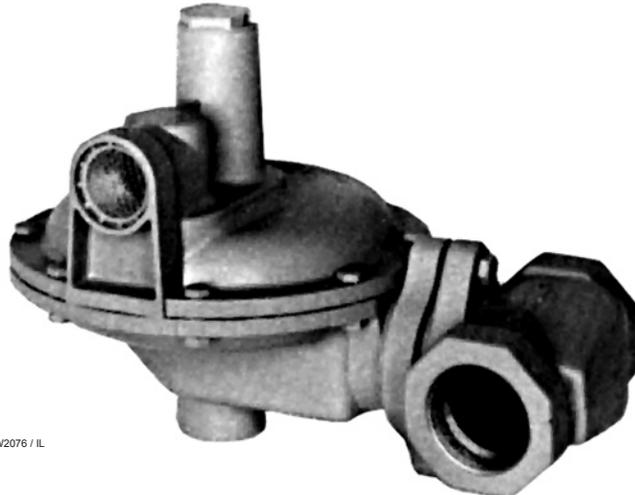


January 2009

# Types S301 and S302 Gas Regulators



W2076 / IL

Figure 1. Typical S301 Series Regulator



## WARNING

Fisher® regulators must be installed, operated, and maintained in accordance with federal, state, and local codes, rules and regulations, and Fisher instructions. For LP-Gas service, an approved regulator (such as one listed by UL) should be used. The installation, in most states, must comply with NFPA standards.

If the regulator vents gas or a leak develops in the system, service to the unit may be required. Failure to correct trouble could result in a hazardous condition.

Call a gas service person to service the unit. Only a qualified person must install or service the regulator.

## Introduction

### Scope of the Manual

This instruction manual provides instructions and a parts list for Types S301, S301H, S302, and S302H gas service regulators.

### Description

S301 Series regulators are typically installed on industrial and commercial applications. The Types S302 and S302H units contain an internal relief valve. Units with an “H” suffix are similar to the basic regulators but deliver a higher outlet pressure (1 to 8 psig) (0,07 to 0,55 bar).

### Specifications

Specifications for Types S301 and S302 gas regulators are listed in the Specifications section on page 2. The following information is stamped on the regulator at the factory: type number, date of manufacture, spring range, and seat ring port size.



# Types S301 and S302

## Specifications

### Body Sizes and End Connection Styles

NPT inlet and outlet  
 1-1/4 x 1-1/4, 1-1/2 x 1-1/2, 2 x 2-inch  
 (DN 32 x 32, 40 x 40, 50 x 50)  
 2-inch (DN 50) CL125 RF flange

### Maximum Allowable Inlet Pressures

See Table 1

### Maximum Emergency Outlet Pressure

15 psig (1,0 bar) (Spring case pressure)

### Maximum Allowable Outlet Pressure

3 psi (0,21 bar) above outlet setting

### Seat Ring Diameters

5/32 x 3/16, 3/16, 7/32 x 1/4, 1/4, 7/32 x 3/8, 3/8,  
 1/2, 3/4, and 3/4 x 7/8-inch  
 (3,9 x 4,8; 4,8; 5,6 x 6,4; 6,4; 5,6 x 9,5;  
 9,5; 13; 19; 19 x 22 mm)

### Temperature Capabilities

-20° to 170°F (-29° to 77°C)

### Pressure Registration

Internal

### Approximate Weight

9 pounds (4 kg)

**Table 1. Inlet Pressure**

SEAT RING SIZE		MAXIMUM INLET PRESSURE			
		Types S301 and S302		Types S301H and S302H	
Inch	mm	Psig	bar	Psig	bar
5/32 x 3/16	3,9 x 4,8	125	8,6	----	----
3/16	4,8	125	8,6	125	8,6
7/32 x 1/4	5,6 x 6,4	60	4,1	----	----
1/4	6,4	60	4,1	125	8,6
7/32 x 3/8	5,6 x 9,5	30	2,1	----	----
3/8	9,5	30	2,1	80	5,5
1/2	13	25	1,7	60	4,1
3/4	19	15	1,0	40	2,8
3/4 x 7/8	19 x 22	15	1,0	----	----

**Table 2. Maximum Outlet Pressure Setting**

TYPES	MAXIMUM OUTLET <sup>(1)</sup>
S301 and S302	28-inches w.c. (70 mbar)
S301H	8 psig (0,55 bar)
S302H	3 psig (0,21 bar)

