

Types S100C and S102C Pressure Regulators

Introduction

Scope of Manual

This manual provides instructions for the installation, adjustment, maintenance and parts ordering for Types S100C and S102C pressure regulators.

Description

Types S100C and S102C self-operated, spring-loaded regulators provide economical pressure-reducing control in a variety of residential, commercial, and industrial applications. Both regulators can be used with natural, manufactured, or liquified petroleum gases

and have the same inlet and outlet pressure capabilities. In addition, the Type S102C regulator has internal relief across the diaphragm to help minimize overpressure. Any outlet pressure above the start-to-discharge point of the nonadjustable relief valve spring moves the diaphragm off the relief valve seat, allowing excess pressure to bleed out through the screened spring case vent.

Specifications

Table 1 lists the specifications for Types S100C and S102C constructions. The following information is located on the spring case and closing cap: type number, orifice size, spring range and date of manufacture.



W6504/IL

Figure 1. Type S102C Pressure Regulator



Type S100C and S102C

Table 1. Specifications

<p>Body Sizes and End Connection Styles ■ 3/4 x 3/4, ■ 3/4 x 1, ■ 1 x 1, ■ 1 x 1-1/4, ■ 1 x 1-1/2, ■ 1-1/4 x 1-1/4, or ■ 1-1/2 x 1-1/2 inch NPT screwed</p> <p>Maximum Allowable Inlet Pressures See table 2</p> <p>Outlet Pressure Range 1.5-inch wc to 2.5 psig (3.8 to 172 mbar)</p> <p>Maximum Emergency Outlet Pressure (Casing) 25 psig (1.7 bar) casing pressure</p> <p>Maximum Operating Pressure to Avoid Internal Part Damage 3 psi (0.21 bar differential) above outlet pressure setting</p>	<p>Orifice Sizes 1/8, 3/16, 1/4, 5/16, 3/8, 1/2, or 3/16 x 1/8, 3/16 x 5/32, 1/4 x 3/16, 5/16 x 1/4, 9/16 x 5/8</p> <p>Temperature Capabilities -20° to 160°F (-29° to 77°C)</p> <p>Pressure Registration Internal</p> <p>Approximate Weight 6 pounds (2.7 kg)</p>
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Installation



WARNING

Personal injury, equipment damage, or leakage due to escaping gas or bursting of pressure-containing parts might result if these regulators are overpressured or installed where service conditions could exceed the limits for which the regulators were designed, or where conditions exceed any ratings of the adjacent piping or piping connections. To avoid such injury or damage, provide pressure-relieving or pressure-limiting devices (as required by the appropriate code, regulation or standard) to prevent service conditions from exceeding those limits.

Additionally, physical damage to a regulator could cause personal injury and property damage due to escaping gas. To avoid such injury and damage, install the regulator in a safe location.

A regulator may vent some gas to the atmosphere in hazardous or flammable gas service, vented gas might accumulate and cause personal injury, death or property damage due to fire or explosion. Vent a regulator in hazardous gas service to a remote, safe location away from air intakes or any hazardous loca-

tion. The vent line must be protected against condensation or clogging.

Before installing the regulator, check for damage which might have occurred in shipment. Also check for dirt or foreign matter which may have accumulated in the regulator body or in the pipeline. Apply pipe compound to the male threads of the pipeline and install the regulator so that the flow is in the direction of the arrow cast on the side of the body. The diaphragm casing assembly can be rotated to any position relative to the body, in 90° increments. Remove the two cap screws that hold the body to the actuator (key 18) in order to rotate the diaphragm casing assembly.

Do not install the regulator in a location where there can be excessive water accumulation, such as directly beneath a downspout or in an undrained pit.

To obtain the maximum flow capacities or other performance characteristics, the length of pipe from the regulator outlet to the meter or for the first 18 inches (457 mm), whichever is closer should have no bends and should be the same size as the regulator outlet. Replace the regulator if water gets into the spring case or the lower casing of the regulator.

Types S100C and S102C regulators have a spring case vent (1-inch NPT female is standard; optional 3/4-inch NPT female) which is screened to prevent insects or foreign material from entering.



