

# Type 2625 and 2625NS Volume Boosters

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Figure 1. Type 2625 Volume Booster

## Introduction

### Scope of Manual

This instruction manual provides installation, operation, maintenance, and parts information for Type 2625 and 2625NS volume boosters (figure 1). Refer to separate instruction manuals for information regarding the valve body, actuator, and other accessories.

Do not install, operate, or maintain a Type 2625 or 2625NS volume booster without first • being fully trained and qualified in valve, actuator and accessory installation, operation and maintenance, and • carefully reading and understanding the contents of this manual. If you have any questions regarding these instructions, contact your Emerson Process Management™ sales office before proceeding.

## Description

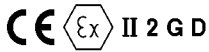
The Type 2625 and 2625NS volume boosters are used in conjunction with a positioner on a throttling control valve to increase stroking speed. The booster has a fixed deadband (controlled by the seat-to-seat dimension of the supply and exhaust plugs) which is factory set during assembly and testing. In addition, the booster incorporates soft-seat construction and an integral bypass restriction to eliminate positioner saturation problems that can occur with volume boosters that do not have these features. Adjustment of the integral bypass restriction is necessary for system stability. This adjustment does not affect the deadband of the booster, but does permit the control valve to respond to small input signal changes from the positioner without sacrificing steady-state accuracy.

It also allows the booster to deliver high-volume output for fast stroking when large, rapid input signal changes occur.



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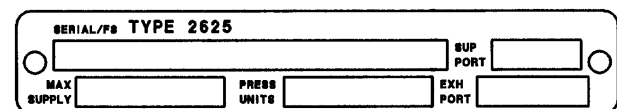
Table 1. Specifications

<p><b>Port Diameters<sup>(1)</sup></b>  <b>Supply Port:</b> ■ 9.5 mm (0.375 inch) or ■ 12.7 mm (0.5 inch)  <b>Exhaust Port:</b> ■ 2.4 mm (0.094 inch), ■ 9.5 mm (0.375 inch) or ■ 12.7 mm (0.5 inch)</p> <p><b>Input Signal</b>          Positioner output</p> <p><b>Maximum Input Signal Pressure</b>          10.3 bar (150 psig)</p> <p><b>Input to Output Pressure Ratio</b>          Fixed at 1 to 1</p> <p><b>Supply Pressure Ranges<sup>(2)</sup></b>          When used in conjunction with a positioner or other pneumatic accessory, always pipe the positioner and booster with one common supply through a Type 64 or 95H regulator (see figure 4). A high-capacity filter, such as the Type 262K, should be installed in the supply line to the regulator. Supply pressure also must not exceed the maximum pressure rating of the actuator. Constructions are available in two maximum supply ranges.</p> <p><b>When Normally Used With Diaphragm Actuators:</b> Up to 2.8 bar (40 psig)  <b>When Normally Used With Piston Actuators:</b> Up to 10.3 bar (150 psig)</p> <p><b>Nominal Deadband<sup>(3)</sup></b>  <b>Percent of Positioner Output Span<sup>(4)</sup>:</b>          2.4 mm (0.094 inch) exhaust port: 2%</p>	<p>9.5 mm (0.375 inch) exhaust port: 3.5%          12.7 mm (0.5 inch) exhaust port: 5%</p> <p><b>Operative Temperature Limits<sup>(2,3)</sup></b>  <b>Type 2625:</b> -40 to 71°C (-40 to 160°F)  <b>Type 2625NS:</b> -40 to 93°C (-40 to 200°F)</p> <p><b>Maximum Flow Coefficients</b>          See table 2</p> <p><b>Connections</b>  <b>Input Signal:</b> 1/4 NPT  <b>Supply and Output Signal:</b> 3/4 NPT</p> <p><b>Hazardous Area Classification</b>          Complies with the requirements of ATEX Group II Category 2 Gas and Dust  </p> <p><b>Approximate Weight</b>  <b>Aluminum Body:</b> 2.3 kg (5 pounds)  <b>Brass Body:</b> 5.0 kg (11 pounds)</p> <p><b>Declaration of SEP</b>          Fisher Controls International LLC declares this product to be in compliance with Article 3 paragraph 3 of the Pressure Equipment Directive (PED) 97 / 23 / EC. It was designed and manufactured in accordance with Sound Engineering Practice (SEP) and cannot bear the CE marking related to PED compliance.          However, the product <i>may</i> bear the CE marking to indicate compliance with <i>other</i> applicable EC Directives.</p>
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1. May be used in any combination.  
 2. The pressure/temperature limits in this document, and any applicable code or standard limitation should not be exceeded.  
 3. This term defined in ISA Standard S51.1  
 4. Zero psig to maximum supply.

