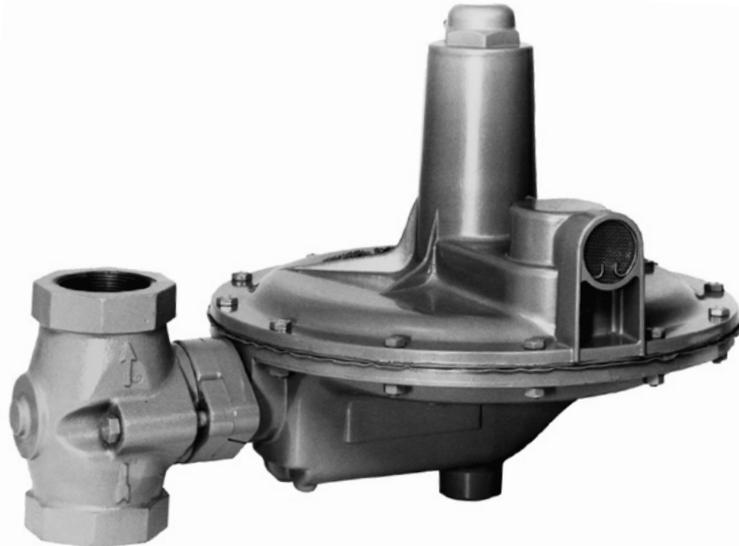


October 2009

S201 and S202 Series Gas Regulators



W1919

Figure 1. Typical S200 Gas Regulator



WARNING

Fisher® regulators must be installed, operated, and maintained in accordance with federal, state, and local codes, rules and regulations, and Emerson Process Management Regulator Technologies, Inc., 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 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 for installation, adjustment, maintenance, and parts ordering information for Types S201, S201H, S201K, S202, and S202H gas service regulators.

Description

S201 and S202 Series regulators are typically installed on industrial and commercial applications. The Types S202 and S202H regulators contain an internal relief valve. Units with an “H” or “K” suffix are similar to the basic regulators but deliver a higher outlet pressure of 1 to 5 psig (69 mbar to 0,35 bar) and 2 to 10 psig (0,14 to 0,69 bar), respectively.

Specifications

The Specifications section lists the specifications for the regulators. The following information is stamped on the regulator at the factory: type number, date of manufacture, spring range, orifice size, maximum inlet pressure, maximum operating outlet pressure, and outlet pressure which may damage regulator parts.



S201 and S202 Series

Specifications

Available Configurations

See Figure 3

Body Size and End Connection Styles

1-1/2 or 2 NPT inlet and outlet and
NPS 2 (DN 50) CL125 FF flanged

Maximum Allowable Inlet Pressures⁽¹⁾

See Table 1

Maximum Emergency Outlet Pressure⁽¹⁾

15 psig (1,0 bar)

Outlet Pressure Range

2.0-inches w.c. to 10 psig (5 mbar to 0,69 bar)

Orifice Size

1/4, 3/8, 1/2, 3/4, 1, and 1-3/16-inches
(6,4; 9,5; 13; 19; 25; and 30 mm)

Temperature Capabilities

-20° to 150°F (-29° to 66°C)

Pressure Registration

Internal

Approximate Weight

22 pounds (10 kg)

1. The pressure/temperature limits in this Instruction Manual and any applicable standard or code limitation for valve should not be exceeded.

