

Valtek Flow Boosters

GENERAL INFORMATION

This bulletin is designed to assist in installing, adjusting, troubleshooting, and performing maintenance as required for the Valtek® Flow Booster. Product users and maintenance personnel should thoroughly review and follow the instructions contained in this bulletin prior to the operation of the flow booster. If there are any questions concerning the procedures outlined in these instructions, contact your Valtek representative.

Installation, operation, maintenance instructions on Valtek actuators and valves are contained elsewhere; reviewing those instructions is suggested before maintaining or troubleshooting a flow booster.

To avoid possible injury to personnel or damage to valve parts, WARNING and CAUTION notes must be strictly adhered to. Modifying this product, substituting non-factory parts, or using maintenance procedures other than outlined could drastically affect performance, be hazardous to personnel and equipment, and may void existing warranties.

Principle of Operation

The Valtek booster is a pressure-balanced instrument that increases actuator stroking speeds when large input-signal changes are received.

Through the adjustment of the bypass valve, sensitivity to a signal change can be increased or decreased. A small input signal to the booster will not create a pressure differential across the diaphragm assembly sufficient to cause booster actuation. Rather, the air passes through the bypass porting while the poppet valves remain tightly shut to prevent unnecessary air use.

A sudden, large input-signal change will create a pressure differential across the diaphragm assembly, forcing the poppet valve down, and permitting high air flow into the control valve actuator.

This high air flow continues until the pressure difference between the control valve actuator and the input signal fall within the deadband limits of the booster. Likewise, when the booster is used to exhaust a control valve actuator, the pressure imbalance across the diaphragm assembly forces it up off the upper poppet valve and the air exits the booster between the diaphragms. For on/off control valves, the bypass valve can be virtually closed to maximize the stroking speed.

Installation

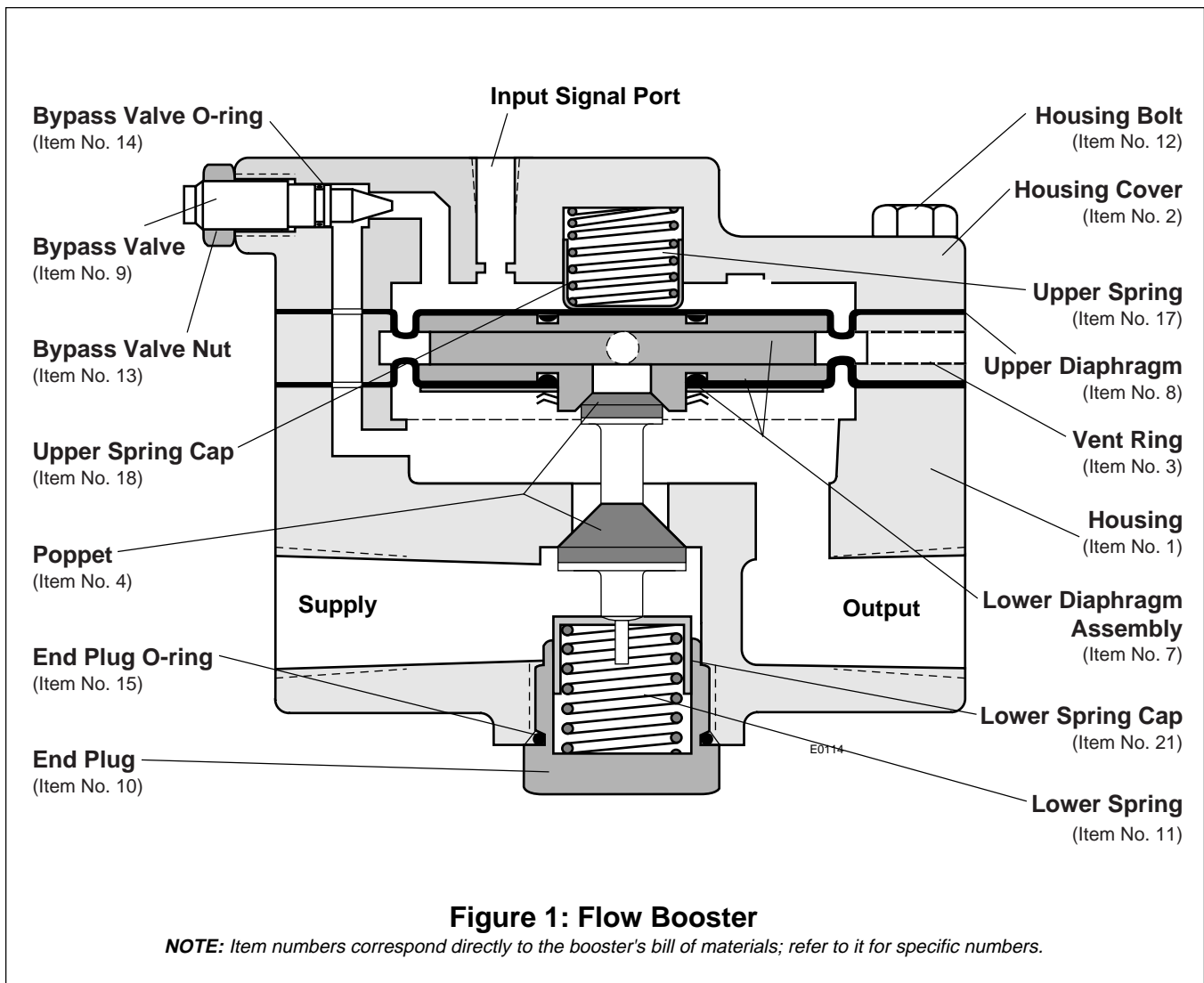
When installing the flow booster, refer to Figure 1, and proceed as follows:

