

Type 2625 and 2625NS Volume Boosters

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Introduction

Scope of Manual

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

Only personnel qualified through training or experience should install, operate, and maintain these volume boosters. If you have any questions about these in-

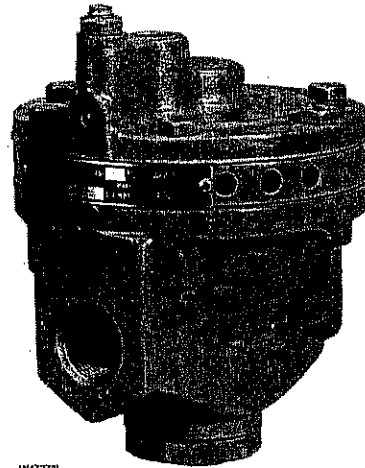


Figure 1. Type 2625 Volume Booster

structions, contact your Fisher Controls sales office or sales representative 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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Type 2625 and 2625NS

Table 1. Specifications

<p>Port Diameters⁽¹⁾ Supply Port: ■ 3/8 inch (9.5 mm) or ■ 1/2 inch (12.7 mm) Exhaust Port: ■ 3/32 inch (2.4 mm), ■ 3/8 inch (9.5 mm) or ■ 1/2 inch (12.7 mm)</p> <p>Input Signal Positioner output</p> <p>Maximum Input Signal Pressure 150 psig (10.3 bar)</p> <p>Input to Output Pressure Ratio Fixed at 1 to 1</p> <p>Supply Pressure Ranges 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 262C, 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>When Normally Used With Diaphragm Actuators: Up to 40 psig (2.8 bar) When Normally Used With Piston Actuators: Up to 150 psig (10.3 bar)</p> <p>Nominal Deadband⁽²⁾ Percent of Positioner Output Span⁽³⁾: 3/32 inch (2.4 mm) exhaust port: 2% 3/8 inch (9.5 mm) exhaust port: 3.5% 1/2 inch (12.7 mm) exhaust port: 5%</p> <p>Operative Temperature Limits⁽²⁾ Type 2625: -40 to 160°F (-40 to 71°C) Type 2625NS: -40 to 200°F (-40 to 93°C)</p> <p>Maximum Flow Coefficients See table 2</p> <p>Connections Input Signal: 1/4-inch NPT Supply and Output Signal: 3/4-inch NPT</p> <p>Approximate Weight Aluminum Body: 5 pounds (2.3 kg) Brass Body: 11 pounds (5.0 kg)</p>
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1. May be used in any combination.
 2. This term defined in ISA Standard S51.1-1979
 3. Zero psig to maximum supply.

Table 2. Maximum Flow Coefficients⁽¹⁾

PORT SIZE COMBINATIONS				SUPPLY PORT COEFFICIENTS			EXHAUST PORT COEFFICIENTS		
Supply Port		Exhaust Port		C _v	C _g	C _t	C _v	C _g	C _t
Inch	mm	Inch	mm						
3/8	9.5	3/32	2.4	3.74	113	30.2	0.23	8.05	35.0
		3/8	9.5	3.74	113	30.2	2.29	80.2	35.0
		1/2	12.7	3.74	113	30.2	2.52	88.2	35.0
1/2	12.7	3/32	2.4	4.98	160	32.1	0.24	8.43	35.0
		3/8	9.5	4.98	160	32.1	2.30	80.7	35.0
		1/2	12.7	4.98	160	32.1	2.72	95.4	35.0
Type 3570 Valve Positioner				0.25	8.8	35.2	0.25	8.8	35.2
Type 3582 Valve Positioner				0.17	6.0	35.3	0.19	6.65	35.0
Type 3610J, 3610JP, 3611JP, 3620J, 3620JP, 3621JP				0.37	13.0	35.0	0.30	10.5	35.0

1. Select the lowest C_g that will meet the stroking speed specifications; oversizing the booster may cause stability problems. Consult your Fisher Controls sales office or sales representative for special stroking speed requirements.

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.

The Type 2625NS volume booster meets typical requirements of the nuclear power industry. The Type 2625NS construction includes materials that provide superior performance at elevated temperature and radiation levels.

The O-rings in the Type 2625NS are EPDM (ethylene propylene) and the diaphragms are EPDM/Nomex. EPDM⁽¹⁾ demonstrates superior temperature capability and shelf life over nitrile. The Nomex diaphragm fabric demonstrates improved strength retention at elevated temperature and radiation conditions.

In addition, the Type 2625NS positioner is qualified "commercial grade dedicated" under Fisher's 10CFR50, Appendix B, quality assurance program. These can be supplied as 10CFR21 items.