CAUTION

You are advised to use new vent piping because defective threads on the relief

Type S100C and S102C

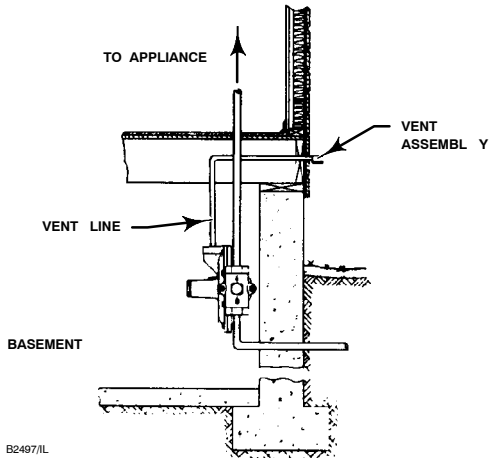


Figure 2. Typical Vent Line Installation

vent piping may interfere with the venting assembly if the piping obstructs the movement of the vent flapper.

On indoor installations, the vent should be piped outside the building, see figure 2. Remove the screen from the regulator vent connection and connect vent piping from that connection to the outdoors. Vent piping should be as large in diameter as practical, be as short as possible, and have a minimum number of bends and elbows. Install a weather and insect resistant vent assembly on the outside end of the pipe, such as a Fisher Type Y602. The same installation precautions apply to vent assemblies as the integral regulator vents described previously.

A program of regular inspection of the vent opening should be established to see that it has not become plugged by foreign material. On some installations, such as in areas of heavy snow fall, it may be necessary to install the regulator beneath a protective hood. If other protection is provided from the elements, the vent should be pointing or sloping down sufficiently to allow any condensate to drain. Also check the regulator periodically for external or internal corrosion.

Overpressure Protection



Some type of overpressure protection is needed if actual inlet pressure can exceed the outlet pressure rating. Overpressuring any portion of this equipment above the limits given in tables 1, 2, and 3 may cause damage to regulator parts, leaks in the regulator, or personal injury due to bursting of pressure-containing parts or explosion of accumulated gas.

Type S102C regulators provide internal relief that limits the total outlet pressure buildup over setpoint. This internal relief may be adequate for the application, if not, provide additional pressure relief or a pressure-limiting device downstream. External downstream overpressure protection is required on Type S100C because this unit does not have an internal relief valve. Regulators should be inspected for damage after any overpressure condition.



To avoid personal injury or property damage due to explosion or damage to regulator or downstream components during startup, release downstream pressure to prevent an overpressure condition on the diaphragm of the regulator.

In order to avoid an overpressure condition and possible equipment damage, pressure gauges should always be used to monitor pressures during startup.

Startup

1. Check to see that all appliances are turned off.
2. Slowly open the upstream shutoff valve.
3. Slowly open the downstream shutoff valve
4. Check all connections for leaks.
5. Make final control spring adjustments according to the adjustment procedures.
6. Light the appliance pilots.

Adjustment

To increase the outlet pressure setting of the regulator, the adjusting screw (key 3, figures 4 & 5) must be turned clockwise. This requires removal of the closing cap (key 4, figures 4 & 5). To reduce the outlet pressure setting, turn the adjusting screw counter-clockwise. A pressure gauge should always be used to monitor downstream pressure while adjustments are being made. Do not adjust the spring to produce an outlet pressure setting above the limit stamped on the closing cap. If the required pressure setting is not within the range of the spring being used, substitute with the correct spring, see table 3. When changing the spring, also change the range stamped on the closing cap to indicate the actual pressure range of the spring in use. After the spring adjustment has been completed, replace the closing cap.