1. Maximum emergency outlet (casing) pressure for S300 Series is 15 psig (1,0 bar).

**Table 3. Spring Chart**

TYPES	SPRING RANGES		PART NUMBER	COLOR CODE
	Inches w.c.	mbar		
S301, S302	3.5 to 6.0	9 to 15	T1124127222	Red
	5.0 to 8.5	12 to 21	T1122127222	Silver
	6.0 to 14	15 to 35	T1123637222	Blue
	12 to 28	30 to 70	T1123727012	Green
S301H	2.5 to 5.5 psig	0,17 to 0,38 bar	T1138327142	Yellow
	4.5 to 8.0 psig	0,31 to 0,55 bar	T1138227142	Brown
S301H, S302H	1 to 2 psig	0,07 to 0,14 bar	T1138527142	Black
	2.5 to 5.5 psig	0,17 to 0,38 bar	T1138327142	Yellow
	1.5 to 3.0 psig	0,10 to 0,21 bar	T1138427142	Olive Drab

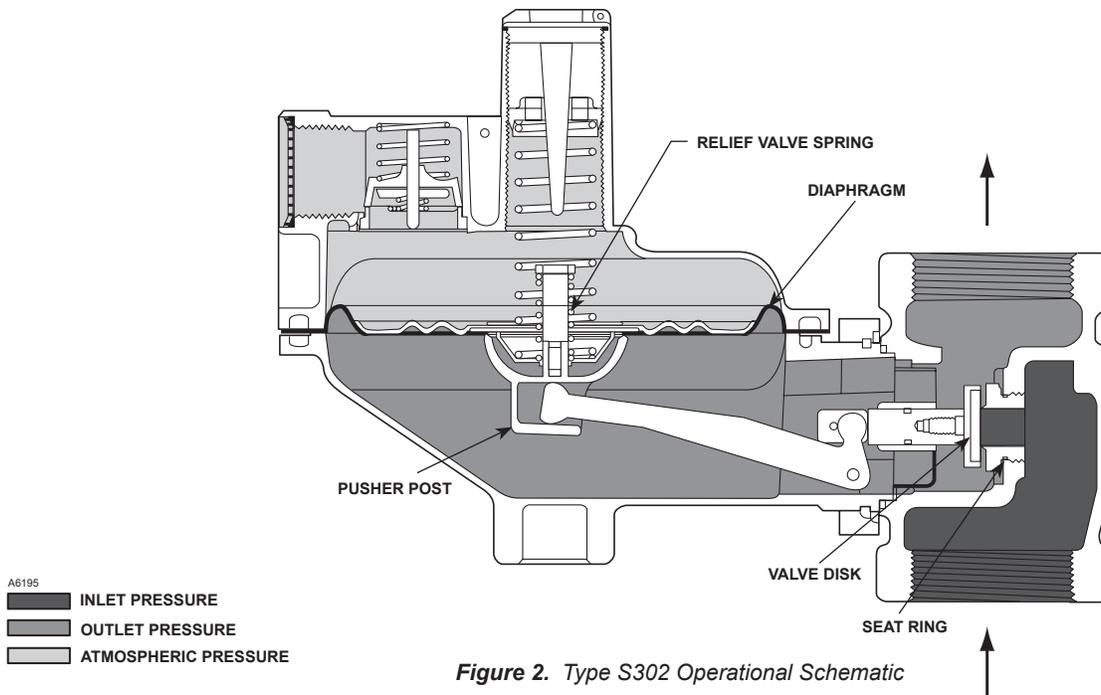


Figure 2. Type S302 Operational Schematic

## Principle of Operation

Refer to Figure 2. When the 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 seat ring and reduces gas flow. If demand downstream increases, pressure under the diaphragm decreases. Spring force pushes the pusher post assembly downward, the valve disk moves away the seat ring, and the gas flow increases.

The Types S302 and S302H regulators include an internal relief valve for overpressure protection. If the downstream pressure exceeds the regulator setting by 7-inches w.c. to 1 psig (17 mbar to 0,07 bar) (depending on the main spring used), the relief valve opens and excess gas is vented through the stabilizer vent in the upper spring case.

construction. Regulator installations should be adequately protected from physical damage.

All vents should be kept open to permit free flow of gas to the atmosphere. Protect openings against entrance of rain, snow, insects, or any other foreign material that may plug the vent or vent line. On outdoor installations, point the spring case vent downward to allow condensate to drain. This minimizes the possibility of freezing and of water or other foreign materials entering the vent and interfering with proper operation.

Under enclosed conditions or indoors, escaping gas may accumulate and be an explosion hazard. In these cases, the vent should be piped away from the regulator to the outdoors.