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

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Figure 2. Example Nameplate

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).

Installation

WARNING

Personal injury or system damage may result if you install a volume booster without adequate protection from physical damage, or where service conditions could exceed booster or other equipment ratings. Exceeding the pressure specifications in table 1 may cause leakage, part damage, or personal injury due to bursting of pressure-containing parts or explosion of accumulated gas.

CAUTION

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 262C, 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-inch NPT. The supply and output connections are 3/4-inch NPT (minimum pipe size recommended for nipple mounting is 1/2-inch 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-inch NPT pipe nipple, pipe tee, and pipe bushings with a 1/8-inch NPT pipe bushing for the connector. The connector consists of a 1/8-inch 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⁽²⁾, and it should be filtered.

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

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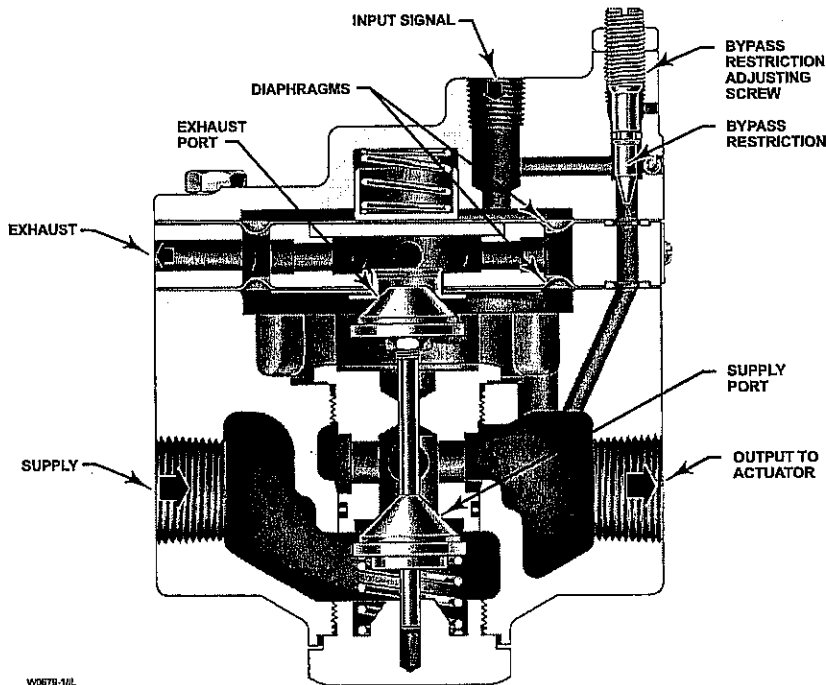


Figure 3. Volume Booster Sectional View

WARNING

Personal injury, property damage or equipment damage may result if you allow vented gas to accumulate and create an explosion hazard. 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.

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_d 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

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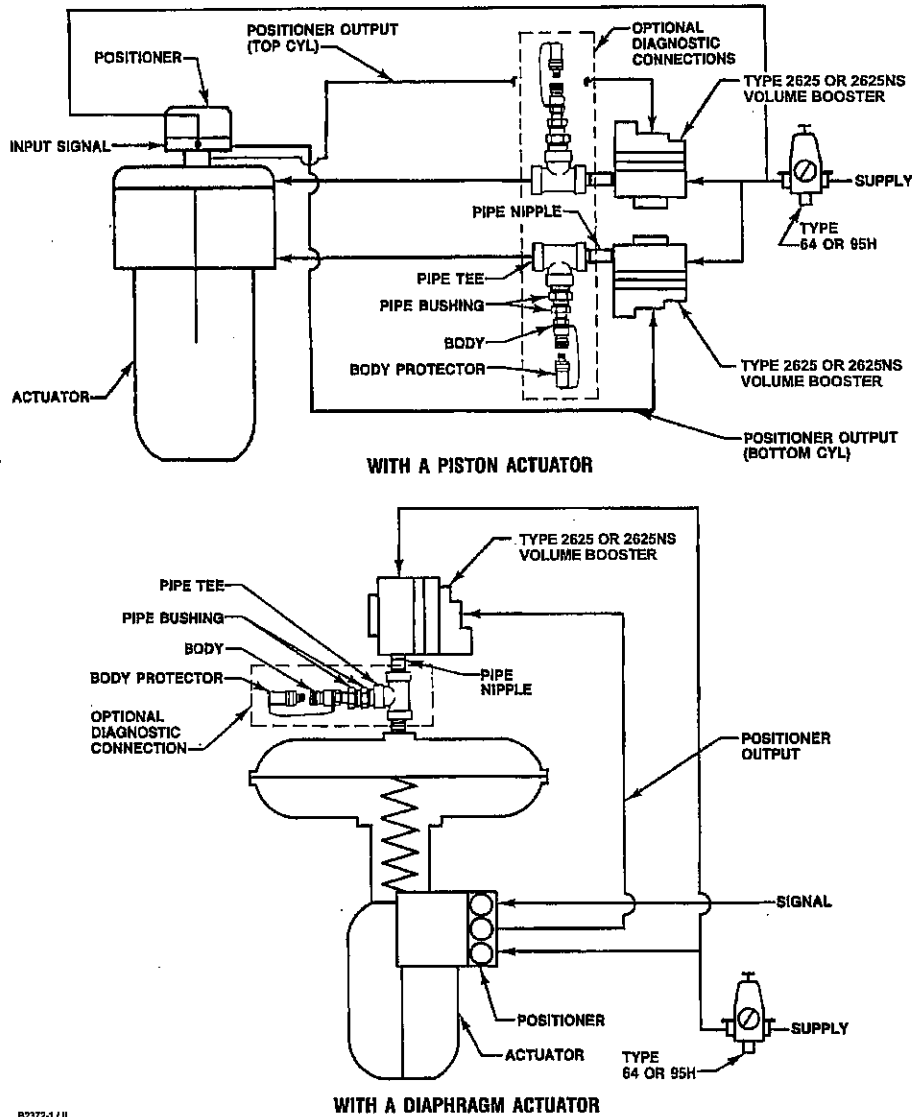