WARNING: Before installing or performing any maintenance on the flow booster, shut off the air pressure to the supply line and the input signal line, and slowly release any internal pressure in the actuator and booster. High pressures not released from the booster supply lines may cause personal injury or damage to the flow booster.

WARNING: Shutting off the air supply to the positioner and hence control valve can cause the valve to move to its fail position or be disabled, causing excessive pressures to build up in the system. This, in turn, may result in the system failing, causing injury to equipment or personnel.

Generally the flow booster is nipple mounted on the actuator with 3/4-inch NPT pipe. However, some systems require multiple boosters or special configurations that may require the booster to be mounted with a bracket. If special mounting is needed, contact your local Valtek representative or the factory for assistance.

The supply port connection (marked SUP) and the actuator port connection (marked CYL) are both 3/4-inch NPT. The input signal port connection (marked SIGNAL) is a 1/4-inch NPT. A pipe sealant compound should be applied to all connections prior to installation



to prevent leaks. All piping and connection adapters should be rated at least as high as the maximum rated booster pressure, 150 psi (10.3 Bar). The flow booster is designed to function properly in any position. Figures 2 and 3 show possible installation configurations for two types of actuators.

The supply air to the flow booster does not require regulation if the maximum rated pressure of the actuator or the flow booster, 150 psig (10.3 Bar), is not exceeded. All air flowing into the flow booster should be dry and filtered to ensure a clean and non-corrosive medium.

WARNING: The exhaust ports on the flow booster exhaust air at extremely high velocities. Harm to individuals or equipment can result if positioned too closely to the exhaust ports.

After the flow booster has been installed, it may need to be adjusted for optimal performance. Refer to "Adjusting Flow Booster Operation" section to make these adjustments correctly.

Adjusting Flow Booster Operation

Once the flow booster is mounted properly, the bypass valve may need to be adjusted for proper operation. This should be done prior to making any positioner calibrations. To make this adjustment, refer to Figure 1, and proceed as follows:

1. Turn the bypass valve counter-clockwise three or four turns from its closed position.
2. Calibrate the positioner according to positioner instructions.
3. Turn the bypass valve clockwise until the flow booster actuates with large positioner input changes but does not actuate with small positioner input changes. This is done by stroking the control valve and adjusting the bypass valve slightly until the desired dynamics is achieved. Turning the bypass valve clockwise increases booster action and overshoot.

CAUTION: Cycling the control valve can disrupt the process. Care must be used to ensure this disruption will not adversely affect the process.

4. Once the bypass valve has been optimally set, the bypass valve nut should be tightened down to prevent the bypass valve from turning during operation.

NOTE: The flow booster is bench calibrated and may need to be re-adjusted once the valve is in the process.

NOTE: When two or more flow boosters are used on one actuator, all bypass valves on one side of the actuator can usually be set the same.

NOTE: If the control valve is used for only on-off operation, the bypass valve should be turned clockwise until it is nearly closed to maximize stroking speed.

