Type 310A-32A Pressure Reducing Regulator and Type 310A-32A-32A Working Monitor Regulator

WARNING

Failure to follow these instructions or to properly install and maintain this equipment could result in an explosion and/or fire causing property damage and personal injury or death.

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.

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.

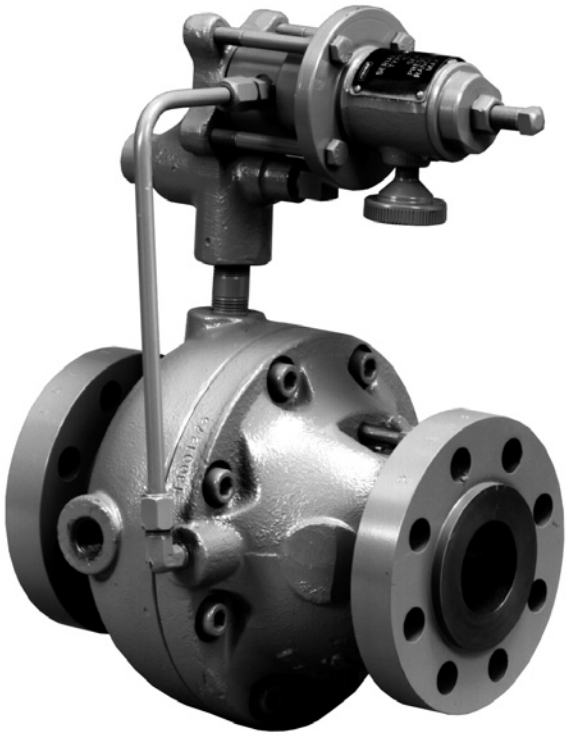

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Figure 1. *Type 310A Regulator with Type 32A Pilot*

Introduction

Scope of the Manual

This Instruction Manual provides installation, maintenance, and parts ordering information for the Type 310A-32A pilot-operated, pressure reducing regulator and the Type 310A-32A-32A working monitor regulator. Information on equipment used with this regulator is found in separate manuals.

Description

The Type 310A-32A pilot-operated, pressure reducing regulator includes a single Type 32A pilot mounted on the Type 310A main valve for pressure reducing or wide-open monitoring applications.

The Type 310A-32A-32A working monitor regulator includes Type 310A regulator which functions as the first-stage regulator in the working monitor situations by taking the initial pressure reduction and two Type 32A pilots which serve as the monitoring and working pilots.

Specifications

Ratings and specifications for the Type 310A configurations are listed in the Specifications section on page 2. Some specifications for a specific regulator are stamped on a nameplate attached to the pilot spring case (key 1, Figure 9).

D102068X012

Specifications

Available Configurations

Type 310A-32A: Type 310A main valve with one Type 32A pilot for standard pressure reducing and wide-open monitoring applications

Type 310A-32A-32A: Type 310A main valve with two Type 32A pilots for working monitor applications

Body Sizes and End Connection Styles

NPS 1 body with NPT ends; and NPS 1, 2, 3, 4, or 4 x 6 (DN 25, 50, 80, 100, and 100 x 150) body with CL300 RF or CL600 RF flanged ends

Maximum Inlet and Pilot Supply Pressures(1)

NPT and CL600 RF: 1500 psig (103 bar)

CL300 RF: 750 psig (51,7 bar)

Maximum Pressure Drop(1)

NPT and CL600 RF: 1425 psig (98,3 bar)

CL300 RF: 720 psig (49,6 bar)

Maximum Outlet Pressure(1)

Operating: 700 psig (48,3 bar)

To Avoid Internal Part Damage: 800 psig (55,2 bar) Exceeding this pressure may result in gas venting from pilot spring case.

Emergency (Casing): 1500 psig (103 bar) or maximum inlet pressure whichever is lower.

Outlet Pressure Ranges and Proportional Bands

See Table 1

Minimum Differential Pressure(1)

15 psig (1,0 bar)

Maximum Travel

See Table 3

External Pilot Supply and Pilot Vent Connections

1/4 NPT

Temperature Capabilities(1)

Nitrile (NBR) with Wiper Ring:
-20° to 150°F (-29° to 66°C)

Fluorocarbon (FKM) with Wiper Ring:
0° to 150°F (-18° to 66°C)

Fluorocarbon (FKM) without Wiper Ring:
0° to 300°F (-18° to 149°C)

Options

- Main valve body without pilot for on-off service
- Remote-mounted pilot
- Electrically controlled pilot using Type 662 Kixcel™
- Travel indicator
- Pressure loaded pilot
- Type 252 pilot supply filter
- Backpressure protection system
- Restricted Trim (30%, 50%, or 70%)
- NACE construction
- Inlet tap

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

Table 1. *Outlet Pressure Ranges*

OUTLET PRESSURE RANGE, PSIG (bar)	PROPORTIONAL BAND, PSIG (bar)	SPRING COLOR	SPRING PART NUMBER
10 to 20 (0,69 to 1,4)	0.5 (0,03)	Silver	1D809627022
10 to 100 (0,69 to 6,9)	2 (0,14)	Yellow	1E392527022
100 to 250 (6,9 to 17,2)	5 (0,34)	Blue	1D387227022
250 to 600 (17,2 to 41,4)	12 (0,83)	Red	1D465127142
400 to 700 (27,6 to 48,3)(1)	20 (1,4)	Green	13A5543X012

1. Available with Nitrile (NBR) pilot diaphragm only.

Table 2. *Recommended Minimum Differential Between Monitoring Pilot Setting and Distribution Pressure*

OUTLET PRESSURE RANGE, PSIG (bar)	SPRING COLOR	SPRING PART NUMBER	MINIMUM PRESSURE AT WHICH MONITORING PILOT CAN BE SET, PSIG (bar)
10 to 20 (0,69 to 1,4)	Silver	1D809627022	3.0 (0,21) over normal distribution pressure
10 to 100 (0,69 to 6,9)	Yellow	1E392527022	5.0 (0,34) over normal distribution pressure
100 to 250 (6,9 to 17,2)	Blue	1D387227022	10 (0,69) over normal distribution pressure
250 to 600 (17,2 to 41,4)	Red	1D465127142	15 (1,0) over normal distribution pressure
400 to 700 (27,6 to 48,3)	Green	13A5543X012	20 (1,4) over normal distribution pressure

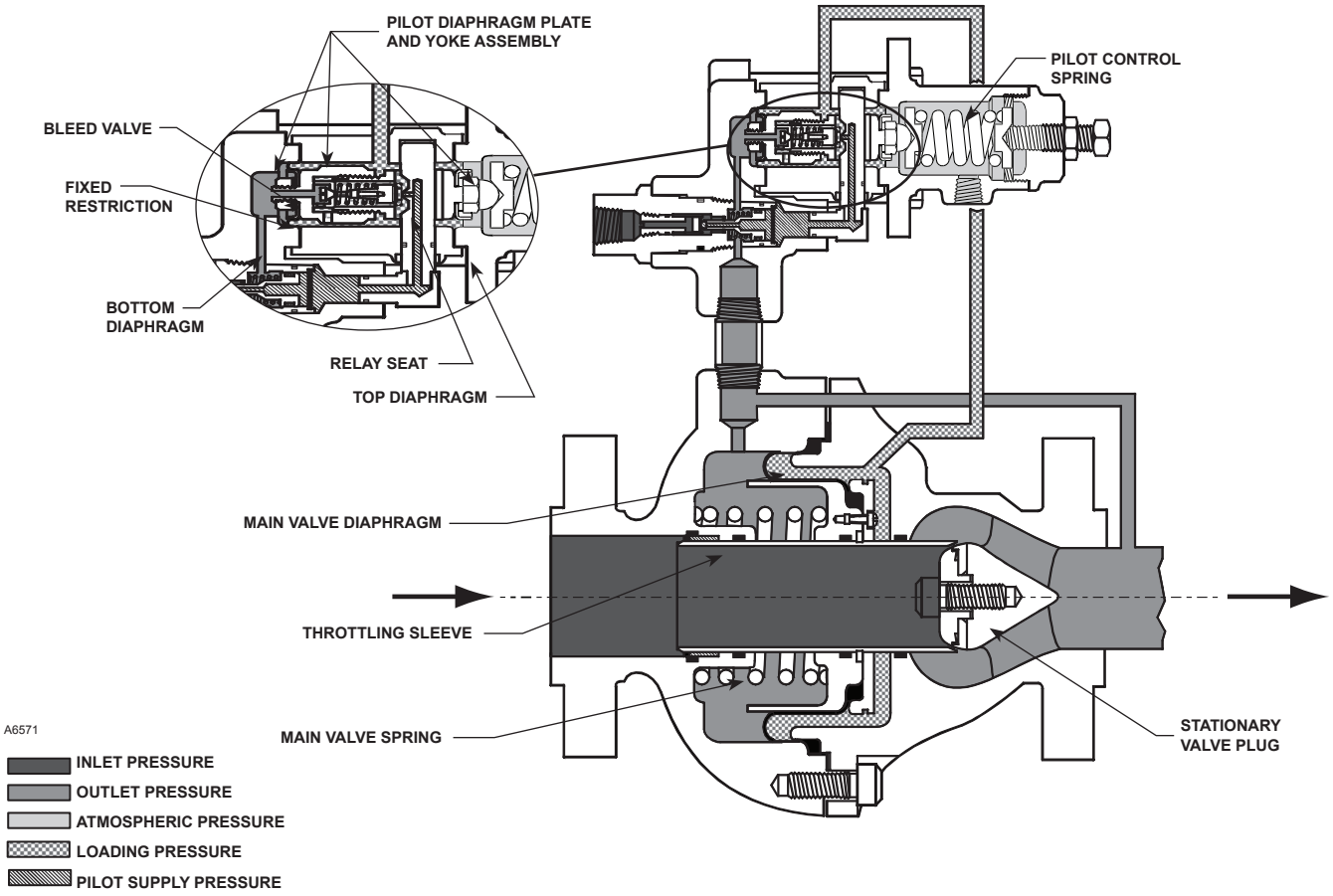


Figure 2. *Type 310A-32A Regulator Operational Schematic*

Principle of Operation

Single-Pilot Regulator (Figure 2)

The regulator inlet pressure enters the pilot through the external pilot supply line and is utilized as the supply pressure for the pilot. The setting of the pilot control spring determines the reduced outlet (downstream) pressure.

In operation, assume the outlet pressure is less than the setting of the pilot control spring. Pilot control spring force then overcomes the force resulting from outlet pressure acting on the bottom diaphragm. The spring pushes the diaphragm plate and yoke assembly away from the relay seat, opening it and supplying additional loading pressure to the main valve diaphragm. When this additional loading pressure exceeds the force resulting from outlet pressure acting on the main valve diaphragm plus the force of the main valve spring, the diaphragm is pushed away from the stationary valve plug. The throttling sleeve opens wider, and the required gas is supplied to the downstream system.

