

FLA Series Pressure Reducing Regulators



E0820

Figure 1. Type FLA Regulator

Introduction

Scope of the Manual

This manual provides instructions for installation, adjustment, maintenance, and parts ordering for the FLA Series regulators, its pilots, booster valves, and filter.

Description

The FLA Series regulators are accurate pilot-operated, pressure balanced, soft seated regulators designed for Natural Gas high pressure transmission/city gate, large capacity distribution systems and power plant feeds. The FLA Series provides smooth, quiet operation, tight shutoff and long life. The regulator utilizes a main valve actuator, a PRX or PS Series pressure reducing pilot, and/or a Type SA/2 pilot supply pressure regulator.

Principle of Operation

Single Pilot Regulator

The pilot-operated Type FLA (Figure 2) uses inlet pressure as the operating medium, which is reduced through pilot operation to load the actuator diaphragm. Outlet or downstream pressure opposes loading pressure in the actuator and also opposes the pilot control spring.

When outlet pressure drops below the setting of the pilot control spring, pilot control spring force on the pilot diaphragm opens the pilot valve plug, providing additional loading pressure to the actuator diaphragm. This diaphragm loading pressure opens the main valve plug, supplying the required flow to the downstream system. Any excess loading pressure on the actuator diaphragm escapes downstream through the exhaust restriction in the pilot.

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Specifications

The Specifications section gives some general specifications for the FLA Series regulators. The nameplates give detailed information for a particular regulator as it comes from the factory.

Available Configurations

Type FLA: Pilot-operated pressure reducing regulator for medium to high outlet pressures

Body Sizes

Type FLA:

DN 25, 40, 50, 80, 100, and 150 / NPS 1, 1-1/2, 2, 3, 4, and 6

Type FLA with Type SRS Silencer (inlet x outlet):

DN 25 x 100, 40 x 150, 50 x 150, 80 x 250, 100 x 250, and 150 x 300 / NPS 1 x 4, 1-1/2 x 6, 2 x 6, 3 x 10, 4 x 10, and 6 x 12

Main Valve End Connection Style and Pressure Ratings⁽¹⁾

ASME CL300 RF: 51.0 bar / 740 psig⁽³⁾

ASME CL600 RF: 100 bar / 1450 psig⁽³⁾

Maximum Inlet and Outlet (Casing) Pressure⁽¹⁾

100 bar / 1450 psig

Minimum Operating Differential Pressure⁽²⁾

0.50 bar d / 7.3 psid

Outlet Pressure Ranges

See Table 1

Construction Materials

Covers and Flanges: Steel, ASTM A105

Sleeve: Steel, FE510 UNI 7729

Seat: Stainless Steel, 30CR UNI 6901-71 (AISI 420-B)

Diaphragm Plates: Steel

Diaphragm: Nitrile (NBR) Rubber with PVC coating

Seal: Nitrile (NBR) Rubber or Fluorocarbon (FKM)

Seal Pad: Nitrile (NBR) Rubber

Pressure Registration

External

Temperature Capabilities

Working: -10 to 60°C / 14 to 140°F

Ambient: -20 to 80°C / -4 to 176°F

Options

Booster Valve

Pneumatic Device

Electric Remote Drive Unit

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

2. When using a Type SA/2 pilot supply filter regulator, the differential pressure across the regulator must be at least 3.10 bar d / 45 psid for optimum regulator performance.

3. At average ambient temperature.

When the gas demand in the downstream system has been satisfied, the outlet pressure increases. The increased pressure is transmitted through the downstream control line and acts on the pilot diaphragm. This pressure exceeds the pilot spring setting and moves the diaphragm, closing the orifice. The loading pressure acting on the main diaphragm bleeds to the downstream system through the exhaust restriction in the pilot.

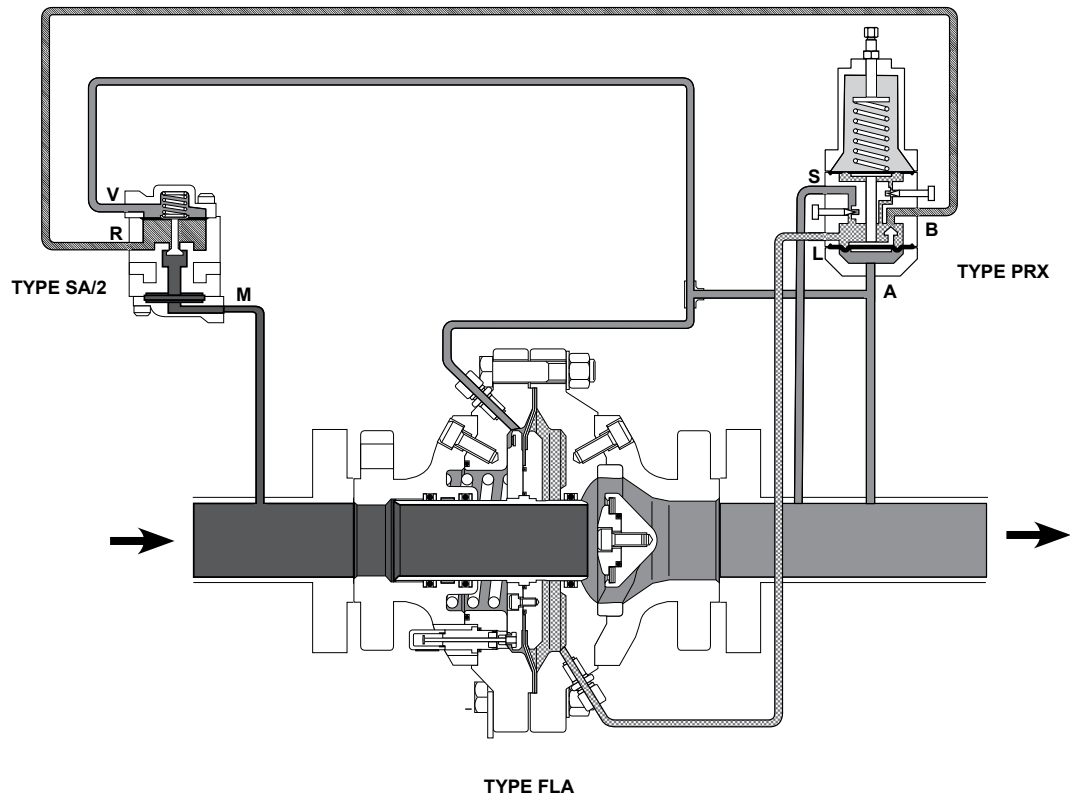
Monitoring Systems

Monitoring regulation is overpressure protection by containment; therefore, there is no relief valve to continuously vent gas to the atmosphere. When the working regulator fails to control the pressure, a monitor regulator installed in series, which has been

sensing the downstream and control pressure, goes into operation to maintain the downstream pressure at a slightly higher than normal pressure. During an overpressure situation, monitoring keeps the fluid gas in line. Also, testing is relatively easy and safe. To perform a periodic test on a monitoring regulator, increase the outlet set pressure of the working regulator and watch the outlet pressure to determine if the monitoring regulator takes over at the appropriate outlet pressure.

Wide-Open Monitoring Systems (Figure 3)

There are two types of wide-open monitoring systems: upstream and downstream. The difference between upstream and downstream monitoring is that the functions of the regulators are reversed.



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|--|------------------|-----------------------|
|  INLET PRESSURE | | |
|  OUTLET PRESSURE | | |
|  LOADING PRESSURE | | |
|  PILOT SUPPLY PRESSURE | | |
|  ATMOSPHERIC PRESSURE | | |
| | TYPE PRX: | TYPE SA/2: |
| | S - BLEED PORT | V - SENSING PORT |
| | B - SUPPLY PORT | R - PILOT SUPPLY PORT |
| | L - LOADING PORT | M - INLET PORT |
| | A - SENSING PORT | |

Figure 2. Type FLA Single Pilot Operational Schematic

Systems can be changed from upstream to downstream monitoring, and vice-versa, by simply reversing the setpoints of the two regulators. The decision to use either an upstream or downstream monitoring system is largely a matter of personal preference or company policy.

In normal operation of a wide-open configuration, the working regulator controls the system's outlet pressure. With a higher outlet pressure setting, the monitor regulator senses a pressure lower than its setpoint and tries to increase outlet pressure by going wide-open. If the working regulator fails, the monitoring regulator assumes control and holds the outlet pressure at its outlet pressure setting.

Working Monitoring Regulators (Figure 3)

In a working monitoring system, the upstream regulator requires two pilots and it is always the monitoring regulator. The additional pilot permits the monitoring regulator to act as a series regulator to control an intermediate pressure during normal operation. In this way, both units are always operating and can be easily checked for proper operation.

In normal operation, the working regulator controls the outlet pressure of the system. The monitoring regulator's working pilot controls the intermediate pressure and the monitoring pilot senses the system's outlet pressure. If the working regulator fails, the monitoring pilot will sense the increase in outlet pressure and take control.