## Installation



### WARNING

Personal injury or system damage may result if this regulator is installed, without appropriate overpressure protection, where service conditions could exceed the limits shown in the Specifications section and Tables 1 to 3 for a given



### CAUTION

Like most regulators, S301 Series regulators have an outlet pressure rating lower than their inlet pressure rating. If actual inlet pressure can exceed the outlet pressure rating, outlet overpressure protection is necessary.

# Types S301 and S302

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**However, overpressuring any portion of the regulators beyond the limits in Tables 1 and 2 may cause leakage, damage to regulator parts, or personal injury due to bursting of pressure-containing parts.**

**Some type of external overpressure protection should be provided if inlet pressure will be high enough to damage downstream equipment. Common methods of external overpressure protection include relief valves, monitoring regulators, shutoff devices, and series regulation.**

**If regulator is exposed to an overpressure condition, it should be inspected for any damage that may have occurred. Regulator operation below these limits does not preclude the possibility of damage from external sources or from debris in the pipeline.**

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 flow is in the direction of the arrow cast on the body. The diaphragm casing assembly can be rotated to any position relative to the body. Loosen the two cap screws (key 28, Figure 3) 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.

If the regulator is used in conjunction with a Type 289H relief valve, the Type 289H should be set 10-inches w.c. (25 mbar) higher than the outlet pressure setting of the regulator, up to 30-inches w.c. (75 mbar) reduced pressure. For pressure greater than this, set the Type 289H 0.75 psi (0,05 bar) higher than the outlet pressure setting of the regulator.

The Types S301 and S302 regulators have 1-inch NPT screened vent openings in the spring case. If necessary to vent escaping gas away from the regulator, install a remote vent line in the spring case tapping. Vent piping should be as short and direct as possible with a minimum number of bends and elbows. The remote vent line should have the largest practical diameter. Vent piping on regulators with internal relief (Types S302 and S302H) must be large enough to vent all relief valve discharge to atmosphere without excessive backpressure and resulting excessive pressure in the regulator.

Periodically check all vent openings to be sure that they are not plugged.

Maximum outlet pressure settings are shown in Table 2. Outlet pressure more than 3 psi (0,21 bar) above the set point may damage internal parts such as the diaphragm head and valve disk. **The maximum emergency (casing) outlet pressure is 15 psig (1,0 bar).**

## Startup



### CAUTION

**Pressure gauges should always be used to monitor downstream pressure during startup.**

1. Check to see that all appliances are turned off.
2. Slowly open the upstream plug cock.
3. Check all connections for leaks.
4. Light the appliance pilots.

## Adjustment

To increase the outlet pressure setting of the regulator, the adjusting screw (key 3, Figure 3) must be turned clockwise. This requires removal of the closing cap (key 4). To reduce the outlet pressure setting, turn the adjusting screw counterclockwise. 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. (Note: High pressure springs of 1 psig (0,07 bar) or more cannot be used in the low pressure regulators). 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.

## Shutdown

Installation arrangements may vary, but in any installation it is important that the valves be opened or closed slowly and that the outlet pressure be vented before venting inlet pressure to prevent damage caused by reverse pressurization of the regulator. The steps below apply to the typical installation as indicated.

1. Open valves downstream of the regulator.
2. Slowly close the upstream shutoff valve.
3. Inlet pressure will automatically be released downstream as the regulator opens in response to the lowered pressure on the diaphragm.

## Maintenance



### WARNING

To avoid personal injury or equipment damage, do not attempt any maintenance or disassembly without first isolating the regulator from system pressure and relieving all internal pressure as described in “Shutdown”.

Regulators that have been disassembled for repair must be tested for proper operation before being returned to service. Only parts manufactured by Fisher® should be used for repairing Fisher regulators. Relight pilot lights according to normal startup procedures.

Due to normal wear or damage that may occur from external sources, this regulator should be inspected and maintained periodically. The frequency of inspection and replacement of parts depends upon the severity of service conditions or the requirements of local state, and federal rules and regulations.

## Disassembly to Replace Diaphragm

Refer to Figure 3.

1. Remove closing cap (key 4) and adjusting screw (key 3).
2. Take out the spring case screws and lift the spring case (key 1) and spring (key 2) off the lower casing (key 10).
3. Lift the diaphragm assembly slightly so that the pusher post (key 7) can release the valve lever (key 14).
4. On S301 Series, remove the screw (key 9); on S302 Series, remove the relief valve stem (key 30).
5. The diaphragm can be disassembled by removing the spring seat (key 6).
6. Reassemble in the reverse order of the above procedures. Before tightening the screw (key 9) or relief valve stem (key 30) into the pusher post (key 7) to secure the new diaphragm, place the loosely assembled diaphragm and head unit into position in the lower casing (key 10), being sure the pusher post is properly hooked on the lever (key 14). Rotate the diaphragm so that diaphragm and lower casing holes align. Tighten the screw (key 9) or relief valve stem (key 30) and proceed with reassembly.