When gas demand in the downstream system has been satisfied, the outlet pressure tends to increase. The increased outlet pressure acting on the bottom diaphragm of the diaphragm plate and yoke assembly results in a force that overcomes the pilot spring setting and forces the assembly toward the relay seat, closing it. The loading pressure acting on the main valve diaphragm bleeds to the downstream system through the fixed restriction in the diaphragm plate and yoke assembly. When rapid main valve closure is required by unusual control conditions, the bleed valve opens for increased bleed rate. The force of increased outlet pressure acting on the main valve diaphragm plus the main valve spring force overcomes the force of decreased loading pressure acting on the main valve diaphragm and moves the throttling sleeve toward the stationary valve plug to decrease the gas flow to the downstream system.

The top diaphragm in the pilot acts as a sealing member for the loading chamber and as a balancing member to the bottom diaphragm. The two diaphragms are connected by a machine yoke. Pressure change to the center chamber has little effect on the positioning of the valve disk.

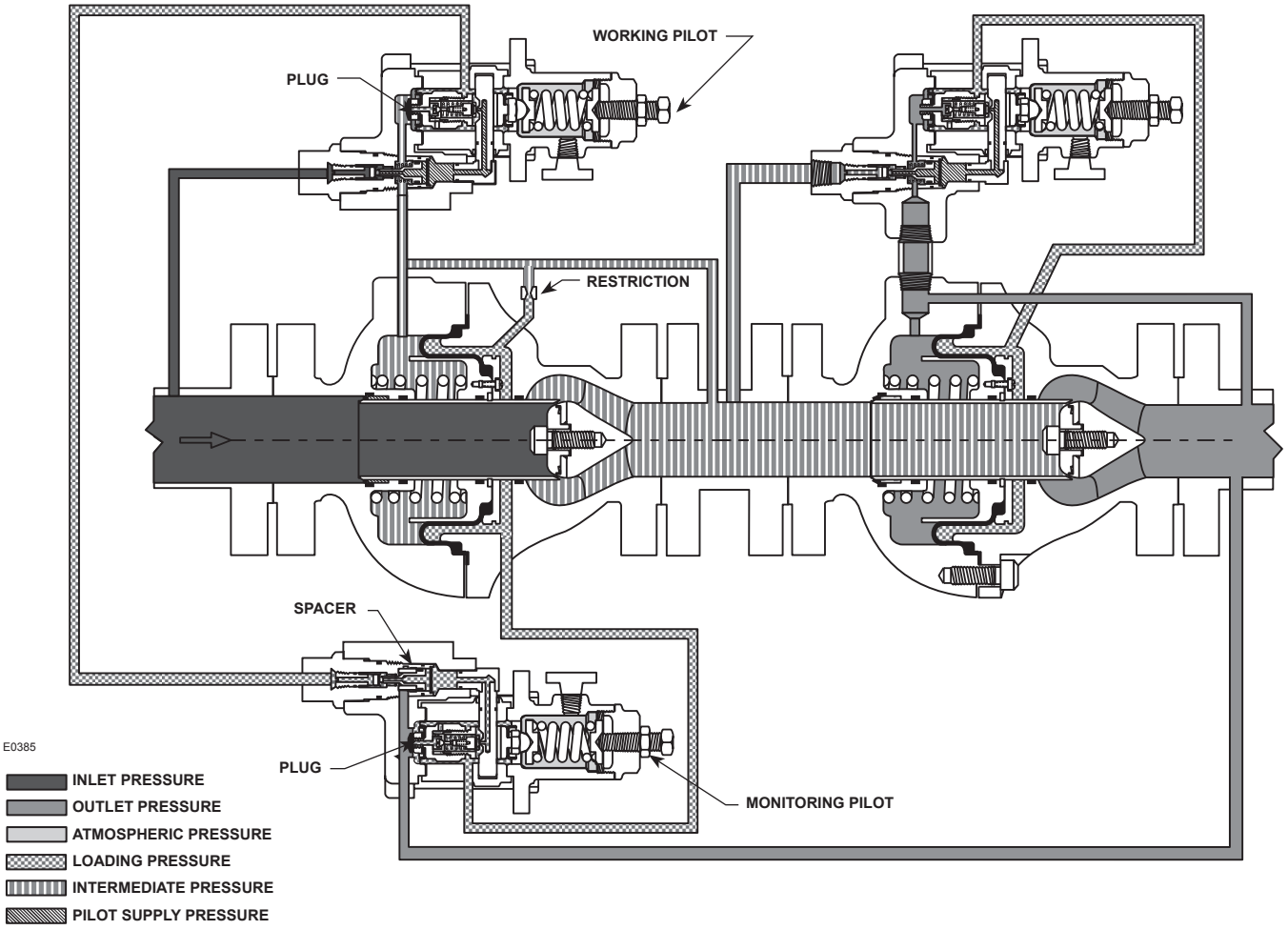


Figure 3. *Type 310A-32A-32A Working Monitor Regulator Operational Schematic*

Monitor Systems

Wide-Open Monitors (Figure 4)

Monitoring regulators serve as overpressure protection devices to limit system pressure in the event of failure of working regulators feeding the system. The control line of a wide-open monitoring regulator may be connected downstream of the working regulator, so that during normal operation the wide-open monitoring regulator is standing wide-open with the pressure reduction being taken across the working regulator. Only in case of working regulator failure does the wide-open monitoring regulator function.

Working Monitors (Figure 5)

The Type 310A-32A-32A differs from wide-open monitors in that it has working monitor capability. This means that it normally reduces pressure and throttles while the second-stage regulator is in operation. Should the second-stage working regulator fail open, the Type 310A-32A-32A will take over the entire pressure reduction function.

The working monitor pilots are adaptations of two Type 32A pilots with special internal parts, due to the pressure conditions in this piloting system. A spacer blocks open the differential regulator portion of the Type 32A monitoring pilot. A plug in both the working and monitoring pilots makes the internal bleed non-

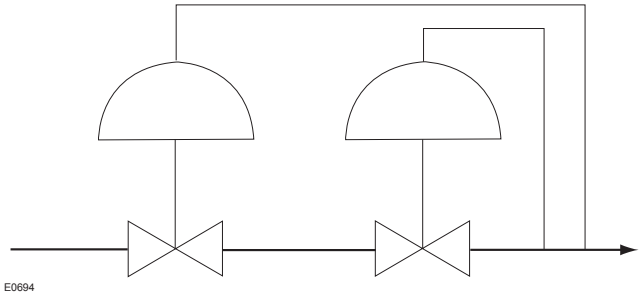


Figure 4. *Wide-Open Monitor System*

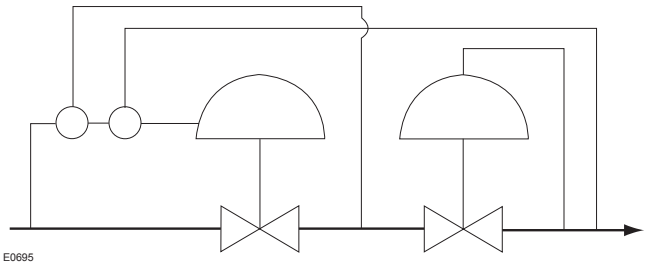


Figure 5. *Working Monitor System*

Table 3. *Maximum Travel*

BODY SIZE, NPS	MAXIMUM TRAVEL, INCH (mm)
1 (25)	0.5 (13)
2 (50)	0.875 (22)
3 (80)	1 (25)
4 (100)	1.125 (29)
4 x 6 (100 x 150)	1.5 (38)

functional. A restriction placed in the external tubing between the diaphragm loading pressure and the intermediate pressure acts as a downstream bleed.

If the second-stage working regulator fails open, the distribution pressure increases to the setting of the Type 32A monitoring pilot (slightly higher than the original distribution pressure) and is controlled at that level by the Type 310A-32A-32A. Thus, downstream equipment is protected against a major overpressure condition without disrupting service or venting gas to atmosphere.

In the working pilot, the inlet pressure is reduced to a pre-determined pilot supply pressure, which is further reduced to loading pressure for the Type 310A diaphragm. The loading pressure is piped through the portion of the monitoring pilot blocked open by the spacer and, as long as distribution pressure is below the setting of the monitoring pilot, passes through the relay orifice of the monitoring pilot to the diaphragm case of the Type 310A body.

Distribution pressure is piped back to the monitoring pilot. As long as the distribution pressure is less than the monitoring pilot setting, the working pilot controls the Type 310A to maintain intermediate pressure. If the distribution pressure increases to the monitoring pilot setting, the monitoring pilot relay orifice starts to throttle the loading pressure to the Type 310A diaphragm. This allows the Type 310A main spring to move the throttling sleeve closer to the seat and control distribution pressure at the monitoring pilot setpoint. Therefore, failure of the second-stage working regulator is controlled with only a slight increase in distribution pressure, with the Type 310A-32A-32A accomplishing the entire pressure reduction function.

Installation and Startup

WARNING

Personal injury or equipment damage, due to bursting of pressure-containing parts may result if this regulator is overpressured or is installed where service conditions could exceed the limits given in the Specifications section and on the appropriate nameplate, or where conditions exceed any rating of the adjacent piping or piping connections. To avoid such injury or damage, provide pressure-relieving or pressure-limiting devices to prevent service conditions from exceeding those limits. Also, check that the installation is in compliance with all applicable codes and regulations.

Additionally, physical damage to the regulator could break the pilot off the main valve, causing personal injury and property damage due to bursting of pressure-containing parts. To avoid such injury and damage, install the regulator in a safe location.

Note

For the installation of the regulator in the line, please consider that SLIP-ON flange gaskets need to be used on the inlet of all Type 310A regulators, from NPS 1 to 6 (DN 25 to 150). The gaskets for the outlet of the Type 310A are standard CL600 RF welding-neck flange gaskets.

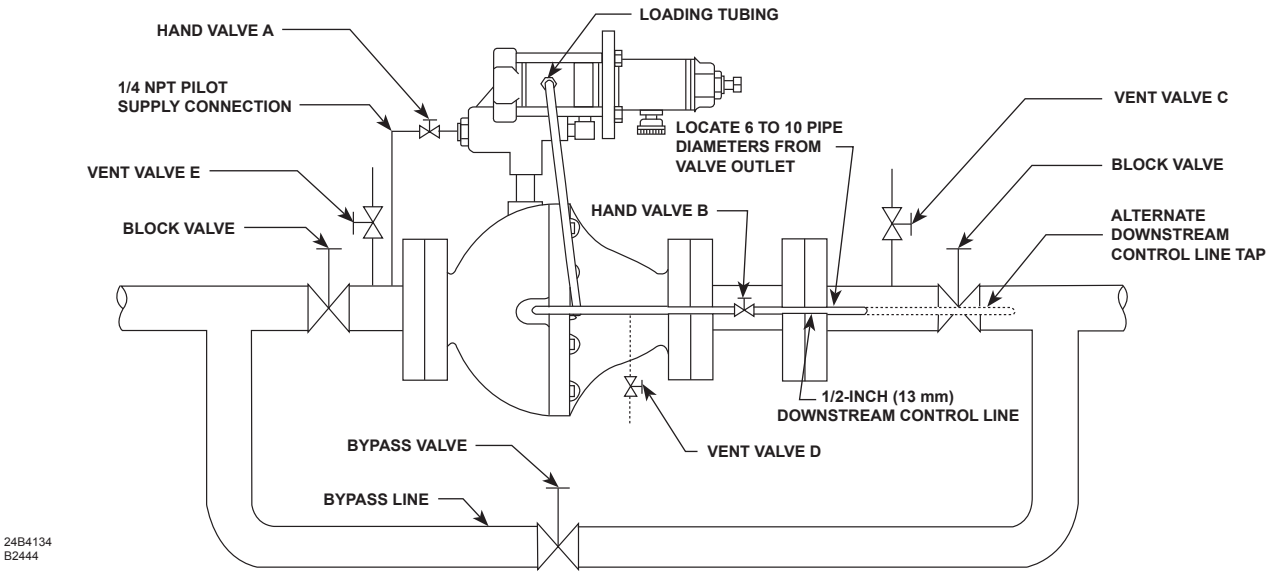


Figure 6. *Typical Pressure Reducing Installation*

Single-Pilot Regulator

Installation

A Type 310A-32A regulator bleeds no gas to atmosphere during normal operation, thus making the regulator suitable for installation in pits and other enclosed locations without elaborate venting systems. This regulator also can be installed in pits subject to flooding by venting the pilot spring case above the expected flood level so that the pilot setting can be referenced to atmospheric pressure.