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Table 1. Pilot Types and Outlet Pressure Ranges⁽¹⁾

PILOT TYPES	USAGE		ALLOWABLE PRESSURE, bar / psig	SET PRESSURE RANGE, bar / psig	COVER AND FLANGES MATERIAL
	Regulator	Monitor			
PS/79 ⁽²⁾	PSO/79	REO/79	100 / 1450	0.50 to 40.0 / 7 to 580	Steel
PS/80 ⁽²⁾	PSO/80	REO/80	100 / 1450	1.5 to 40.0 / 22 to 580	
PRX/120 ⁽³⁾	PRX/120	PRX/125	100 / 1450	1.0 to 40.0 / 15 to 580	
PRX-AP/120 ⁽³⁾	PRX-AP/120	PRX-AP/125	100 / 1450	30.0 to 80.0 / 435 to 1160	

1. FLA Series regulators are equipped with the PS or PRX Series pilots.
 2. All PS Series pilots are supplied with a filter (5 micron filtering degree) and built-in pressure stabilizer, with the exception of Types PSO/79 and PSO/80.
 3. Type SA/2 pressure pre-reducer must be used with PRX Series pilots.

Note

The working regulator must be rated for the maximum allowable operating pressure of the system because this will be its inlet pressure if the monitoring regulator fails. Also, the outlet pressure rating of the monitoring pilot, and any other components that are exposed to the intermediate pressure must be rated for full inlet pressure.

Adjustment

The adjustment of the regulator is performed by means of the pilot adjusting screw, which varies the compression of the control spring. Adjustment is performed while the regulator is in operation with the aid of a test pressure gauge to monitor downstream pressure. The shutoff valve downstream of the regulator must not be completely closed; it is necessary that a small quantity of gas flows downstream to allow the outlet side to vent down, when it is necessary to lower the pressure.

Loosen the locknut and turn the adjusting screw slowly to adjust outlet pressure. Use a pressure gauge to check the outlet pressure until the desired pressure is reached.

Installation and Startup

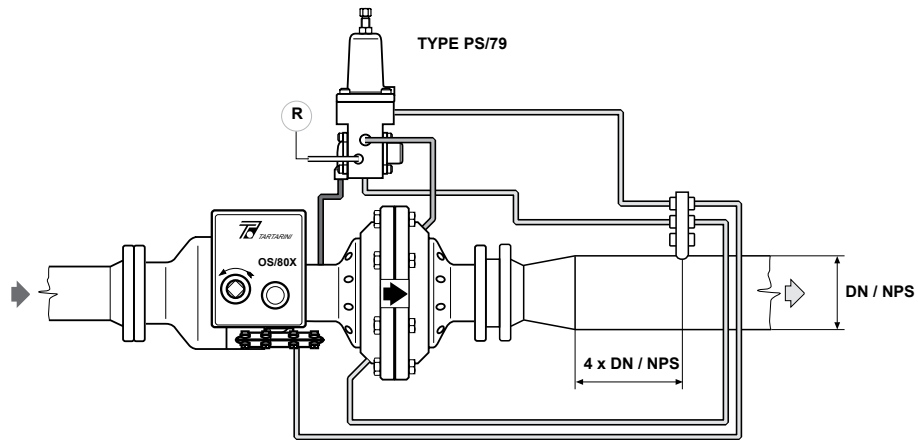
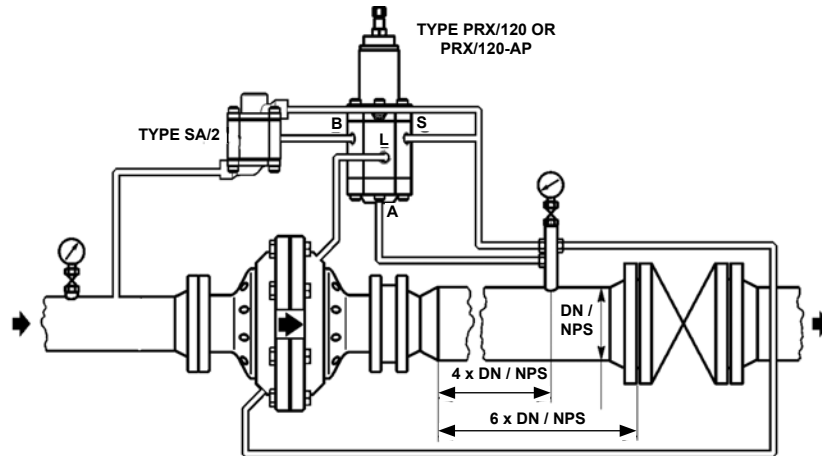


Personal injury or equipment damage, due to bursting of pressure-containing parts may result if this regulator is overpressured or is installed where service conditions could exceed the limits given in the Specifications section and on the appropriate nameplate, or where conditions exceed any rating of the adjacent piping or piping connections.

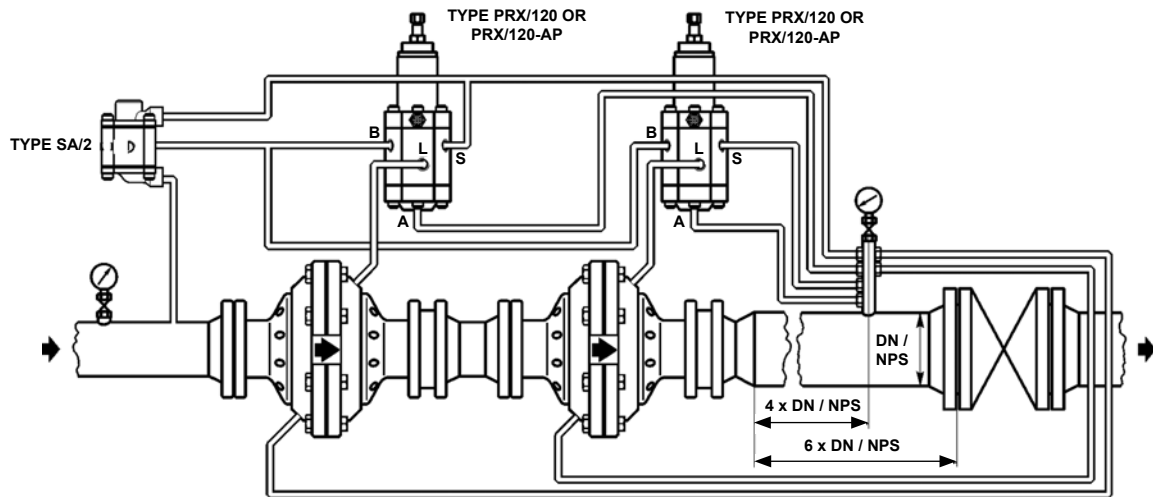
To avoid such injury or damage, provide pressure-relieving or pressure-limiting devices to prevent service conditions from exceeding those limits. Also, check that the installation is in compliance with all applicable codes and regulations.

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.

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.