Figure 4. Typical Installations

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 difference between the booster input and output pressures returns to within the dead-band 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



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.

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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).

CAUTION

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.

5. Replace the six cap screws (key 15) and tighten them in a crisscross manner. To avoid damage to the diaphragms, do not overtighten the screws.

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 en-

sure 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).
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).

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CAUTION

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 spring case assembly. Press on the bottom of the spring seat with your finger. If the spring seat does not move freely in the spring case assembly, remove the spring seat, apply lubricant (key 23), and reinstall in the spring case assembly.

17. Replace the six cap screws (key 15) and tighten them in a crisscross manner. To avoid damage to the diaphragms, do not over-tighten the screws.

Installation of Diagnostic Connections

See figure 4 for part names and order of installation.

1. Before you assemble the pipe nipple, pipe tee, pipe bushings, actuator piping, and connector body, apply sealant to all threads.
2. Turn the pipe tee to position the connector body and body protector for easy access when doing diagnostic testing.

Parts Ordering

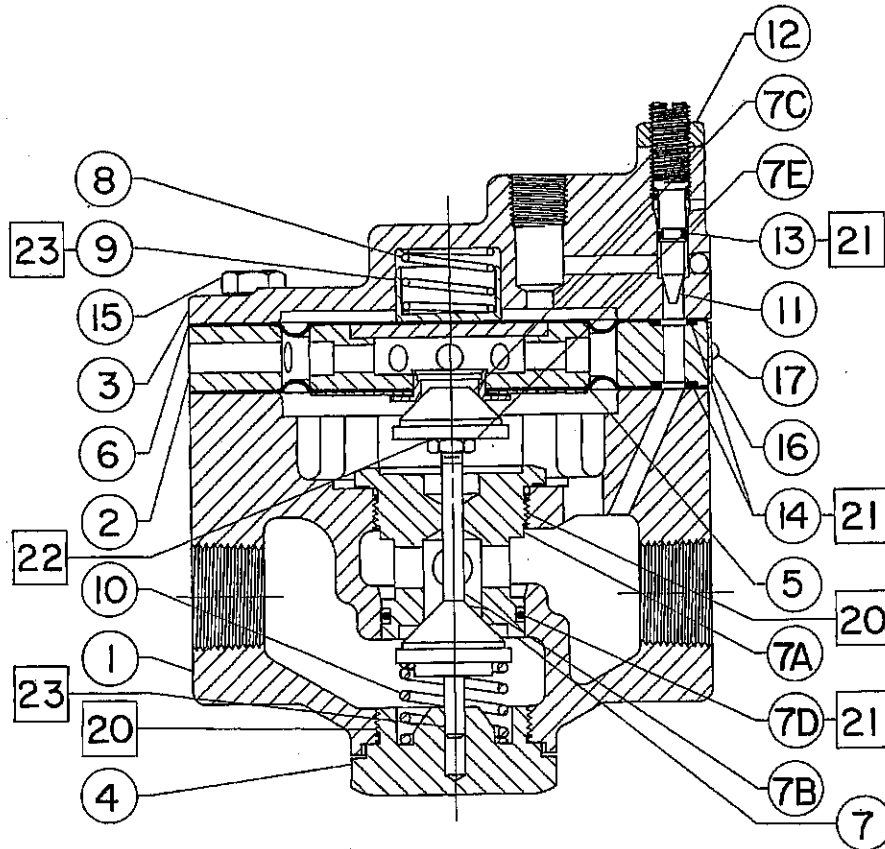
Whenever corresponding with your Fisher sales office or sales representative about this equipment, mention the serial number of the volume booster. This serial number can be found on the nameplate (figure 2 and key 16, figure 5). When ordering replacement parts, also state the complete eleven-digit part number of each part required as found in the following parts list.