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Table 2. Maximum Inlet Pressures

ORIFICE SIZE		WIDE-OPEN C _g FOR RELIEF SIZING	MAXIMUM OPERATING INLET PRESSURE TO OBTAIN GOOD REGULATING PERFORMANCE ⁽¹⁾								
			With White Standard-Boost Stem Guide T80344T0012				With Black Low-Boost Stem Guide T80368T0012		With White No-Boost Stem Guide T80370T0012		
			1.5 to 28 Inches wc (3.8 to 70 mbar) Spring Ranges		1.5 to 2.5 Psig (103 to 172 mbar) Spring Ranges						
Inch	mm	Psig	Bar	Psig	Bar	Psig	Bar	Psig	Bar		
1/8	3.2	12.5	125	8.6	125	8.6	125	8.6	125	8.6	
3/16	4.8	28.2	60	4.1	60	4.1	60	4.1	100	6.9	
1/4	6.4	50.0	20	1.4	40	2.8	60 ⁽¹⁾	4.1 ⁽¹⁾	60 ⁽¹⁾	4.1 ⁽¹⁾	
5/16	7.9	76.0	12	0.83	20	1.4	40 ⁽¹⁾	2.8 ⁽¹⁾	40 ⁽¹⁾	2.8 ⁽¹⁾	
3/8	9.5	105	8	0.55	12	0.83	---				
1/2	12.7	185	5	0.34	8	0.55	---				
RESTRICTED ORIFICE SIZES											
3/16 x 1/8	4.8 x 3.2	12.5	60	4.1	60	4.1	60	4.1	100	6.9	
3/16 x 5/32	4.8 x 4.0	14.5	60	4.1	60	4.1	60	4.1	100	6.9	
1/4 x 3/16	6.4 x 4.8	28.2	20	1.4	40	2.8	60	4.1	60	4.1	
5/16 x 1/4	7.9 x 6.4	50	12	0.8	20	1.4	40	2.8	40	2.8	
9/16 x 5/8	14.3 x 15.9	240	5	0.34	8	0.55	---	---	---	---	

1. Relief capacity may restrict maximum operating inlet pressure for some vent size, stem guide and orifice combinations to meet ANSI B109.4.

Table 3. Spring Chart

OUTLET PRESSURE RANGE	CONTROL SPRING PART NUMBER	CONTROL SPRING COLOR CODE	CONTROL SPRING WIRE DIAMETER INCH (cm)	CONTROL SPRING FREE LENGTH INCH (cm)
1.5 to 3.5 inches wc (3.8 to 8.8 mbar)	T12607T0012	Purple	0.054 (0.137)	3.28 (8.33)
3.5 to 5.5 inches wc (8.5 to 13.5 mbar)	1E983927212	Red	0.054 (0.137)	3.50 (8.89)
3 to 9 inches wc (7.5 to 22.5 mbar)	1P730927222	Zinc plated silver	0.070 (0.178)	3.06 (7.77)
5.5 to 8.5 inches wc (13.8 to 21.3 mbar)	1E984027062	Olive drab	0.067 (0.170)	3.50 (8.89)
6 to 7.5 inches wc (15 to 17 mbar)	1F192227212	Blue	0.062 (0.157)	3.88 (9.86)
6.5 to 10 inches wc (21.3 to 25 mbar)	T13394T0012	Yellow	0.067 (0.170)	3.75 (9.53)
8 to 15 inches wc (20 to 38 mbar)	1E985127212	Green	0.080 (0.203)	3.28 (8.33)
14 to 28 inches wc (35 to 70 mbar)	1K645127052	Gray	0.090 (0.229)	3.34 (8.48)
1.5 to 2.5 psig (103 to 172 mbar)	T1020027222	plated silver	0.109 (0.277)	3.65 (9.27)

Shutdown



WARNING

To avoid personal injury or property damage due to explosion or damage to regulator or downstream components during shutdown, release downstream pressure to prevent an overpressure condition on the diaphragm of the regulator.

Installation arrangements may vary, but in any installation it is important that the valves be opened or closed slowly. The steps below apply to the typical installation as indicated.

1. Slowly close the downstream shutoff valve.
2. Slowly close the upstream shutoff valve.
3. Open vent valves downstream of the regulator.
4. Open vent valves upstream of the regulator.