MAINTENANCE

Although the flow booster is designed to provide a long service life, periodic maintenance is required to extend the booster's life. Some parts in the flow booster may need to be replaced periodically. These parts may include: diaphragms, poppet valve, O-rings and springs. If the lower diaphragm needs replaced, the entire lower diaphragm assembly (Item No. 7) must be ordered.

WARNING: Before performing any maintenance on the flow booster, shut off the air pressure to the supply line and the input signal line and slowly release any internal pressure in the actuator and booster. High pressures not released from the booster supply lines may cause personal injury or damage to the flow booster.

WARNING: Shutting off the air supply to the positioner and hence control valve can cause the valve to move to its fail position or be disabled, causing excessive pressures to build up in the system. This, in turn, may result in the system failing, causing injury to equipment or personnel.

Replacing The Diaphragm Assembly

To replace the diaphragms, refer to Figures 1 and 4, and proceed as follows:

1. With the flow booster in an upright position, unscrew the six cap screws. Lift the cover off the upper diaphragm. (If the cover adheres to the diaphragm, gently tap the cover loose with a rubber mallet under the bypass valve protrusion.)
2. Remove the upper diaphragm and inspect for damage or wear. If necessary, replace the upper diaphragm.

3. Remove the lower diaphragm assembly and inspect for damage or wear. Particular attention should be given to where the bottom diaphragm contacts the housing limit stops. Also, inspect the retaining rings for tightness of fit. If necessary, replace this assembly.

4. Reinstall the lower diaphragm assembly.

NOTE: Clean the diaphragm mating surfaces thoroughly before replacing the diaphragms.

5. The poppet must be centered in the housing. This is ensured by pressing down on the lower diaphragm assembly slightly and then releasing pressure while holding the lower diaphragm assembly centered. This procedure may need to be repeated to center the poppet in the housing.

Be certain the lower diaphragm assembly is centered on the housing and the bypass hole and diaphragm bolt holes line up with the appropriate housing holes.

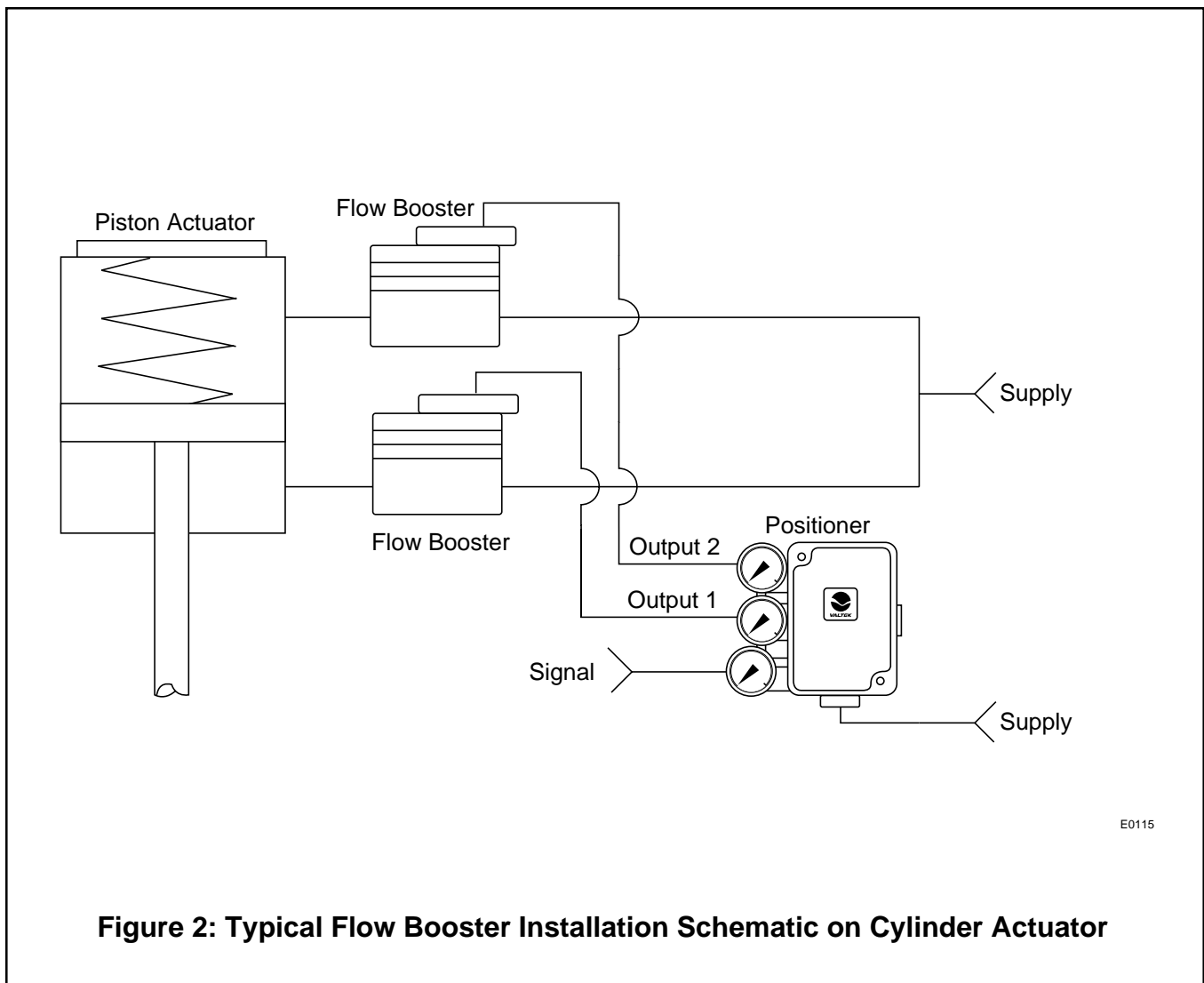
NOTE: The lower diaphragm assembly and housing have the same outside diameter dimension and should be flush when installed correctly.