1. Use qualified personnel when installing, maintaining, or operating this regulator. Inspect the regulator and the pipeline to be certain both are free of foreign materials.

2. Install the regulator so that the flow arrow cast on the main valve matches the flow direction of process fluid through the regulator.

3. Apply pipe compound to the male pipeline threads before installing a regulator with NPT end connections. Use gaskets between pipeline and regulator flanges when installing a regulator with flanged end connections.

WARNING

A regulator may vent some gas to the atmosphere. In hazardous or flammable gas service, vented gas may accumulate, causing personal injury, death, or property damage due to bursting of pressure-retaining parts. Vent a regulator in hazardous gas service to a remote, safe location away from air intakes or any hazardous location. The vent line or stack opening must be protected against condensation or clogging.

4. A Type 32A pilot has a 1/4 NPT vent connection in the spring case. To remotely vent gas from the spring case, remove the screened vent, and connect 1/4-inch (6,4 mm) piping or tubing to the spring case connection.
   The piping or tubing should vent to a safe location, have as few elbows as possible, and have a screened vent on its exhaust. Install the regulator and any remote vent piping or tubing so that the vent is protected from condensation, freezing, or any substance that could clog it.

5. Connect a pilot supply line from the upstream piping to the 1/4 NPT pilot inlet.

6. Connect a downstream control line to a straight run of pipe 6 to 10 pipe diameters from the regulator outlet as shown in Figure 6. If such a distance is not practical, connect the control line away from elbows, swages, nipples, or any area where abnormal flow velocities occur.

7. Install a hand valve in the control line.
8. Install the other end of the downstream control line to the 1/2 NPT connection in either side of the case body (key 1, Figure 10 or 11).
9. Consult the appropriate Instruction Manual for installation of an optional pneumatic or electric remote control-drive unit. For optional remote pneumatic loading of a Type 32A pilot, make the spring case piping connections just as they would be made for remote venting.

Prestartup Considerations

Each regulator is factory-set for the outlet pressure specified on the order. If no setting was specified, outlet pressure was factory-set at the mid-range of the pilot control spring. Before beginning the startup procedure in this section, make sure the following conditions are in effect:

- Block valves isolate the regulator
- Vent valves are closed
- A bypass, if any, is in operation

In all cases, check the control spring setting to make sure it is correct for the application.

CAUTION

Pilot supply pressure must be introduced into the regulator before introduction of any downstream pressure, or internal damage may occur due to reverse pressurization of the pilot and main valve components.

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.

Note

Pilot supply pressure must be at least 15 psig (1,0 bar) greater than control pressure to operate the regulator at rated travel.

Although remote loading or control constructions may require separate adjustments on associated equipment, the only adjustment normally necessary on a Type 310A-32A regulator is the pressure setting of the pilot control spring. Turning the adjusting screw clockwise into the spring case increases the spring compression and pressure setting. Turning the adjusting screw counterclockwise decreases the spring compression and pressure setting.

Pilot Adjustment

To adjust a standard Type 32A pilot, loosen the locknut (key 4, Figure 9), and turn the adjusting screw (key 3, Figure 9). Then tighten the locknut to maintain the adjustment position.

Startup

1. Open the upstream block (isolating) valve. Open hand valve A in the external pilot supply line before opening the downstream isolating valve (See Figure 6).
2. Open the downstream block (isolating) valve for minimum flow.
3. Slowly open hand valve B in the downstream control line, while at the same time adjusting the pilot setting, if necessary.
4. Completely open the downstream block valve.
5. Slowly close the bypass valve, if any.

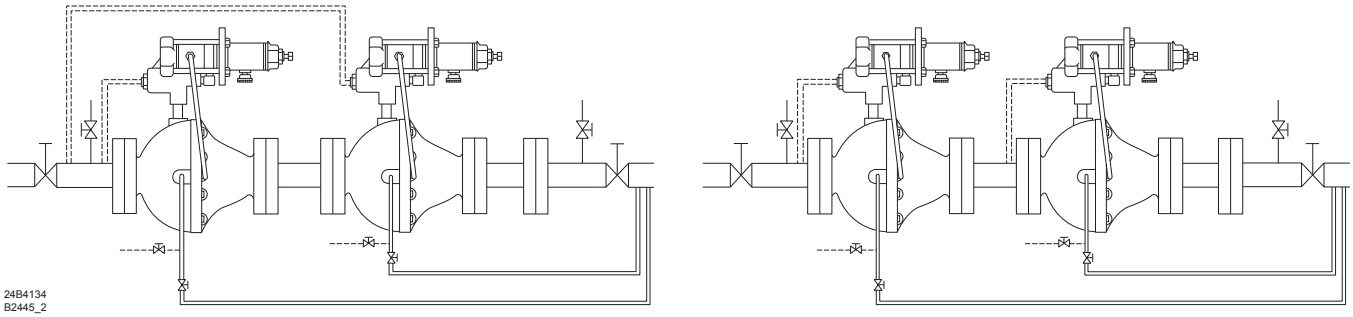
Wide-Open Monitor Regulator

Installation

1. For both the wide-open monitoring regulator and the working regulator, perform the Single-Pilot Regulator Installation procedures through step 9.
2. Connect the control line of a wide-open monitoring regulator (Figure 7) to downstream piping near the working regulator control line connection. During normal operation the wide-open monitoring regulator stands wide-open with the pressure reduction being taken across the working regulator. Only in case of working regulator failure does the wide-open monitoring regulator take control at its slightly higher setting.

Prestartup Considerations

Each regulator is factory-set for the outlet pressure specified on the order. If no setting was specified,



FLEXIBLE WIDE-OPEN MONITOR ARRANGEMENT THAT PERMITS WIDE-OPEN MONITOR TO BE EITHER UPSTREAM OR DOWNSTREAM OF THE WORKING REGULATOR

MINIMUM PIPING WIDE-OPEN MONITOR ARRANGEMENT THAT REQUIRES WIDE-OPEN MONITOR ALWAYS TO BE UPSTREAM OF WORKING REGULATOR

Figure 7. *Typical Wide-Open Monitor Installation*

outlet pressure was factory-set at the mid-range of the pilot control spring. Before beginning the startup procedures in this section, make sure the following conditions are in effect:

- Block valves isolate the regulator
- Vent valves are closed
- Hand valves are closed
- A bypass, if any, is in operation

In all cases, check the control spring setting to make sure it is correct for the application.

CAUTION

Introduce pilot supply pressure into the regulator before introducing any downstream pressure, or internal damage may occur due to reverse pressurization of the pilot and main valve components.

Always use pressure gauges to monitor downstream pressure during startup. If the downstream is pressurized by another regulator, plan startup procedures accordingly.

Note

Pilot supply pressure must exceed control pressure by at least 15 psig (1,0 bar) in order to operate the regulator at rated travel.

Although remote loading or control constructions may require separate adjustments on associated equipment, the only adjustment normally necessary on a Type 310A-32A regulator is the pressure setting of the pilot control spring. Turning the adjusting screw clockwise into the spring case increases the spring compression and pressure setting. Turning the adjusting screw counterclockwise decreases the spring compression and pressure setting.

Pilot Adjustment

To adjust a standard Type 32A pilot, loosen the locknut (key 4, Figure 9), and turn the adjusting screw (key 3, Figure 9). Then tighten the locknut to maintain the adjustment position.

Startup

This procedure is to be repeated in turn for each regulator in the installation.

1. Slowly open the hand valve in the pilot supply line.
2. Slowly open the upstream block (isolating) valve and partially open the downstream block valve for minimum flow.
3. Slowly open the hand valve in the control line while, at the same time, adjusting the pilot setting if necessary.
4. Completely open the downstream block valve.
5. Slowly close the bypass valve, if any.

Working Monitor Regulator

Installation

All Type 310A-32A-32A working monitor regulators are bench set at the factory according to the service conditions specified on the customer's order. Examine the unit on arrival to make sure no damage has occurred in shipment. Clean and blow out pipelines to be sure no welding slag or other foreign material is present.

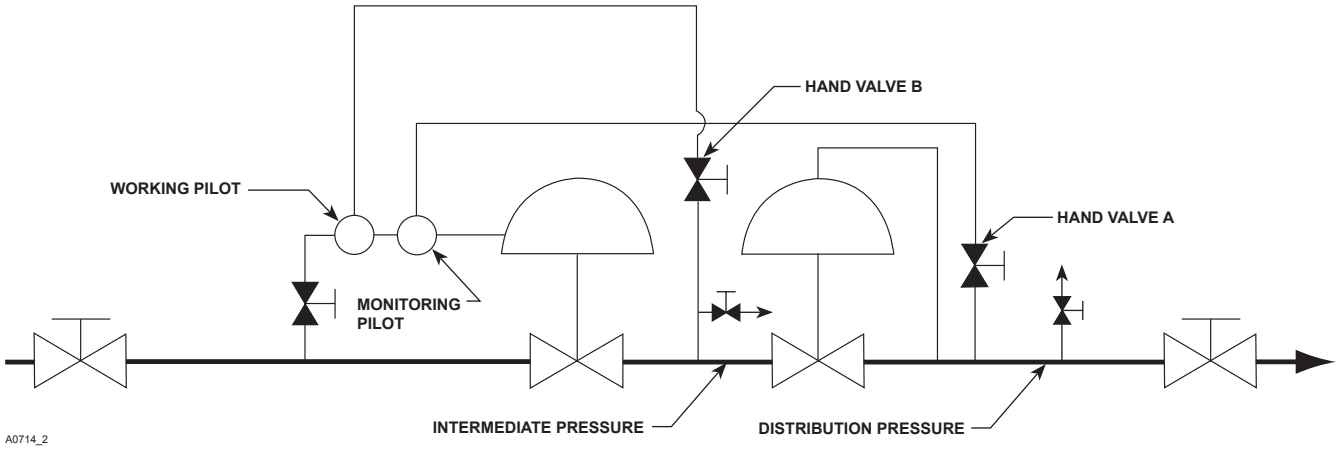


Figure 8. *Typical Working Monitor Installation*

Install the Type 310A-32A-32A into the pipeline using adequate gaskets for flanged regulator units and good piping technique. Be sure to provide suitable pressure gauges where appropriate, block valves, bypass valves and piping, and bleed valves to permit safe and easy maintenance of both the working monitor regulator and the second-stage working regulator. Be sure flow will be in the direction indicated by the arrow cast on the body.

