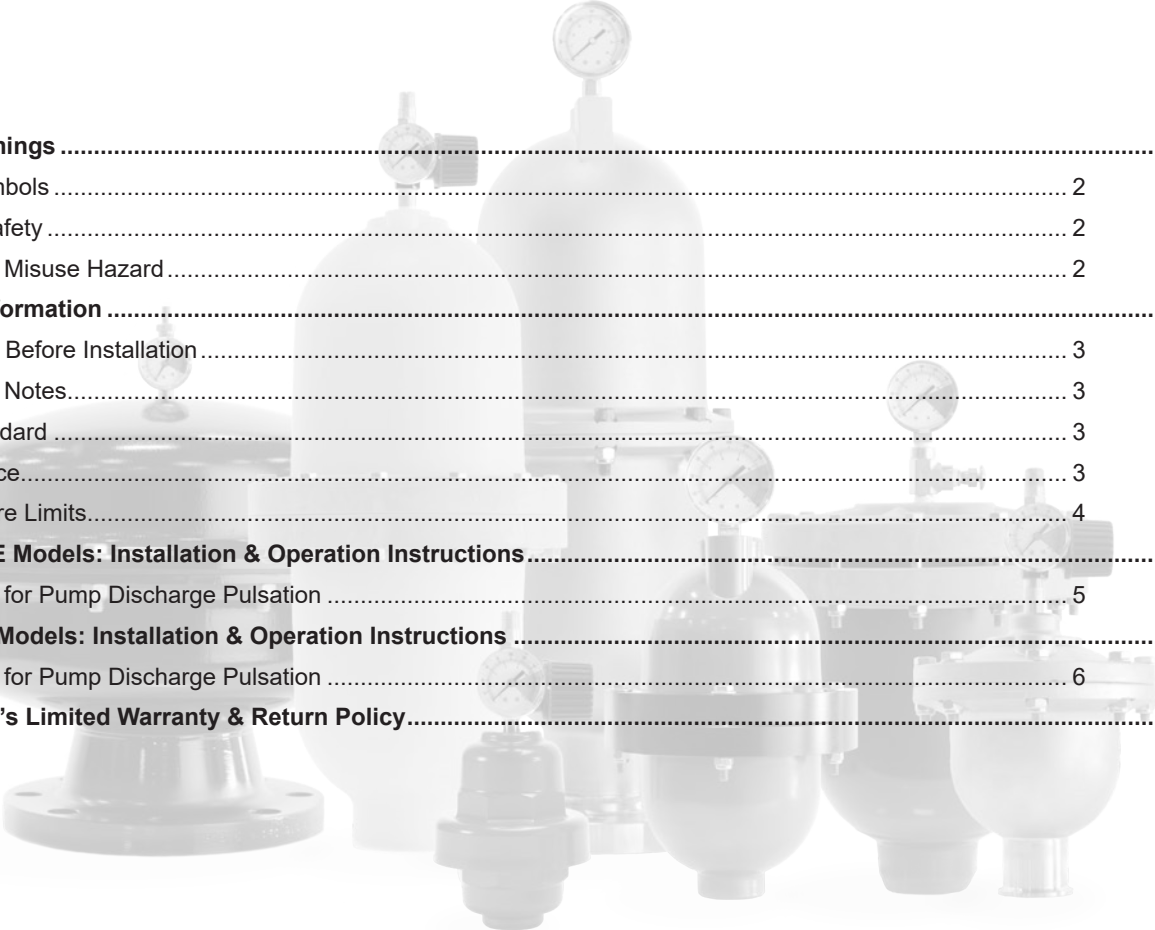




Installation and Operation Manual



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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.

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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 ⚠

- 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.
- Dampeners are designed to operate with compressed air or clean dry Nitrogen **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 ⚠

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 or clean dry Nitrogen 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 elastomer 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 bladder or bellows.

