

Fisher Controls

Instruction Manual

Type S301 & S302 Gas Regulators



October 1981

Form 5180

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 U.L.) 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 serviceman to service the unit. Only a qualified person must install or service the regulator.



Figure 1. Typical S301 Series Regulator

INTRODUCTION

Scope of Manual

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

Description

Type S301 series regulators are typically installed on industrial and commercial applications. The 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).

Specifications

Table 1 lists the specifications for the regulators. The following information is stamped on the regulator at the factory: type number, date of manufacture, spring range, and seat ring port size.

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 tables 1-4 for a given 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.

Type S301 and S302

Table 1. Specifications

| | | | |
|-------------------------------------|---|--------------------------|--|
| BODY SIZES AND END CONNECTION STYLE | NPT screwed inlet and outlet 1-1/4 x 1-1/4 inch ■ 1-1/2 x 1-1/2 inch ■ 2 x 2 inch, 2 inch ANSI 125 lb. R. F. flange | 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 inches |
| MAXIMUM ALLOWABLE INLET PRESSURES | See table 2 | TEMPERATURE CAPABILITIES | -20° to +170° F (-29° to 77° C) |
| MAXIMUM EMERGENCY OUTLET PRESSURE | 15 psig (Spring case pressure) | PRESSURE REGISTRATION | Internal |
| MAXIMUM ALLOWABLE OUTLET PRESSURE | 3 psi above outlet setting | APPROXIMATE WEIGHT | 9 pounds (4.1 kg) |

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.

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. However, overpressuring any portion of the regulators beyond the limits in tables 2 and 3 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 down spout.

If the regulator is used in conjunction with a 289H relief valve, the Type 289H should be set 10" W.C. higher than the outlet pressure setting of the regulator, up to 30 inches W.C. reduced pressure. For pressure greater than this, set the 289H 3/4 psi higher than the outlet pressure setting of the regulator.

The Type 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 (S302 & S302H) must be large enough to vent all relief valve discharge to atmosphere without excessive back pressure 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 3. Outlet pressure more than 3 psi 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.**

STARTUP

CAUTION

Pressure gauges should always be used to monitor downstream pressure during start-up.

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.

Table 2. Inlet Pressure

| Seat Ring Size | | Maximum Inlet Pressure | | | |
|----------------|-------------|------------------------|-----|---------------|-----|
| | | S301 & S302 | | S301H & S302H | |
| Inches | mm | Psig | Bar | Psig | Bar |
| 5/32 x 3/16 | 4.0 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 | 12.7 | 25 | 1.7 | 60 | 4.1 |
| 3/4 | 19.0 | 15 | 1.0 | 40 | 2.8 |
| 3/4 x 7/8 | 19.0 x 22.2 | 15 | 1.0 | — | — |

Table 3. Maximum Outlet Pressure Setting

| Type Number | Maximum Outlet * |
|-------------|------------------------|
| S301 & S302 | 28" W.C. (70 millibar) |
| S301H | 8 psig (552 millibar) |
| S302H | 3 psig (207 millibar) |

* Maximum emergency outlet (casing) pressure for S300 Series is 15 psig.

Table 4. Spring Chart

| Type Number | Spring Range | | Part Number | Color Code |
|--------------|----------------|-------------|--------------|------------|
| | Inches W.C. | Millibar | | |
| S301, S302 | 1.5 - 3.5 | 3.7 - 8.7 | T12609 T0012 | Purple |
| | 3.5 - 6.0 | 8.7 - 14.9 | T11241 27222 | Red |
| | 5.0 - 8.5 | 12.5 - 21.2 | T11221 27222 | Cadmium |
| | 6.0 - 14 | 14.9 - 34.9 | T11236 37022 | Blue |
| | 12 - 28 | 29.9 - 69.7 | T11237 27012 | Green |
| S301H | 2.5 - 5.5 psig | 172 - 379 | T11383 27142 | Yellow |
| | 4.5 - 8.0 psig | 310 - 552 | T11382 27142 | Brown |
| S301H, S302H | 1 - 2 psig | 69 - 138 | T11385 27142 | Black |
| | 1.5 - 3.0 psig | 103 - 207 | T11384 27142 | Olive Drab |

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 4. (Note: High pressure springs of 1 psig 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.

PRINCIPAL OF OPERATION

Refer to figure 2. 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 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 from the seat ring, and the gas flow increases.

The Type 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 (depending on the main spring used), the relief valve opens and excess gas is vented through the stabilizer vent in the upper spring case.