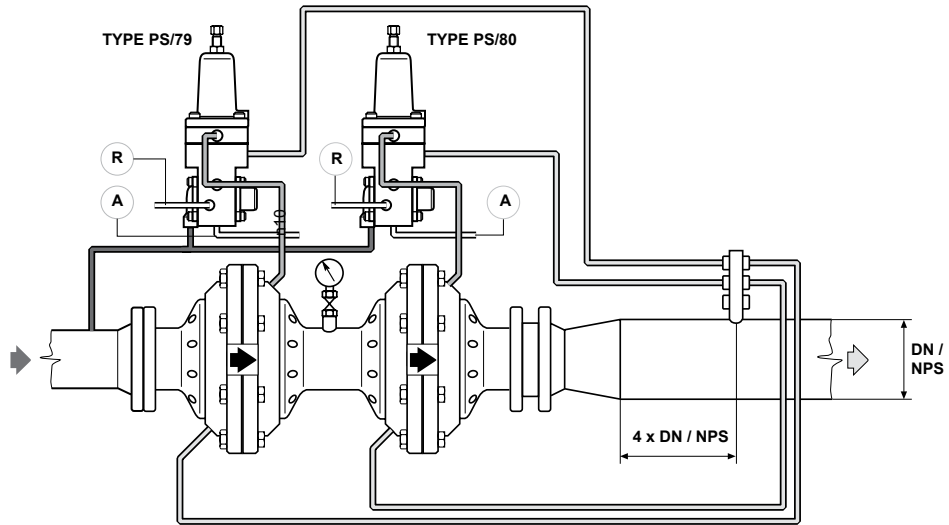


SINGLE PILOT SYSTEM INSTALLATION

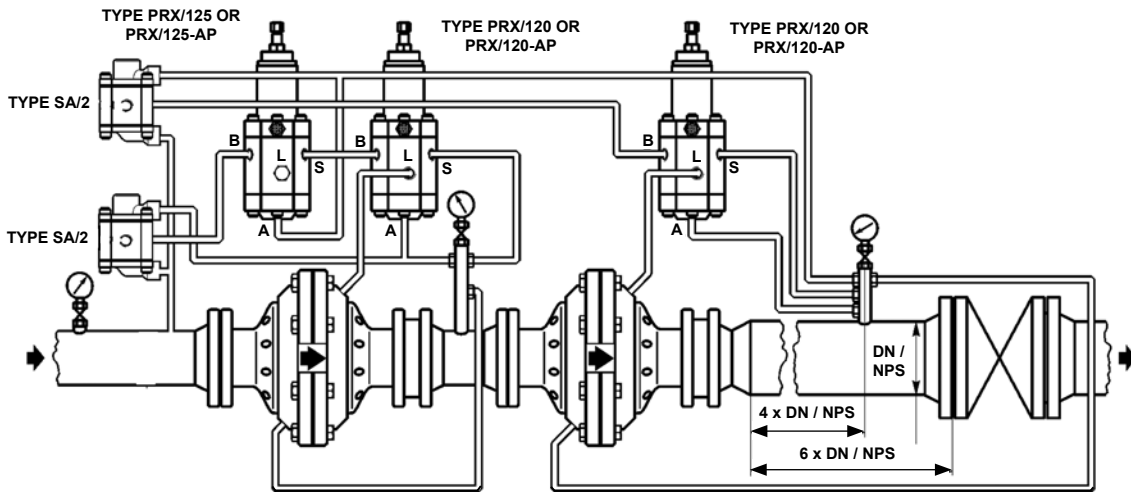


UPSTREAM OR DOWNSTREAM WIDE-OPEN MONITORING SYSTEM INSTALLATION

Figure 3. Typical Installation / Connection Schematics



UPSTREAM OR DOWNSTREAM WIDE-OPEN MONITORING SYSTEM INSTALLATION (CONTINUED)



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WORKING MONITORING SYSTEM INSTALLATION

Figure 3. Typical Installation / Connection Schematics (continued)

Single Pilot Regulator

Installation

A Type FLA 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 system, if the outlet pressure sensing lines are connected to the downstream pipeline. 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 screwed 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. The PRX and PS Series pilots have a 1/4 NPT vent connection at the spring case and at the side of the body respectively. To remotely vent the pilots, remove the vent and install obstruction-free tubing or piping into the 1/4 inch NPT vent tapping. Provide protection on a remote vent by installing a screened vent cap onto the remote end of the vent pipe. 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. (The PS Series pilots have an internal relief valve to protect the internal parts of the pilot in case of overpressure.)

5. If Type PRX is used, connect a pilot supply line from the upstream piping to the lower port of the Type SA/2 filter/stabilizer regulator.
6. Connect a downstream control line to a straight run of pipe 4 pipe diameters from the regulator outlet as shown in Figure 3. 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 full flow hand valve, such as a full port ball valve, in the control line.
8. Install the other end of the downstream control line to the 1/2 NPT connection in the upstream side of the case body.
9. Consult the appropriate instruction manual for installation of an optional pneumatic or electric remote control-drive unit. For optional remote pneumatic loading of PRX and PS Series pilots, make the spring case piping connections just as they would be made for remote venting.

Pre-startup 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 1.03 bar / 15 psig 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 FLA 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 change the regulator outlet pressure, loosen the locknut, and turn the adjusting screw clockwise to increase pressure or counterclockwise to decrease pressure. Then tighten the locknut to maintain the adjustment position.

Startup

1. Open the upstream block (isolating) valve. Open the hand valve in the external pilot supply line before opening the downstream isolating valve.
2. Open the downstream block (isolating) valve for minimum flow.
3. Slowly open the hand valve 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 3) 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.

Pre-startup 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 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.



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 1.03 bar / 15 psig 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 FLA 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 change the regulator outlet pressure, loosen the locknut, and turn the adjusting screw clockwise to increase pressure or counterclockwise to decrease pressure. 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 FLA working monitor regulators are bench set at the factory according to the service conditions specified on the customer's order.

Install the Type FLA using adequate gaskets for flanged regulator units and good piping practices. 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 Figures 3 and 4, and proceed in the following steps.

1. Connect control lines as shown in Figure 3.
2. Connect the pilot supply pressure to the Type SA/2 and from the Type SA/2 to the pilots (Figure 3). Supply pressure should be filtered.
3. Install downstream working regulator per guidelines.

Startup

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



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 1.03 bar / 15 psi 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 the hand valve 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 the hand valve.

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 and turning the adjusting screw clockwise (into the spring case cap) 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 locknut 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.

With settings as desired on both the monitoring and the working pilots, tighten the locknuts 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, the steps in this procedure also are valid for a wide-open monitoring installation and should be repeated for each regulator in such an installation.

1. Close the upstream isolating valve.
2. Close the hand valve 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 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 valves and open vent valves, permitting all pressure to bleed out of the regulator.

5. 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.



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.

Main Valve

Main Valve Pad Replacement

1. Remove outlet flange (key 22) by removing socket head cap screws (key 5).
2. Remove pad holder assembly and O-ring (key 18).

3. Remove pad (key 20) from pad holder (key 19) by removing cap screw (key 25) and pad retainer (key 21), replace pad if necessary.
4. Reinstall the pad.

Main Valve Diaphragm Maintenance

1. Place main valve with inlet side up.
2. Remove the travel indicator assembly by removing the indicator cover (key 40) and indicator bushing (key 38). Check O-ring (key 37), replace if necessary. Remove the indicator support (key 36). Check O-ring (key 35), replace if necessary. Lift out indicator stem assembly (keys 33 and 34).
3. Remove inlet flange (key 1) by removing socket head cap screws (key 5). Due to force created by the spring (key 6), always remove inlet flange with caution.
4. Lift out spring (key 6). Remove hex head cap screws, washers, and nuts (keys 9, 14, and 15). Lift off the inlet cover (key 11).
5. Remove diaphragm assembly by removing screws (key 27) to separate the outlet and the inlet plates (keys 12 and 8). Check diaphragm (key 10) and O-rings (keys 26 and 28) for damage and replace if necessary. Check sleeve (key 16) seating surface for damage. Check O-rings (keys 3 and 4) and antifriction rings (key 2), replace if necessary.
6. Reassemble in reverse order.

PRX Series Pilot



Always remove spring (key 7) tension before performing maintenance on this unit. To remove spring tension, loosen locknut (key 2) and back out adjusting screw (key 1) until compression is removed from the spring.

Lower Case Maintenance

1. Remove pressure from the pilot.
2. Remove screws (key 10) from lower cover (key 21) and the separate lower cover from the body (key 16).

3. Use a wrench to hold the stem (key 23) and break loose the stem nut (key 20). Remove the stem nut and washer (key 11).
4. Remove the diaphragm plate (key 13), diaphragm (key 14), pad holder (key 22), and O-ring (key 18). Inspect the parts for damage or wear, and replace if necessary.
5. Remove orifice (key 19) and O-ring (key 17). Inspect the parts for damage or wear, and replace if necessary. Lightly lubricate the O-ring and place in the body (key 16). Install the orifice.
6. Set the pad holder (key 22) in the body (key 16).
7. Lightly lubricate the rims of the diaphragm (key 14) and place it on top of the pad holder (key 22). Set the diaphragm plate (key 13) on the diaphragm (key 14).
8. Lightly lubricate the O-ring (key 18) and place it in the lower case (key 21).
9. Place the washer (key 11) and stem nut (key 20) on the stem (key 23) and tighten. If performing Upper Case Maintenance, skip to step 2 of the Upper Case Maintenance section below.
10. Insert machine screws (key 10) in the lower cover (key 21) and tighten uniformly to ensure proper seal.

Upper Case Maintenance

1. Remove pressure from the pilot.
2. Loosen locknut (key 2) and back out adjusting screw (key 1) until compression is removed from the spring. Remove cap (key 3).
3. Lift the spring carrier (key 6), spring (key 7), and O-ring (key 4) out of the upper cover (key 8). Inspect O-ring and replace if necessary.
4. Remove machine screws (key 10) from lower cover (key 21) and the separate lower cover from the body (key 16), unless removed during lower diaphragm maintenance. Use a wrench to hold stem (key 23) securely while removing the stem nut (key 26).
5. Remove remaining loose components: washer, upper diaphragm plate, diaphragm, lower diaphragm plate, and O-rings (keys 11, 13, 14, 15, 18, and 25). Inspect diaphragm and O-rings for damage or wear, and replace if necessary.
6. Lightly lubricate the O-ring (key 25). Place O-ring over the stem (key 23) and press it down into the body (key 16).

7. Set the lower diaphragm plate (key 15) into the body (key 16).
8. Lightly lubricate the rims of the diaphragm (key 14) and place it in the body (key 16) on top of the lower diaphragm plate (key 15).
9. Set the upper diaphragm plate (key 13) on top of the diaphragm (key 14).
10. Place washer (key 11) and stem nut (key 26) on the stem (key 23) and tighten using a wrench to hold the stem.
11. Set the spring carrier (key 6).