6. Reinstall the vent ring, aligning it with the appropriate housing holes.
7. The distance between the lower poppet seat line and the upper poppet seat line is important to booster performance. To check this distance, place a straight edge across the middle of the vent ring. The aluminum seat should be on the same plane, within ± 0.030 inch (± 762 mm), with the vent ring. If it is not, the poppet may not be centered (see step 5), or it may be worn (see "Replacing the Poppet Valve" section).
8. Reinstall the upper diaphragm and apply an anti-seize lubricant inside the cover spring bore.
9. Place the cap and spring on the center of the diaphragm, and replace the cover on the diaphragm (be certain spring cap slides into the bore).

CAUTION: To ensure proper flow booster operation, be certain the bypass hole in the diaphragms orients properly with the bypass holes in the housing, vent and cover.

10. Replace the six housing cap screws and tighten them finger tight. Be certain that the housing, vent and cover are concentric with each other before tightening the bolts with a wrench in a crisscross pattern.

CAUTION: Care should be taken to not over-tighten the housing cap screws. Over-tightening may damage the diaphragms, preventing the booster from operating properly.



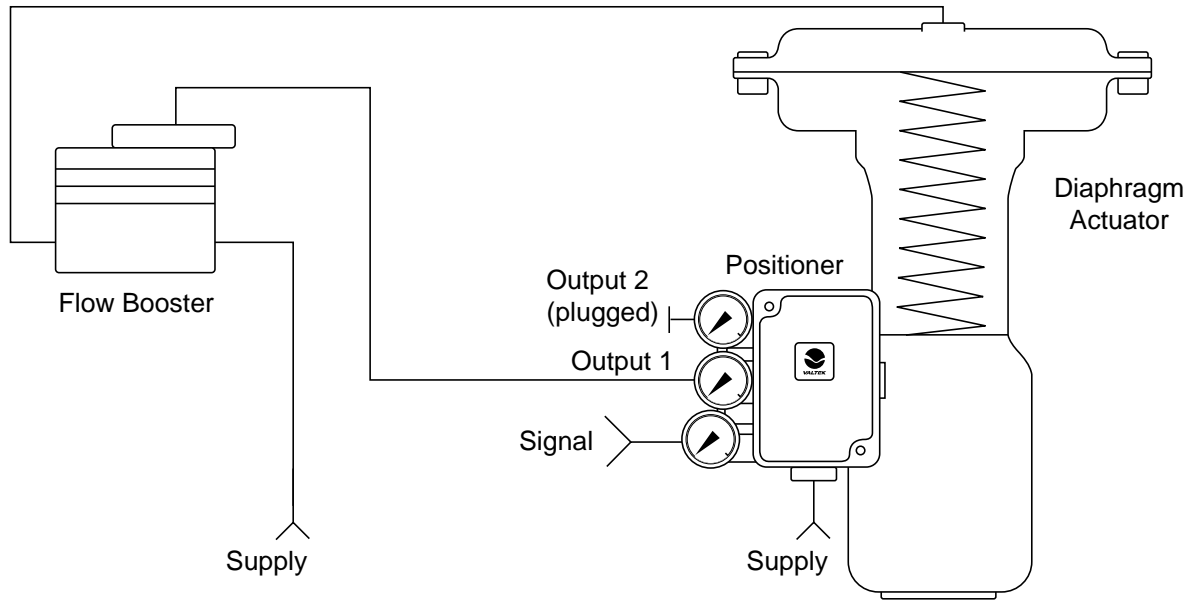
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Figure 2: Typical Flow Booster Installation Schematic on Cylinder Actuator