Parts List (figure 5)

Key	Description	Part Number
1	Body	
	Aluminum (must be used w/Type 1069 actuator)	4V196207012
	Brass	4V1962X0012
2	Diaphragm Spacer	
	Aluminum (must be used w/Type 1069 actuator)	2V196309032
	Aluminum with 1/2 NPT vent connection	22B5263x012
	Brass	2V1963X0012
3	Spring Case Assembly	
	Aluminum/heat-treated 440 stainless steel (must be used w/Type 1069 actuator)	1V3747000A2
	Brass	1V3747X0012
4	Body Cap	
	Brass	1V196514012
	Aluminum (must be used w/Type 1069 actuator)	1V1965X0012
5*	Diaphragm Assembly	
	For Type 2625	
	Nitrile on nylon	
	With blocked exhaust	1V4056000A2
	With 3/32-inch (2.4 mm) exhaust	1V4054000A2
	With 3/8-inch (9.5 mm) exhaust	1V4055000A2
	With 1/2-inch (12.7 mm) exhaust	1V3624000A2
	Brass	
	with 3/8-inch (9.5 mm) exhaust	1V4055X00A2
	Aluminum (must be used w/Type 1069 actuator)	
	With 3/8-inch (9.5 mm) exhaust	1V4055X0022
	With 1/2-inch (12.7 mm) exhaust	1V3624X0032
	Aluminum with 1/2 NPT vent connection	
With 3/8-inch (9.5 mm) exhaust	12B5261X012	
With 1/2-inch (12.7 mm) exhaust	12B5261X022	
For Type 2625NS		
EPDM/Nomex,		
With 3/8-inch (9.5 mm) exhaust	17B4810X0A2	
With 1/2-inch (12.7 mm) exhaust	17B4796X0A2	
6*	Upper Diaphragm	
	For Type 2625, nitrile on nylon	2V197702052
	For Type 2625NS, EPDM/Nomex	27B4799X012
7*	Valve Assembly	
	(includes keys 7A, 7B, 7C, 7D, and 7E)	
	For Type 2625	
	Brass/nitrile	
	3/8-inch (9.5 mm) supply port	1V1998000A2
	1/2-inch (12.7 mm) supply port	1V1997000A2
	Aluminum/nitrile (must be used w/Type 1069 actuator)	
	3/8-inch (9.5 mm) supply port	1V1998X0022
	1/2-inch (12.7 mm) supply port	1V1997X0022
	For Type 2625NS	
3/8-inch (9.5 mm) supply port	17B4811X0A2	
1/2-inch (12.7 mm) supply port	17B4802X0A2	
7A*	Seat Ring	
	Brass	
	3/8-inch (9.5 mm) supply port	2V197814012
	1/2-inch (12.7 mm) supply port	2V197914012
	Aluminum (must be used w/Type 1069 actuator)	
3/8-inch (9.5 mm) supply port	2V1978X0012	
1/2-inch (12.7 mm) supply port	2V1979X0012	

* Recommended spare part.

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Figure 5. Volume Booster Assembly Drawing