The volume booster, when used in conjunction with a positioner/actuator, is used only to improve stroking speed. It is not recommended for other applications requiring a high-accuracy, instrument-type volume booster. If you use the volume booster only with an actuator, for on-off control, the integral bypass restriction on the volume booster must be closed (turned fully clockwise).

To facilitate diagnostic testing, you can install connectors and piping with each Type 2625 and 2625NS volume booster.



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Figure 2. Example Nameplate

The Type 2625NS volume booster is designed for nuclear power applications. The Type 2625NS construction includes materials that provide superior performance at elevated temperature and radiation levels.

Table 2. Maximum Flow Coefficients

PORT SIZE COMBINATIONS				SUPPLY PORT COEFFICIENTS $C_v$	EXHAUST PORT COEFFICIENTS $C_v$
Supply Port		Exhaust Port			
mm	Inch	mm	Inch		
9.5	0.375	2.4	0.094	3.74	0.23
		9.5	0.375	3.74	2.29
		12.7	0.5	3.74	2.52
12.7	0.5	2.4	0.094	4.98	0.24
		9.5	0.375	4.98	2.30
		12.7	0.5	4.98	2.72
Type 3570 Valve Positioner				0.25	0.25
Type 3582 Valve Positioner				0.17	0.19
Type 3610J, 3610JP, 3611JP, 3620J, 3620JP, 3621JP				0.37	0.30
Type DVC5000, DVC5000f				0.24	0.27
Type DVC6000, DVC6000f				0.37	0.31

The O-rings in the Type 2625NS are EPDM (ethylene propylene) and the diaphragms are EPDM/meta-aramid. EPDM demonstrates superior temperature capability and shelf life over nitrile. The meta-aramid diaphragm fabric demonstrates improved strength retention at elevated temperature and radiation conditions.

**CAUTION**

**Use a clean, dry, oil-free air supply with instruments containing EPDM components. EPDM is subject to degradation when exposed to petroleum based lubricants.**

Under the 10CFR50, Appendix B, quality assurance program, the 2625NS volume booster is qualified "commercial grade dedicated". These can be supplied as 10CFR, Part 21 items.

**Specifications**

Specifications for the Type 2625 and 2625NS volume booster are listed in table 1. Information for an individual unit as it comes from the factory appears on the nameplate (figure 2).

**Educational Services**

For information on available courses for Type 2625 and 2625NS volume boosters, as well as a variety of other products, contact:

Emerson Process Management  
Educational Services, Registration  
P.O. Box 190; 301 S. 1st Ave.  
Marshalltown, IA 50158-2823  
Phone: 800-338-8158 or  
Phone: 641-754-3771  
FAX: 641-754-3431  
e-mail: education@emersonprocess.com

**Note**

**Neither Emerson, Emerson Process Management, nor any of their affiliated entities assumes responsibility for the selection, use, and maintenance of any product. Responsibility for the selection, use, and maintenance of any product remains with the purchaser and end-user.**

**Installation**

**WARNING**

**Always wear protective clothing, gloves, and eyewear when performing any maintenance procedures to avoid personal injury.**

**System damage may result if a volume booster is installed in a way that it can be physically damaged.**

**Personal injury or system damage may result when service conditions exceed booster or other equipment ratings. Exceeding the pressure specifications in table 1 may cause leakage, parts damage, or personal injury due to bursting of pressure-containing parts or explosion of accumulated gas.**

**Check with your process or safety engineer for any additional measures that must be taken to protect against process media.**