Damper and Restrictor Maintenance

1. Remove screw (key 31) and plate (key 29).
2. Remove ring nuts (key 30).
3. Remove damper adjusting screw (key 27). Remove and inspect O-ring (key 28) for damage or wear, and replace if necessary. Lightly lubricate O-ring before placing on the adjusting screw. Insert damper adjusting screw into the body (key 16) and tighten. Insert ring nut (key 30) and tighten. Back out damper adjusting screw until it stops.
4. Remove restrictor adjusting screw (with hole) (key 32). Remove and inspect O-ring (key 28) for damage or wear, and replace if necessary. Lightly lubricate O-ring before placing on the adjusting screw. Insert restrictor adjusting screw into the body (key 16) and completely tighten. Insert ring nut (key 30) and completely tighten. Back out restrictor adjusting screw 1/2 turn.

Note

When using a Type PRX/120 pilot with a Type PRX/125 pilot as a monitor, use the following settings:

- **Restrictor - completely tighten and then back out three full turns.**
 - **Damper - back out until it stops.**
5. Install plate (key 29) and screw (key 31).

Types PS/79 and PS/80 Pilot (See Figure 7)



Servicing should be carried out by qualified, skilled personnel only. For further information, please contact our Technical Support Engineers or our authorized dealers.

Before servicing, cut off regulator inlet and outlet and release any trapped pressurized gas. Use suds to check that there are no leaks.

Replacing Filter

1. Remove the screws (key 41), cover (key 59), and replace filter (key 61). Reassemble by reversing the above sequence.

Replacing Stabilizer Diaphragm and Seal Pad

1. Remove screws (key 41), cover (key 64), spring (key 47) and diaphragm assembly (keys 48, 49, 50, 51, 52, and 53). Replace diaphragm if necessary.
2. Unscrew seat (key 54) and replace pad holder (key 56).
3. Reassemble by reversing the above sequence.

Replacing Valve Seal Pads

1. Remove plug (key 27) and seat (key 30). Slide out spring (key 32), pad holder (key 34) and forked stem (key 35).
2. Replace pad holder (key 34) and O-ring (key 37).
3. Reassemble by reversing above sequence.

General Maintenance

1. Completely release spring (key 5) by turning the adjusting screw (key 1) counterclockwise.
2. Remove screws (key 7) and cover (key 4).
3. Keep plate (key 9) blocked with a box wrench, unscrew nut (key 6). This must be done exactly as described to prevent damage to or breaking of safety valve (key 20).
4. Unscrew plate (key 9) from stem (key 13) remove diaphragm, plate, and O-ring (keys 10, 11, and 12) and slide off split pin (key 40).

5. Remove locknut (key 16) with appropriate wrench and slide out GACO ring, thrust bearing, spring, and safety valve (keys 17, 18, 19, and 20).
6. Make sure that the surface of seat (key 26) which is sealed by pad (key 21) is in proper condition.
7. Replace diaphragm (key 10) and all seals.
8. Proceed as directed in the replacement of filter, stabilizer diaphragm and seal pad, and valve seal pads (see instructions above).

Reassembly

Lubricate the static O-rings with a thin layer of Molykote 55 M, be very careful not to damage the O-rings when reassembling. No other pilot parts are to be lubricated. Reassemble parts by reversing the above steps. As you proceed, make sure that parts move freely and without friction. In addition:

1. Once lever (key 39) and stem (key 13) have been mounted, check lever with stem against body (key 25). Clearance between forked stem (key 35) and register of lever (key 39) is 0.2 to 0.3 mm / 8 to 12 milli-inch. If not, use register to correct.

CAUTION

The above clearance can be checked by gently pulling stem (key 13) upward. Use the proper tool to make sure that the top plate (key 9) is on the same plane as that supporting the diaphragm (key 10) in the body (key 25).

2. Mount diaphragm (key 10) and screw on plate (key 9), first by hand then with box wrench, (always holding upper diaphragm (key 10) firmly in place) in order to avoid damage to stem (key 13) and levers below.
3. Hold plate (key 9) firmly in place with box wrench, tighten nut (key 6).
4. Before remounting cover (key 4), center diaphragm as follows: mark a reference point (with pencil) on the diaphragm; turn it to the right without forcing and mark another reference on body. Now turn diaphragm to the left and mark a further reference. Position the diaphragm mark midway between the two marks on the body.
5. Tighten all screws uniformly to ensure proper sealing.

CAUTION

The pilot has a wide range of self-adjustment values. However, given actual operating conditions, it may necessary to assist it at times by finding the best setting of pin screw/register (key 29) or the most suitable calibration orifice/jet (key 15).

Type PRX/131 Booster Valve Booster Valve (See Figure 8)

CAUTION

Servicing should be carried out by qualified, skilled personnel only. For further information, please contact our Technical Support Engineers or our authorized dealers.

Ordinary Maintenance

1. Disconnect and remove the pilot from the line.
2. Fully unscrew the adjusting screw (key 1).
3. Unscrew the cap (key 3), remove the spring holder (key 6) and the spring (key 7). Replace the O-rings (keys 4 and 5).
4. Loosen screws (key 10), remove the upper cover (key 8) and the lower cover (key 21). Replace the O-ring (key 18).
5. Lock the stem (key 23) by inserting a key into the notches and unscrew nuts (keys 20 and 26).
6. Disassemble the parts and replace the diaphragm (key 14) and the pad (key 22).
7. Unscrew the seat (key 19) and replace the O-ring (key 17).
8. Use petrol to cleanse the pilot body and all metal parts. Blow them thoroughly with compressed air and check for clear holes along gas conduits. Replace any worn parts.

Reassembly

Reassemble all parts by following in reverse order the assembly as described above (see Ordinary Maintenance section).

As parts are assembled, make sure they move freely causing no friction.

CAUTION

- a. O-rings and diaphragms should be lubricated by applying a thin layer of 'Molykote 55 M' grease. Pay attention not to damage them during reassembly. All other pilot parts require no lubrication.
- b. The cover clamping screws (key 10) should be tightened evenly to ensure proper tightness.
- c. Pilot operation, calibration, and tightness should be tested as described under periodical checks.
- d. Previously disassembled fittings must be connected. Check for leaks by using suds.

Type V/31-1 Booster Valve (See Figure 9)

Overhaul booster valve when servicing monitor. Remove cover (key 4) and replace pad (key 19), diaphragms (keys 10 and 23) and O-ring (key 18). When remounting, make sure that the tightening of the ring nut (key 25) does not put undue stress on diaphragm (key 23). Set valve at no less than 5 mbar / 0.73 psig over monitor's pilot pressure. Any value below this will result in a lower than desired flow rate.

Type SA/2 Filter/Stabilizer (See Figure 10)

Note

The ports marked H in the top view of Figure 10 are optional heating ports.

1. Remove pressure from the Type SA/2.
2. Remove cap screws, washers, and nuts (keys 2, 9, and 10) from body (key 7) and the separate upper and lower covers (keys 11 and 19) from the body (key 7). When separating the covers from the body, be aware of loose components: (keys 1, 3, 4, 8, 12, 18, 20, and 21).

3. Remove and inspect O-ring (key 13) for damage or wear, and replace if necessary. Lightly lubricate the O-ring before placing it back in the cover (key 11).
4. Clean filter net (key 8). Replace filter pad (key 12).
5. Inspect diaphragm (key 18) for damage or wear, and replace if necessary. Check the seating surface of the orifice in the screw (key 17) for erosion, scratches, spurs, or other damage, and replace if necessary.
6. Unscrew and remove the seat (key 5). Inspect O-ring (key 6) for damage or wear, and replace if necessary. Lightly lubricate the O-ring and place it on the seat (key 5).
7. Pull the pad holder (key 15) out of the body (key 16). Inspect the seat for damage, and replace if necessary.
8. Set the pad holder (key 15) on the spring (key 14) and insert the seat (key 5). Tighten the seat (key 5) until it stops.
9. Lightly lubricate the outer and inner rims of the diaphragm (key 18). Place the diaphragm assembly on top of the seat (key 5). The screw (key 17) will slide into the seat (key 5). Use care to avoid damage to parts when reassembling.
10. Set the spring (key 1) on top of the nut (key 21).
11. Align the cover (key 19) over the body (key 7) with the sensing port (V) opposite the pilot supply port (R).
12. Place the filter pad (key 12) and filter net (key 8), one on each side of the filter pad, on the inlet cover (key 11).
13. Pick up the body (key 7) and place it on the inlet cover (key 11) with the inlet port (M) aligned vertically with the sensing port (V).
14. Insert cap screws (key 2). Place washers (key 9) and nuts (key 10) on the end of the screws. Tighten the nuts.

Parts Ordering

Contact your local Sales Office when ordering replacement parts. Separate kits containing all recommended spare parts are available.

