Type 99 Pressure Reducing Regulators

Introduction

Scope of the Manual

This manual describes and provides instructions and parts lists for Type 99 pressure reducing regulators complete with standard P590 Series integral filter. However, complete instructions and parts listing for the Type 1301F pilot supply regulator, and other Fisher® equipment, such as monitoring pilots will be found in separate instruction manuals.

Description

The Type 99 gas regulators provide a broad capacity for controlled pressure ranges and capacities in a wide variety of distribution, industrial, and commercial applications.

A Type 99 regulator has a Type 61L (low pressure), Type 61H (high pressure), or a Type 61HP (extra high pressure) pilot integrally mounted to the actuator casing as shown in Figure 1. The Type 99 regulator can handle up to 1000 psig (69,0 bar) inlet pressures (the 1000 psig (69,0 bar) regulator requires a Type 1301F pilot supply regulator and a Type H110 pop relief valve). The pilot supply regulator reduces inlet pressure to a usable 200 psig (13,8 bar) for the extra high pressure pilot. This regulator comes standard with O-ring seals on the guide bushing and valve carrier (key 26, Figure 7) to keep main valve body outlet pressure from interfering with outlet pressure in the lower casing assembly (key 29, Figure 9).

Specifications

WARNING

Since a pilot-operated regulator is constructed of both a pilot and a main valve, care should be used not to exceed the maximum inlet pressure shown on the nameplate of either unit. When inlet pressure exceeds the pilot limitation, a pilot supply reducing regulator and/or relief valve will be required.

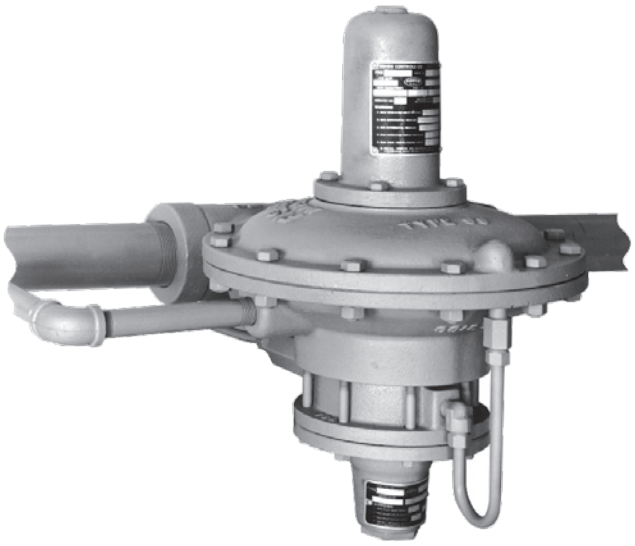

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Figure 1. *Type 99 Regulator with Type 61H (high pressure) Pilot*

Specifications and ratings for various Type 99 constructions are listed in the Specifications section on page 2. Some specifications for a given regulator as it originally comes from the factory are stamped on nameplates located on the pilot and actuator spring cases. A tag (key 159, Parts List) additionally may be installed on the pilot to indicate a regulator with O-ring stem seal. These regulators and their installations should be checked for compliance with applicable codes.

D100260X012

Specifications

Body Size and End Connection Styles
2-inch (DN 50) body with NPT; CL125, CL150, CL250, or CL300 flanged; or SWE

Maximum Allowable Inlet Pressure(1)
160 psig (11,0 bar): When using Type 61LD pilot
400 psig (27,6 bar): When using Types 61L/ 61H pilots
600 psig (41,4 bar): Type 61HP pilot (5/8-inch (15,9 mm) orifice maximum)
1000 psig (69,0 bar): Type 61HP pilot, along with Type 1301F pilot supply regulator and Type H110 relief valve (1/2-inch (12,7 mm) orifice only)

Outlet (Control) Pressure Ranges
See Table 1

Approximate Proportional Bands
See Table 2

Maximum Allowable Pressure Drop(1)
See Table 3

Maximum Actuator Pressures(1)
Operating: 100 psig (6,90 bar)
Emergency: 110 psig (7,58 bar)

Maximum Pilot Spring Case Pressure for Pressure Loading(1, 2)
Types 61L, 61LD(3), and 61LE(4): 50 psi (3,45 bar) with special steel closing cap
Types 61H and 61HP: 100 psi (6,90 bar)

Minimum Differential Pressure Required for Full Stroke
See Table 3

Maximum Rated Travel
1/4-inch (6,35 mm)

Temperature Capabilities(1)
With Nitrile (NBR) / Neoprene (CR):
-20° to 180°F (-29° to 82°C)
With Fluorocarbon (FKM):
0° to 300°F (-18° to 149°C)

1. The pressure/temperature limits in this Instruction manual and any applicable standard or code limitation should not be exceeded.
2. For stability or overpressure protection, a pilot supply regulator may be installed in the pilot supply tubing between the main valve and pilot.
3. Type 61LD construction has narrower proportional band than does the standard Type 61L pilot.
4. Type 61LE construction has broader proportional band than does the standard Type 61L pilot.