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 compressed air or clean dry Nitrogen only. **DO NOT USE OXYGEN.**

Dampener Bladder/Bellows Failure

Dampeners utilize a bladder or bellows to separate system fluid from the air supply or gas charge. When failure occurs, system fluid may be expelled from the air valve. Always perform preventive maintenance and replace bladder/bellows before excessive wear occurs. O-rings for PTFE bellows and gaskets for Stainless Steel metal bellows cannot be reused.

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 compressed air or clean dry Nitrogen 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.
-  Many plastics lose strength rapidly as temperature increases. Consult factory if in doubt.

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 bladder/bellows from a system pressure test:
Adjustable and Chargeable models — charge dampener to 80% of the system test pressure prior to test.
Automatic model — prior to test, dampener must be equipped with a constant source of compressed air with pressure equal to or greater than system test pressure.
Inlet Stabilizer model — maximum pressure test 30 psi (2.0 bar), charge to 20 psi (1.3 bar) for system pressure test.
-  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.

Maintenance

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

Dampeners require very little maintenance. There is no need for lubrication with bladders or bellows.


Elastomeric bladder replacement should be part of a preventive maintenance program. Dampeners used in conjunction with diaphragm pumps should have the bladders replaced at least every second time the diaphragms in the pump are replaced. 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.

Temperature Limits

- ① 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.
- ① **CAUTION!** Plastic (non-metallic) body materials lose strength as temperature increases, which reduces the maximum pressure sustainable by the material. All plastic materials must have an appropriate derating factor applied when working at elevated temperatures above 73.4°F (23°C) to determine maximum allowable working pressure (MAWP).

Elastomer Materials	Temperature Limits		Applications
Aflas	0°F to +400°F	(-18°C to +204°C)	High temperature, petroleum based chemicals, strong acids and bases.
Buna-N	+10°F to +180°F	(-12°C to +82°C)	Good flex life; use with petroleum, solvents and oil-based fluids.
FDA Buna-N	+10°F to +180°F	(-12°C to +82°C)	FDA-approved food grade; similar characteristics of regular Buna-N.
EPDM	-60°F to +280°F	(-51°C to +138°C)	Use in extreme cold; good chemical resistance with ketones, caustics.
FDA EPDM	-50°F to +225°F	(-45°C to +107°C)	FDA-approved food grade; similar characteristics of regular EPDM.
Hypalon	-20°F to +275°F	(-29°C to +135°C)	Excellent abrasion resistance; good in aggressive acid applications.
Neoprene	0°F to +200°F	(-18°C to +93°C)	Good abrasion resistance and flex; use with moderate chemicals.
PTFE Diaphragm	+40°F to +220°F	(+4°C to +104°C)	Use with highly aggressive fluids.
PTFE Bellows	-20°F to +220°F	(-29°C to +104°C)	Exclusive bellows design with excellent flex life; use with highly aggressive fluids.
Santoprene	-20°F to +225°F	(-29°C to +107°C)	Excellent choice as a low cost alternative for PTFE in many applications.
FDA Silicone	-20°F to +300°F	(-29°C to +149°C)	FDA-approved food grade material; for use in food and pharmaceutical processing.
Viton®	-10°F to +350°F	(-23°C to +177°C)	Use with hot and aggressive fluids; good with aromatics, solvents, acids and oils.

Non-Metallic Body Materials	Temperature Limits		Applications
Acetal*	+32°F to +175°F	(0°C to +79°C)	Good flex life; low moisture sensitivity; high resistance to solvents and chemicals.
CPVC	+32°F to +180°F	(0°C to +82°C)	Chlorinated PVC (CPVC): Good general chemical resistance; loses strength as temperature rises.
Noryl	+32°F to +220°F	(0°C to +104°C)	Good resistance to acids and bases; good temperature stability.
Polypropylene*	+32°F to +175°F	(0°C to +79°C)	Good general purpose plastic; broad chemical compatibility at medium temperatures.
PTFE	+40°F to +220°F	(+4°C to +104°C)	Use with highly aggressive fluids, high temperatures.
PVC	+32°F to +140°F	(0°C to +60°C)	Good general chemical resistance; loses strength as temperature rises.
PVDF	+10°F to +200°F	(-12°C to +93°C)	Excellent resistance to most acids and bases; high temperatures.