Principle of Operation

Refer to figure 3. When downstream demand decreases, the pressure under the diaphragm increases. This pressure overcomes the regulator setting (which is set by a spring). Through the action of the pusher post assembly, the valve disk moves closer to the orifice and reduces gas flow. If demand downstream increases, pressure under the diaphragm decreases.

Type S100C and S102C

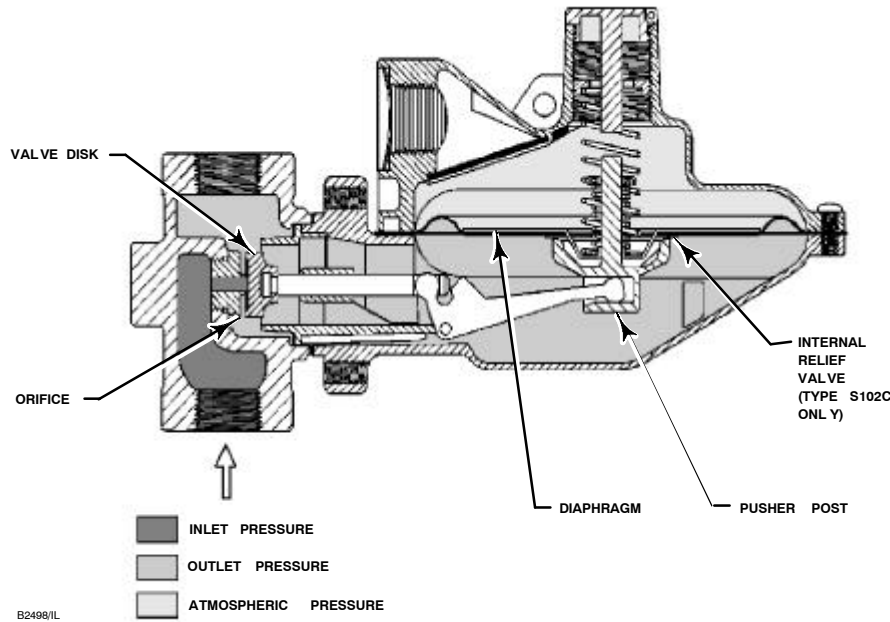


Figure 3. Type S100C or S102C Regulator Operational Schematic

Spring force pushes the pusher post assembly downward and the valve disk moves away from the orifice.

The Type S102C regulators include an internal relief valve for overpressure protection. If the downstream pressure exceeds the regulator setting by 7 inches wc to 1.25 psig (17 to 86 mbar), depending on the main spring used, the relief valve opens and excess gas escapes through the vent in the upper spring case.

Maintenance



Avoid personal injury or damage to property from sudden release of pressure or uncontrolled gas or other process fluid. Before starting to disassemble, isolate the regulator from all pressure and cautiously release trapped pressure from the regulator. Use gauges to monitor inlet, loading and outlet pressures while releasing these pressures.

These procedures are for gaining access to the diaphragm, valve disk and orifice. All pressure must be

released from the diaphragm casing before the following steps can be performed.

While using the following procedures, refer to figures 4 and 5 for key number locations, unless otherwise directed.

Disassembly to Replace Diaphragm

1. Remove the closing cap (key 4) and adjusting screw (key 3).
2. Remove the spring case cap screws (key 14) out of the spring case (key 1), and remove the spring case and control spring (key 2).
3. Lift the diaphragm slightly, and slide it away from the lever (key 10a), so that the pusher post (key 8) releases the lever.
4. On the Type S100C, remove the screw (key 12, figure 4). On the Type S102C, remove the spring retainer (key 24, figure 5), then remove the relief spring (key 25, figure 5).
5. Remove the diaphragm (key 7). Examine the diaphragm and replace with a new diaphragm if necessary.
6. Reassemble in the reverse order of the above procedures. Before attaching the screw, on the Type S100C, (key 12, figure 4) or spring retainer, on the Type S102C, (key 24, figure 5) to the pusher post (key 8, figures 4 & 5) to secure the new diaphragm, place the loosely assembled diaphragm into position in the

Type S100C and S102C

lower casing (key 9, figures 4 & 5), being sure the pusher post is properly hooked on the lever (key 10a, figures 4 & 5). Rotate the diaphragm so that the diaphragm and lower casing holes align. Tighten the screw (key 12, figure 4) or install the spring retainer (key 24, figure 5) and proceed with reassembly.