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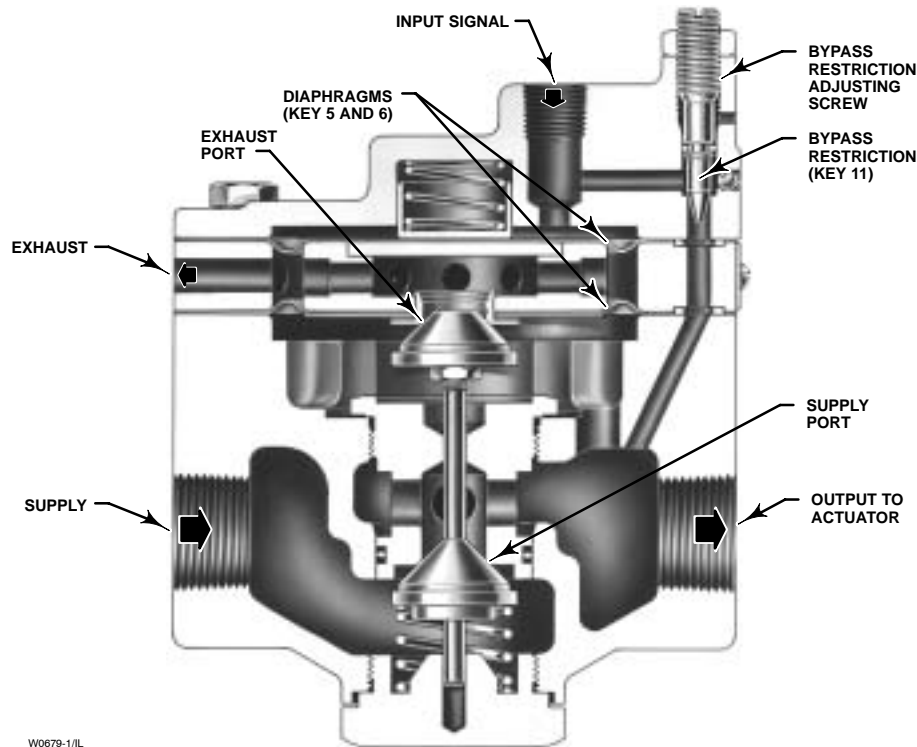


Figure 3. Volume Booster Sectional View

### Note

**Do not use separate pressure supplies for the volume booster and associated positioner.**

**The volume booster may not exhaust immediately upon loss of a separate pressure supply. However, if the system is in a transient state at the time of pressure supply loss or if changes to the booster's input signal are sufficient to overcome the deadband, the booster will exhaust.**

**A loss of a pressure supply (either separate or common) to a Type 3582 or 3610J positioner will cause the positioner's output pressure (booster's input pressure) to decay.**

Always pipe the positioner and the volume booster with one common supply. See figure 4 for typical installation examples. A Type 64 or 95H regulator is required to provide sufficient capacity to supply both components. A high-capacity filter, such as the Type

262K, should be installed in the supply line to the Type 64 or 95H regulator.

### Mounting

The volume booster is typically nipple-mounted between the pneumatic supply source and the actuator, and may be used with piston or diaphragm actuators. Many actuators require larger casing or cylinder connections and modifications to allow the booster to deliver the higher volume output.

The booster may also be directly mounted to the actuator by using an actuator yoke mounting bracket (see figure 6) or casing mounting bracket.

### Pressure Connections

The input signal connection is 1/4 NPT. The supply and output connections are 3/4 NPT (minimum pipe size recommended for nipple mounting is 1/2 NPT). Connections to the volume booster should be made as indicated in figure 3. Connections for two typical applications are shown in figure 4. Ensure that the piping is of proper size to meet the capacity

demands of the booster and that you equip the actuator with properly sized input connections.

## Diagnostic Connections

To support diagnostic testing of valve/actuator/positioner packages, install connectors and hardware between the Type 2625 or 2625NS volume booster and the actuator. Typical connector installations are shown in figure 4.