Key	Description	Part Number	Key	Description	Part Number
7B*	Lower Valve and Stem For Type 2625 Aluminum/nitrile/416 stainless steel	1V1981000A2	15	Cap Screw, steel pl (6 req'd) Standard	1A352524052
	For Type 2625NS	17B4803X012		With 1/2 NPT vent connection	1F960324052
7C*	Upper Valve For Type 2625, Aluminum/nitrile	1V198470972	16	Nameplate, stainless steel For Type 2625	1V4059X00A2
	For Type 2625NS	17B4804X012		For Type 2625NS	17B4808X0A2
7D*	Valve O-Ring For Type 2625, nitrile	1P420606992	17	Drive Screw, stainless steel (2 req'd)	1A368228982
	For Type 2625NS, EPT-N Duro 80	17B4805X012	18	Pipe Nipple Steel/galvanized (maximum of 2 req'd)	
7E	Hex Nut, steel pl	1A839628982		1/2 NPT x 1-1/2 inch (38.1 mm) long	1K201526022
8	Upper Spring, steel pl For 40 psig (2.8 bar) max. supply pressure	1V600527012		1/2 NPT x 3-inch (76.2 mm) long	1A473526012
	For 150 psig (10.3 bar) max. supply pressure	1V198627122		1/2 NPT x 4-inch (101.6 mm) long	1C782526012
9	Spring Seat, 303 stainless steel	1V198735032		1/2 NPT x 7-inch (177.8 mm) long	1F731526012
10	Lower Spring, steel pl For 40 psig (2.8 bar) max. supply pressure	1V600427012		3/4 NPT x 2-inch (50.8 mm) long	1B539126012
	For 150 psig (10.3 bar) max. supply pressure	1V198827122		316 SST (maximum of 2 req'd)	
11	Restriction, 303 stainless steel	1V198935032		1/2 NPT x 1-1/2 inch (38.1 mm) long	1K2015X0022
12	Hex Nut, steel pl	1A680324122		1/2 NPT x 3-inch (76.2 mm) long	1A4735X0012
13*	O-Ring For Type 2625, nitrile	1C854606992		1/2 NPT x 4-inch (101.6 mm) long	15A4786X012
	For Type 2625NS, EPDM Duro 80A	17B4800X012		1/2 NPT x 7-inch (177.8 mm) long	1F7315X0012
14*	O-Ring (2 req'd) For Type 2625, nitrile	1C853806992	19	Pipe Bushing (maximum of 2 req'd)	1A6371X0052
	For Type 2625NS, EPDM Duro 80A	17B4801X012		3/4 x 1/2 NPT, steel/galvanized	1K289528992
				3/4 x 1/2 NPT, 316 SST	1K2895X0012
			20	Sealant, Zink-Plate No. 770 (not furnished with the volume booster)	

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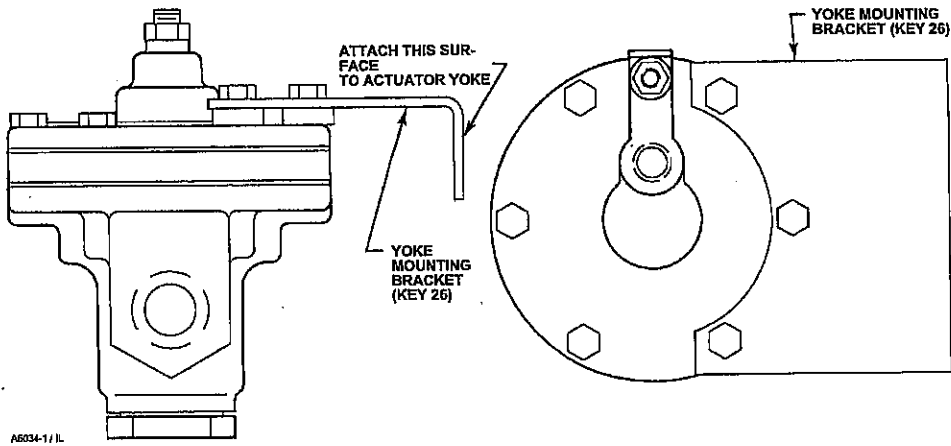


Figure 6. Volume Booster with Yoke Mounting Bracket

Key	Description	Part Number	Key	Description	Part Number
21	Lubricant, Dow Corning Compound III (not furnished with the volume booster)		26	Mounting Bracket For yoke mounting (see figure 6)	23A9540X012
22	Sealant, Loctite 222 (not furnished with the volume booster)			For casing mounting (Use two brackets, stacked, for seismic mounting)	28A4271X012
23	Lubricant For Type 2625 use Magna-Lub G (not furnished with the volume booster) For Type 2625NS use Molykote No. 33 (not furnished with the volume booster)		Diagnostic Connections FlowScanner™ diagnostic system hook-up Includes pipe tee, pipe nipple, pipe bushings, connector body, and body protector. Also, part number provides correct quantities of each item		
24	Elbow, 1/2 inch, 90 degree Iron/galvanized	1B952821992		For diaphragm actuator	
	316 SST	1E8095X0012		SST fittings	12B8042X012
25	Street elbow, 1/2 inch, 90 degree Iron/galvanized, plated	1K139921992		Brass fittings	12B8042X022
	316 SST	17A3127X022		For piston actuator	
				SST fittings	12B8043X012
				Brass fittings	12B8043X022

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