Disassembly to Replace Valve Disk and Orifice

1. Remove the cap screws (key 18) which hold the lower casing to the body (key 21).
2. The regulator can be removed from the body, exposing the disk (key 16) and the orifice (key 20).
3. Examine the disk. If it is nicked, cut, or otherwise damaged, the disk (key 16) should be removed from the valve stem (key 10b) and replaced with a new part.
4. Examine the seating edge of the orifice (key 20). If it is nicked or rough, it should be unscrewed from the body with a thin wall 7/8 inch socket wrench and replaced with a new orifice to provide proper shutoff. Treat the male threads of the new orifice with lubricant before reassembling.
5. Reassemble in the reverse order of the above procedures.

Ordering Parts

The type number, orifice size, spring range, and date of manufacture are stamped on the closing cap. Always provide this information in any correspondence with your Fisher representative regarding replacement parts or technical assistance. If construction changes are made in the field, be sure that the closing cap is also changed to reflect the most recent construction.

Parts List

Key	Description	Part Number
1	Spring case assembly, Aluminum 3/4 inch vent (optional) Type S100C Type S102C 1 inch vent (standard) Type S100C Type S102C	T20987T0012 T20987T0022 T20987T0032 T20987T0042

Key	Description	Part Number
2	Control spring, spring wire	See table 3
3	Adjusting screw, Delrin ⁽¹⁾ All springs except T1020027222 For T1020027222	T10610X0012 1E982344012
4	Closing cap, ASA	T20118X0012
7*	Diaphragm, nitrile/nylon/plated steel	T20970T0012
8	Pusher post Type S100C, Aluminum Type S102C, Delrin ⁽¹⁾	2E981608012 T40378T0012
9	Lower casing, Aluminum	T40524T0012
10a	Lever, Plated steel	T13729T0012
10b	Stem, Aluminum	T13730T0012
11	Pin, Stainless steel	1E983735032
12	Screw, Steel (Type S100C only)	1E985428982
14	Screw, Steel (8 req d)	T13526T0012
16*	Disk	T13731T0012
18	Cap screw, Steel (2 req d) (not shown)	1E985528992
19	Gasket, Neoprene	T1019906992
20	Orifice, Aluminum 1/8 inch 3/16 inch 1/4 inch 5/16 inch 3/8 inch 1/2 inch 9/16 x 5/8 inch	1A936709012 T13983T0012 0B042009012 0B042109012 0B042209012 1A928809012 1E985209022
21	Body, Cast iron 3/4-inch 3/4 x 1-inch 1-inch 1 x 1 1/4-inch 1 x 1 1/2-inch 1 1/4-inch 1-1/2-inch Body, Cast iron, with inlet gage connection 3/4-inch 3/4 x 1-inch 1-inch 1 x 1 1/4-inch 1 x 1 1/2-inch 1 1/4-inch 1 1/2-inch Body, with outlet gage connection 1-inch NPT Body, with inlet and outlet gage connection 3/4-inch NPT	1E987119012 1E987219012 1E987319012 1E987419012 1E987619012 1E987519012 1E987819012 1E988819012 1E988919012 1E989019012 1E989119012 1E989319012 1E989219012 1E989519012 T2001219012 T20805T0012
22	Vent screen, Stainless steel	T1121338982
24	Spring retainer, Steel, (Type S102C only)	T13039T0012
25	Relief valve spring, (Type S102C only) 9 to 13 inches wc above setpoint 7 to 11 inches wc above setpoint (1/8 inch orifice only) 7 to 11 inches wc above setpoint (3/16 inch & larger orifices)	T13505T0012 T13675T0012 T13785T0012
74	Stem guide, Standard (white) Low boost (black) No boost (white)	T80344T0012 T80368T0012 T80370T0012
75	Lubricant, 8lb. can	1M523906992

* Recommended spare part.
1. Trademark of E.I. duPont De Nemours Co.
2. Trademark of Borg-Warner Chemicals.