Table 1. *Outlet Pressure Ranges*

PILOT TYPE	MAXIMUM PILOT SUPPLY PRESSURE, PSIG (bar)	OUTLET (CONTROL) PRESSURE RANGES	PILOT CONTROL SPRING			
			Part Number	Color Code	Wire Diameter, Inches (cm)	Free Length, Inches (cm)
61L	400 (27,6)	2 to 4-inches w.c. (5 to 10 mbar)	1B558527052	Orange	0.075 (0,19)	4-1/8 (10,5)
		3 to 12-inches w.c. (7 to 30 mbar)	1C680627222	Unpainted	0.080 (0,20)	3-1/4 (8,26)
61LD(1)	160 (11,0)	0.25 to 2 psig (0,02 to 0,14 bar)	1B886327022	Red	0.109 (0,28)	2-3/4 (7,00)
		1 to 5 psig (0,07 to 0,34 bar)	1J857827022	Yellow	0.142 (0,36)	2-3/4 (7,00)
		2 to 10 psig (0,14 to 0,69 bar)	1B886427022	Blue	0.172 (0,44)	2-7/8 (7,30)
61LE(2)	400 (27,6)	5 to 15 psig (0,34 to 1,03 bar)	1J857927142	Brown	0.187 (0,47)	2-7/8 (7,30)
		10 to 20 psig (0,69 to 1,38 bar)	1B886527022	Green	0.363 (0,92)	3-1/8 (7,94)
61H	400 (27,6)	10 to 65 psig (0,69 to 4,48 bar)	0Y0664000A2	Green stripe	0.363 (0,92)	6 (15,2)
61HP	600 (41,4)	35 to 100 psig (2,41 to 6,90 bar)	1D387227022	Blue	0.200 (0,51)	1-11/16 (4,29)

1. Type 61LD construction has narrower proportional band than does the standard Type 61L Pilot.
2. Type 61LE construction has broader proportional band than does the standard Type 61L Pilot.

Table 2. *Proportional Bands*

PILOT TYPES	PILOT CONTROL SPRING				PROPORTIONAL BANDS
	Part Number	Color Code	Wire Diameter, Inches (cm)	Free Length, Inches (cm)	
61LD	1B558527052	Orange	0.075 (0,19)	4-1/8 (10,5)	0.1 to 0.5-inch w.c. (0,25 to 1,0 mbar)
	1C680627222	Unpainted	0.080 (0,20)	3-1/4 (8,26)	
61L	1B886327022	Red	0.109 (0,28)	2-3/4 (7,00)	1 to 2-inches w.c. (2 to 5 mbar)
61LD	1B886327022	Red	0.109 (0,28)	2-3/4 (7,00)	0.25 to 1-inch w.c. (0,62 to 2 mbar)
61LE	1B886327022	Red	0.109 (0,28)	2-3/4 (7,00)	5 to 8-inches w.c. (12 to 20 mbar)
61L, 61LD, 61LE	1B886527022	Green	0.207 (0,53)	3-1/8 (7,94)	0.1 to 0.3 psi (0,007 to 0,02 bar)
	1J857927142	Brown	0.187 (0,47)	2-7/8 (7,30)	
	1B886427022	Blue	0.172 (0,44)	2-7/8 (7,30)	
	1J857827022	Yellow	0.142 (0,36)	2-3/4 (7,00)	
61H	0Y0664000A2	Green stripe	0.363 (0,92)	6 (15,2)	0.1 to 0.3 psi (0,007 to 0,02 bar)
61HP	1D387227022	Blue	0.200 (0,51)	1-11/16 (4,29)	1 to 2 psi (0,069 to 0,14 bar)