Replacing the Poppet Valve

If the urethane seat on the poppet is cut, damaged or severely indented, the poppet must be replaced. To do this, refer to Figures 1 and 4, and proceed as follows:

1. Turn the flow booster upside down and remove the end plug. Note that the poppet valve, lower spring cap and lower spring may freely drop from the booster. Check the end plug O-ring for wear or damage. Replace if necessary.
2. Remove the lower spring, lower spring cap and the poppet valve.
3. Before placing a new poppet valve in the booster housing, apply an anti-seize lubricant to the inside bore of the end plug. Re-install the lower spring and the lower spring cap. Place a new poppet into the hole of the lower spring.
4. While holding the flow booster in an upright position, carefully insert the poppet and end plug assembly into the housing.
5. Tighten the end plug.



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Figure 3: Typical Flow Booster Installation Schematic on Diaphragm Actuator

Table I: Flow Booster Specifications

Input Signal Range	Maximum: 150 psig (10.3 Barg) (Same as positioner output)
Supply Pressure Ranges	Up to 150 psi (10.3 Bar) (check actuator rating)
Nominal Deadband	5.5% of input signal span
Ambient Temperature Limits	-40 to 165° F (-40 to 74° C)
Supply Air Temperature Limits	-40 to 165° F (-40 to 74° C)
Maximum C_v	
Supply	5.0
Exhaust	3.0
Connections	
Signal	1/4-inch NPT
Supply, Output	3/4-inch NPT
Net Weight	4.9 lbs (2.2 kg)

Table II: Standard Materials of Construction

Component	Standard Materials
Body	Anodized aluminum
End Plug	Nickel plated brass (electroless)
Diaphragm Assembly	Anodized aluminum and Buna-N/Nylon diaphragms
Poppet	Stainless steel and polyurethane
Needle Valve	Stainless steel
Springs	Stainless steel
Spring Cap	Stainless steel
Bolts, Nuts	Stainless steel