* Conductive Acetal and Conductive Polypropylene available.

- ① Maximum allowable working pressure is reduced slightly for metal bellows at temperatures above 400°F (204°C). Apply an appropriate derating factor to determine maximum allowable working pressure (MAWP).

Metal Bellows	Temperature Limits		Applications
SS w/Gaskets*	-200°F to +800°F	(-129°C to +426°C)	Excellent for applications pumping frigid and molten fluids, outdoor applications in extreme temperatures, chemical applications where elastomers or PTFE would fail.

* Contact Blacoh for more information regarding temperatures below -200°F (-129°C).

[T22E11_030]

ADJUSTABLE Models: Installation & Operation Instructions

- ❗ **ADJUSTABLE dampener models 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 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 serial tag. 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, dampener must be charged with 80% of system test pressure to avoid possible damage to bladder/bellows.**

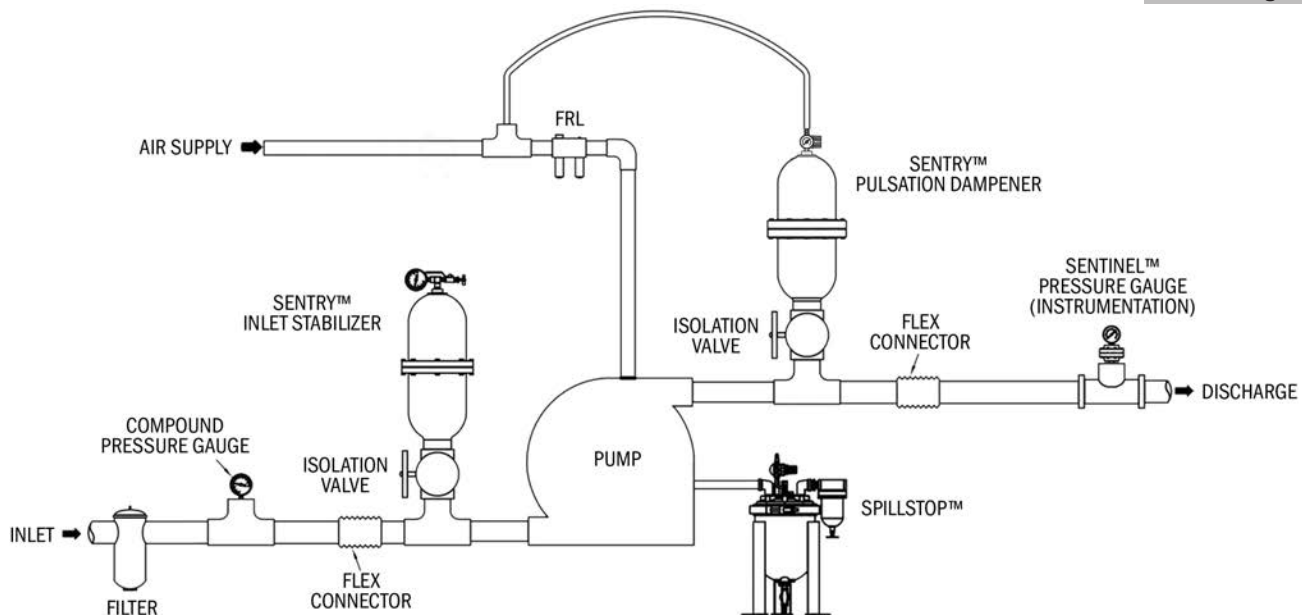
Installation for Pump Discharge Pulsation

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 (see FIGURE 1, ADJUSTABLE Models). 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 bladder/bellows life and/or reduced dampening performance.

ADJUSTABLE Models

Figure 1



Step 2 Air Line Connection

Adjustable dampener models are equipped with a brass 1/4" male one-way check valve on the dampener top for the air line connection. **DO NOT remove one-way check valve.**

Using a 1/4" flexible air hose (I.D. of the hose must be 1/4" or 6.4 mm minimum), run an air line to the top of the dampener and connect it to the dampener one-way check valve. The air supply pressure to the dampener must be greater than the pump discharge and/or system pressure.