The hardware used includes a 3/4 NPT pipe nipple, pipe tee, and pipe bushings with an 1/8 NPT pipe bushing for the connector. The connector consists of an 1/8 NPT body and body protector.

See separate instructions for diagnostic connections to the positioner.

## Supply Pressure

Supply pressure must be clean dry air or noncorrosive gas, and it should be filtered.

### CAUTION

**Use a clean, dry, oil-free air supply with instruments containing EPDM components. EPDM is subject to degradation when exposed to petroleum based lubricants.**



### WARNING

**If a flammable or hazardous gas is to be used as the supply pressure medium, personal injury, property damage or equipment damage could result from fire or explosion of accumulated gas or from contact with hazardous gas. The volume booster has no provision for piping away the vented exhaust gas. Therefore, do not use flammable or otherwise hazardous gas as a supply medium unless the unit is in a well-ventilated area and all ignition sources have been removed.**

## Exhaust Ports

Exhaust to the atmosphere is through exhaust ports in the side of the unit. Keep the exhaust ports free of any obstructions or foreign materials that might clog them.

## Operating Information

The only operating requirement of the volume booster is the adjustment of the bypass restriction for stable actuator performance. Although systems with different characteristics may require different adjusting techniques, the following adjustment procedure is recommended when using the actuator for throttling control.

### Note

**When sizing the booster, select the lowest  $C_g$  that will meet the stroking speed specifications. Oversizing the booster in a closed loop may lead to stability problems, thus requiring the bypass to be opened so far that the booster will never operate.**

Prior to operation, turn the bypass restriction adjusting screw (figure 3) four or five turns counterclockwise from the fully closed position. With the actuator in operation, slowly turn the restriction clockwise until the booster operates in response to large changes in the input signal, yet allows small changes to move the actuator without initiating booster operation.

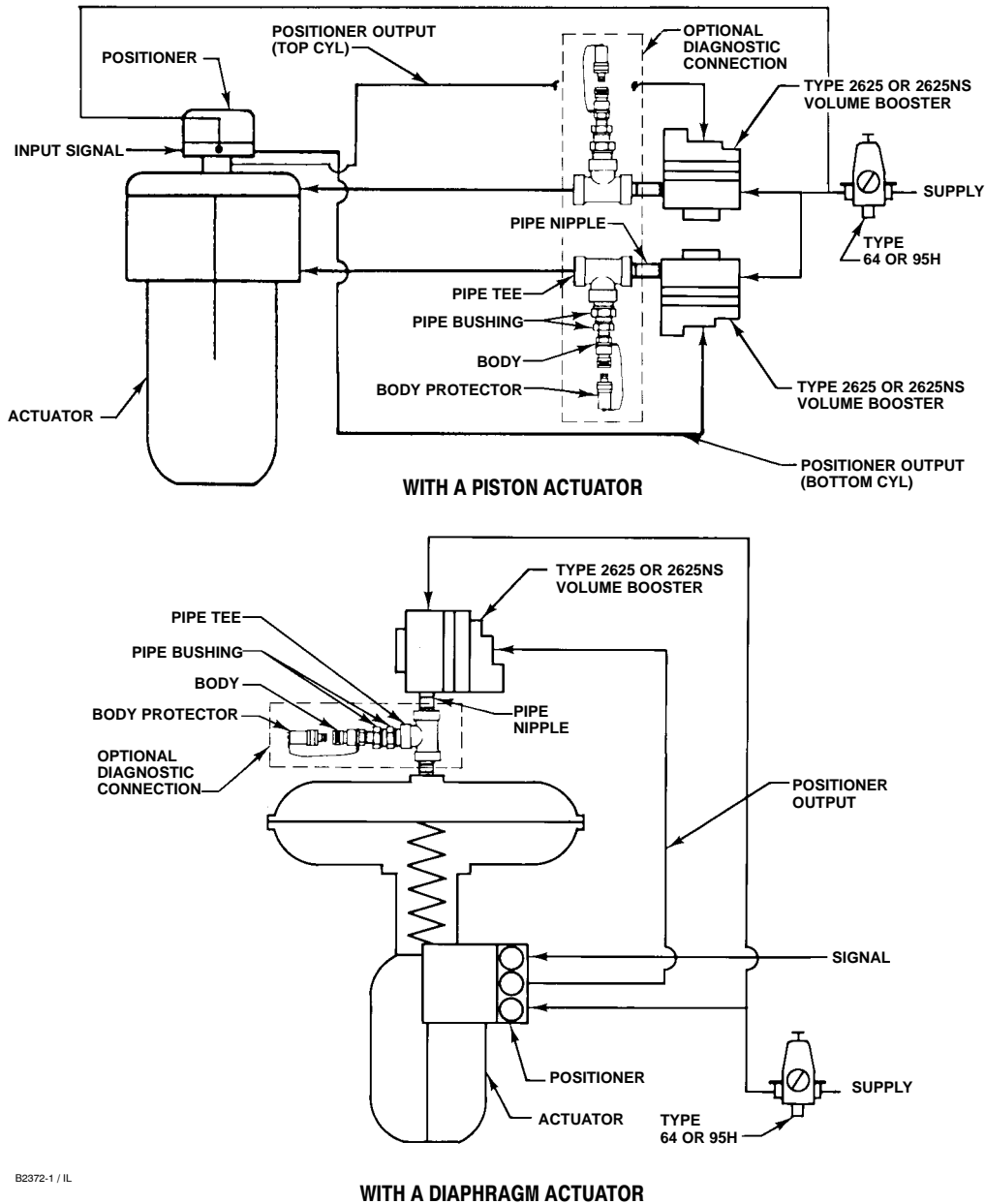
If the actuator is to be used for on-off control, the restriction should be closed (turned fully clockwise).