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

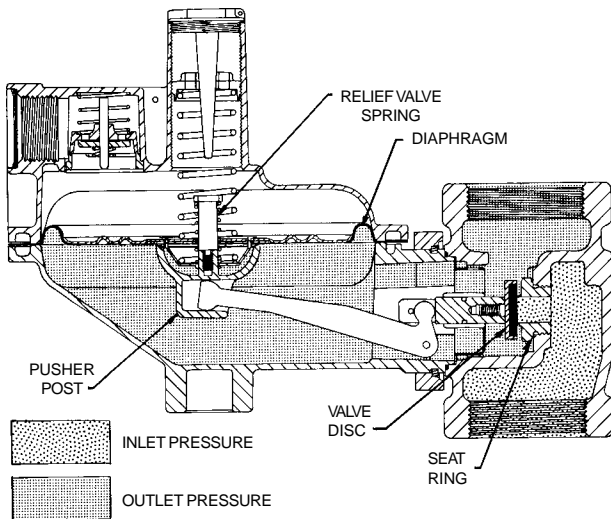


Figure 2. Operational Schematic

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's, remove the screw (key 9); on S302's, 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

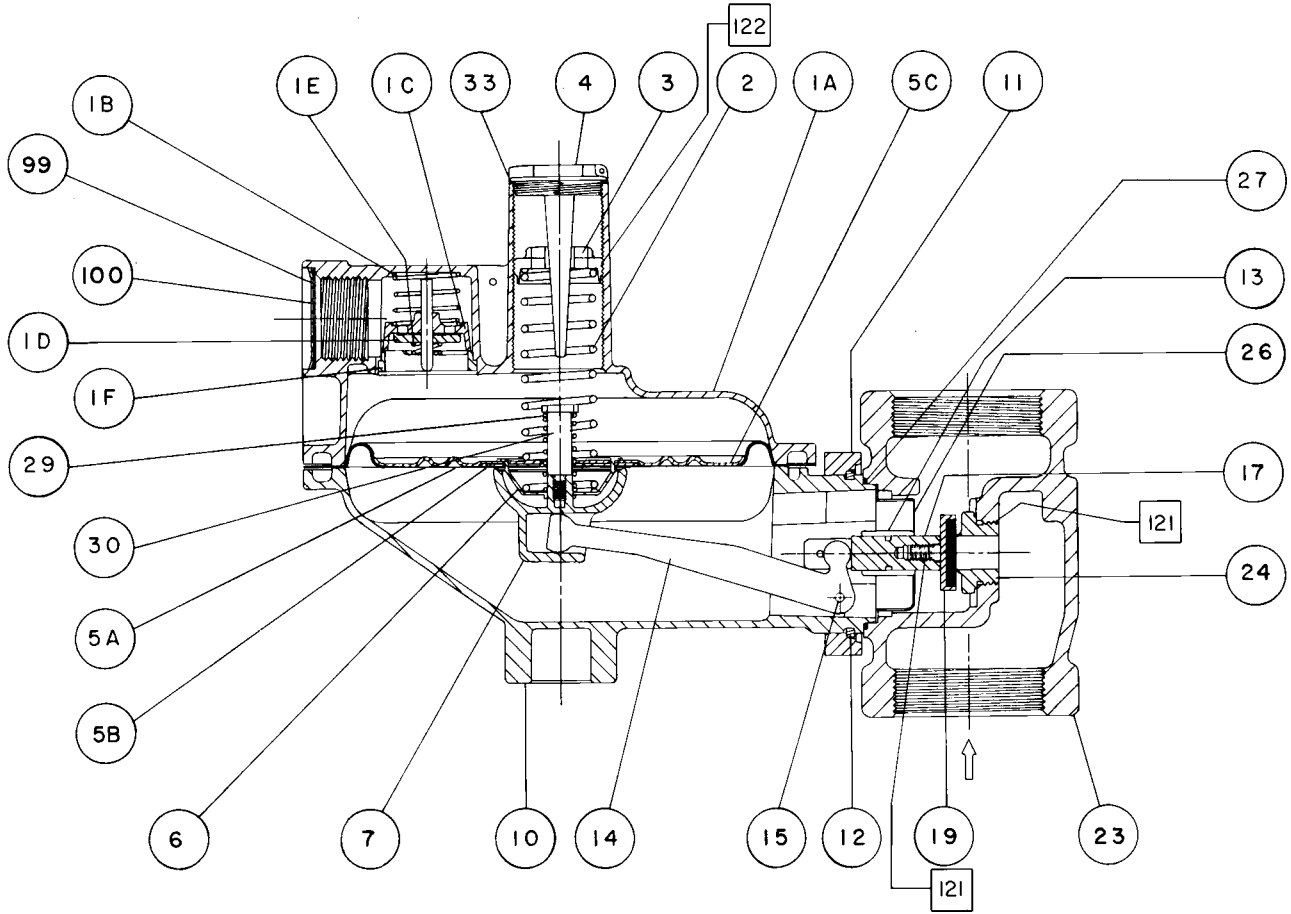
Refer to figure 3.