If the dampener is being used in conjunction with a pneumatically operated pump, a tee can be used to run the air line to the dampener from the existing pump air supply line. The tee should be placed **before** any inline pump instrumentation such as a filter, regulator, lubricator or other pump control valve (see FIGURE 1, ADJUSTABLE Models).

Step 3 Charging and Startup

Prior to starting the pump, adjust regulator to fill the dampener with compressed air to approximately 80% of expected system pressure. The air charge must always be lower than pump discharge pressure. Generally, pulsation is most effectively minimized when the air pre-charge is 80% of system pressure. Start the pump to generate system pressure. **NOTE:** The most effective method to set the proper dampener charge is to install a pressure gauge downstream of the dampener and adjust the dampener to minimize needle movement on the gauge.

Once system pressure is in contact with the bladder/bellows, the air charge will be compressed to the system pressure and the dampener gauge will read the system pressure, not the initial charge pressure. Once working pressure is achieved adjustment may be necessary. Gradually increase or decrease the air charge in the dampener by bleeding or filling through the self-relieving pressure regulator. Allow the system to respond to each adjustment (this may take a minute or two) before making further adjustments.

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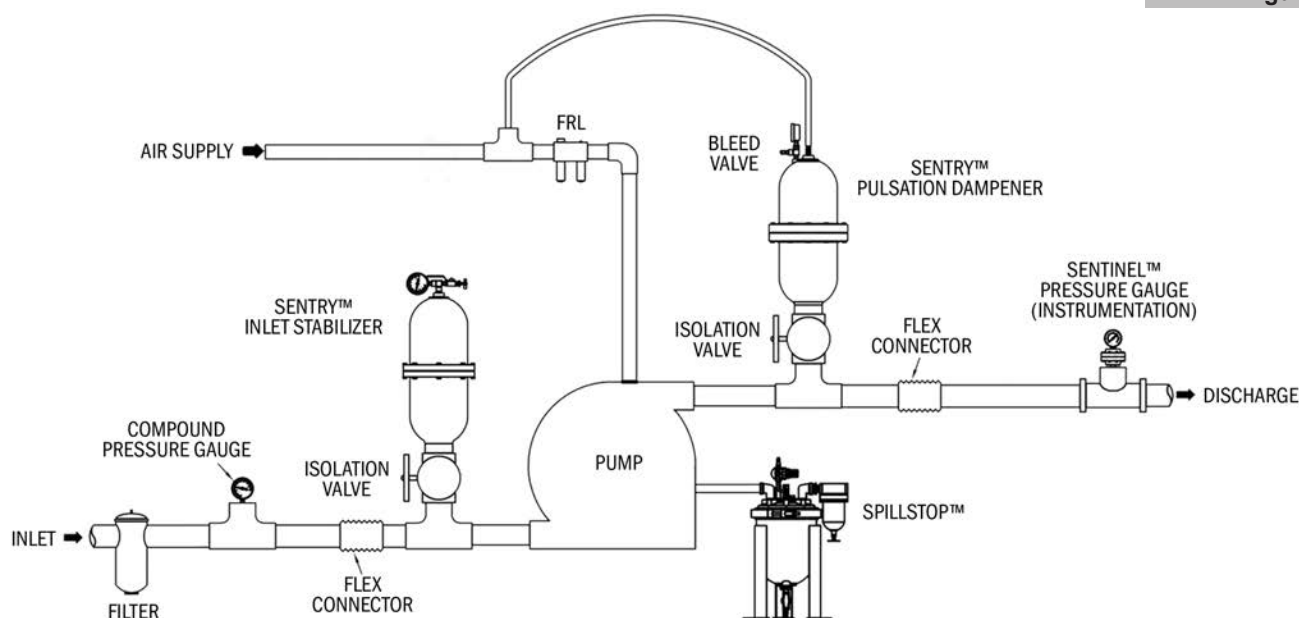
AUTOMATIC Models: Installation & Operation Instructions

- ❗ **AUTOMATIC dampener models 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. Some Automatic dampener models have a pressure bleed valve mounted to the gauge fitting. Use this valve to remove all dampener pressure before disassembly. **Push bleed button slowly.** If bladder/bellows have failed product may leak from bleed valve.
- 🔧 Equip dampener with constant source of 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 serial tag. 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 bladder/bellows. Compressed air pressure must be equal to or greater than system test pressure.