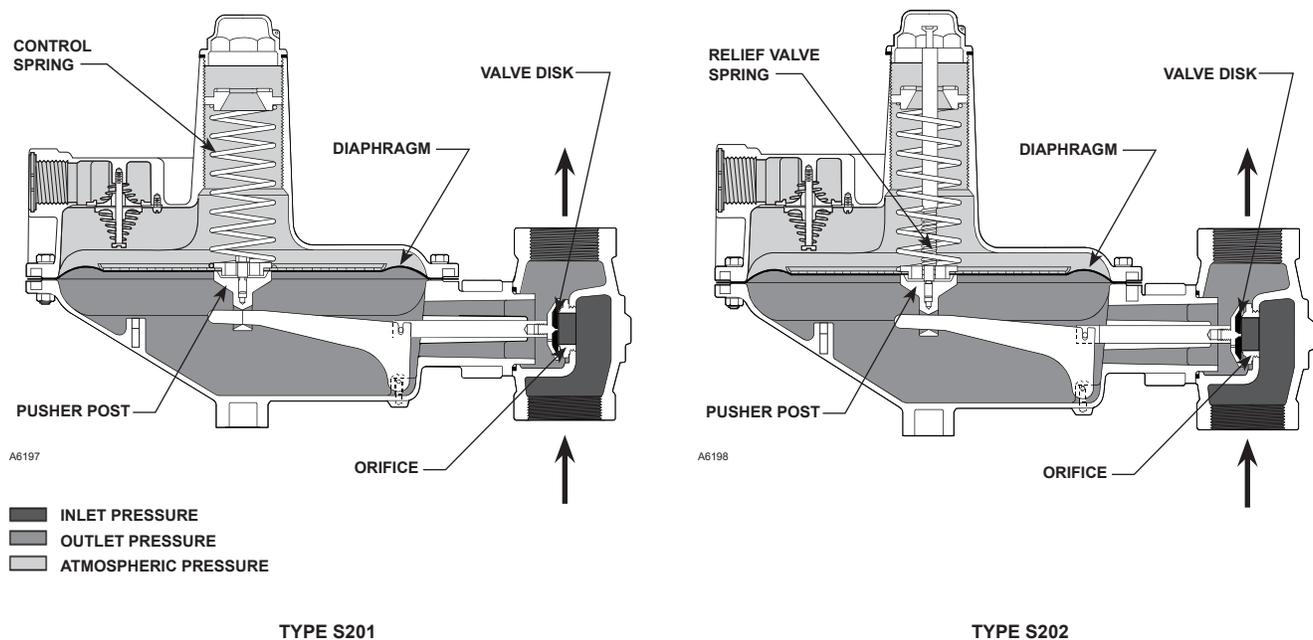


Figure 2. Operational Schematics

Principle 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 the control spring). Through the action of the pusher post assembly, lever, and valve stem, the valve disk moves closer to the orifice and reduces gas flow. If demand downstream increases, pressure under the diaphragm decreases. Spring force pushes the pusher post assembly downward, and the valve disk moves away from the orifice, and the gas flow increases.

The Types S202 and S202H regulators include an internal relief valve. Internal relief is used to help minimize overpressure. Any outlet pressure above the start-to-discharge point of the non-adjustable relief spring moves the diaphragm off of the relief seat, allowing excess pressure to discharge through the vent. Typical start-to-discharge values are 7-inches w.c. to 2 psi (17 to 138 mbar) above the outlet pressure setting, depending on control spring used.

S201 and S202 Series

| TYPE NUMBER | | | | OPTIONS |
|-------------|---|---|--|---|
| S | 2 | 0 | | |
| | | | | REGULATOR TYPE |
| | 1 | | | Regulator, 2 to 30-inches w.c. (5 to 75 mbar) outlet range |
| | 2 | | | Regulator, 2 to 30-inches w.c. (5 to 75 mbar) outlet range with Internal Relief |
| | | | | PRESSURE OUTLET RANGE |
| | H | | | High-Pressure Regulator, 1 to 5 psi (0,07 to 0,34 bar) outlet range with heavy diaphragm plate |
| | K | | | High-Pressure Regulator with external adjusting screw, 2 to 10 psi (0,14 to 0,69 bar) outlet range (Not an option for S202) |

Figure 3. Available Configurations

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 given on the Specifications section and regulator nameplate. 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 (see Figure 4). This minimizes the possibility of freezing and of water or other foreign materials from 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.

CAUTION

S201 and S202 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

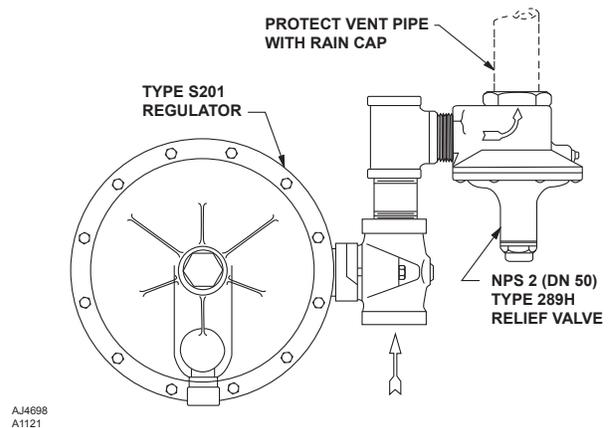


Figure 4. Type S201 Regulator Installed with the Vent Pointed Downward and with a Type 289H Relief Valve for High Capacity Relief