Type S100C and S102C

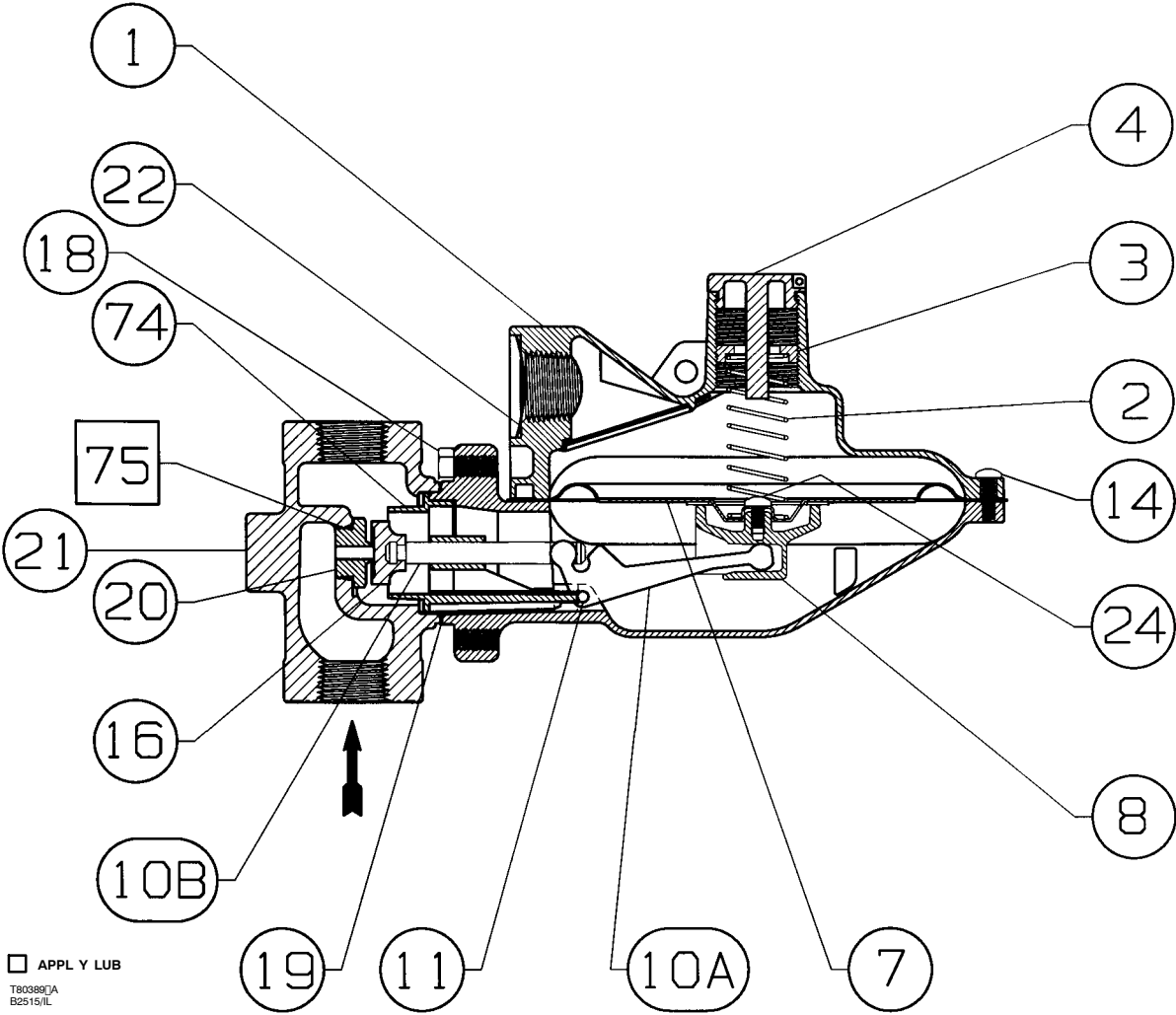


Figure 4. Type S100C Regulator

Type S100C and S102C

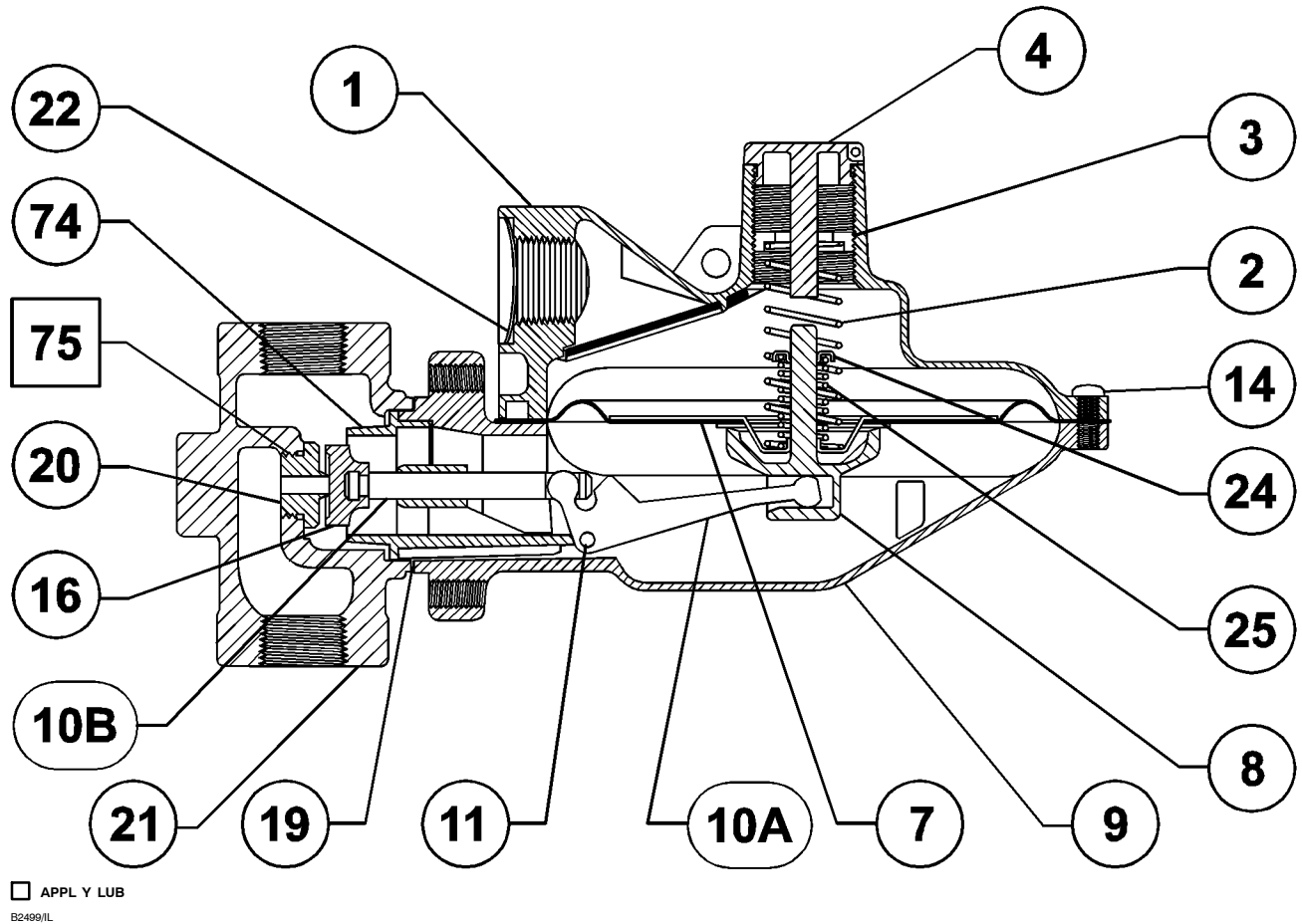


Figure 5. Type S102C Regulator

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Errata Sheet for

Types S100C and S102C Pressure Regulators Instruction Manual,
Form 5404, August 1996

In the Types S100C and S102C regulators, the lever, lever pin, stem guide, and disc can all be inspected or replaced without removing the spring case assembly from the lower casing.