### CAUTION

Before tightening cap screws (key 21), replace the spring and adjusting screw. Turn the adjusting screw to about mid position. This will stretch the oversized diaphragm to ensure slack in the assembled diaphragm. The slack created by this method is necessary for good regulation.

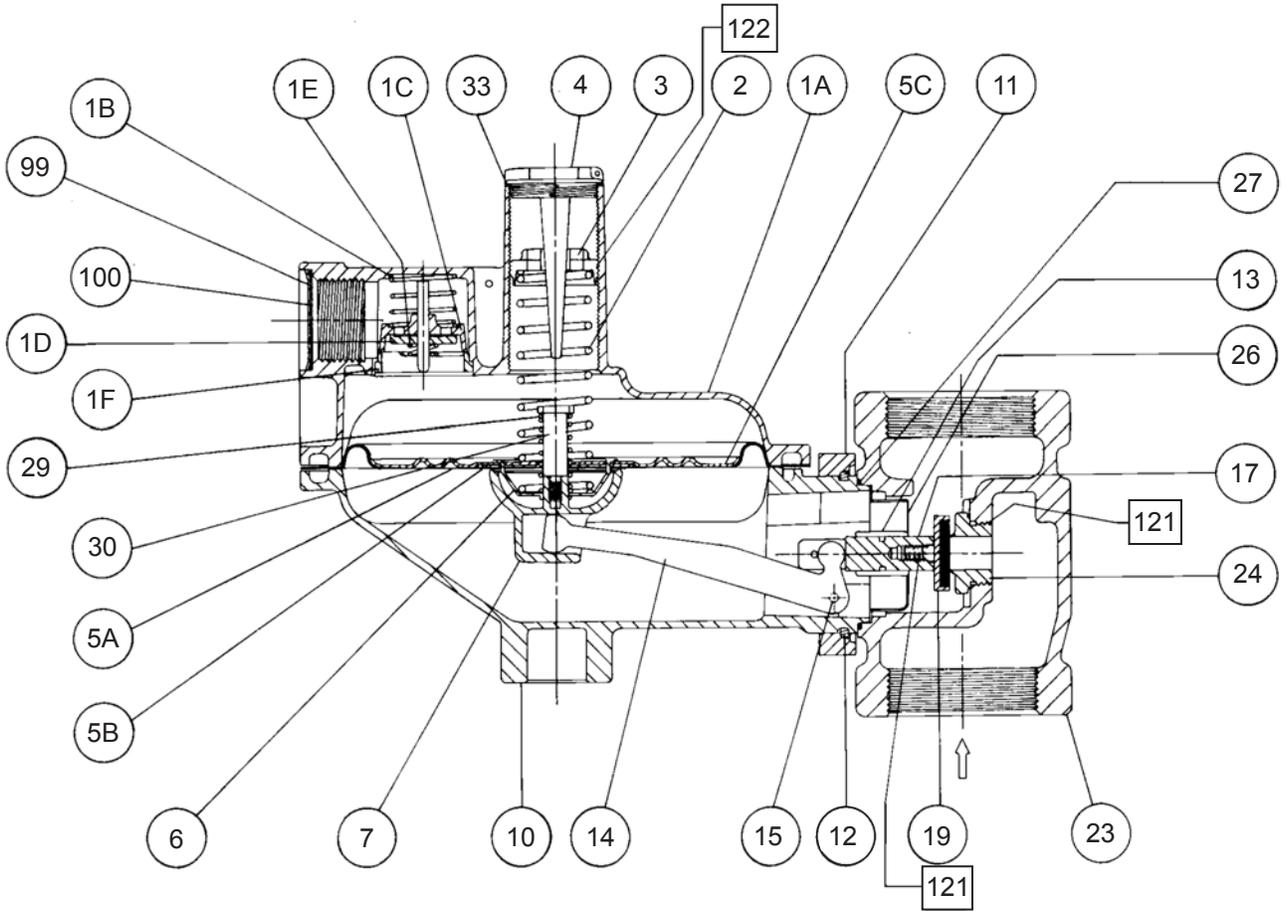
Be sure the diaphragm does not fold over at the flange when reassembling.