Refer to the Figure 8 schematic and Figure 14, and proceed in the following steps.

1. Attach the intermediate pressure control line (1/2 NPT pipe) between the 1/2 NPT pipe tee (key 72, Figure 14) and the intermediate pressure portion of the downstream piping. Install hand valve B in this line.
2. Connect 1/2 NPT distribution pressure control line piping between the 1/2 NPT connection in the mounting bracket (key 45, Figure 14) and the pipeline downstream of the second-stage working regulator. Include hand valve A in this control line.

Note

Each pilot has a nameplate identifying it as the working or monitor pilot.

3. Pipe the pilot supply line to 1/4 NPT connection in the back of the working pilot body. Supply pressure should be filtered if excess dirt or condensate is present in the supply gas.
4. Install downstream working regulator per guidelines.

Startup

1. Before introducing any pressure to the unit, close hand valve A in the distribution pressure control line and hand valve B in the intermediate pressure control line.

CAUTION

Pilot supply pressure must be introduced into the regulator prior to introduction of any downstream pressure or internal damage may occur due to reverse pressurization of the pilot and main valve components. Pilot supply pressure must be at least 15 psi (1,0 bar) greater than control pressure for proper operation.

2. Slowly open the hand valve in the pilot supply line.
3. Slowly open the upstream block valve and partially open the downstream block valve for minimum flow.
4. Slowly open hand valve B and allow the intermediate pressure to increase to the working pilot setting.
5. Put the second-stage working regulator into operation according to recommended procedures and instructions furnished with the second-stage working regulator.
6. After the distribution pressure has been established slowly open hand valve A.

Pilot Adjustment

The second-stage working regulator must be set to operate at a lower pressure than the monitoring pilot or the monitoring pilot will try to take control of the distribution pressure. Follow the steps listed to obtain the desired results.

1. Increase the setting of the monitoring pilot by loosening the locknut (key 4, Figure 9) and turning the adjusting screw (key 3, Figure 9) clockwise (into the spring case cap, key 2, Figure 9) until the working pilot is in control of the intermediate pressure and the second-stage working regulator is in control of the distribution pressure.
2. Adjust the setting of the working pilot by loosening the jam nut and turning the adjusting screw clockwise (into the spring case cap) to increase the intermediate pressure, or counterclockwise (out of the spring case cap) to reduce the intermediate pressure. Adjust until desired intermediate pressure is reached.
3. Adjust the second-stage working regulator to the desired distribution pressure by following instructions for that particular regulator.
4. Adjust the setting of the monitoring pilot to establish the desired emergency distribution pressure, which is to be maintained in the event of failure of the second-stage working regulator. The steps followed may vary with each piping situation. The basic method remains the same.

The following procedure serves as an example which can be used or modified to make monitoring pilot adjustments in any installation.

Increase the outlet pressure setting of the second-stage working regulator until the monitoring pilot takes control of the distribution pressure. Adjust the monitoring pilot setting until the desired emergency distribution pressure is achieved. Refer to Table 2 for the recommended minimum differential between the monitoring pilot setting and the desired distribution pressure.

With settings as desired on both the monitoring and the working pilots, tighten the locknuts (key 4, Figure 9) to maintain proper adjustment screw positions. Then re-adjust the second-stage working regulator to the desired distribution pressure.

Shutdown

In any installation it is important to slowly open and close the valves and to vent the outlet pressure before venting the inlet pressure to prevent damage caused by reverse pressurization of the pilot or main valve.

Single-Pilot Regulators and Wide-Open Monitor Regulators

As well as applying to a single-pilot regulator (Figure 6), the steps in this procedure also are valid for a wide-open monitoring installation (Figure 7) and should be repeated for each regulator in such an installation.

1. Close the upstream isolating valve.
2. Close block valve A (Figure 6) in the supply line.
3. Close the downstream isolating valve.
4. **If the downstream control line taps into the pipeline above the downstream isolating valve,** open vent valve C between the regulator and the downstream isolating valve. Permit all pressure to bleed out of the regulator.

   If the downstream control line taps into the pipeline below the downstream isolating valve, close hand valve B. Then open vent valve C and vent valve D, permitting all pressure to bleed out of the regulator.
5. Open vent valve E to release any inlet pressure that may be trapped in the regulator.

Working Monitor Regulators

1. Close the upstream isolating valve.
2. Close hand valve in pilot supply line.
3. Close the downstream isolating valve.
4. Open a bleed valve between the second-stage working regulator and the downstream isolating valve. Permit all pressure to bleed out of the working monitor regulator and the second-stage working regulator.
5. Open vent valve to vent any intermediate pressure trapped in the system.
6. Open vent valve to release any inlet pressure trapped in the regulator.

Maintenance

The regulator parts are subject to normal wear and must be inspected periodically and replaced as necessary. The frequency of inspection and replacement depends on the severity of service

conditions and on applicable federal, state and local codes and regulations.

WARNING

To avoid personal injury or property damage from sudden release of pressure, isolate the regulator from the pressure system, and release all pressure from the pilot and main valve before performing maintenance operations.

Type 32A Pilots

This procedure describes how the pilot can be completely disassembled and assembled. When inspection or repairs are required, disassemble only those parts necessary to accomplish the job. Refer to Figures 9 and 14 for key numbers.

Disassembly

The pilot may remain on the main valve for steps 1 through 7; however, it must be removed for steps 8 through 15.

1. Remove the piston seat assembly (key 28) from the piston guide (key 23).
2. Remove the piston guide (key 23) from the pilot body (key 22).
3. Check the O-rings (keys 25 and 26), and replace if worn or damaged.
4. Check the Nylon (PA) disk in the piston seat assembly, and replace this assembly if worn or damaged.
5. Remove the retaining ring (key 27), and lift out the piston and spring (keys 29 and 36). On working monitor regulators, remove the working pilot spring (key 36) or the monitoring pilot spacer (key 53, Figure 14).
6. Inspect the valve seating surface on the small end of the piston for nicks and scratches.
7. Use a wire with a hooked end to remove the piston guide bushing O-ring (key 34). Check the O-rings (keys 30 and 34), and replace if worn or damaged.
8. Disconnect the loading tubing and the external supply line from the pilot (Figure 2); and remove the pilot from the main valve.
9. Release control spring compression by loosening the locknut (key 4) and backing out the adjusting screw (key 3).
10. To inspect or replace the control spring (key 37), unscrew spring case cap (key 2) and remove the control spring and spring seats (key 5).
11. Unscrew the cap screws (key 6), and remove the spring case (key 1).
12. As one unit, remove the diaphragm spacer (key 11), yoke (key 16), orifice assembly (key 12), adaptor (key 17), and valve disk assembly (key 18).
13. Slide out the relay seat assembly (key 12), and inspect the O-rings (key 14). Discard the O-rings if worn or damaged. Also, inspect the seating surface for nicks and scratches, and replace if necessary.
14. Push the yoke (key 16) and attached parts (keys 9, 8, 15, 10, 18, 17, 19, 20, 35, and 21) through the diaphragm spacer (key 11).
15. Unscrew the adaptor (key 17) from the yoke (key 16). Unscrew the bleed valve (key 20).

On Single-Pilot Regulators and Wide-Open Monitor Regulators, remove the bleed valve seat (key 19), the spring (key 35), and the valve disk (key 18). Check that the holes drilled in the side of the bleed valve seat and the adaptor are both clean and unplugged.

On Working Monitor Regulators, make sure the plug (key 52, Figure 14) is firmly in place.

16. Unscrew the cap nut and nut (keys 10 and 21), remove the diaphragm plates (key 8) and washers (key 15), and inspect the diaphragms (key 9).

Note

The edges of the diaphragms can be expected to curl up. They will flatten out within a few minutes depending on the temperature. Warming them will help, but do not exceed 150°F (66°C).

Assembly

It is recommended that new diaphragms and O-rings be installed during assembly. If these parts are to be reused, be sure that they are carefully inspected and that no damage has occurred. Lubricate all O-rings.

1. Place the O-ring (key 34) in the piston guide (key 23).
2. Install the O-rings (keys 25 and 26) on the piston guide.
3. Install the O-ring (key 30) on the piston (key 29).

4. **On single-pilot regulators and wide-open monitor regulators,** place the spring (key 36) in the piston guide (key 23). Install the piston, and secure with the retaining ring (key 27).

   On working monitor regulators, place the spring (key 36 - working pilot) or spacer (key 53 - monitoring pilot) in the piston guide. Install the piston and secure it in the piston guide with the retaining ring (key 27).

5. Install the O-ring (key 13) on the piston seat assembly (key 28), and screw the assembly into the piston guide.

6. Install the piston guide in the pilot body (key 22).

7. Insert the bleed valve (key 20) through the bleed valve seat (key 19).

8. Install the spring (key 35) and valve disk assembly (key 18) onto the bleed valve (key 20).

CAUTION

Be sure the bleed valve seat is centered in the yoke while installing the adaptor.

9. Place the above assembly in the yoke (key 16), and screw on the adaptor (key 17).

CAUTION

Each diaphragm (key 9) has one side coated with rubber. Install the diaphragms so that the rubber sides face each other. If the diaphragms are installed any other way, the pilot will not work properly.

10. Place the diaphragm (key 9), diaphragm plate (key 8), and sealing washer (key 15) on the yoke, and secure with the cap screw (key 10).

11. Place the other diaphragm, diaphragm plate, and sealing washer on the adaptor, and secure with the nut (key 21).

12. Insert this entire assembly through the diaphragm spacer (key 11) until the outer edges of both diaphragms are in place on the spacer.

13. Fit the O-rings (key 14) on the orifice assembly (key 12).

14. Rotate the yoke to receive the orifice assembly.

15. Place entire assembly on the pilot body (key 22).

CAUTION

To avoid crushing the diaphragm, do not exceed the torque specified in step 16.

16. Apply lubricant to cap screws (key 6). Insert the cap screws in the spring case (key 1) and pilot body, and tighten the cap screws to 25 to 30 foot-pounds (34 to 41 N•m).

17. If removed, install the spring seats (key 5) and the control spring (key 37).

18. Install the cover gasket (key 7), spring case cap (key 2), adjusting screw (key 3), and locknut (key 4).

19. Install the pilot into the main valve using the pipe nipple (not shown).

20. Connect the loading tubing from the male elbow on the base body (key 2, Figures 10 and 11) to the connector on the side of the pilot. Refer to Figure 1 for the assembled location of the tubing, elbow, and connector.

Type 310A Main Valve

This procedure describes how to completely disassemble and assemble a main valve. When inspection or repairs are required, disassemble only those parts necessary to accomplish the job; then start the assembly at the appropriate step. Key numbers are referenced in Figures 10 and 11.