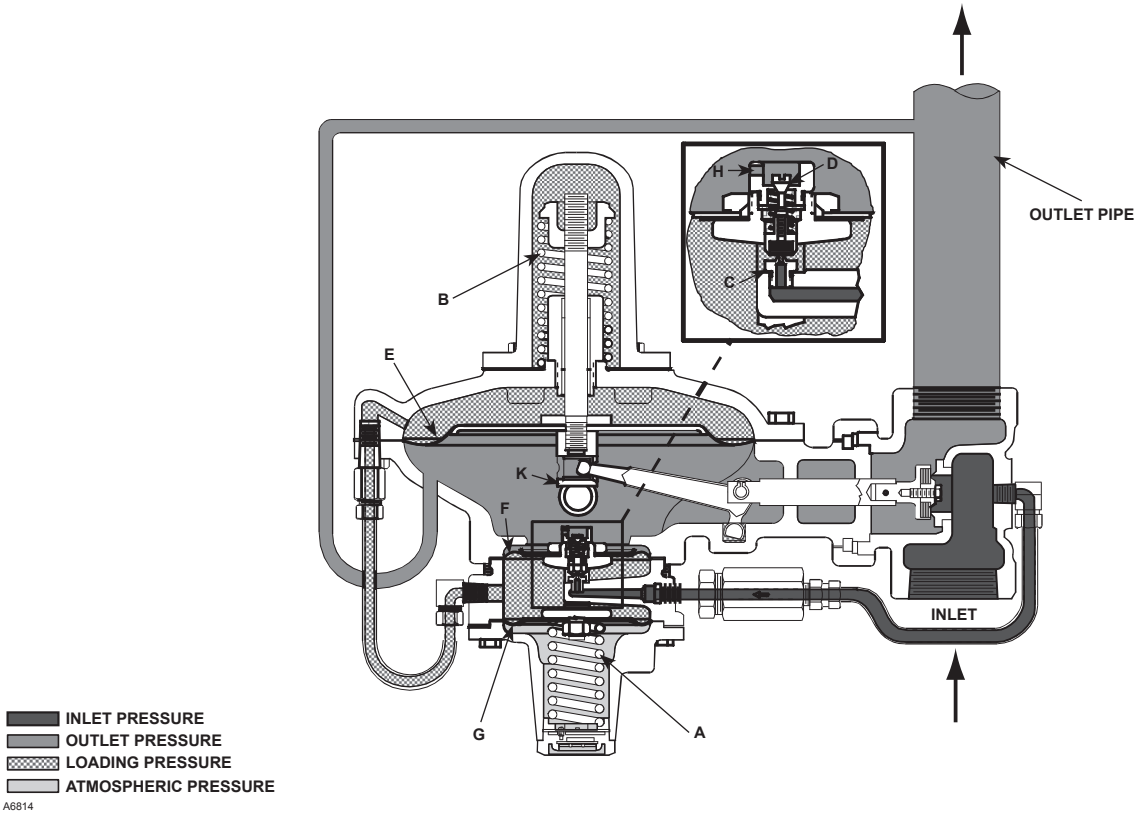


Figure 2. *Schematic of Type 99 Regulator with Type 61L (Low Pressure) Pilot*

Principle of Operation

The key to the operation of a Type 99 regulator is the yoked double-diaphragm pilot (letter keys in this section refer to both Figures 2 and 3 unless otherwise noted). Fast response and accuracy are made possible by the amplifying effect of the pressure-balanced pilot and by the two-path control system. The function of the pilot is to sense change in the controlled pressure and amplify it into a larger change in the loading pressure. Any changes in outlet pressure act quickly on both the actuator diaphragm and the loading pilot, thus providing the precise pressure control that is characteristic of a two-path system.

A typical pilot has an approximate gain of 20, which means the outlet pressure needs to droop only 1/20 as much as a self-operated regulator in order to obtain the same pressure differences across the main diaphragm. Advantages of a pilot operated regulator are high accuracy and high capacity.

Upstream or inlet pressure is utilized as the operating medium, which is reduced through pilot operation to load the main diaphragm chamber. Tubing connects the inlet pressure to the pilot through a filter assembly. Downstream or outlet pressure registers underneath the main diaphragm (E) through the downstream control line.

In operation, assume the outlet pressure is less than the setting of pilot control spring (A). The top side of pilot diaphragm assembly (F) will have a lower pressure than the setting of spring (A). Spring (A) forces the diaphragm head assembly upward, opening the relay or inlet orifice (C). Additional loading pressure is supplied to the pilot body and to the top side of main diaphragm (E).

This creates a higher pressure on the top side of the main diaphragm (E) than on the bottom side, forcing the diaphragm downward. This motion is transmitted through a lever, which pulls the valve disk open, allowing more gas to flow through the valve.

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 top of the pilot diaphragm head assembly (F). This pressure exceeds the pilot spring setting and forces the head assembly down, closing orifice (C). The loading pressure acting on the main diaphragm (E) bleeds to the downstream system through a small slot between the pilot bleed valve (D) and the bleed orifice (H).

Normally, excess loading pressure slowly escapes downstream around bleed valve (D) (Figure 3) or