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 1-1/16 inch 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.

ORDERING PARTS

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 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.



121 – Apply Never-Seez

122 – Apply Lubriplate Mag-1

Figure 3. Type S302

Type S301—S302

PARTS LIST

| Key | Description | Part Number | Key | Description | Part Number |
|-----|---|--|-----|--|--|
| | | | 10 | Lower Casing, aluminum S301 & S302 S301H & S302H | T80061 08012 T20389 08012 |
| 1 | Spring Case, aluminum S301 & S302 S301H & S302H (Spring T11385 or T11384) S301H (Spring T11382 or T11383) | T11238 000A2 T11389 000A2 T11390 000A2 | 11 | Union Ring, Aluminum | T11216 08012 |
| 2 | Spring – See table 4 | | 12 | Split Ring, SST | T11206 37022 |
| 3 | Adjusting Screw S301 & S302 S301H & S302H | T11225 06642 T11388 09012 | 13 | Stem Guide | T20286 06992 |
| 4 | Closing Cap, Zinc | T20290 44012 | 14 | Valve Lever, steel S301 & S302 S301H & S302H | T11205 25062 T11386 25062 |
| 5A* | Diaphragm, Syn. Rubber | T11227 02532 | 15 | Pivot Pin, SST | 1E9837 35032 |
| 5B* | Diaphragm Pad, Syn. Rubber | T11210 03162 | 16 | Screw, Steel (2 req'd) S301 & S302 S301H & S302H | T11214 28982 T11539 28982 |
| 5C | Diaphragm Head, Steel | T20289 25062 | 17 | Valve Stem, aluminum S301 & S302 S301H & S302H | T11197 000A2 T11391 000A2 |
| 6 | Spring Seat, Steel | T11226 25062 | 19* | Disc Holder & Disc | T12523 T0012 |
| 7 | Pusher Post, aluminum S301 & S301H S302 & S302H | T40095 08012 T40091 08012 | 21 | Cap Screw, steel (8 req'd) | T10708 24912 |
| 8 | Retainer, steel S301 & S301H | T11231 24132 | 22 | Nut, steel (8 req'd) | 1E9853 24142 |
| 9 | Screw, steel S301 & S301H | 1B2855 28982 | 23 | Body, cast iron 1-1/4" 1-1/4" with gauge tap 1-1/2" 1-1/2" with gauge tap 2" 2" with gauge tap 2" Flanged 2" Flanged with gauge tap | T20288 19012 T20292 19012 T20287 19012 T20291 19012 T20354 19012 T20355 19012 T40119 19012 T40120 19012 |
| | | | 24 | Seat Ring, aluminum 3/16" 1/4" 3/8" 1/2" 3/4" | T11224 09012 T12522 T0012 T11223 09012 T11220 09012 T11219 09012 |
| | | | 26 | Baffle, aluminum | T11229 11992 |
| | | | 27* | O-Ring, Syn. Rubber | T11211 06992 |
| | | | 28 | Cap Screw, steel (2 req'd) | T11208 28982 |
| | | | 29 | Relief Valve Spring, Spring Wire S302 & S302H | T11215 27012 |
| | | | 30 | Relief Valve Stem, Steel, S302 & S302H | T11207 24272 |
| | | | 32 | Slip Disc, aluminum S301H & S302H | T11510 11992 |
| | | | 33* | Gasket, Syn. Rubber | T13095 T0012 |
| | | | 99 | Vent Screen, SST | T11213 38982 |
| | | | 100 | Retaining Ring, Steel | T11209 25072 |

* Recommended Spare Parts

While this information is presented in good faith and believed to be accurate, Fisher Controls does not guarantee satisfactory results from reliance upon such information. *Nothing contained herein is to be construed as a warranty or guarantee, express or implied, regarding the performance, merchantability, fitness*

or any other matter with respect to the products, nor as a recommendation to use any product or process in conflict with any patent. Fisher Controls reserves the right, without notice, to alter or improve the designs or specifications of the products described herein.



Fisher Controls

For information, contact Fisher Controls:
Marshalltown, Iowa 50158 USA
Cernay 68700 France

Sao Paulo 05424 Brazil
Singapore 0512