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

Parts List

Type FLA Main Valve (Figure 4)

Key	Description	
	Parts Kit (include keys 2, 3, 4, 10, 18, 20, 26, 28, 35, 38, 46, and 47)	See Table 3
1	Inlet Flange	
2*	Anti-Friction Ring	
3*	O-ring	
4*	Body O-ring	
5	Screw	
6	Spring	
7	Fitting	
8	Inlet Plate	
9	Screw	
10*	Diaphragm	
11	Inlet Cover	
12	Outlet Plate	
13	Outlet Cover	
14	Washer	
15	Nut	
16	Sleeve	
17	Fitting	
18**	O-ring	
19	Pad Holder	
20**	Pad	

Type FLA Main Valve (continued)

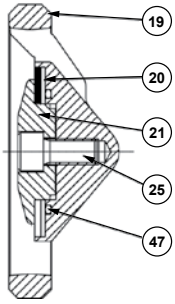
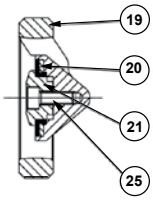
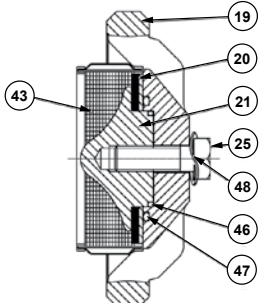
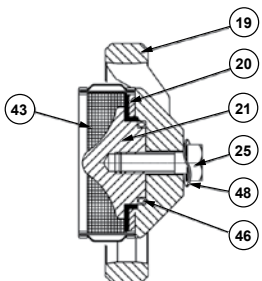
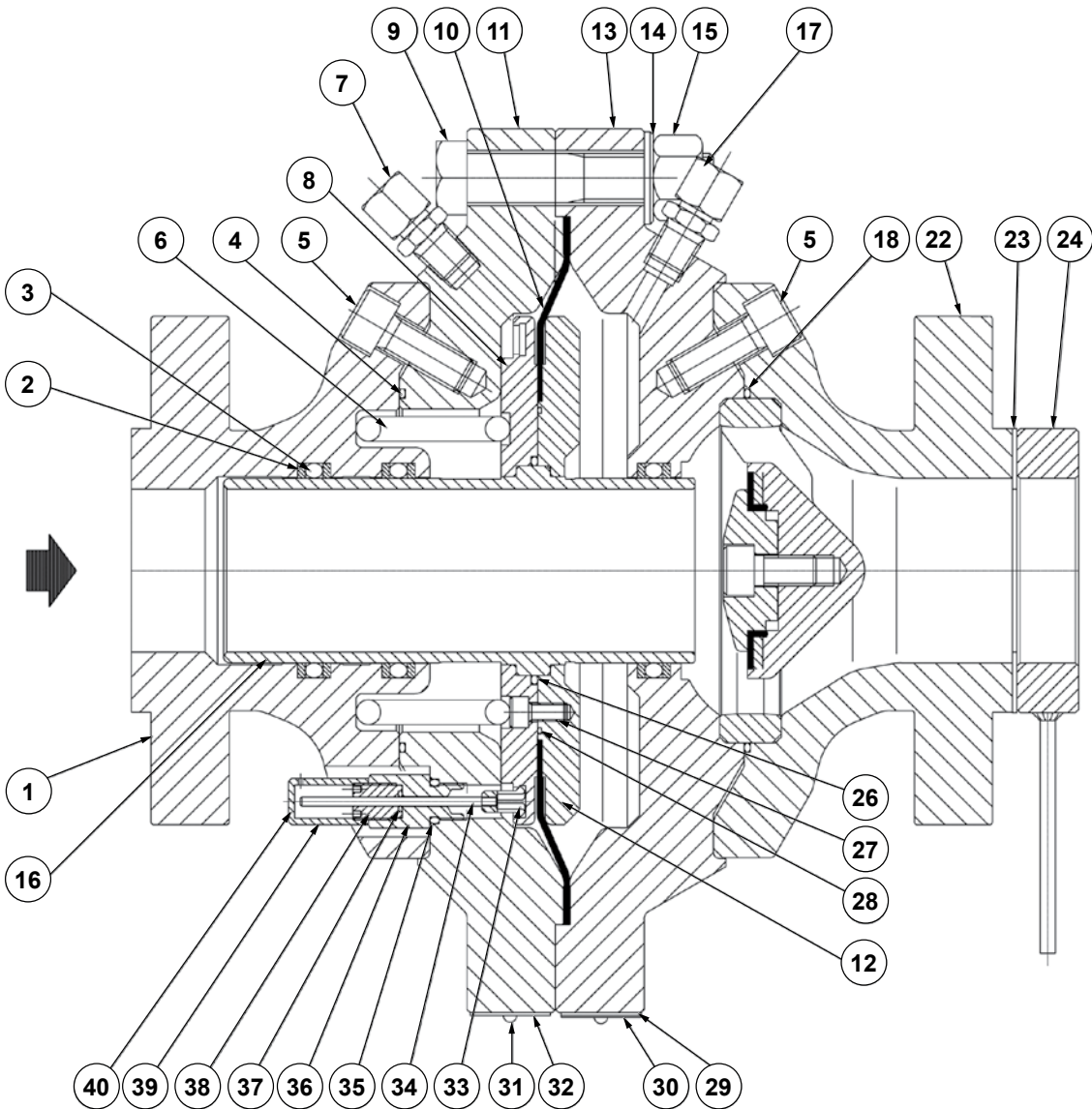
Key	Description
21	Pad Retainer
22	Outlet Flange
23	Gasket
24	Disassembly Spacer
25	Screw
26*	O-ring
27	Screw
28*	O-ring
29	Metal Plate
30	Nameplate Sticker
31	Drive Screw
32	Flow Arrow
33	Spring Collet
34	Indicator
35*	O-ring
36	Support
37*	O-ring
38	Bush
39	Indicator Label
40	Indicator Cover
43	Type SR Silencer
46**	O-ring
47**	O-ring
48	Washer

Type SRS Main Valve (Figure 5)

Key	Description
23*	Gasket
24	Flange Spacer
200	Widened Outlet Flange
201	Retainer
202	Nut
203	Attenuator Late
204	Spring Pin
205	Flange
206	Nut
207	Attenuator Plate
208	Attenuator Plate
209	Stud Bolt
210	Spring Cage
211	Spring

*Recommended Spare Parts.
 **Indicates Part included on Commissioning Kits.