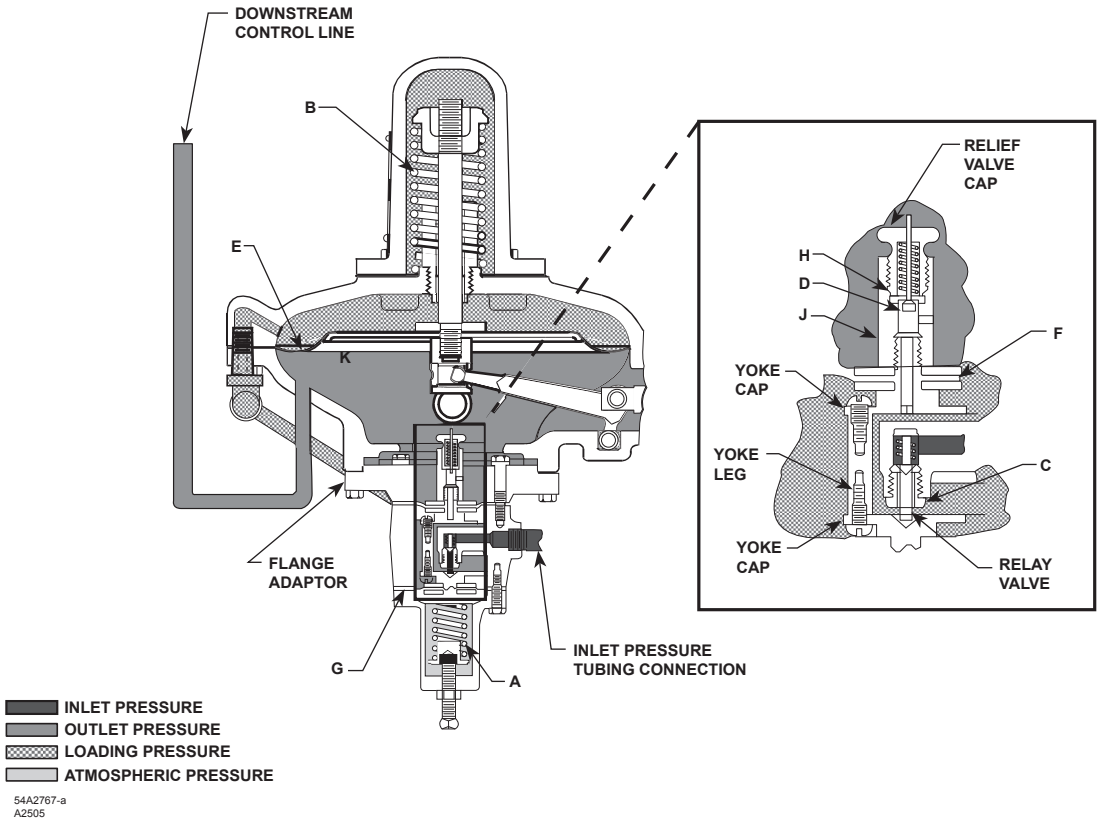


Figure 3. *Schematic of Type 99 Regulator with Type 61HP (Extra High Pressure) Pilot*

through the relief valve body (J) (Figure 4). Since loading pressure needs to exceed outlet pressure only moderately to stroke the main valve fully open, a continued increase in loading pressure differential extends the main diaphragm (E) and the pusher post assembly (K) far enough to separate the bleed valve (D) and the bleed orifice (H). This permits quick dumping of excess loading pressure into the downstream system.

With a decrease in loading pressure on top of the main diaphragm (E), the main spring (B) exerts an upward force on the diaphragm rod connected to the main diaphragm (E), pulling it upward. This moves the main valve toward its seat, decreasing flow to the downstream system.

Diaphragm (G) in the pilot valve acts as a sealing member for the loading chamber and as a balancing member to diaphragm (F). These two diaphragms are connected by a yoke so any pressure change in the pilot chamber has little effect on the position of the pilot valve. Therefore, the active diaphragm in the pilot is (F) and the pressure on the top side of this diaphragm opposes the force of the pilot control spring (A).

Monitoring Systems

Monitoring regulators serve as overpressure protection devices to limit system pressure in the event of open failure of a working regulator feeding the system. Two methods of using Type 99 regulators in monitoring systems are as follows:

Working Monitor

On a working monitor installation (Figure 4), the control line of the monitoring pilot is connected downstream of the working regulator. During normal operation, distribution pressure causes the monitoring pilot to stand wide open. Full pilot supply pressure enters the working monitor pilot and permits the working monitor regulator to control at its intermediate pressure setting.

Open failure of the working regulator increases distribution pressure as the working regulator goes wide-open. Intermediate pressure is then ignored by the monitoring regulator, which controls downstream pressure at its own pressure setting (slightly higher than the normal control pressure).