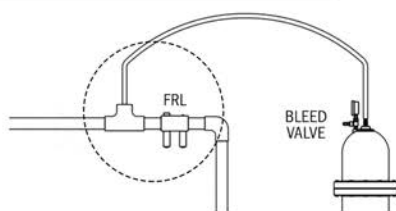
Installation for Pump Discharge Pulsation

Step 1 Installation Position

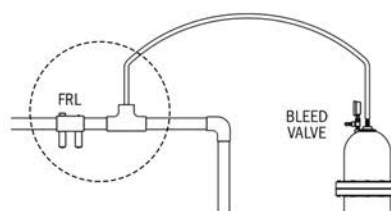
Install the dampener inline as close to the pump discharge as possible to absorb the pulse at its source and before any downstream equipment such as risers, valves, elbows, meters or filters. Dampener installation should be no more than ten pipe diameters from pump discharge. If using a flexible connector 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 (see FIGURE 1, AUTOMATIC Models). 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 bladder/bellows life and/or reduced dampening performance.



*Elastomeric Bladder/PTFE Diaphragm:
place tee before inline pump instrumentation*



*PTFE Bellows:
place tee after inline pump instrumentation*



Step 2 Air Line Connection

Automatic dampener models are equipped with either a brass 1/4" male one-way check valve or stainless steel 1/4" male nipple on the dampener top for the air line connection. **DO NOT remove one-way check valve or nipple.**

Using a 1/4" flexible air hose (I.D. of the hose must be 1/4" or 6.4 mm minimum), run an air line to the top of the dampener and connect it to the dampener one-way check valve or nipple. The air supply pressure to the dampener must be greater than the pump discharge and/or system pressure.

If the dampener is being used in conjunction with a pneumatically operated pump, a tee can be used to run the air line to the dampener from the existing pump air supply line. This is the recommended way to provide compressed air to Automatic dampener models. For dampeners with **elastomeric bladders** or **PTFE diaphragms**, the tee should be placed **before** any inline pump instrumentation such as a filter, regulator, lubricator or other pump control valve. For dampeners with **PTFE bellows**, the tee should be placed **after** inline pump instrumentation. (See FIGURE 1, AUTOMATIC Models)



IMPORTANT! After maintenance or disassembly of Automatic dampener models, the internal automatic valve assembly that is part of the air control must be tested.

The valve assembly of the automatic air control is located in the non-wetted portion of the dampener. The assembly must be tested for proper function before the dampener is reassembled. To test the assembly:

1. Using a 1/4" flexible air hose (I.D. of the hose must be 1/4" or 6.4 mm minimum), run an air line to the top of the dampener and connect it to the dampener one-way check valve or nipple.
2. Press the automatic valve on the underside of the non-wetted portion of the dampener and verify compressed air is flowing. When the valve is released, the flow of compressed air should stop.
3. Spray the assembly with a solution of soap and water or submerge in water to check for air leaks in the valve and threaded fittings. If air bubbles appear when the valve is released, tighten threaded fittings as needed. If air is leaking from the valve port, press and release the valve to clear any dirt or other obstruction. Contact the manufacturer if air leaks cannot be resolved.
4. Remove the compressed air line and reassemble the dampener.

Step 3 Charging and Startup

Prior to starting the pump, Automatic dampener models must have the air supply connected and available to the dampener to avoid possible damage to bladder/bellows. The Automatic dampener's pressure gauge will remain at zero pressure even after the air line is connected because the dampener will only allow air into the air chamber when it is required. Once the air supply line is attached to the dampener's air connection and air is available, the pump can be started. The dampener gauge will then read system pressure and no further adjustments will be necessary.

Manufacturer's Limited Warranty & Return Policy

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



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