## Principle of Operation

Refer to figures 3 and 4.

Because of the restriction, large input signal changes register on the booster input diaphragm sooner than in the actuator. A large, sudden change in the input signal causes a pressure differential to exist between the input signal and the output of the booster. When this occurs, the diaphragms move to open either the supply port or the exhaust port, whichever action is required to reduce the pressure differential. The port remains open until the

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Figure 4. Typical Installations

difference between the booster input and output pressures returns to within the deadband limits of the booster. With the bypass restriction adjusted for stable operation, signals having small magnitude and rate changes pass through the bypass restriction and into the actuator without initiating booster operation. Both the supply and exhaust ports remain closed, preventing unnecessary air consumption and possible saturation of positioner relays.

## Maintenance



Always wear protective clothing, gloves, and eyewear when performing any maintenance procedures to avoid personal injury.

**Maintenance requires taking the volume booster out of service periodically. To avoid personal injury or equipment damage, disconnect or bypass any pressure lines to the booster, and vent any pressure locked in the unit before you begin maintenance.**

**Check with your process or safety engineer for any additional measures that must be taken to protect against process media.**

## Diaphragm Assembly Replacement

Key numbers refer to figure 5.

1. Remove the six cap screws (key 15) from the perimeter of the spring case assembly (key 3), and lift off the assembly, taking care you do not lose the input spring (key 8) or the spring seat (key 9).
2. Remove the upper diaphragm (key 6), diaphragm spacer (key 2), diaphragm assembly (key 5), (which includes the lower diaphragm), and the O-rings (key 14). Inspect these parts for damage and replace if necessary.
3. Replace the O-rings (key 14) after coating with lubricant (key 21). Then replace the diaphragm assembly (key 5), diaphragm spacer (key 2), and the upper diaphragm (key 6).

### Note

**To ensure proper operation of the bypass restriction, make certain that the holes in the diaphragm and the bypass restriction are in line with the holes in the diaphragm spacer (key 2).**

4. Install the spring case assembly (key 3) on the upper diaphragm (key 6). Make sure the spring seat (key 9) and the upper spring (key 8) are installed in the spring case assembly (key 3). Press on the bottom of the spring seat with your finger. If the spring seat (key 9) does not move freely in the spring case assembly (key 3), remove the spring seat (key 9), and apply lubricant (key 23). Reinstall the spring seat (key 9) in the spring case assembly (key 3).