## Disassembly to Replace Valve Disk and Seat Ring

Refer to Figure 3.

1. Remove the bolts (key 28) which hold the union ring (key 11) portion of the lower casing to the body (key 23).
2. The regulator can be removed from the body, exposing the disk holder and disk (key 19) and the seat ring (key 24).
3. Examine the disk portion of the disk holder assembly. If it is nicked, cut, or otherwise damaged, the disk holder can be unscrewed from the valve stem (key 17).
4. Examine the seating edge of the seat ring (key 24). If it is nicked or rough, it should be unscrewed from the body with a 1-1/6-inch (27 mm) socket wrench and replaced with a new seat ring to provide proper shutoff. Treat the male threads of the new seat ring with pipe compound before reassembling.
5. Reassemble in the reverse order of the above procedure.

# Types S301 and S302



121 – Apply Never-Seez

122 – Apply Lubriplate Mag - 1

Figure 3. Type S302 Assembly

# Types S301 and S302

## Parts Ordering

The type number, seat ring (port) size, spring range, and date of manufacture are stamped on the closing cap. Always provide this information in any correspondence with your local Sales Office 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, Aluminum Types S301 and S302 Types S301H and S302H (Spring T11385 or T11384) Type S301H (Spring T11382 or T11383)	T11238000A2 T11389000A2 T11390000A2
2	Spring - See Table 3	
3	Adjusting Screw Types S301 and S302 Types S301H and S302H	T1122506642 T1138809012
4	Closing Cap, Zinc	T2029044012
5A*	Diaphragm, Synthetic Rubber	T1122702532
5B*	Diaphragm Pad, Synthetic Rubber	T1121003162
5C	Diaphragm Head, Steel	T2028925062
6	Spring Seat, Steel	T1122625062
7	Pusher Post, Aluminum Types S301 and S301H Types S302 and S302H	T4009508012 T4009108012
8	Retainer, Steel Types S301 and S301H	T1123124132
9	Screw, Steel Types S301 and S301H	1B285528982
10	Lower Casing, Aluminum Types S301 and S302 Types S301H and S302H	T8006108012 T8006108012
11	Union Ring, Aluminum	T1121608012
12	Split Ring, SST	T1120637022
13	Stem Guide	T2028606992
14	Valve Lever, Steel Types S301 and S302 Types S301H and S302H	T1120525062 T1138625062
15	Pivot Pin, SST	1E983735032
16	Screw, Steel (2 Required) Types S301 and S302 Types S301H and S302H	T1121428982 17B0404X012
17	Valve Stem, Aluminum Types S301 and S302 Types S301H and S302H	T11197T0022 T11391X0022
19*	Disk Holder and Disk	T12523T0012
21	Cap Screw, Steel (8 Required)	T1070824912
22	Nut, Steel (8 Required)	1E985324142
23	Body, Cast iron 1-1/4-inch (DN 32) 1-1/4-inch (DN 32) with gauge tap 1-1/2-inch (DN 40) 1-1/2-inch (DN 40) with gauge tap 2-inch (DN 50) 2-inch (DN 50) with gauge tap 2-inch (DN 50) Flanged 2-inch (DN 50) Flanged with gauge tap	T2028819012 T2029219012 T2028719012 T20599T0012 T2035419012 T2035519012 T4011919012 T4012019012
24	Seat Ring, Aluminum 3/16-inch (4,8 mm) 1/4-inch (6,4 mm) 3/8-inch (9,5 mm) 1/2-inch (13 mm) 3/4-inch (19 mm) Following not for use in Type S301H or S302H: 5/32 x 3/16-inch (3,9 x 4,8 mm) 7/32 x 1/4-inch (5,6 x 6,4 mm) 7/32 x 3/8-inch (5,6 x 9,5 mm) 3/4 x 7/8-inch (19 x 22 mm)	T1122409012 T12522T0012 T1122309012 T1122009012 T1121909012 T1150509012 T1150309012 T1150409012 T1122809012
26	Baffle, Aluminum	T1122911992
27*	O-Ring, Synthetic Rubber	T1121106992
28	Cap Screw, Steel (2 Required)	1B787724052
29	Relief Valve Spring, Spring Wire Types S302 and S302H	T1121527012
30	Relief Valve Stem, Steel, Types S302 and S302H	T1120724272
32	Slip Disk, Aluminum Types S301H and S302H	T1151011992
33*	Gasket, Synthetic Rubber	T13095T0022
99	Vent Screen, Stainless steel	T1121338982
100	Retaining Ring, Steel	T1120925072

\* Recommended spare part.

# Types S301 and S302

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