any portion of the regulators beyond the limits in the Specifications section and Table 1 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 the regulator is exposed to an overpressure condition, it should be inspected for any damage that may have occurred. Regulator operation below these limits specified in the Specifications section and Table 1 does not preclude the possibility of damage from external sources or from debris in the pipeline.

S201 and S202 Series

Table 1. Maximum Allowable Inlet Pressures

| ORIFICE SIZE | | INLET PRESSURE SETTING | | | |
|--------------|-----|------------------------|------|---------|------|
| Inches | mm | Optimum | | Maximum | |
| | | Psig | bar | Psig | bar |
| 1/4 | 6,3 | 125 | 8,6 | 125 | 8,6 |
| 3/8 | 9,5 | 100 | 6,9 | 125 | 8,6 |
| 1/2 | 13 | 60 | 4,1 | 100 | 6,9 |
| 3/4 | 19 | 25 | 1,7 | 60 | 4,1 |
| 1 | 25 | 13 | 0,90 | 25 | 1,7 |
| 1-3/16 | 30 | 5 | 0,34 | 13 | 0,90 |

Table 2. Maximum Outlet Pressure Setting

| TYPE NUMBER | DIAPHRAGM HEAD | MAXIMUM OUTLET* |
|--------------|----------------|--------------------------|
| S201, S202 | Light | 30-inches w.c. (75 mbar) |
| S201H, S202H | Heavy | 5 psig (0,34 bar) |
| S201K | Heavy | 10 psig (0,69 bar) |

* Maximum emergency outlet (casing) pressure for S200 Series is 15 psig (1,0 bar).

Table 3. Outlet Pressure Ranges

| TYPE NUMBER | SPRING RANGE | | PART NUMBER | SPRING FREE LENGTH, INCHES (mm) | SPRING WIRE DIAMETER, INCHES (mm) | COLOR CODE |
|-----------------|------------------|------------------|-------------|---------------------------------|-----------------------------------|--------------|
| | Inches w.c. | mbar | | | | |
| S201 and S202 | 2.0 to 4.5 | 5 to 11 | 1D892527022 | 6.12 (155) | 0.109 (2,77) | Brown |
| | 3.5 to 6.5 | 9 to 16 | 1D892627022 | 7.53 (191) | 0.112 (2,84) | Red |
| | 5.0 to 9.0 | 12 to 22 | 1D892727012 | 7.88 (200) | 0.130 (3,30) | Black |
| | 8.5 to 18.0 | 21 to 45 | 1D893227032 | 7.50 (191) | 0.156 (3,96) | Gray |
| | 14.0 to 30.0 | 35 to 75 | 1D893327032 | 7.25 (184) | 0.182 (4,62) | Dark Green |
| S201H and S202H | 1.0 to 2.0 psig | 0,07 to 0,14 bar | 1H975827032 | 7.09 (180) | 0.225 (5,72) | Dark Blue |
| | 1.5 to 3.25 psig | 0,10 to 0,22 bar | 1H975927032 | 6.91 (176) | 0.250 (6,35) | Orange |
| | 2.0 to 5.0 psig | 0,14 to 0,34 bar | 1P615427142 | 6.50 (165) | 0.295 (7,49) | Yellow |
| S201K | 2.0 to 5.5 psig | 0,14 to 0,38 bar | 0Y066427022 | 6.00 (152) | 0.363 (9,22) | Green Stripe |
| | 4.0 to 10.0 psig | 0,28 to 0,69 bar | 1H802427032 | 6.00 (152) | 0.406 (10,3) | Cadmium |

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 external 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 18, Figure 5) 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, it should be installed as shown in Figure 4. The outside end of the vent line should be protected with a rainproof assembly.

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) outlet 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 S201 and S202 Series regulators have 1 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 S202 and S202H) 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 2 psi (0,14 bar) (light diaphragm head) or 3 psi (0,21 bar) (heavy diaphragm head) above the setpoint 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. Procedures used in putting this regulator into operation must be planned accordingly if the downstream system is pressurized by another regulator or by a manual bypass.