### Note

**When replacing either the upper spring (key 8) or the lower spring (key 10)**

**with one of a different maximum allowable supply pressure, make sure that both springs are identically rated.**

## CAUTION

**To avoid damage to the diaphragms, do not overtighten the screws.**

5. Replace the six cap screws (key 15) and tighten them in a crisscross manner.

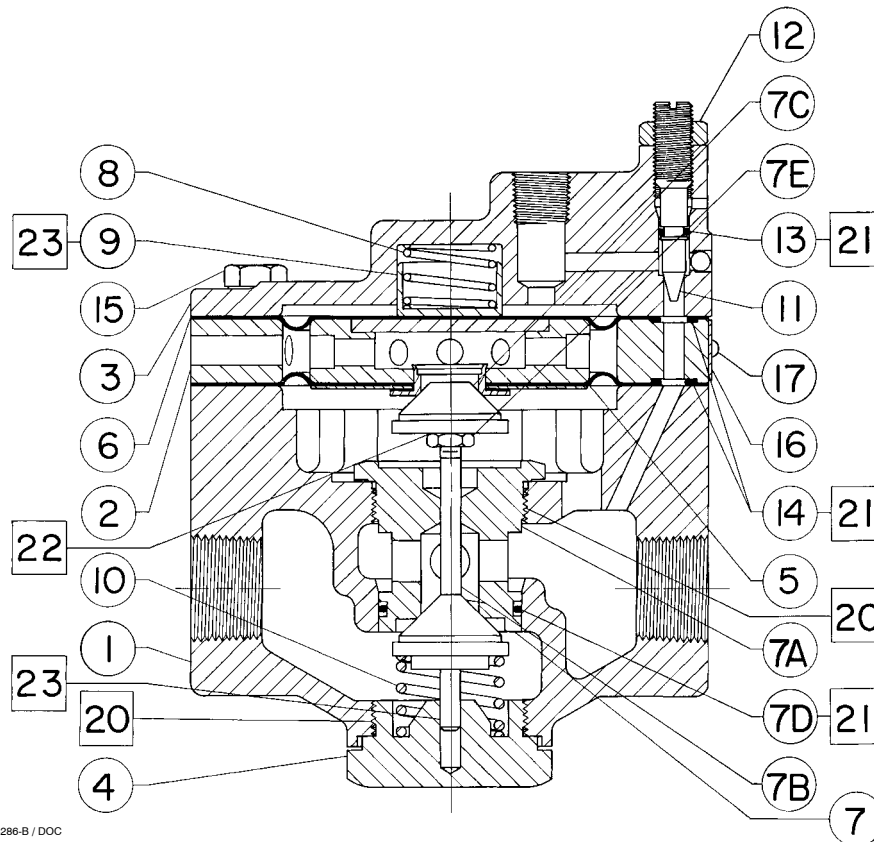
## Valve Assembly Replacement

## CAUTION

**The distance between the exhaust port seat line on the upper valve (key 7C) and the supply port seat line on the lower valve and stem (key 7B) is critical to ensure the deadband requirements of the volume booster. This distance must be adjusted in accordance with the following steps before you replace the valve assembly (key 7), or the upper valve (key 7C), and lower valve and stem (key 7B).**

For key numbers refer to figure 5.

1. Remove the six cap screws (key 15) from the perimeter of the spring case assembly (key 3) and lift off the assembly, taking care you do not lose the upper spring (key 8) or the spring seat (key 9).
2. Remove the upper diaphragm (key 6), the diaphragm spacer (key 2), the diaphragm assembly (key 5), (which includes the lower diaphragm), and the O-rings (key 14).
3. Unscrew the valve assembly (key 7) from the body. The seat ring (key 7A) has a 1-1/2 inch hex for removal.
4. If you are replacing a complete valve assembly (key 7), proceed to step 8.
5. If you are replacing an upper valve (key 7C) and a lower valve and stem (key 7B), loosen the hex nut (key 7E), and remove the upper valve. Remove the hex nut, and remove the lower valve and stem from the seat ring (key 7A).