Disassembly

1. Disconnect the loading tubing from the connection in the base body (key 2). Disconnect the downstream pressure control line from the connection in the case body (key 1) and the external supply line from the pilot.

2. Remove the main valve from the pipeline.

3. Remove the cap screws (key 14), and separate the case body (key 1) from the base body (key 2).

Note

If a body gasket (key 29) is not present, one must be installed when a new diaphragm is installed. Also, if the soft seat inside the sleeve (key 3) is damaged, the sleeve (key 3), washer or O-ring (key 11), disk retainer (key 12),

disk (key 27), and disk holder (key 28) need to be replaced.

4. Slide the sleeve and diaphragm assembly out of the case body (key 1).

5. Inspect the seating area of the sleeve for nicks and erosion damage. Inspect the diaphragm (key 6) for damage.

6. Remove the cap screw (key 10), disk retainer (key 12), disk holder (key 28), O-ring or washer (key 11). Examine the disk and O-ring or washer for evidence of damage or wear.

Note

If the regulator has restricted capacity trim, the percentage of full capacity will be stamped on the outside of the disk retainer. If this is done, the change should be noted on the nameplate to avoid confusion.

7. If either the sleeve or diaphragm must be replaced, remove the screws (key 13) and diaphragm plate (key 4). Remove the split ring (key 7), and slide the lower diaphragm plate (key 5) off the sleeve. This also exposes the O-ring (key 9) in the lower diaphragm plate for inspection.

Assembly

Before assembly, be sure all parts are clean. During assembly, lubricate all O-rings and both diaphragm beads with a high quality lubricant. Be certain the Polytetrafluoroethylene (PTFE) backup rings (key 26) are properly installed in the O-ring grooves in the base body (key 2) and the case body (key 1).

1. Inspect the O-rings (key 9), and PTFE backup rings (key 26) in the base body (key 2). If damaged, replace with new parts.

2. Inspect the O-ring (key 9), backup rings (key 26), and wiper ring (key 19) in the case body (key 1). Replace with new parts if wear or damage is noted. The wiper ring will not be present in units designed for high temperatures.

3. Inspect the O-ring (key 9) in the lower diaphragm plate (key 5). If damaged, install a new O-ring.

4. Place the split ring (key 7) on the sleeve (key 3), and insert the sleeve in the lower diaphragm plate.

CAUTION

If the diaphragm in the following step is installed with the wrong side against the lower diaphragm plate, the beads become distorted and the main valve will not shut off properly.

5. Lubricate both diaphragm beads to facilitate assembly and sealing of the diaphragm (key 6). Place the inner bead of the diaphragm on the lower diaphragm plate with the side marked SPRING SIDE against the lower diaphragm plate. Add the upper diaphragm plate (key 4), and install the screws (key 13), tighten them down evenly. Be sure the inner bead of the diaphragm does not partially slip out from between the plates.

6. Fold the diaphragm down around the lower diaphragm plate.

7. Fit the disk (key 27) into the disk holder (key 28). Install the disk retainer (key 12) on top of the disk, being sure the leading edge of the disk is properly positioned around the outside of the retainer and is not pinched under the retainer. Place the O-ring or washer (key 11) on the sub-assembly and install in the base body (key 2). Secure with the cap screw (key 10).

8. On units with travel indicator, fit one edge of the flanged head of the travel indicator rod (key 15) into the groove in the diaphragm plate (key 4) and slide the entire assembly into the base body (key 2), being sure the travel indicator rod is properly oriented so it enters and extends through the hole in the base body and is visible through the travel indicator cover (key 20). Check to make sure indicator rod is still engaged in the diaphragm plate groove.

9. Lubricate the body gasket (key 29) and the gasket surface of the base body (key 2), place the body gasket (key 29) on the base body. Then fit the diaphragm bead over the machined nose of the base body.

10. Place the spring (key 8) in the lower diaphragm plate. On units with travel indicator, orient the case body so that the pilot mounting bracket (key 45) is in line with the travel indicator.

11. Fasten the two body halves together with the cap screws (key 14), and tighten hand tight. Lubricating the threads will make proper tightening easier.

Table 4. *Maximum Cap Screw (key 14) Torque Values*

BODY SIZE, NPS (DN)	MAXIMUM TORQUE VALUE, FOOT-POUNDS (N•m)
1 (25)	55 (75)
2 (50)	105 (142)
3 (80)	125 (170)
4 and 4 x 6 (100 and 100 x 150)	500 (678)

CAUTION

Overtightening the cap screws in step 12 can damage the diaphragm. Do not exceed the torque value listed in Table 4 when tightening the cap screws.

12. Alternately tighten the cap screws on opposite sides of the unit to evenly compress the gasket. Follow this sequence several times until the cap screws will not turn at the maximum torque given in Table 4. If this procedure is properly followed, the gap between the two body halves will be uniform all the way around.
13. Connect the external supply line to the pilot.

Parts Ordering

Each Type 310A regulator is assigned a serial number, which can be found on the nameplate. Refer to the number when contacting your local Sales Office for technical information or when ordering parts.

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

Type 32A Pilot (Figure 9)

Key	Description	Part Number
	Repair Kits (Include keys 7, 9, 13, 14, 15, 18, 25, 26, 28, 30, and 34)	
	With Fluorocarbon (FKM) disk, Nitrile (NBR) diaphragm, disk and O-rings	R32AX000012
	With Fluorocarbon (FKM) disk, diaphragm, and O-rings	R32AX000022
1	Spring Case, Steel	2R742222012
2	Spring Case Cap, Zinc-plated steel	11A8122X012
3	Adjusting Screw,	
	Standard mounting, Zinc-plated steel	1D995448702
	Type 662 Kixcel mounting, Steel	18B3500X062
4	Locknut, Zinc-plated steel	1H483324122
5	Spring Seat, Steel (2 required)	1R742524092
6	Cap Screw, Zinc-plated steel (4 required)	1B139324052
7*	Gasket, Composition	1R742604022
8	Diaphragm Plate, Zinc-plated steel (2 required)	1R742724152
9*	Diaphragm (2 required)	
	Nitrile (NBR)	1R742806992
	Fluorocarbon (FKM)	1U448302462
10	Cap Nut, Stainless steel	1D651538992
11	Diaphragm Spacer	
	Steel **(standard)**	2R742924092
	Steel (NACE)	2R7429X0052
12	Orifice Assembly	
	416 Stainless steel **(standard)**	1R7430000A2
	316 Stainless steel (NACE)	1R7430X0022
13*	O-ring	
	Nitrile (NBR) **(standard)**	1D687506992
	Fluorocarbon (FKM)	1N430406382
14*	O-ring (2 required)	
	Nitrile (NBR) **(standard)**	1E216306992
	Fluorocarbon (FKM)	1L949306382
15*	Washer, Plated steel with bonded synthetic rubber (2 required)	1J186999012
16	Yoke	
	410/416 Stainless steel **(standard)**	1R743335132
	316 Stainless steel (NACE)	1R7433X0012
17	Adaptor	
	410/416 Stainless steel **(standard)**	1R743435132
	316 Stainless steel (NACE)	1R7434X0012
18*	Valve Disk Assembly	
	416 Stainless steel/Fluorocarbon (FKM)	10A4912X012
	Stainless steel with PTFE disk	12A3962X012
	316 Stainless steel/Fluorocarbon (FKM) (NACE)	10A4912X082
19	Bleed Orifice, 316 Stainless steel	1R743835162
20	Bleed Valve	
	416 Stainless steel **(standard)**	1D986735132
	316 Stainless steel (NACE)	1D9867X0012
21	Nut, Zinc-plated steel	1A309324122
22	Pilot Body, Steel	34B3863X012
23	Piston Guide	
	410/416 Stainless steel **(standard)**	34B3880X012
	316 Stainless steel (NACE)	34B3880X022
25*	O-Ring	
	Nitrile (NBR) **(standard)**	1U379006992
	Fluorocarbon (FKM)	1V101506382
26*	O-Ring	
	Nitrile (NBR) **(standard)**	1F463606992
	Fluorocarbon (FKM)	1N571406382
27	Retaining Ring, Carbon-plated steel	1R744228982
28*	Piston Seat Assembly	
	416 Stainless steel/Nylon (PA) **(standard)**	14B3881X012
	316 Stainless steel/Nylon (PA) (NACE)	14B3881X022
29	Piston	
	416 Stainless steel **(standard)**	1R744535232
	316 Stainless steel (NACE)	1R7445X0012
30*	O-Ring	
	Nitrile (NBR) **(standard)**	1E218106992
	Fluorocarbon (FKM)/PTFE	1N530106382
33	Bushing	
	303 Stainless steel **(standard)**	1F262035032
	316 Stainless steel (NACE)	1F2620X0012
34*	O-Ring	
	Nitrile (NBR) **(standard)**	1D191706992
	Fluorocarbon (FKM)/PTFE	1N423906382
35	Spring	
	302 Stainless steel **(standard)**	1R744637022
	Nickel-Based alloy (NACE)	12B7884X012
36	Spring	
	302 Stainless steel	1U550637022
	Nickel-Based alloy (NACE)	12B7883X012
37	Control Spring, Zinc-plated steel	
	10 to 20 psig (0,69 to 1,4 bar), Silver	1D809627022
	10 to 100 psig (0,69 to 6,9 bar), Yellow	1E392527022
	100 to 250 psig (6,9 to 17,2 bar), Blue	1D387227022
	250 to 600 psig (17,2 to 41,4 bar), Red	1D465127142
	400 to 700 psig (27,6 to 48,3 bar), Green	13A5543X012