If the downstream system is not pressurized by another regulator or manual bypass valve, use the following procedure to startup the regulator.

1. Check to see that all appliances are turned off.
2. Slowly open the upstream block valve.
3. Check inlet and outlet pressure for correct values.
4. Check all connections for leaks.
5. Light the appliance pilots.

Adjustment

The range of allowable pressure settings is stamped on the nameplate. If the required setting is not within this range, substitute the correct spring (as shown in Table 3). If the spring is changed, change the nameplate to indicate the new pressure range.

A pressure gauge should always be used to monitor downstream pressure while adjustments are being made.

1. Remove the closing cap (key 4, Figure 5) or loosen the hex locknut.
2. To increase the outlet setting, turn the adjusting screw (key 3, Figure 5) clockwise. To decrease the outlet setting, turn the adjusting screw counterclockwise.
3. Replace the closing cap or tighten the hex locknut.

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 the vent valves downstream of the regulator.
2. Slowly close the upstream block 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 returned to service. Only parts manufactured by Emerson Process Management Regulator Technologies, Inc. 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 requirement of local, state, and federal rules and regulations.

Disassembly to Replace Diaphragm

1. Remove the closing cap (key 4, Figure 5) or loosen hex locknut. Turn the adjusting screw or nut (key 3) counterclockwise to ease spring compression.
2. For Types S201, S201H, S202, and S202H units, remove the adjusting screw and spring (key 2).

For Type S201K remove the adjusting screw, hex locknut, and closing cap (key 4), the upper spring seat (key 6), and spring (key 2).

3. Remove hex nuts (key 15) and cap screws (key 14). Separate the upper spring case (key 1) from the lower casing assembly (key 9).

Note

If disassembling a Type S202 or S202H regulator, lift the upper spring case straight up in order to avoid hitting the stem (key 24).

4. Slide the diaphragm and diaphragm head assembly (key 7) away from the body (key 21) to unhook the pusher post (key 8) from the lever (key 10). Lift off the diaphragm and diaphragm head assembly.
5. Unscrew the cap or reset stem (key 24) which fastens the lower spring seat (key 6) to the pusher post to separate the lower spring seat, diaphragm and diaphragm head assembly, and pusher post. (The relief valve spring (key 25) will also have to be removed from Types S202 and S202H regulators).

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Note

Take care not to pinch or tear the diaphragm when reassembling.

- Reassemble the spring case unit in the reverse order of the above steps. Before tightening the cap screw or stem into the pusher post, place the loosely-assembled diaphragm and diaphragm head assembly into position in the lower casing, being sure that the pusher post is hooked on the lever. Rotate the diaphragm so that the diaphragm and lower casing holes are aligned. Tighten the screw or stem.



CAUTION

Before tightening cap screws (key 14), 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, Orifice, and O-Rings

- Remove the cap screws (key 18, Figure 5) which hold the lower spring casing (key 9) to the body (key 21). Separate the lower spring casing from the body.
- Check the body O-ring (key 19) for wear.
- Examine the valve disk (key 16) for nicks, cuts, and other damage. Unscrew the disk holder assembly (key 16) and replace it with a new part if necessary.
- If the seating edge of the orifice (key 20) is nicked or rough, remove the orifice from the body. Change to a new part when reassembling the regulator. (If the orifice is replaced with a different size, change the nameplate to state the new size and maximum inlet pressure).
- Reassemble the regulator in reverse order of the above steps.

Parts Ordering

The type number, orifice size, spring range, and date of manufacture are stamped on the nameplate. Always provide this information in any correspondence with your local Sales Office regarding replacement parts or technical assistance.