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Figure 5. Volume Booster Assembly Drawing

6. Insert the replacement lower valve and stem (key 7B) into the seat ring (key 7A) and install the hex nut (key 7E) on the stem.

7. Apply sealant (key 22) to the threads of the lower valve and stem (key 7B) and install the upper valve (key 7C). Tighten the hex nut (key 7E).

8. Apply lubricant (key 21) to the O-ring (key 7D), lubricant (key 23) to the lower valve and stem (key 7B), and sealant (key 20) to the thread of the seat ring (key 7A).

9. Install the valve assembly (key 7) into the body (key 1)—making sure the lower valve and stem (key 7B) engages over the lower spring (key 10)—and into the bottom plug (key 4).

10. Install the diaphragm assembly (key 5) onto the upper valve (key 7C).

11. Install the diaphragm spacer (key 2) onto the body (key 1).

12. Place a straight edge at least 5 inches (127 mm) long across the diaphragm spacer (key 2). The upper surface of the diaphragm assembly (key 5) should coincide with the upper surface of the

diaphragm spacer (key 2). If not, loosen the hex nut (key 7E) and raise or lower the upper valve (key 7C) accordingly. Remove the valve assembly (key 7) to loosen the hex nut (key 7E).

13. Repeat steps 9 through 12 until the upper surface of the diaphragm assembly (key 5) coincides with the upper surface of the diaphragm spacer (key 2).

### Note

**To ensure proper operation of the bypass restriction, make certain that the holes in the diaphragm and the bypass restriction are in line with the holes in the diaphragm spacer (key 2).**

14. Make sure the O-rings (key 14) are installed in the diaphragm spacer (key 2) and coated with lubricant (key 21).

15. Install the upper diaphragm (key 6).

16. Install the spring case assembly (key 3) on the upper diaphragm (key 6). Make sure the spring seat (key 9) and upper spring (key 8) are installed in the



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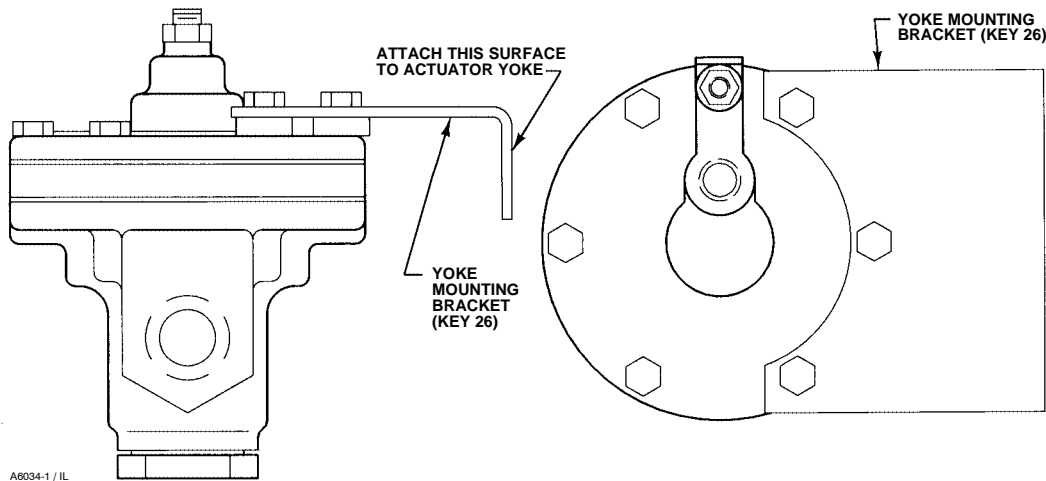