Add the following procedures to the Maintenance Section of the instruction manual:

Disassembly to Inspect or Replace the Valve Disc and Orifice

1. Remove the cap screws (key 18) holding the body (key 21) to the lower casing (key 9).
2. The actuator can be removed from the body, exposing the disc (key 16) and the orifice (key 20).
3. Examine the disc (key 16). If it is nicked, cut, or otherwise damaged, the disc should be removed from the valve stem (key 10b) and replaced with a new disc.

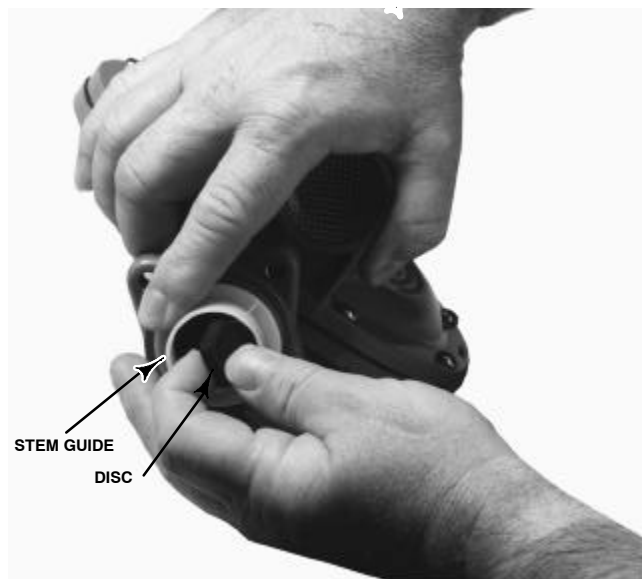


Figure 1. Removing Disc From Stem



Figure 2. Reassembling Disc and Stem

4. To replace the disc, remove the disc from the stem by holding the stem guide in place, and pry the disc off the stem (see figure 1).
5. To reinstall the disc, snap or push a new disc onto the end of the stem (see figure 2).
6. Examine the seating edge of the orifice (key 20). To provide proper shutoff, if the orifice is nicked or rough it should be unscrewed from the body with a thin wall 7/8 inch socket wrench and replaced with a new orifice. Coat the male threads of the new orifice with lubricant (key 75) before reassembling.

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7. To reassemble, place the gasket (key 19) onto the lower casing and assemble the actuator to the body while holding the stem guide in place. Secure to the body using two cap screws (key 18).

Disassembly to Inspect or Replace the Valve Stem and Lever

1. Remove the cap screws (key 18) holding the body (key 21) to the lower casing (key 9).

2. The actuator can be removed from the body, exposing the stem guide (key 74) and the disc (key 16).



Figure 3. Removing Stem, Stem Guide, Lever, and Lever Pin

3. Pull the stem guide (key 74) and stem (key 10b) from the lower casing (key 9). The lever (key 10a) and lever pin (key 11) can now be removed from the lower casing (see figure 3). Note that the lever pin is not secured to the lever.

4. Examine the parts for bends, cracks, or other damage. Replace the part if any damage is evident.

5. To reassemble, place the lower casing on a flat surface. Push the lever pin into the lever, then slide the lever into the slot of lower casing and position as shown in figure 4 .



Figure 4. Lever and Lever Pin in Lower Casing



Figure 5. Stem Guide, Stem, and Lever Assembly

6. With the stem and stem guide assembled as shown in figure 5, position the machined slot in the stem over the knob of the lever and set the two prongs of the stem guide up against the lever pin. Holding the stem guide and disc together, slide the assembly into the lower casing. The lever will slide into the slot on the pusher post (see figure 5).

7. To reassemble, place the gasket (key 19) onto the lower casing and assemble the regulator to the body while holding the stem guide in place. Secure to the body using two cap screws (key 18).