*Recommended Spare Part

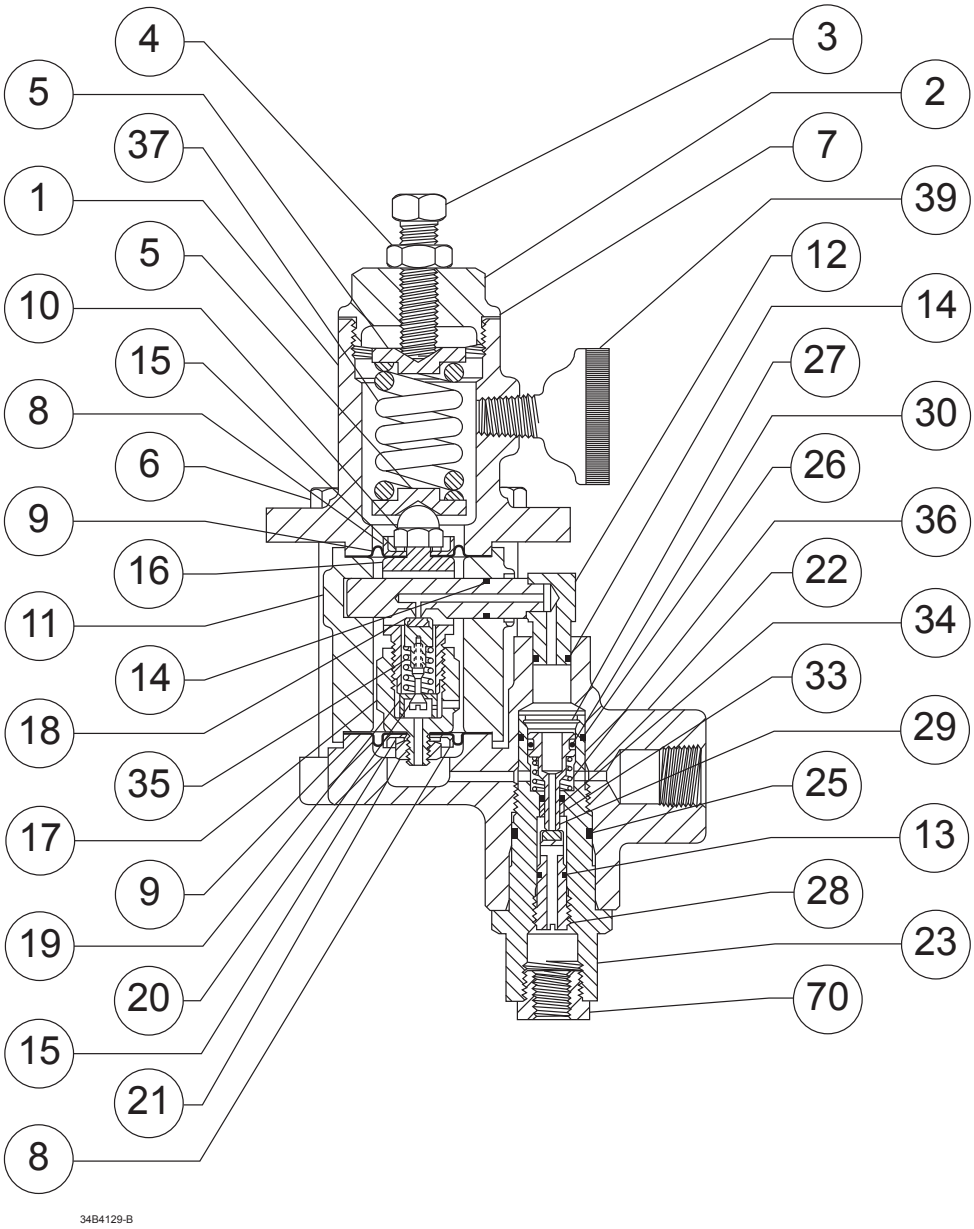


Figure 9. *Type 32A Pilot Assembly*

Key	Description	Part Number
38	Connector, Carbon-plated steel (not shown)	15A6002X462
39	Type Y602-1 Vent Assembly, for pilot mounted on main valve (not required when pressure loaded)	17A6570X012
41	Drive Screw, 18-8 Stainless steel (4 required)	1A368228982
52	Plug, Brass	1V211714012
53	Spacer, 304 Stainless steel	17B8959X012
66	Sealing Washer, (For use with pressure loaded pilot only)	1V205699012
70	Pipe Bushing, Carbon-plated steel	1B6149X0012
71	Pipe Nipple, Zinc	1B828626012

Type 310A Main Valve

Key	Description	Part Number
	Repair Kits (Include keys 6, 9, 11, 19, 26, 27, and 29)	
	With Nitrile (NBR) O-rings	
	NPS 1 (DN 25)	R310X000012
	NPS 2 (DN 50)	R310X000032
	NPS 3 (DN 80)	R310X000052
	NPS 4 and 4 x 6 (DN 100 and 100 x 150)(1)	R310X000072

1. In case the kit R310X000072 is for a size NPS 4 x 6 (DN 100 x 150) Type 310A, it is necessary to purchase an extra Wiper Ring (PN 1R752604152).

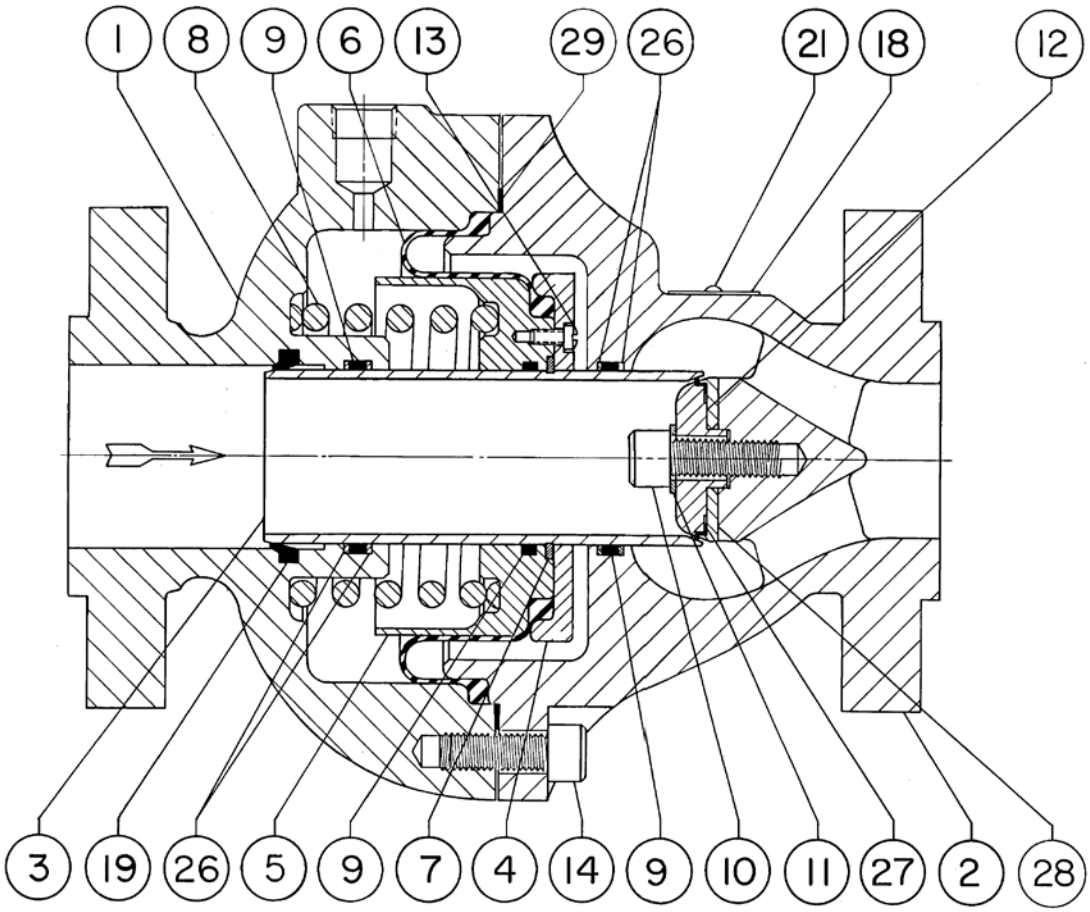


Figure 10. *NPS 1 (DN 25) Body Size Type 310A Main Valve Assembly*

Key	Description	Part Number
	Repair Kits (Include keys 6, 9, 11, 19, 26, 27, and 29) (continued)	
	With Fluorocarbon (FKM) O-rings	
	NPS 1 (DN 25)	R310X000022
	NPS 2 (DN 50)	R310X000042
	NPS 3 (DN 80)	R310X000062
	NPS 4 and 4 x 6 (DN 100 and 100 x 150)	R310X000082
1	Case Body, WCC steel	
	Without inlet tapping **(standard)** or with travel indicator	
	NPT	
	NPS 1	44B3869X012
	CL300 RF	
	NPS 1 (DN 25)	44B3870X012
	NPS 1 (DN 25) (NACE)	44B3870X022
	NPS 2 (DN 50)	44B3872X012
	NPS 2 (DN 50) (NACE)	44B3872X022
	NPS 3 (DN 80)	44B3874X012
	NPS 3 (DN 80) (NACE)	44B3874X022
	NPS 4 and 4 x 6 (DN 100 and 100 x 150)	44B3876X012
	NPS 4 (DN 100) (NACE)	44B3876X022
	CL600 RF	
	NPS 1 (DN 25)	44B3871X012
	NPS 2 (DN 50)	44B3873X012
	NPS 3 (DN 80)	44B3875X012
	NPS 4 (DN 100)	44B3877X012

Key	Description	Part Number
1	Case Body, WCC steel (continued)	
	With inlet tapping	
	CL300 RF	
	NPS 1 (DN 25)	24B5843X012
	NPS 2 (DN 50)	24B6356X012
	CL600RF	
	NPS 1 (DN 25)	24B6355X012
	NPS 2 (DN 50)	24B6357X012
2	Base Body, WCC steel	
	Without travel indicator **(standard)**	
	NPT	
	NPS 1	34B4103X012
	CL300 RF	
	NPS 1 (DN 25)	34B3980X012
	NPS 1 (DN 25) (NACE)	34B3980X022
	NPS 2 (DN 50)	44B3981X012
	NPS 2 (DN 50) (NACE)	44B3981X022
	NPS 3 (DN 80)	44B3982X012
	NPS 3 (DN 80) (NACE)	44B3982X022
	NPS 4 (DN 100)	44B3983X012
	NPS 4 (DN 100) (NACE)	44B3983X022
	NPS 4 x 6 (DN 100 x 150)	44B4110X012

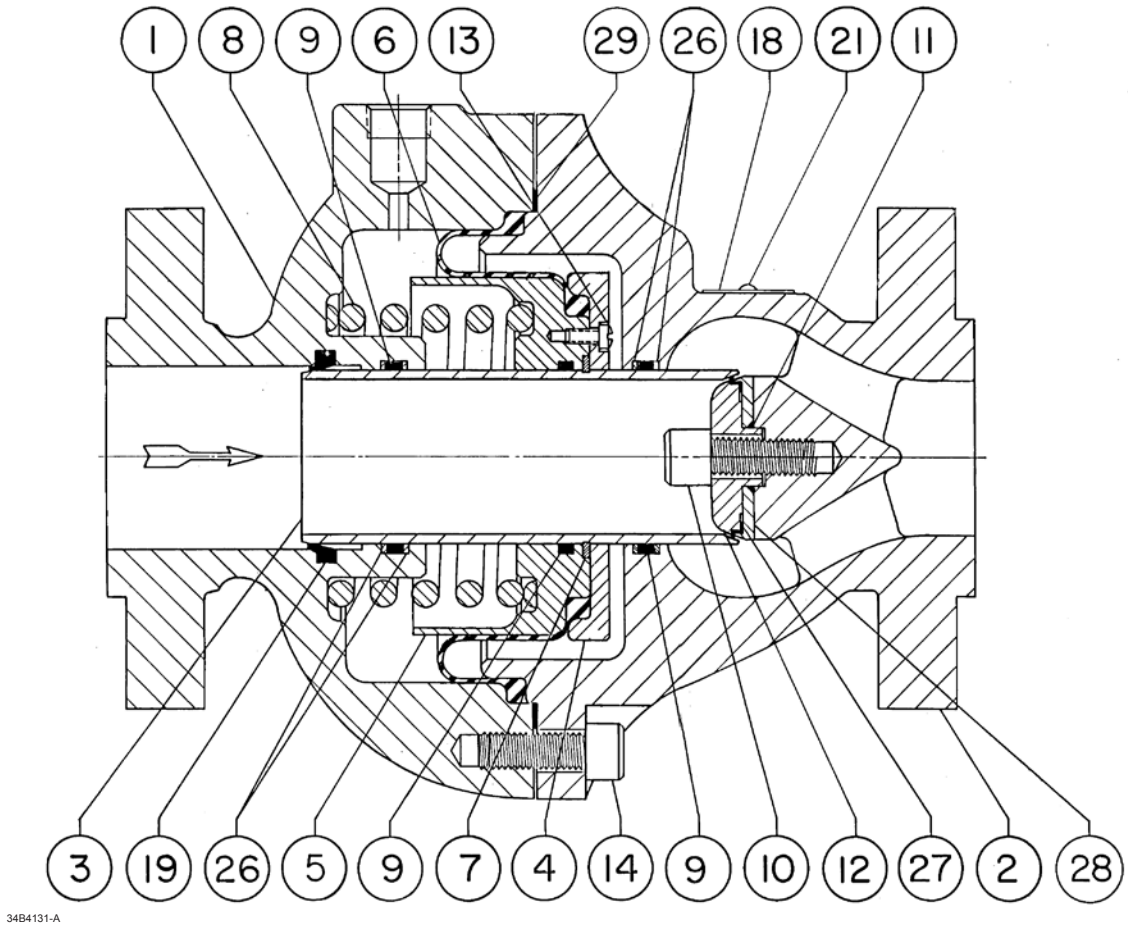


Figure 11. *NPS 2, 3, and 4 (DN 50, 80, and 100) Body Size Type 310A Main Valve Assembly*