FLA Series

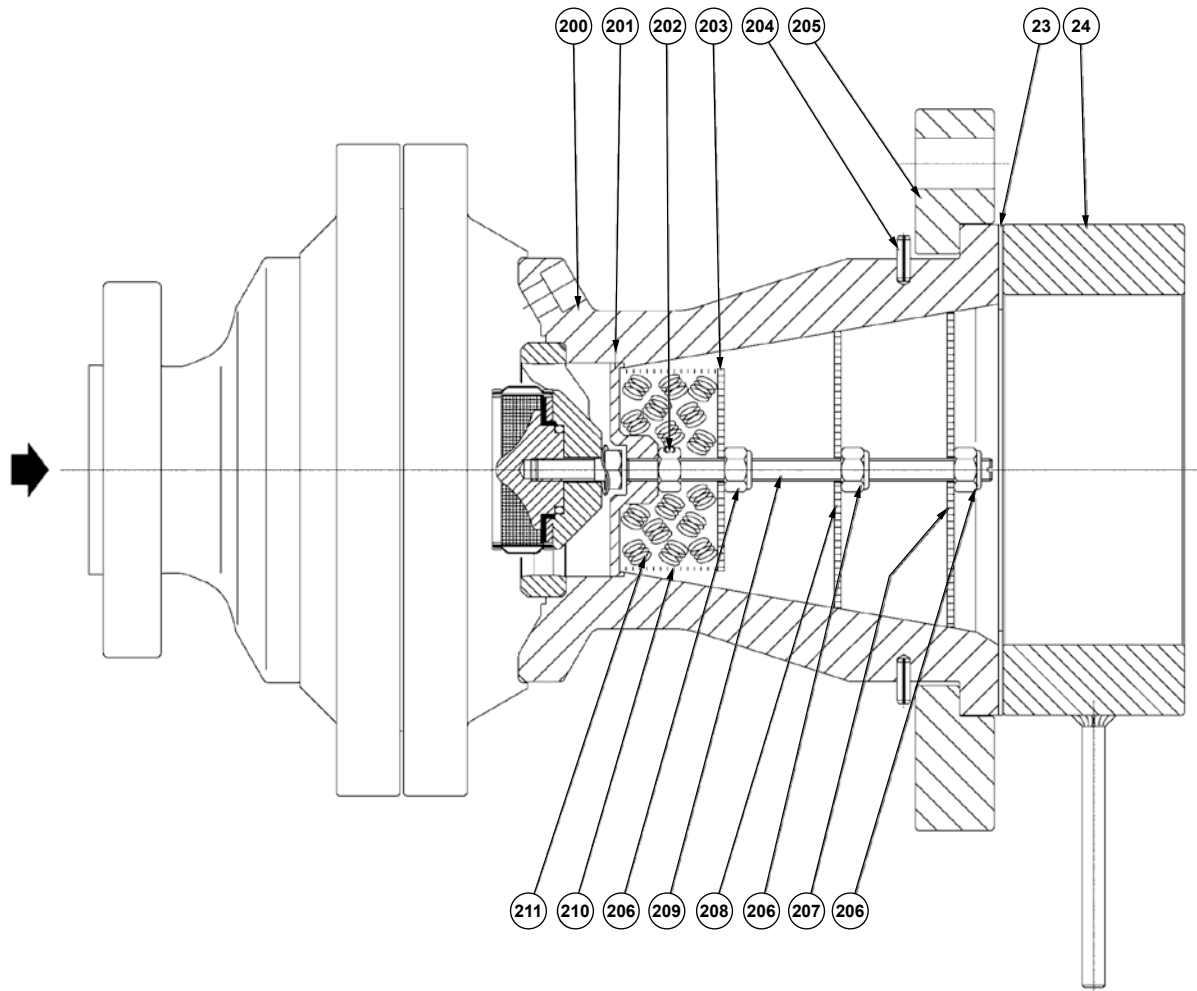


DETAILS WITH TYPE SR SILENCER

DETAILS WITHOUT SILENCER

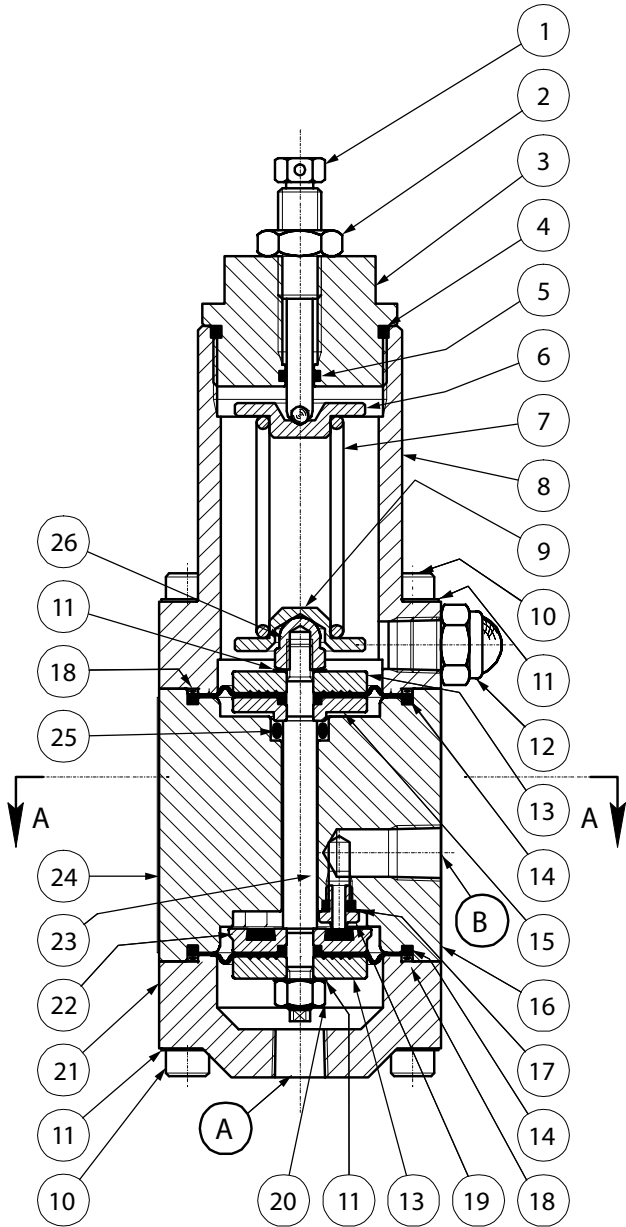
Figure 4. Type FLA Main Valve Assembly

Asia Pacific Only

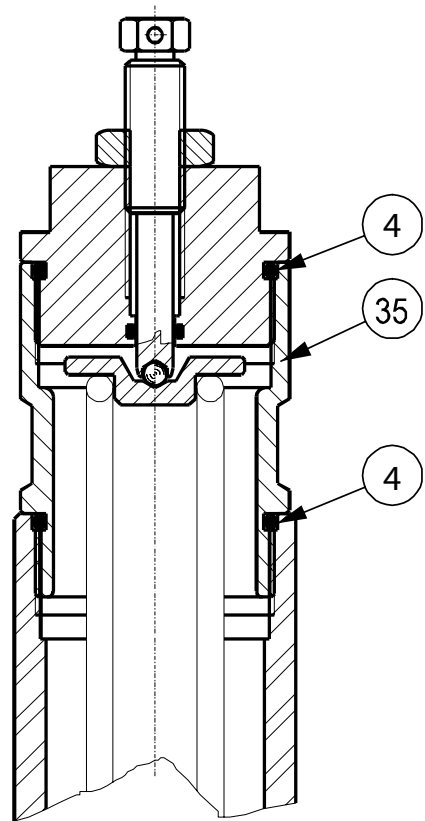


Asia Pacific Only

Figure 5. Type SRS Assembly



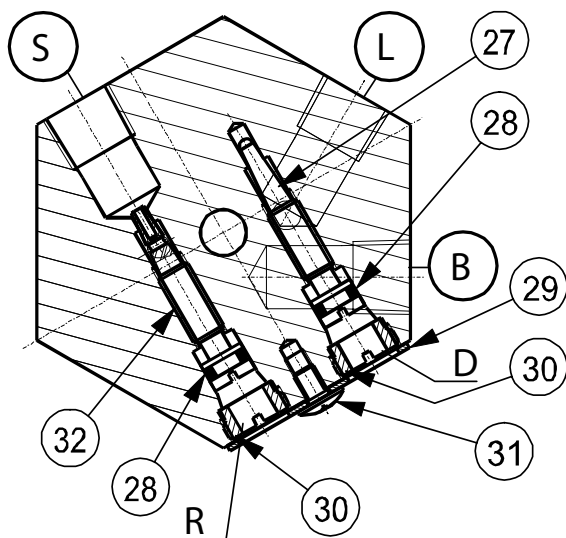
TYPES PRX/120 AND PRX/125 PILOT ASSEMBLY