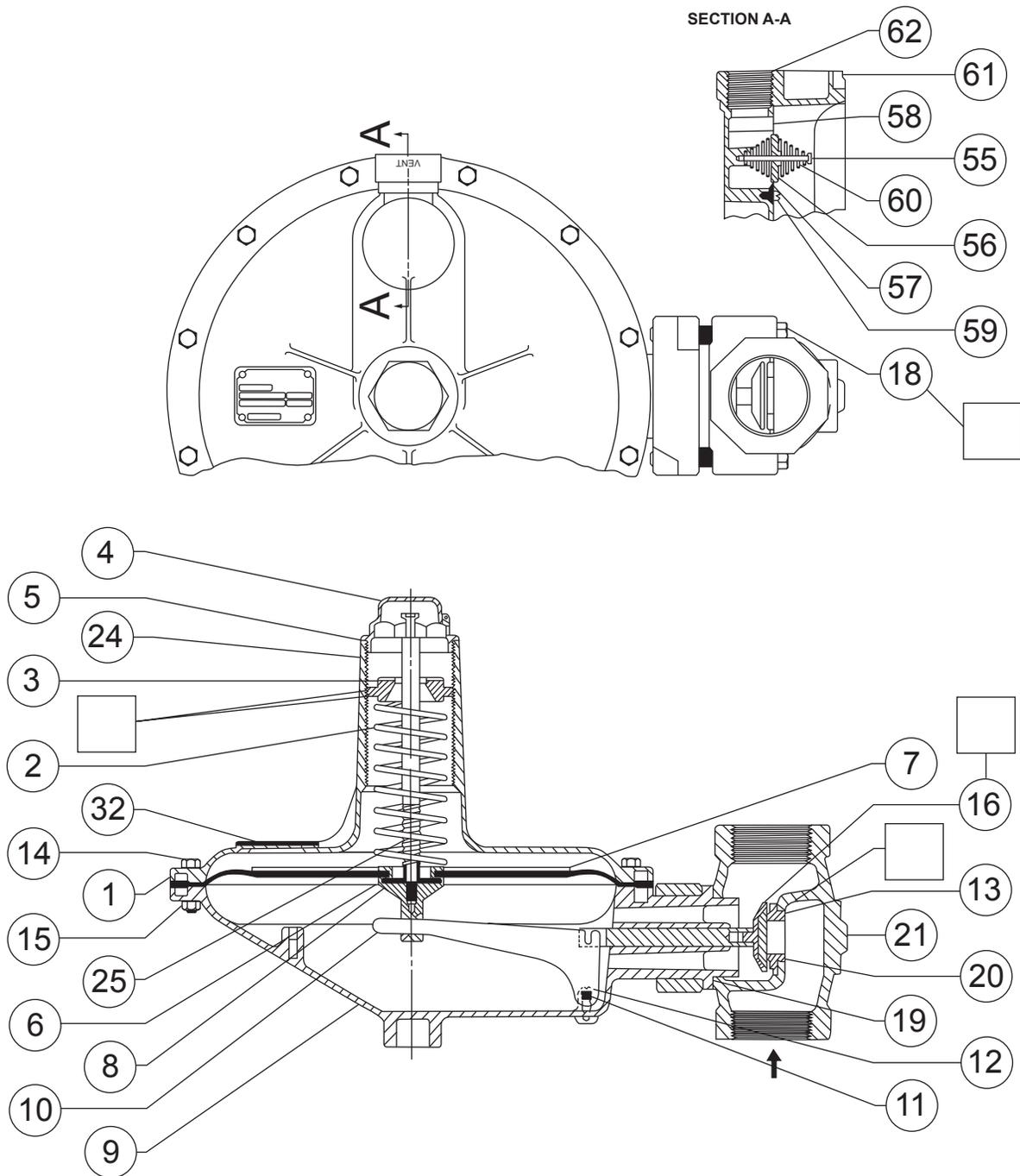
When ordering replacement parts, reference the key number of each needed part as found in the following parts list. Separate kit containing all recommended spare parts is available.