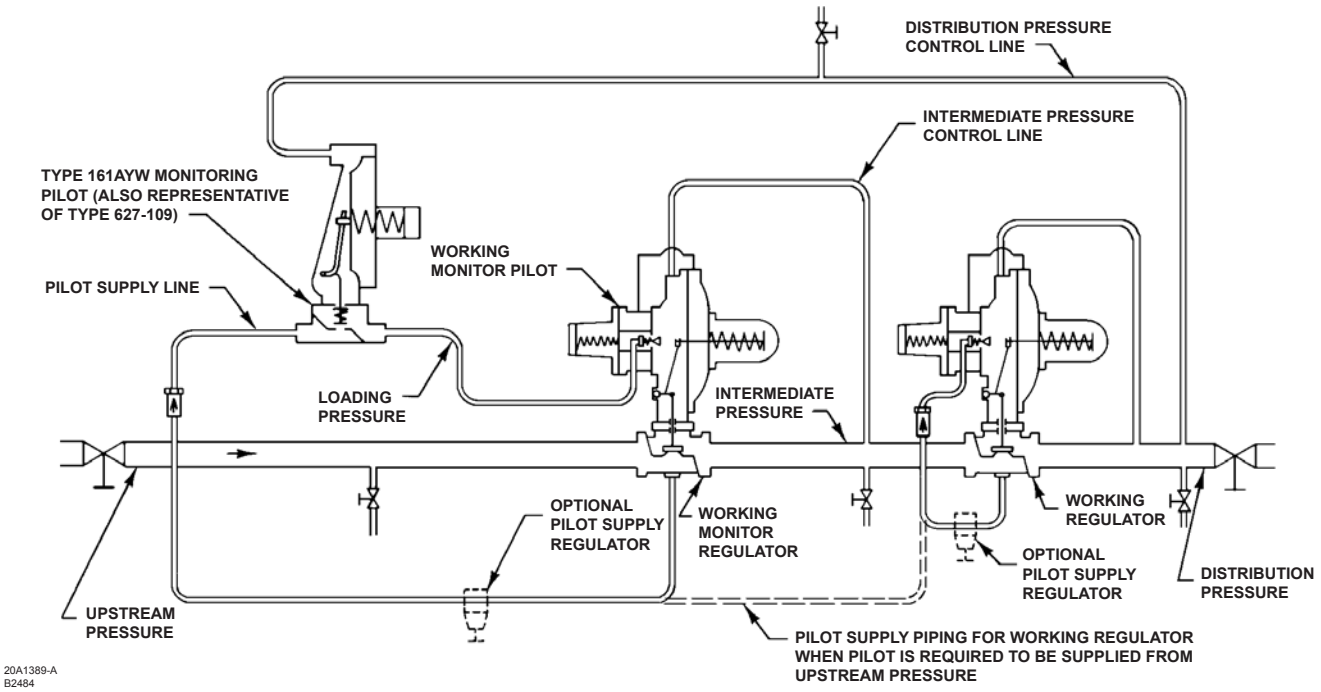


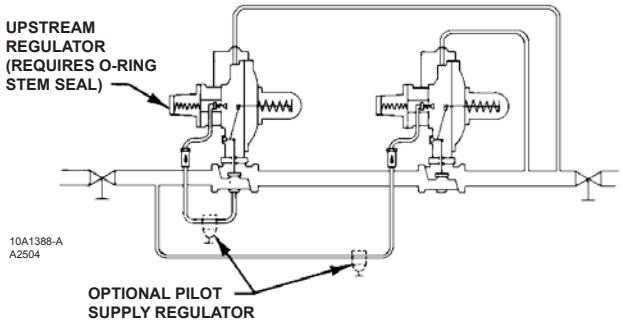
Figure 4. *Working Monitor Installation*

The monitoring pilot should be upstream of the working monitor regulator. This enables a closer setpoint between the working regulator and the monitoring pilot. Special Types 161AYW and 627-109 monitoring pilots with quick-bleed operation have been designed to give faster response to abnormal downstream conditions. Table 4 gives the spread between normal distribution pressure and the minimum pressure at which the working monitor regulator can be set to take over if the working regulator fails open.

Wide-Open Monitor

The control line of the upstream regulator is connected downstream of the second regulator (Figure 5), so that during normal operation the monitoring regulator is standing wide open with the reduction to distribution pressure being taken across the working regulator. Only in case of open failure of the working regulator does the wide-open monitoring regulator take control at its slightly higher setting.

The upstream regulator must have an O-ring seal on the valve carrier assembly. This seals off the leak path that otherwise would let line pressure ahead of the working regulator inlet try to close the wide-open monitoring regulator.



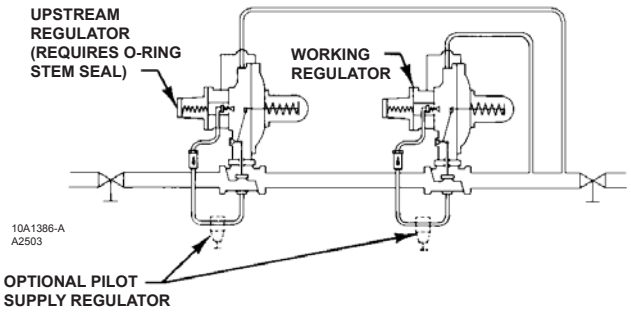


Figure 5. *Typical Wide-Open Monitor Installations*

Table 3. *Maximum Allowable Drop and Minimum Differential Pressures*

MAXIMUM ALLOWABLE PRESSURE DROP, PSIG (bar)	MAIN VALVE SPRING			MINIMUM DIFFERENTIAL PRESSURE FOR FULL STROKE, PSIG (bar)	SEAT MATERIAL	MAXIMUM PORT DIAMETER[1], INCHES (mm)
	Part Number	Wire Diameter, Inches (cm)	Free Length, Inches (cm)			
25 (1,72)	1C277127022	0.148 (0,38)	6 (15,2)	0.75 (0,05)	Nitrile (NBR), Neoprene (CR), Fluorocarbon (FKM)	1-1/8 (28,6)
50 (3,45)	1N801927022	0.156 (0,40)	7-1/8 (18,1)	1.5 (0,10)	Nitrile (NBR), Neoprene (CR), Fluorocarbon (FKM)	1-1/8 (28,6)
150 (10,3)	1B883327022	0.187 (0,47)	6-5/8 (16,8)	3 (0,21)	Nitrile (NBR), Neoprene (CR), Fluorocarbon (FKM)	1-1/8 (28,6)
175 (12,1)	1B883327022	0.187 (0,47)	6-5/8 (16,8)	3 (0,21)	Nitrile (NBR)[2], Neoprene (CR)[2], Fluorocarbon (FKM)[2]	7/8 (22,2)
250 (17,2)	1B883327022	0.187 (0,47)	6-5/8 (16,8)	3 (0,21)	Nitrile (NBR), Fluorocarbon (FKM)	7/8 (22,2)
	0W019127022	0.281 (0,71)	6 (15,2)	10 (0,69)	Nitrile (NBR)[3], Fluorocarbon (FKM)[3]	1-1/8 (28,6)
300 (20,7)	0W019127022	0.281 (0,71)	6 (15,2)	10 (0,69)	Nylon (PA)	1-1/8 (28,6)
400 (27,6)	0W019127022	0.281 (0,71)	6 (15,2)	10 (0,69)	Nylon (PA)	7/8 (22,2)
600 (41,4)	0W019127022	0.281 (0,71)	6 (15,2)	10 (0,69)	Nylon (PA)	5/8 (15,9)
1000 (69,0)	0W019127022	0.281 (0,71)	6 (15,2)	10 (0,69)	Nylon (PA)	1/2 (12,7)[4]

1. Can use all port diameters up to maximum size listed.
2. CL125 FF flanged body only.
3. O-ring seat only.
4. 1/2-inch (12,7 mm) is the only orifice available for 1000 psig (69,0 bar) maximum inlet pressure regulator.