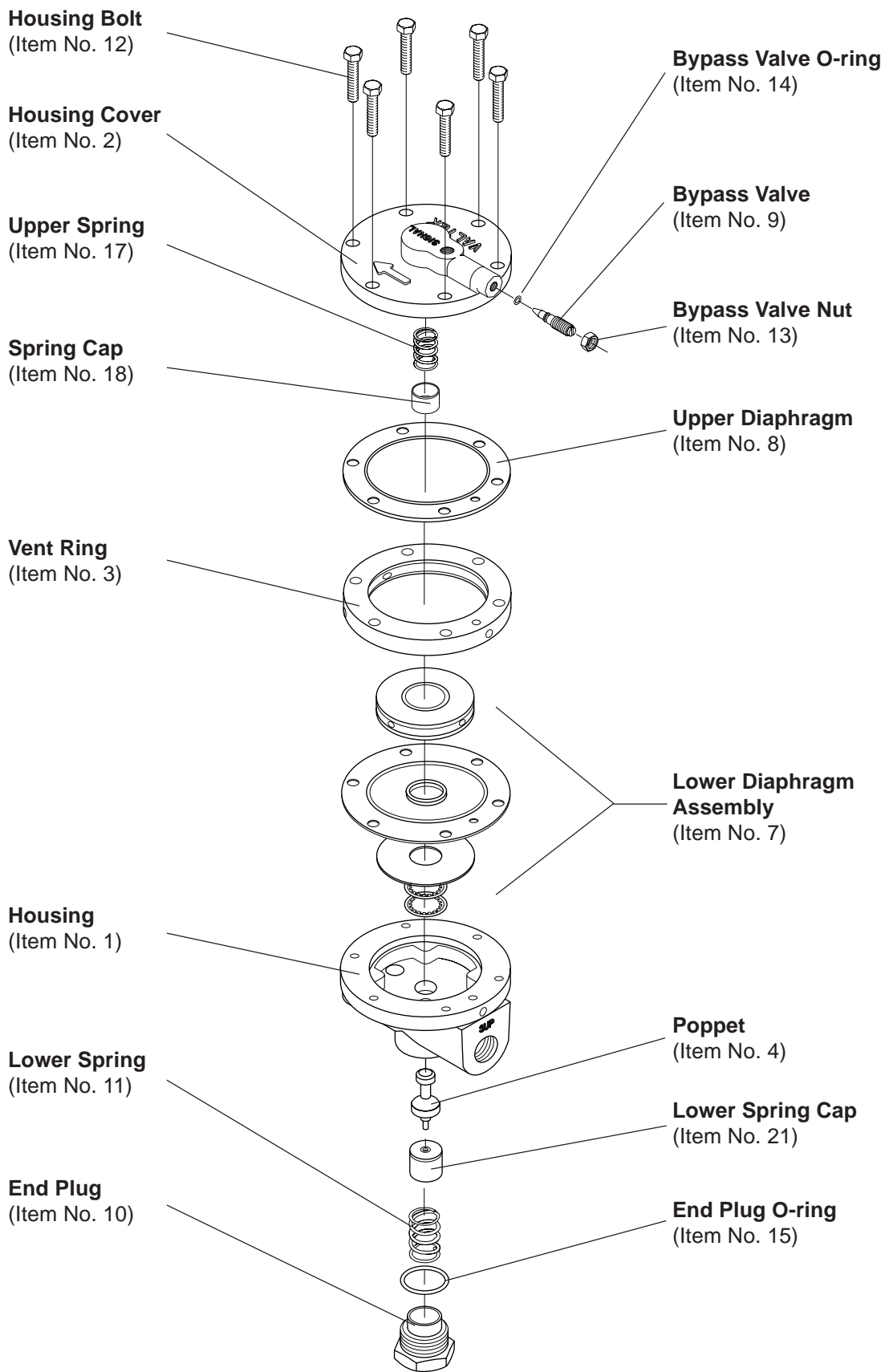


Figure 4: Flow Booster – Exploded View

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Flow Booster Troubleshooting

Problem	Probable Cause	Corrective Action
Valve overshoots	<ol style="list-style-type: none"> 1. Bypass porting is too restrictive 2. Diaphragm not aligned properly over bypass porting 3. Obstruction in the bypass porting 	<ol style="list-style-type: none"> 1. Turn the bypass valve counterclockwise until overshoot is corrected 2. Disassemble the flow booster and align both diaphragms over their appropriate holes 3. Disassemble the flow booster and clean out the porting
Valve is over-damped	<ol style="list-style-type: none"> 1. Bypass porting is not restrictive enough 2. Diaphragms are damaged and leaking 	<ol style="list-style-type: none"> 1. Turn the bypass valve clockwise until over-damping is corrected 2. Replace the diaphragms
Loss of sensitivity	<ol style="list-style-type: none"> 1. Spring caps not sliding properly 2. Obstruction in the signal port 	<ol style="list-style-type: none"> 1. Apply an anti-seize lubricant to the surface of the spring bore 2. Remove obstruction in signal port
Booster continuously exhausting	<ol style="list-style-type: none"> 1. Bypass needle valve is closed 2. Lower diaphragm is leaking air 3. Poppet seating surfaces are damaged 4. Positioner pressure imbalance problem 5. Aluminum seat/upper poppet valve not sealing 6. Actuator is leaking air 	<ol style="list-style-type: none"> 1. Adjust bypass valve (see "Adjusting Flow Booster Operation" section.) 2a. Disassemble flow booster and press down on retaining ring or replace retaining ring 2b. Replace the lower diaphragm 3a. Replace the poppet valve and clean out obstructions that may have caused the damage 3b. Replace booster body or upper diaphragm assembly if their seats are damaged 4. Refer to the appropriate positioner maintenance instructions 5a. Replace the retaining ring under the lower diaphragm 5b. Align the lower diaphragm with the housing bolt holes 6. Repair actuator as needed
Excessive air consumption	<ol style="list-style-type: none"> 1. Air leakage over or under the diaphragms 2. Air leakage past the bypass valve 3. Air leakage past the end plug 4. Air leakage at NPT connections 	<ol style="list-style-type: none"> 1a. Tighten the six capscrews evenly 1b. Clean the diaphragm surfaces 1c. Replace the diaphragm(s) 2. Replace the O-ring on the bypass valve and lubricate the O-ring 3a. Tighten the end plug 3b. Replace or straighten the O-ring 4a. Tighten connections 4b. Apply sealing compound/tape