Figure 6. Volume Booster with Yoke Mounting Bracket

Key	Description	Part Number	Key	Description	Part Number
6*	Upper Diaphragm For Type 2625, nitrile on nylon For Type 2625NS, EPDM/meta-aramid	2V197702052 27B4799X012	10	Lower Spring, steel pl For 2.8 bar (40 psig) max. supply pressure For 10.3 bar (150 psig) max. supply pressure	
7*	Valve Assembly (includes keys 7A, 7B, 7C, 7D, and 7E) For Type 2625 Brass/nitrile 9.5 mm (0.375 inch) supply port 12.7 mm (0.5 inch) supply port Aluminum/nitrile (must be used w/Type 1069 actuator) 9.5 mm (0.375 inch) supply port 12.7 mm (0.5 inch) supply port For Type 2625NS 9.5 mm (0.375 inch) supply port 12.7 mm (0.5 inch) supply port	1V1998000A2 1V1997000A2 1V1998X0022 1V1997X0022 17B4811X0A2 17B4802X0A2	11	Restriction, 303 stainless steel	
7A*	Seat Ring Brass 9.5 mm (0.375 inch) supply port 12.7 mm (0.5 inch) supply port Aluminum (must be used w/Type 1069 actuator) 9.5 mm (0.375 inch) supply port 12.7 mm (0.5 inch) supply port	2V197814012 2V197914012 2V1978X0012 2V1979X0012	12	Hex Nut, steel pl	
7B*	Lower Valve and Stem For Type 2625 Aluminum/nitrile/416 stainless steel For Type 2625NS	1V1981000A2 17B4803X012	13*	O-Ring For Type 2625, nitrile For Type 2625NS, EPDM	1C854606992 17B4800X012
7C*	Upper Valve For Type 2625, Aluminum/nitrile For Type 2625NS	1V198470972 17B4804X012	14*	O-Ring (2 req'd) For Type 2625, nitrile For Type 2625NS, EPDM	1C853806992 17B4801X012
7D*	Valve O-Ring For Type 2625, nitrile For Type 2625NS, EPDM	1P420606992 17B4805X012	15	Cap Screw, steel pl (6 req'd) Standard With 1/2 NPT vent connection	1F960324052
7E	Hex Nut, steel pl		16	Nameplate, stainless steel	
8	Upper Spring, steel pl For 2.8 bar (40 psig) max. supply pressure For 10.3 bar (150 psig) max. supply pressure		17	Drive Screw, stainless steel (2 req'd)	1A368228982
9	Spring Seat, 303 stainless steel		18	Pipe Nipple Steel/galvanized (maximum of 2 req'd) 1/2 NPT x 38.1 mm (1-1/2 inch) long 1/2 NPT x 76.2 mm (3-inch) long 1/2 NPT x 101.6 mm (4-inch) long 1/2 NPT x 177.8 mm (7-inch) long 3/4 NPT x 50.8 mm (2-inch) long 316 SST (maximum of 2 req'd) 1/2 NPT x 38.1 mm (1-1/2 inch) long 1/2 NPT x 76.2 mm (3-inch) long 1/2 NPT x 101.6 mm (4-inch) long 1/2 NPT x 177.8 mm (7-inch) long 3/4 NPT x 38.1 mm (1-1/2 inch) long	
			19	Pipe Bushing (maximum of 2 req'd) 3/4 x 1/2 NPT, steel/galvanized 3/4 x 1/2 NPT, 316 SST	
			20	Anti-seize sealant (not furnished with the volume booster)	
			21	Lubricant, silicone sealant (not furnished with the volume booster)	

# Instruction Manual

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Key	Description	Part Number	Key	Description	Part Number
22	Thread locking adhesive, mild strength (not furnished with the volume booster)				
23	PTFE petroleum-based lubricant (not furnished with the volume booster) (see note immediately below)				
	<b>Note</b> <b>PTFE petroleum-based lubricant is only for use with Type 2625. For Type 2625NS use a medium grade silicone-based lubricant.</b>				
24	Elbow, 1/2 NPT, 90 degree Iron/galvanized				
25	Street elbow, 1/2 NPT, 90 degree Iron/galvanized, plated 316 SST				
26	Mounting Bracket For yoke mounting (see figure 6) For casing mounting (Use two brackets, stacked, for seismic mounting)				

## Diagnostic Connections

FlowScanner™ diagnostic system hook-up  
Includes pipe tee, pipe nipple, pipe  
bushings, connector body, and body  
protector.

For diaphragm actuator  
SST fittings  
Brass fittings  
For piston actuator  
SST fittings  
Brass fittings

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