Installation

WARNING

- **Personal injury, equipment damage, or leakage due to escaping gas or bursting of pressure-containing parts might result if this regulator is overpressured or is installed where service conditions could exceed the limits for which the regulator was designed, or where conditions exceed any ratings of the adjacent piping or piping connections. To avoid such injury or damage, provide pressure-relieving or pressure-limiting devices (as required by the appropriate code, regulation, or standard) to prevent service conditions from exceeding those limits.**
- **A regulator may vent some gas to the atmosphere in hazardous or flammable gas service, vented gas might accumulate and cause personal injury, death or property damage due to fire or explosion. 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.**

Like most regulators, the Type 99 regulator has a outlet pressure rating lower than its inlet pressure rating.

Complete downstream overpressure protection is needed if the actual inlet pressure can exceed the regulator outlet pressure rating or the pressure ratings of any downstream equipment. Although the Type H110 relief valve provides sufficient relief capacity to protect the extra high pressure pilot of the 1000 psig (69,0 bar) maximum inlet regulator in case the Type 1301F supply regulator fails open, this protection is insufficient if the main valve body fails open. Regulator operation within ratings does not preclude the possibility of damage from external sources or from debris in the lines. A regulator should be inspected for damage periodically and after any overpressure condition.

WARNING

The 1000 psig (69,0 bar) maximum inlet regulator must not be used on hazardous gas service unless the Type H110 relief valve can be vented into a safe area. If vented gas can accumulate and become a hazard in enclosed conditions such as in a pit, underground, or indoors, the relief valve must be repiped to carry the gas to a safe location.

A repiped vent line or stack must be located to avoid venting gas near buildings, air intakes, or any hazardous

Table 4. *Working Monitor Performance*

MONITORING PILOT INFORMATION					MINIMUM PRESSURE AT WHICH WORKING MONITOR REGULATOR CAN BE SET
Construction	Spring Range	Pilot Spring			
		Part Number	Wire Diameter, Inches (cm)	Free Length, Inches (cm)	
Type 161AYW with 1/8-inch (3,18 mm) port diameter and 150 psig (10,3 bar) maximum allowable inlet pressure	5 to 15-inches w.c. (12 to 37 mbar) 11 to 28-inches w.c. (27 to 70 mbar)	1B653927022 1B537027052	0.105 (0,27) 0.114 (0,29)	3-3/4 (9,52) 4-5/16 (11,0)	3-inches w.c. (7 mbar) over normal distribution pressure
	1 to 2.5 psig (0,069 to 0,17 bar) 2.25 to 4.5 psig (0,16 to 0,31 bar) 4.5 to 7 psig (0,31 to 0,48 bar)	1B537127022 1B537227022 1B537327052	0.156 (0,40) 0.187 (0,47) 0.218 (0,55)	4-1/8 (10,5) 3-15/16 (10,0) 4-1/8 (10,5)	0.5 psi (0,03 bar) over normal distribution pressure
Type 627-109 with 1/8-inch (3,18 mm) port diameter and 150 psig (10,3 bar) maximum allowable inlet pressure for cast iron body or 750 psig (51,7 bar) maximum allowable inlet pressure for malleable iron body	5 to 15 psig (0,34 to 1,03 bar) 10 to 25 psig (0,69 to 1,72 bar) 20 to 35 psig (1,38 to 2,41 bar) 25 to 60 psig (1,72 to 4,14 bar)	1D892327022 1D751527022 1D665927022 1D755527142	0.168 (0,43) 0.187 (0,47) 0.218 (0,55) 0.500 (1,27)	2-15/16 (7,46) 2-13/16 (7,14) 2-15/32 (6,27) 9-1/4 (23,5)	3.0 psi (0,21 bar) over normal distribution pressure
	40 to 80 psig (2,76 to 5,52 bar) 80 to 150 psig (5,52 to 10,3 bar) 130 to 200 psig (9,00 to 13,8 bar)	1E543627142 1P901327142(1) 1P901327142(2)	0.283 (0,72) 0.240 (0,61) 0.240 (0,61)	2-15/16 (7,46) 2-5/8 (6,67) 2-5/8 (6,67)	5.0 psi (0,34 bar) over normal distribution pressure

1. With large diaphragm plate.
2. With small diaphragm plate.

location. The line or stack opening must be protected against condensation, freezing, and clogging.

Clean out all pipelines before installation and check to be sure the regulator has not been damaged or collected foreign material during shipping.