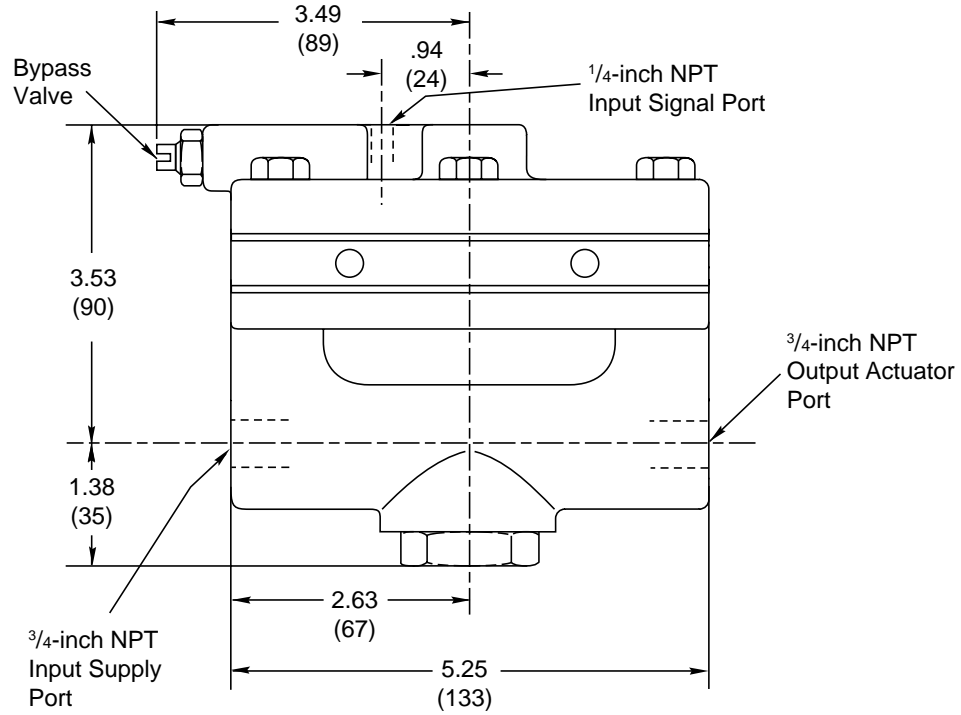


Figure 5: Dimensions inches (mm)

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Flowserve Corporation has established industry leadership in the design and manufacture of its products. When properly selected, this Flowserve product is designed to perform its intended function safely during its useful life. However, the purchaser or user of Flowserve products should be aware that Flowserve products might be used in numerous applications under a wide variety of industrial service conditions. Although Flowserve can (and often does) provide general guidelines, it cannot provide specific data and warnings for all possible applications. The purchaser/user must therefore assume the ultimate responsibility for the proper sizing and selection, installation, operation and maintenance of Flowserve products. The purchaser/user should read and understand the Installation Operation Maintenance (IOM) instructions included with the product, and train its employees and contractors in the safe use of Flowserve products in connection with the specific application.

While the information and specifications presented in this literature are believed to be accurate, they are supplied for informative purposes only and should not be considered certified or as a guarantee of satisfactory results by reliance thereon. Nothing contained herein is to be construed as a warranty or guarantee, express or implied, regarding any matter with respect to this product. Because Flowserve is continually improving and upgrading its product design, the specifications, dimensions and information contained herein are subject to change without notice. Should any question arise concerning these provisions, the purchaser/user should contact Flowserve Corporation at any of its worldwide operations or offices.

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