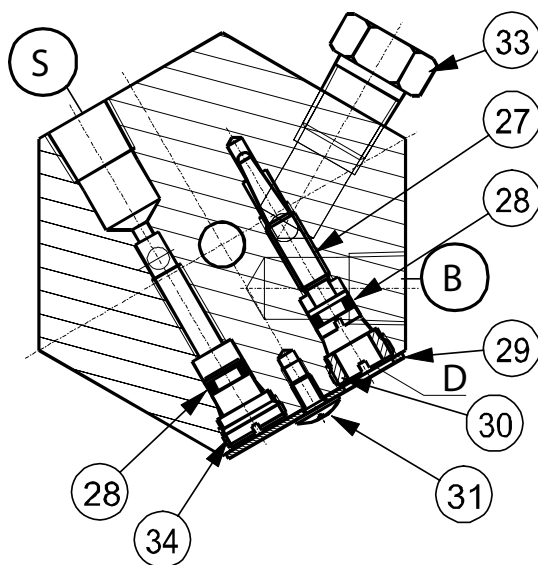
TYPE AP VERSION

Asia Pacific Only

Figure 6. PRX/120 and PRX/125 Series Pilot Assemblies



TYPE PRX/120 - SECTION A-A

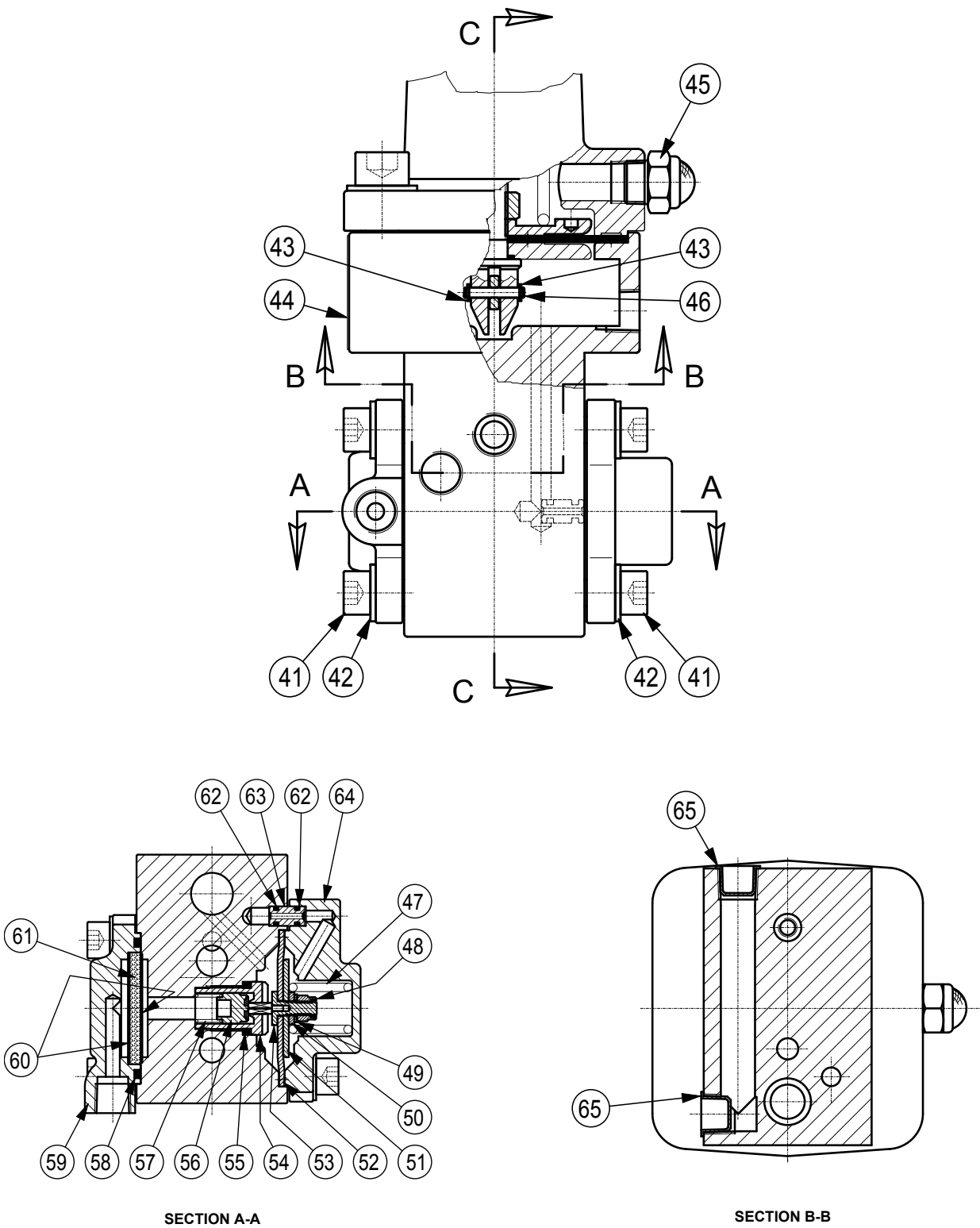


TYPE PRX/125 - SECTION A-A

Table 2. Type PRX/120 Connections

CODE	BOOT TRIM	TUBE AND HARD TRIM
A	Downstream impulse	Downstream impulse
B	Outlet discharge	Pilot feed
S	Pilot feed	Outlet discharge
L	To regulator loading pressure chamber	To regulator loading pressure chamber

Figure 6. PRX/120 and PRX/125 Series Pilot Assemblies (continued)

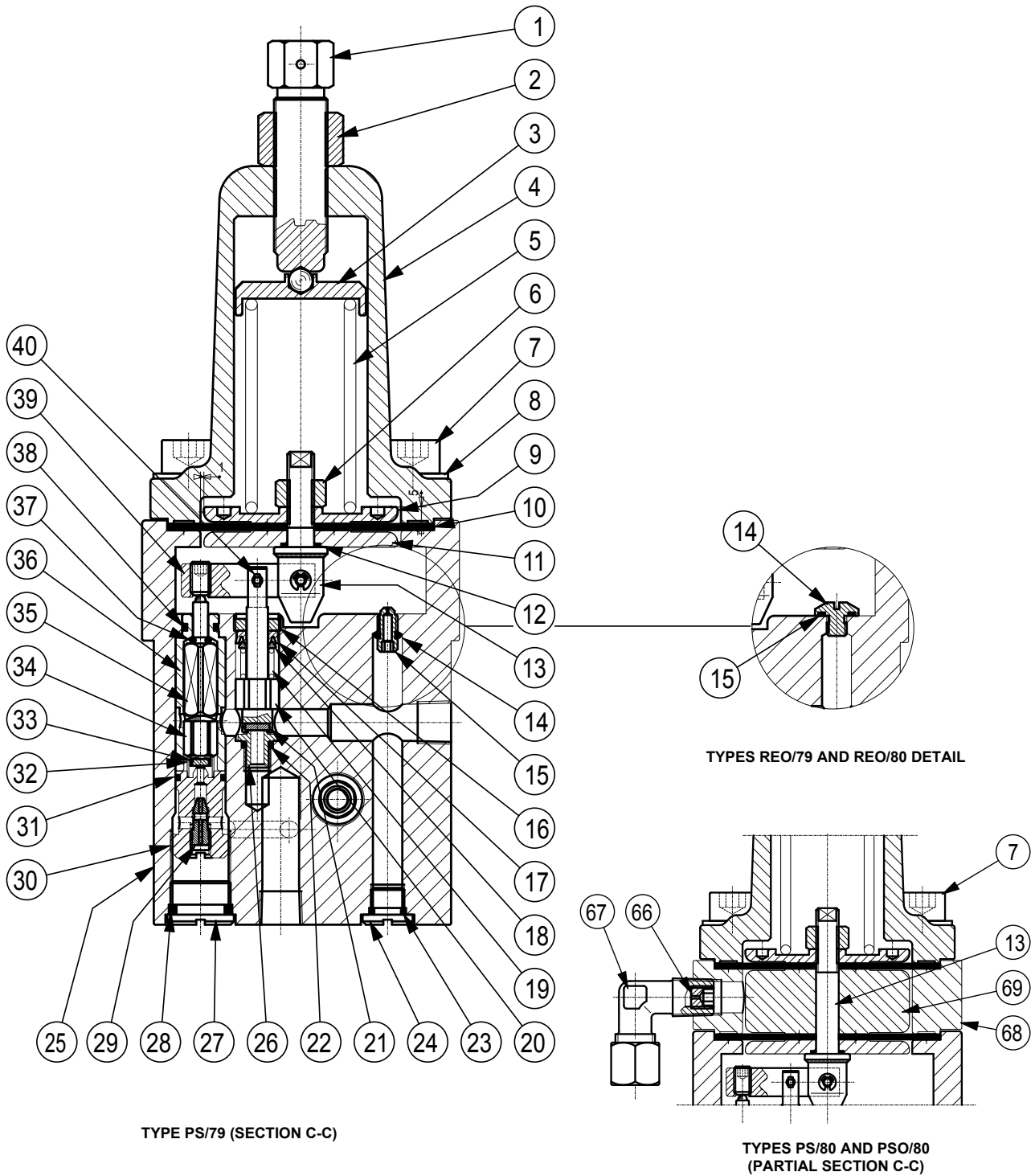


SECTION A-A

SECTION B-B

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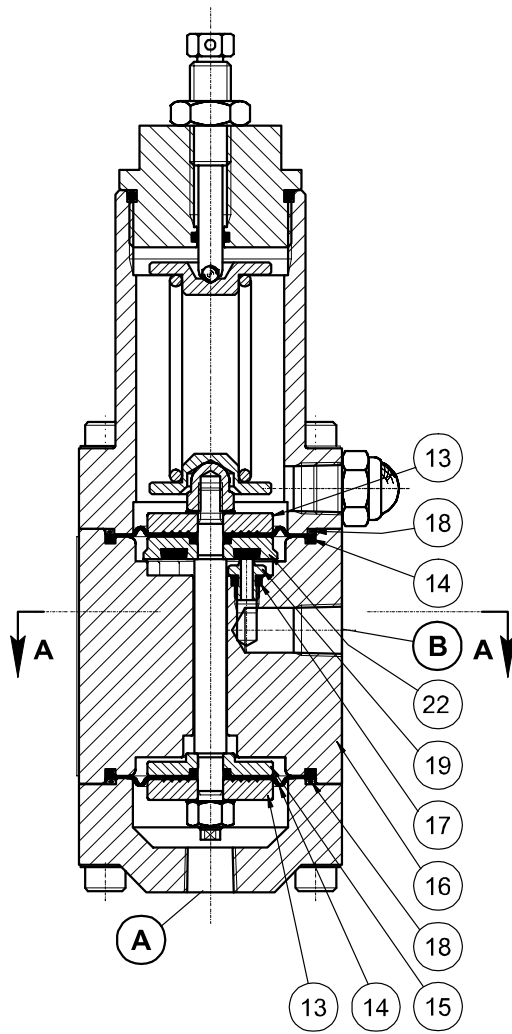
Figure 7. Types PS/79 and PS/80 Detailed Pilot Assemblies



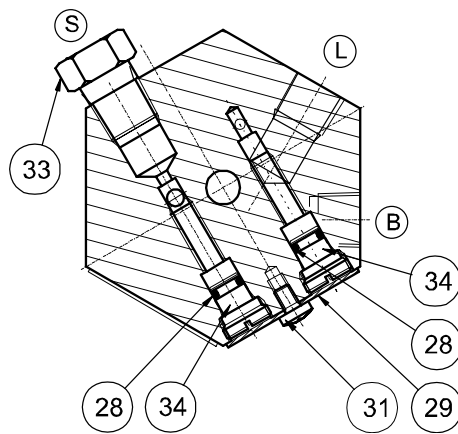
Asia Pacific Only

LM/1346

Figure 7. Types PS/79 and PS/80 Detailed Pilot Assemblies (continued)