Apply pipe compound to the male pipe threads only with a screwed body, or use suitable line gaskets and good bolting practices with a flanged body. This regulator may be installed in any position desired as long as the flow through the body is in the direction indicated by the arrow on the body. Install a three-valve bypass around the regulator if continuous operation is necessary during maintenance or inspection.

Although the standard orientation of the actuator and pilot to the main valve body is as shown in Figure 1, this orientation may be changed as far as the inlet tubing (key 24, Figure 9 or 11) will permit by loosening the union nut (key 14, Figure 9), rotating the actuator lower casing (key 29, Figure 9) as desired, and tightening the union nut. To keep the pilot spring case from being plugged or the spring case from collecting moisture, corrosive chemicals, or other foreign material, the vent must be pointed down, oriented to the lowest possible point on the spring case, or otherwise protected. Vent orientation may be changed by rotating the spring case with respect to the pilot body, or on the extra high pressure pilot with optional tapped spring case by rotating the vent with respect to the spring case.

To remotely vent a low pressure pilot, install the vent line in place of the pressed-in vent assembly (key 60, Figure 9). Install obstruction-free tubing or piping into the 1/4-inch (6,35 mm) vent tapping. Provide protection on a remote vent by installing a screened vent cap into the remote end of the vent pipe.

To remotely vent a high pressure pilot, or an extra high pressure pilot with optional tapped spring case, remove the screwed-in vent assembly (key 72, Figure 9) from the high pressure pilot spring case or the pressed-in vent assembly from the extra high pressure pilot spring case and install obstruction-free tubing or piping into the 1/4-inch (6,35 mm) vent tapping. Provide protection on a remote vent by installing a screened vent cap into the remote end of the vent pipe.

An upstream pilot supply line is not required because of the integral pilot supply tubing (key 24, Figure 9 or 11). However, as long as the 1/4-inch NPT tapping in the main valve body is plugged, this tubing may be disconnected from both the main valve and filter assembly (key 75, Figure 9) in order to install a pilot supply line from a desired remote location into the filter.

If the maximum pilot inlet pressure will be exceeded by main valve pressure, install a separate reducing regulator (if not already provided) in the pilot supply line.

A Type 99 regulator has two 1/2-inch threaded NPT control line pressure taps on opposite sides of the lower casing (key 29, Figure 9). The regulator normally comes from the factory with the tap closest to the regulator outlet left unplugged for the downstream control line as shown in Figure 1, and with opposite tap plugged.

Attach the control line from the unplugged tap 2 to 3 feet (0,61 to 0,91 meter) downstream of the regulator in a straight run of pipe. If impossible to comply with

this recommendation due to the pipe arrangement, it may be better to make the control line tap nearer the regulator outlet rather than downstream of a block valve. Do not make the tap near any elbow, swage, or nipple which might cause turbulence.

In many instances, it will be necessary to enlarge the downstream piping to keep flow velocities within good engineering practices. Expand the piping as close to the regulator outlet as possible.

WARNING

Adjustment of the pilot control spring to produce an outlet pressure higher than the upper limit of the outlet pressure range for that particular spring can cause personal injury or equipment damage due to bursting of pressure-containing parts or the dangerous accumulation of gases if the maximum actuator emergency casing pressure in the Specifications section is exceeded. If the desired outlet pressure is not within the range of the pilot control spring, install a spring of the proper range according to the Maintenance section.

Each regulator is factory-set for the pressure setting specified on the order. If no setting was specified, outlet pressure was factory-set at the midrange of the pilot control spring. In all cases, check the control spring setting to make sure it is correct for the application.

Startup

Key numbers are referenced in Figure 9 for a low or high pressure pilot and in Figure 12 for an extra high pressure pilot. With proper installation completed and downstream equipment properly adjusted, perform the following procedure while using pressure gauges to monitor pressure.

1. Very slowly open the upstream block valve.
2. Slowly open the hand valve (if used) in the control line. The unit will control downstream pressure at the pilot control spring setting. See the adjustment paragraph following these numbered steps if changes in the setting are necessary during the startup procedure.
3. Slowly open the downstream block valve.
4. Slowly close the bypass valve, if any.
5. Check all connections for leaks.

The only adjustment on the regulator is the reduced pressure setting affected by the pilot control spring (key 43, Figure 9 or 11). Remove the closing cap assembly (key 46, Figure 9) and turn the adjusting screw (key 45, Figure 9 or 11). Turning the adjusting screw clockwise into the spring case increases the controlled or reduced pressure setting. Turning the screw counterclockwise decreases the reduced pressure setting. Always replace the closing cap, if used, after making the adjustment.

Shutdown

Isolate the regulator from the system. Vent the downstream pressure first; then vent inlet pressure to release any remaining pressure in the regulator.

Maintenance

Regulator parts are subject to normal wear and must be inspected and replaced as necessary. The frequency of inspection and replacement of parts depends on the severity of service conditions or the requirements of local, state, and federal rules and regulations.

WARNING

Avoid personal injury or damage to property from sudden release of pressure or uncontrolled gas or other process fluid. Before starting to disassemble, isolate the pilot or regulator from all pressure and cautiously release trapped pressure from the pilot or regulator. Use gauges to monitor inlet, loading, and outlet pressures while releasing these pressures.