Key	Description	Part Number
2	Base Body, WCC steel (continued)	
	Without travel indicator **(standard)**	
	CL600 RF	
	NPS 1 (DN 25)	34B4104X012
	NPS 2 (DN 50)	44B4105X012
	NPS 3 (DN 80)	44B4106X012
	NPS 4 (DN 100)	44B4107X012
	NPS 4 x 6 (DN 100 x 150)	44B4111X012
	With travel indicator	
	NPT	
	NPS 1	3R746822012
	CL300 RF	
	NPS 1 (DN 25)	3U357022012
	NPS 1 (DN 25) (NACE)	3U3570X0072
	NPS 2 (DN 50)	4U356822012
	NPS 2 (DN 50) (NACE)	4U3568X0072
	NPS 3 (DN 80)	4U357222012
	NPS 3 (DN 80) (NACE)	4U3572X0062
	NPS 4 (DN 100)	4U357622012
	NPS 4 (DN 100) (NACE)	4U3576X0022
	NPS 4 x 6 (DN 100 x 150)	41A8162X012
	CL600 RF	
	NPS 1 (DN 25)	3R746622012
	NPS 2 (DN 50)	4R740422012
	NPS 3 (DN 80)	4R749422012
	NPS 4 (DN 100)	4R751222012
	NPS 4 x 6 (DN 100 x 150)	40A9616X012
3	Sleeve, 304 Stainless steel	
	NPS 1 (DN 25)	10A8220X012
	NPS 2 (DN 50)	20A8221X012
	NPS 3 (DN 80)	20A8222X012
	NPS 4 (DN 100)	20A8223X012
	NPS 4 x 6 (DN 100 x 150)	20A9619X012
4	Diaphragm Plate, Steel	
	NPS 1 (DN 25)	1R747024092
	NPS 1 (DN 25) (NACE)	1R7470X0012
	NPS 2 (DN 50)	1R740724392
	NPS 2 (DN 50) (NACE)	1R7407X0012
	NPS 3 (DN 80)	1R749624392
	NPS 3 (DN 80) (NACE)	1R7496X0012
	NPS 4 and 4 x 6 (DN 100 and 100 x 150)	1R751425012
	NPS 4 (DN 100) (NACE)	1R7514X0012
5	Lower Diaphragm Plate, Steel	
	NPS 1 (DN 25)	1R747124092
	NPS 1 (DN 25) (NACE)	1R7471X0012
	NPS 2 (DN 50)	1R740922012
	NPS 2 (DN 50) (NACE)	1R7409X0012
	NPS 3 (DN 80)	2R749822012
	NPS 3 (DN 80) (NACE)	2R7498X0012
	NPS 4 and 4 x 6 (DN 100 and 100 x 150)	2R751622012
	NPS 4 (DN 100) (NACE)	2R7516X0012

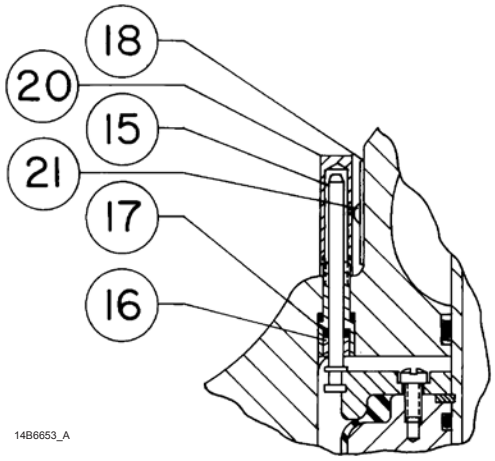


Figure 12. *Travel Indicator Assembly*

Key	Description	Part Number
6*	Diaphragm	
	Nitrile (NBR)	
	NPS 1 (DN 25)	1R747299982
	NPS 2 (DN 50)	1R741099982
	NPS 3 (DN 80)	1R749999982
	NPS 4 and 4 x 6 (DN 100 and 100 x 150)	2R751799982
	Fluorocarbon (FKM)	
	NPS 1 (DN 25)	21A1929X022
	NPS 2 (DN 50)	21A1930X022
	NPS 3 (DN 80)	21A1931X022
	NPS 4 and 4 x 6 (DN 100 and 100 x 150)	21A1932X022
7	Split Ring, 410/416 Stainless steel	
	NPS 1 (DN 25)	1R747335132
	NPS 1 (DN 25) (NACE)	1R7473X0012
	NPS 2 (DN 50)	1R741135132
	NPS 2 (DN 50) (NACE)	1R7411X0012
	NPS 3 (DN 80)	1R750035132
	NPS 3 (DN 80) (NACE)	1R7500X0012
	NPS 4 and 4 x 6 (DN 100 and 100 x 150)	1R751835132
	NPS 4 (DN 100) (NACE)	1R7518X0012
8	Spring, Steel	
	NPS 1 (DN 25)	1U888627112
	NPS 1 (DN 25) (NACE)	13B7203X012
	NPS 2 (DN 50)	1U888527132
	NPS 2 (DN 50) (NACE)	12B7885X012
	NPS 3 (DN 80)	1U888727082
	NPS 3 (DN 80) (NACE)	13B9520X012
	NPS 4 (DN 100)	1U888827082
	NPS 4 (DN 100) (NACE)	14B3560X012
	NPS 4 x 6 (DN 100 x 150)	10A9620X012
9*	O-Ring (3 required)	
	Nitrile (NBR)/PTFE	
	NPS 1 (DN 25)	1E736906992
	NPS 2 (DN 50)	1H2921X0012
	NPS 3 (DN 80)	1K8776X0022
	NPS 4 and 4 x 6 (DN 100 and 100 x 150)	1H862106992
	Fluorocarbon (FKM)/PTFE	
	NPS 1 (DN 25)	1N163306382
	NPS 2 (DN 50)	1R752306382
	NPS 3 (DN 80)	1L111206382
	NPS 4 and 4 x 6 (DN 100 and 100 x 150)	1U448406382
10	Cap Screw, Stainless steel	
	NPS 1 (DN 25)	1R747538982
	NPS 1 (DN 25) (NACE)	1R7475X0012
	NPS 2 (DN 50)	1R741438982
	NPS 2 (DN 50) (NACE)	1R7414X0012
10	Cap Screw, Stainless steel (continued)	
	NPS 3 (DN 80)	1R740638982
	NPS 3 (DN 80) (NACE)	1R7406X0012
	NPS 4 and 4 x 6 (DN 100 and 100 x 150)	1R741338982
	NPS 4 (DN 100) (NACE)	1R7413X0012
11*	Washer, Plated steel/composition	
	(for NPS 1 (DN 25) body) (not shown)	1U984499012
	O-Ring	
	Nitrile (NBR)	
	NPS 2 (DN 50)	1F463606992
	NPS 3 (DN 80)	10A8217X022
	NPS 4 and 4 x 6 (DN 100 and 100 x 150)	10A8218X032
	Fluorocarbon (FKM)	
	NPS 2 (DN 50)	1N571406382
	NPS 3 (DN 80)	10A8217X012
	NPS 4 and 4 x 6 (DN 100 and 100 x 150)	10A8218X012
12	Disk Retainer, Stainless steel	
	NPS 1 (DN 25)	
	30% Capacity	10A8202X012
	50% Capacity	10A8203X012
	70% Capacity	19A0690X012
	100% Capacity	10A8204X012
	100% Capacity (NACE)	10A8204X022
	NPS 2 (DN 50)	
	30% Capacity	20A8205X012
	50% Capacity	20A8206X012
	70% Capacity	20A8207X012
	100% Capacity	20A8208X012
	100% Capacity (NACE)	20A8208X022
	NPS 3 (DN 80)	
	30% Capacity	20A8209X012
	50% Capacity	20A8210X012
	70% Capacity	20A8211X012
	100% Capacity	10A8212X012
	100% Capacity (NACE)	10A8212X022
	NPS 4 and 4 x 6 (DN 100 and 100 x 150)	
	30% Capacity	20A8213X012
	50% Capacity	20A8214X012
	70% Capacity	20A8215X012
	100% Capacity	20A8216X012
	100% Capacity (NACE)	20A8216X022
13	Screw, Zinc-plated steel (8 required)	
	NPS 1 and 2 (DN 25 and 50)	1A3321X0032
	NPS 1 and 2 (DN 25 and 50) (NACE)	1A3321X0042
	NPS 3 (DN 80)	1U154838982
	NPS 3 (DN 80) (NACE)	1U1548X0032
	NPS 4 and 4 x 6 (DN 100 and 100 x 150)	1E304428982
	NPS 4 (DN 100) (NACE)	1E3044X0012
14	Cap Screw (8 required)	
	NPS 1 (DN 25)	1N2579X0022
	NPS 2 (DN 50)	1A771132982
	NPS 3 (DN 80)	1L469632982
	NPS 4 and 4 x 6 (DN 100 and 100 x 150)	1R752132982
15	Travel Indicator Rod, 316 Stainless steel	
	NPS 1 (DN 25)	1R7477X0012
	NPS 2 (DN 50)	1R7416X0012
	NPS 3 (DN 80)	1R7503X0012
	NPS 4 (DN 100)	1R7527X0012
	NPS 4 x 6 (DN 100 x 150)	10A9621X022
16	Bushing, 316 Stainless steel	1F2620X0012
17	O-ring, Fluorocarbon (FKM)/PTFE	1N423906382
18	Travel Indicator Scale, 18-8 Stainless steel	
	NPS 1 (DN 25)	1R747838982
	NPS 2 (DN 50)	1R741738982
	NPS 3 (DN 80)	1R750838982
	NPS 4 (DN 100)	1R752238982
	NPS 4 x 6 (DN 100 x 150)	10A9622X012