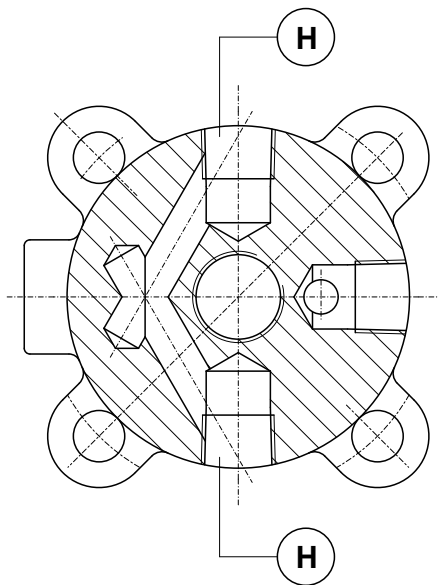
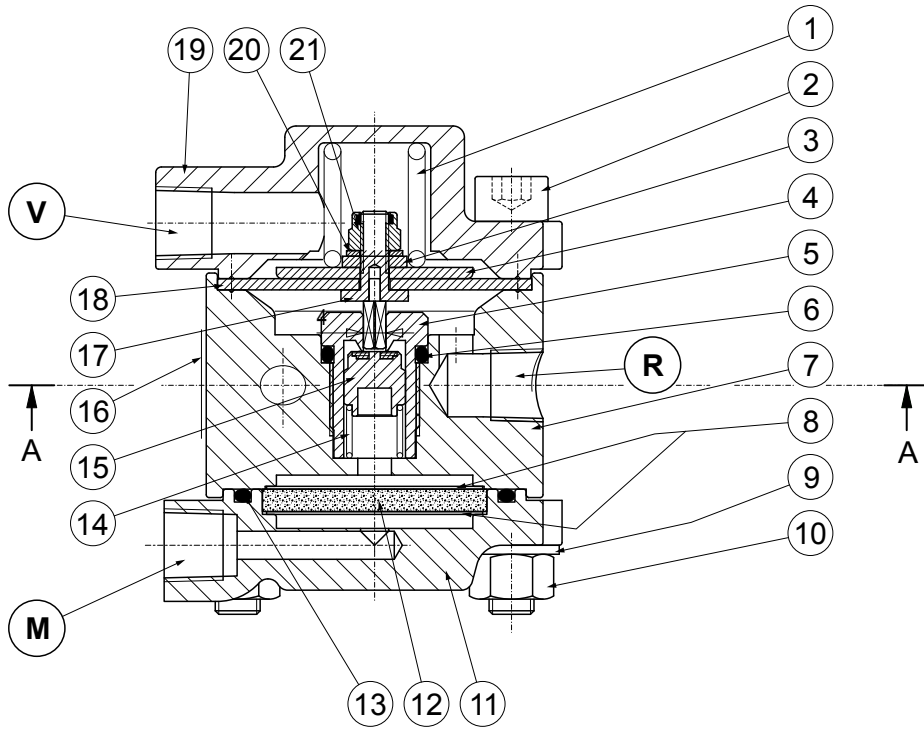
TYPE PRX/131 BOOSTER VALVE ASSEMBLY



SECTION A-A

Figure 8. Type PRX/131 Booster Valve Assembly

FLA Series



H - WATER INLET/OUTLET
M - UPSTREAM OF THE REGULATOR
R - TO THE FEEDING OF THE PILOT
V - DOWNSTREAM OF THE REGULATOR

SECTION A-A

LM/1162

Figure 10. Type SA/2 Pilot Supply Filter/Stabilizer Assembly

Asia Pacific Only

Types PRX/120, PRX/125, PRX-AP/120, and PRX-AP/125 Pilot (See Figure 6)

Key Description

Elastomer Parts Kits (include keys 4, 5, 14, 17, 18, 25, and 28)	
Types PRX/120 and PRX/125	
Nitrile (NBR) Rubber	RPRX00X0N12
Fluorocarbon (FKM)	RPRX00X0F12
Types PRX/120-AP and PRX/125-AP	
Nitrile (NBR) Rubber	RPRX00X0N12
Fluorocarbon (FKM)	RPRX00X0F12
1	Adjusting Screw
2	Locknut
3	Cap
4*	Upper Cover O-ring
5*	O-Ring
6	Spring Carrier Plate
7	Spring
8	Upper Cover
9	Spring Carrier Plate
10	Machine Screw
11	Washer
12	Filter
13	Diaphragm Plate
14*	Diaphragm
15	Diaphragm Plate
16	Body
17*	Seat O-ring

Types PRX/120, PRX/125, PRX-AP/120, and PRX-AP/125 Pilot (See Figure 6) (continued)

Key Description

18*	Lower Cover O-ring
19	Orifice
20	Nut
21	Lower Cover
22*	Pad Holder
23	Stem
24	Nameplate
25*	Stem O-ring
26	Upper Diaphragm Nut
27	Damper Adjusting Screw
28*	Restrictor/Damper O-ring
29	Plate
30	Ring Nut
31	Damper/Restrictor Screw
32	Restrictor Adjusting Screw with Hole
33	Plug
34	Plug
35	Spring Barrel Extension for AP version

Table 3. FLA Series Parts Kit Parts Number

MATERIAL	SIZE, DN / NPS					
	25 / 1	40 / 1-1/2	50 / 2	80 / 3	100 / 4	150 / 6
Nitrile (NBR) Rubber	GD89973X012	GD89977X012	GD89972X012	GD89971X012	GD89970X012	GD89969X012
Fluorocarbon (FKM)	GD89973X022	GD89977X022	GD89985X022	GD89972X022	GD89970X022	GD89969X022
Nitrile (NBR) Rubber SR-SRS	GD89973X012	GD89976X012	GD89972X012	GD89971X012	GD89970X012	GD89969X012
Fluorocarbon (FKM) SR-SRS	GD89973X022	GD89976X022	GD89972X022	GD89971X022	GD89970X022	GD89969X022

*Recommended Spare Parts.

FLA Series

Types PS/79 and PS/80 (See Figure 7)

Key	Description
1	Adjusting screw
2	Nut
3	Spring holder
4	Cover
5	Spring
6	Nut
7	Screw
8	Washer
9	Plate
10*	Diaphragm
11	Plate
12*	O-ring
13	Stem
14*	O-ring
15*	Jet
16	Locknut
17*	"GACO" Ring
18	Thrust bearing
19	Spring
20	Safety valve
21*	Pad
22*	O-ring
23*	O-ring
24	Plug
25	Body
26	Seat
27	Plug
28*	O-ring
29	Pin screw
30	Seat
31*	O-ring
32	Spring
34*	Pad holder
35	Forked stem
36	Spacer
37*	O-ring
38*	O-ring
39	Lever
40	Split pin
41	Screw
42	Washer
43	Seeger
44	Data plate
45	Silencer
46	Pin
47	Spring
48	Autolocking nut
49	Washer

Types PS/79 and PS/80 (continued)

Key	Description
50	Washer
51	Plate
52*	Diaphragm
53	Screw
54	Seat
55*	O-ring
56*	Pad holder
57	Spring
58*	O-ring
59	Filter cover
60	Filter net
61*	Felt
62*	O-ring
63	Pawl
64	Cover
65	Plug

Type PS/80 Pilot Only

Key	Description
66	Elbow Fitting
67	Screw
68	Middle flange
69	Hub

Type PRX/131 Booster Valve (See Figure 8)

Key	Description
1	Adjusting screw
2	Nut
3	Cap
4*	O-ring
5*	O-ring
6	Spring carrier plate
7	Spring
8	Upper cover
9	Spring carrier plate
10	Screw
11	Washer
12	Filter
13	Plate
14*	Diaphragm
15	Plate
16	Body
17*	O-ring
18*	O-ring
19	Seat
20	Nut

*Recommended Spare Parts

Type PRX/131 Booster Valve (continued)

Key	Description
21	Lower cover
22*	Pad holder
23	Stem
24	Plate
25*	O-ring
26	Nut
28*	O-ring
29	Plate
31	Screw
33	Plug
34	Plug

Type V/31-1 Booster Valve (See Figure 9)

Key	Description
1	Adjusting screw
2	Nut
3	Cap
4	Cover
5	Spring holder
6	Spring
7	Nut
8	Washer
9	Plate
10*	Diaphragm
11	Plate
12	Washer
13	Nut
14	Screw
15*	Gasket
16	Fitting
17	Seat
18*	O-ring
19*	Pad
20	Stem
21	Stem Guide
22	Plate

Type V/31-1 Booster Valve (continued)

Key	Description
23*	Diaphragm
24	Washer
25	Ring nut
26	Body
27*	Gasket
28	Screw
29	Data Plate

Type SA/2 Pilot Supply Filter Regulator (Figure 10)

Key	Description	
	Elastomer Parts Kits (include keys 6, 12, 13, 15, and 18)	
	Nitrile (NBR) Rubber	GD89995X012
	Fluorocarbon (FKM)	GD89995X022
1	Spring	
2	Socket head cap screw	
3	Washer	
4	Plate	
5	Regulator seat	
6*	O-ring	
7	Body	
8	Filter Net	
9	Washer	
10	Nut	
11	Filter cover	
12*	Filter Pad	
13*	O-ring	
14	Spring	
15*	Pad holder	
16	Nameplate	
17	Screw	
18*	Diaphragm	
19	Regulator cover	
20	Spring washer	
21	Nut	

*Recommended Spare Parts

FLA Series

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