Parts List

| Key | Description | Part Number |
|-----|--|--|
| | Spare Parts (Repair Parts Kit includes keys 5, 7, 16, and 19) | |
| | Types S201, S202 | RS201X00012 |
| | Types S201H, S202H | RS201HX0012 |
| | Type S201K | RS201KX0012 |
| 1 | Spring Case Aluminum Pinned for heavy spring | 4L142308032 1J718699022 |
| 2 | Spring, Steel | See Table 3 |
| 3 | Adjusting Screw Aluminum (Types S201, S201H, S202, S202H) Steel (Type S201K) | 1L928608012 1R8085T0012 |
| 4 | Closing Cap Aluminum (Types S201, S201H, S202, S202H) Brass (Type S201K) | 1L928308012 1H798714012 |
| 5* | Closing Cap Gasket, Neoprene (CR) | 1N446206992 |
| 6 | Upper/Lower Spring Seat Aluminum (Types S201, S201H, S202, S202H) Brass, Type S201K (2 required) | 1L928708012 1H797414012 |
| 7* | Diaphragm and Diaphragm Head Types S201, S202 - Use with 1D8933 and lighter springs Types S201H and S202H - Use with 1H9758 and heavier springs Type S201K (Diaphragm only) | 1L1544X0012 1L1545X0012 1K649602052 |
| 8 | Pusher Post, Aluminum Types S201, S201H, S201K Types S202, S202H | 2H980608012 2H975208012 |
| 9 | Lower Casing Assembly, Aluminum/Stainless steel | 1H9751X0012 |
| 10 | Lever, Steel | 1H974028992 |
| 11 | Pin, 303 Stainless steel | 1H972935032 |
| 12 | Machine Screw, Steel (2 required) | 1B420428982 |
| 13 | Valve Stem Assembly | 1H9748000A2 |
| 14 | Cap Screw, Steel (12 required) | 1B136324052 |
| 15 | Hex Nut, Plated steel (12 required) | 1A309324122 |
| 16* | Disk Holder Assembly For Natural Gas Service For Manufactured Gas (3/4-inch (19 mm) larger orifices) | 1P7349000A2 1J1680X0012 |
| 17 | Diaphragm Plate, Steel (Type S201K) | 1A347825022 |
| 18 | Cap Screw, Plated steel (2 required) | 1H974724052 |
| 19* | O-ring, Nitrile (NBR) | T12587T0012 |
| 20 | Orifice, Aluminum 1/4-inch (6,3 mm) 3/8-inch (9,5 mm) 1/2-inch (13 mm) 3/4-inch (19 mm) 1-inch (25 mm) 1-3/16-inch (30 mm) | T13833T0012 1H979309022 1H979409022 1H979509022 1H979609022 1H979709022 |

*Recommended spare part.

S201 and S202 Series



50A9455

PARTS NOT SHOWN: 46

□ APPLY LUB/SEA/ADH

Figure 5. Type S202 Regulator Assembly

S201 and S202 Series

| Key | Description | Part Number | Key | Description | Part Number |
|-----|------------------------------------|-------------|-----|--|-------------|
| 21 | Body | | 25 | Relief Valve Spring, Plated steel (Types S202, S202H) Standard For U.L. listed units with 1D8933 or lighter springs | 1H976027012 |
| | Cast Iron | | | | |
| | 1-1/2 NPT | 1J190319012 | | | |
| | 2 NPT | 1H974919012 | 46 | Pipe Plug, 1/8 NPT, Brass | 1R100427012 |
| | NPS 2 (DN 50), CL125 Flanged | 2K184219012 | 53 | Hex Nut, Plated steel, Type S201K only | 1A621914012 |
| | With 1/8 NPT Test Gauge Connection | | 55 | Flapper Stem, 302 Stainless steel | 1A3524X0082 |
| | 1-1/2 NPT | 1P799219012 | 56 | Lower Flapper, Nylon (PA) | 1H976335022 |
| | 2 NPT | 1P799319012 | 57 | Upper Flapper, Nylon (PA) | 1H976406992 |
| | NPS 2 (DN 50), CL125 Flanged | 2P806119012 | 58 | Flapper Orifice, 302 Stainless steel | 1H976506992 |
| | Steel | | 59 | Self-tapping Screw, Steel (3 required) | T13609T0012 |
| | 1-1/2 NPT | 1K787922012 | 60 | Spring, 302 Stainless steel (2 required) | 1H976728982 |
| | 2 NPT | 1K792122012 | 61 | Screen, Stainless steel | 1H976837022 |
| 24 | Cap Screw, Plated steel | | 62 | Snap Ring, 302 Stainless steel | 1E564843122 |
| | Type S201 | 1H975424272 | | | 1E564937022 |
| | Type S201H | 1A667824052 | | | |
| | Type S201K | 1K427828982 | | | |
| | Stem, Plated steel | | | | |
| | Types S202, S202H | 1H969224272 | | | |

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