*Recommended Spare Part

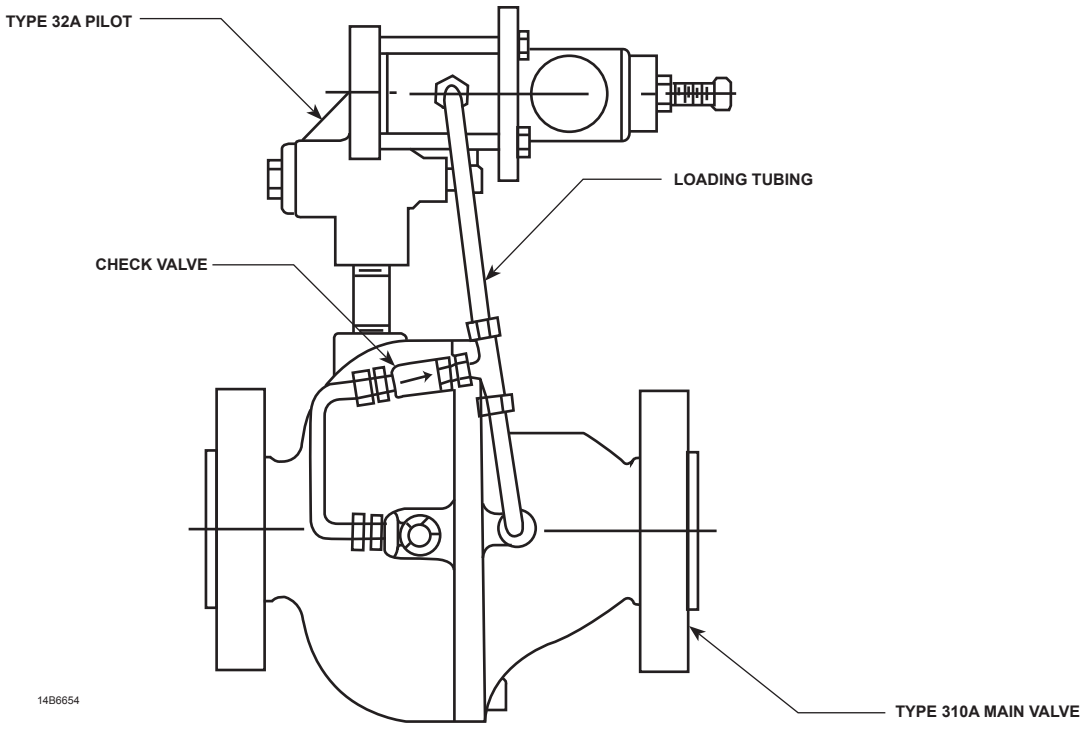


Figure 13. *Backpressure Protection System Assembly*

Key	Description	Part Number
19	Wiper Ring, Nitrile (NBR) (Not for use over 200°F (93°C))	
	NPS 1 (DN 25)	1R748204152
	NPS 2 (DN 50)	1R745203362
	NPS 3 (DN 80)	1R750704152
	NPS 4 (DN 100)	1R752604152
	NPS 4 x 6 (DN 100 x 150) (2 required)	1R752604152
20	Indicator Cap, 410/416 Stainless steel	
	NPS 1 (DN 25)	12A6413X012
	NPS 2 (DN 50)	12A6414X012
	NPS 3, 4, and 4 x 6 (DN 80, 100, and 100 x 150)	12A6415X012
21	Screw, Carbon-plated steel (2 required)	1C941928982
24	Pipe Plug, Steel (not shown)	1A369224492
26*	Backup Ring, PTFE (4 required)	
	NPS 1 (DN 25)	1V435606242
	NPS 2 (DN 50)	1V435706242
	NPS 3 (DN 80)	1V435806242
	NPS 4 and 4 x 6 (DN 100 and 100 x 150)	1V435906242
27*	Disk, PTFE	
	NPS 1 (DN 25)	10A8224X012
	NPS 2 (DN 50)	10A8225X012
	NPS 3 (DN 80)	10A8226X012
	NPS 4 and 4 x 6 (DN 100 and 100 x 150)	10A8227X012
28	Disk Holder, 303/316 Stainless steel	
	NPS 1 (DN 25)	10A8228X012
	NPS 1 (DN 25) (NACE)	10A8228X022
	NPS 2 (DN 50)	10A8229X012
	NPS 2 (DN 50) (NACE)	10A8229X022
	NPS 3 (DN 80)	10A8234X012
	NPS 3 (DN 80) (NACE)	10A8234X022
	NPS 4 and 4 x 6 (DN 100 and 100 x 150)	10A8235X012
	NPS 4 (DN 100) (NACE)	10A8235X022
29*	Body Gasket, Nitrile (NBR)	
	NPS 1 (DN 25)	11A6853X012
	NPS 2 (DN 50)	11A6854X012
	NPS 3 (DN 80)	11A6855X012
	NPS 4 and 4 x 6 (DN 100 and 100 x 150)	11A6856X012
38	Drive Screw, 18-8 Stainless steel (4 required)	1A368228982

*Recommended Spare Part

Mounting Parts

Single-Pilot or Wide-Open Monitor Pilot Mounting

Key	Description	Part Number
22	Tubing, 316 Stainless steel (not shown)	0500213809W
23	Elbow, Plated steel (not shown)	
	Steel	15A6002XW32
	316 Stainless steel	15A6002X612
71	Pipe Nipple, 1/2 NPT (not shown)	1B828626012

Working Monitor Pilot Mounting

Key	Description	Part Number
45	Mounting Bracket, Steel	14B8803X012
46	Tubing, 316 Stainless steel	0500213809W
50	Elbow, Plated steel (5 required)	15A6002XW32
52	Plug, Brass	1V211714012
53	Spacer, 304 Stainless steel	17B8959X012
54	Tubing, 316 Stainless steel	0500213809W
55	Tubing, 316 Stainless steel	0500213809W
56	Connector	15A6002XW22

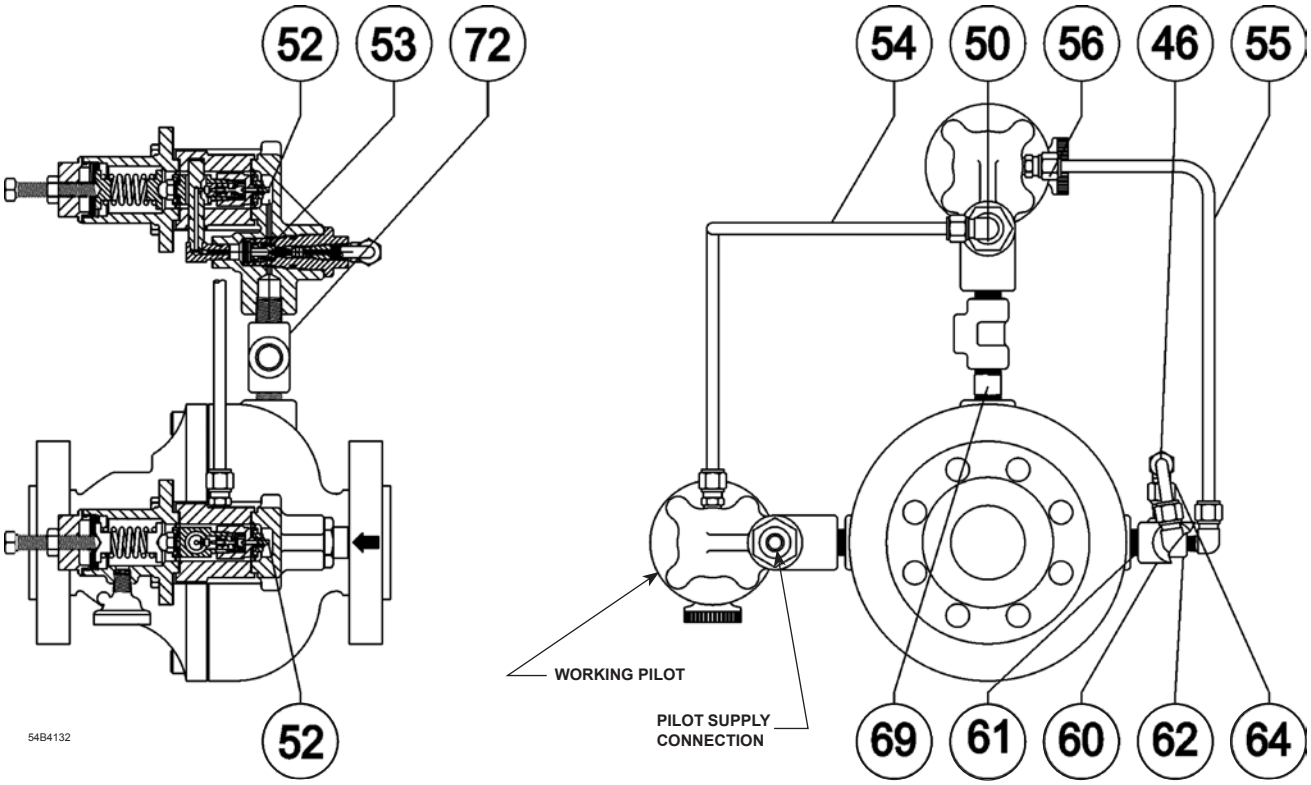


Figure 14. *Type 310A-32A-32A Assembly*

Key	Description	Part Number
60	Pipe Tee, Carbon steel	1K201428992
61	Pipe Nipple, Galvanized steel	1B352626012
62	Pipe Tee, Carbon steel	1B860628992
64	Restriction, 316 Stainless steel	1D7469X00A2
69	Mounting Bar, 303 Stainless steel	14B5625X012
72	Pipe Tee, Carbon steel	1H359428992

Industrial Regulators

Emerson Process Management
Regulator Technologies, Inc.

USA - Headquarters
McKinney, Texas 75069-1872 USA
Tel: 1-800-558-5853
Outside U.S. 1-972-548-3574

Asia-Pacific
Shanghai, China 201206
Tel: +86 21 2892 9000

Europe
Bologna, Italy 40013
Tel: +39 051 4190611

Middle East and Africa
Dubai, United Arab Emirates
Tel: +971 4811 8100

Natural Gas Technologies

Emerson Process Management
Regulator Technologies, Inc.

USA - Headquarters
McKinney, Texas 75069-1872 USA
Tel: 1-800-558-5853
Outside U.S. 1-972-548-3574

Asia-Pacific
Singapore, Singapore 128461
Tel: +65 6777 8211

Europe
Bologna, Italy 40013
Tel: +39 051 4190611
Gallardon, France 28320
Tel: +33 (0)2 37 33 47 00

TESCOM

Emerson Process Management
Tescom Corporation

USA - Headquarters
Elk River, Minnesota 55330-2445 USA
Tel: 1-763-241-3238

Europe
Selmsdorf, Germany 23923
Tel: +49 (0) 38823 31 0

For further information visit www.fisherregulators.com