On reassembly of the regulator, it is recommended that a pipe thread sealant be applied to pressure connections and fittings as indicated in Figures 7 and 9 and lubricant be applied to sliding and bearing surfaces as indicated in Figures 7 and 9, and that an anti-seize compound be applied to adjusting screw threads and other areas indicated Figures 9 and 11.

Actuator and Standard P590 Series Filter

This procedure is to be performed if changing the main spring and spring seat for those of a different range, or if inspecting, cleaning, or replacing any other parts. Unless otherwise indicated, part key numbers for a Type 99 regulator with low or high pressure pilot and

disk or O-ring seat are referenced in Figure 9, part key numbers unique to the 1000 psig (69,0 bar) maximum inlet regulator are referenced in Figure 11, and part key numbers for a Type 61HP (extra high pressure) pilot is referenced in Figure 12.

1. Access to all internal actuator parts can be gained without removing the main valve body from the line. Disconnect the loading tubing from the upper casing.

CAUTION

If the regulator has an indicator assembly, perform the following step carefully to avoid bending the travel indicator stem (key 103, Figure 6).

Note

The O-rings and gaskets (keys 111 and 108, Figure 6) in the indicator assembly are static seals and need not be disturbed, unless they are leaking.

2. Remove the four cap screws (key 58, Figure 9) and lift off the spring case (key 1, Figure 9). Remove the travel indicator stem, if any, by unscrewing the indicator stem adapter (key 101, Figure 6).
3. Remove the main spring seat (key 2, Figure 9) and main spring (key 3, Figure 9).
4. Remove the 12 cap screws (key 12, Figure 9) and hex nuts (key 13, Figure 9), and lift off the upper casing.
5. Remove the diaphragm (key 11, Figure 9) and diaphragm plate (key 10, Figure 9) by tipping it so that the lever (key 9, Figure 9) slips out of the pusher post (key 8, Figure 9).
6. Separate the diaphragm and diaphragm plate by unscrewing the diaphragm rod (key 4, Figure 9) from the pusher post. Inspect the diaphragm (key 11, Figure 9) and pusher post gasket (key 7, Figure 9). Either part must be replaced if it is damaged or no longer pliable.
7. If the unit has a stem seal O-ring (key 64, Figure 7 or 11), this O-ring may be replaced by removing the retaining ring or cotter pin (key 28, Figure 9) and disconnecting the lever from the valve carrier (key 26, Figure 9 or 11), removing the union nut (key 14, Figure 9 or 11), disconnecting the pilot supply tubing (key 24, Figure 9 or 11), and sliding the lower casing (key 29, Figure 9) away from the valve body (key 17, Figure 9), with a disk or O-ring seat, the valve carrier must be pulled out of the lower casing to gain access to the O-ring. Another O-ring, held captive by the pressed-in bushing, is part of the lower casing assembly on a stem seal unit and normally does not require replacement.
8. If clogging is suspected in the upstream regulator passages, disconnect the pilot supply tubing (key 24, Figure 9 or 11), remove the filter assembly (key 75, Figure 9), and blow through it to check for filter clogging. If necessary, to clean or replace filter parts in a standard P590 Series filter assembly, remove the following as shown in Figure 10: filter body (key 1), machine screw (key 4), spring washer (key 6), gasket (key 7), washer (key 5), and filter element (key 2). Upon reassembly, one of the flat washers must go between the filter element and filter head (key 3) and the other must go between the filter element and gasket.
9. If the lower casing was removed, install a new body gasket (key 16, Figure 9) and, with a disk or O-ring seat, slide the valve carrier into the casing. Then slide the entire assembly into the valve body (disk or O-ring seat) and secure with the union nut. Secure the lever to the valve carrier with the retaining ring or cotter pin.
10. Loosely reassemble the diaphragm and diaphragm plate so that the bolt holes and loading connection hole in the diaphragm can be properly aligned with the corresponding holes in the casing when the lever is fitted properly into the pusher post. When this orientation is made, install the collar (key 6, Figure 9) and tighten the diaphragm rod into the pusher post (key 8, Figure 9).
11. In order for the regulator to operate properly, the assembled collar, diaphragm, diaphragm plate, pusher post, and diaphragm rod must be mounted on the ball of the lever so that the pusher post (key 8, Figure 9) orientation is as shown in Figure 9.
12. Install the upper casing and secure it to the lower casing with the twelve cap screws torque 580 to 920 inch-pounds (65,5 to 104 N•m) and hex nuts. Put lower casing back on body and install union nut.

CAUTION

To avoid part damage due to over compressing the main spring seat, always use main spring seat 1E242724092 with main spring 0W019127022.

13. Install the main spring and main spring seat, turning the main spring seat until its bottom shoulder is even with the bottom thread of the diaphragm rod.
14. Install a new spring case gasket (key 57, Figure 9), the spring case, and the four cap screws with 340 to 420 inch-pounds (38,4 to 47,5 N•m) of torque, making sure the indicator stem, O-ring, and gaskets (keys 103, 111, and 108, Figure 6) are installed If used.
15. Connect the loading tubing, then refer to the Startup section for putting the regulator into operation.

Type 61L, 61LD, 61LE (Low), or 61H (High Pressure) Pilots

This procedure is to be performed if changing the control spring for one of a different range, or if inspecting, cleaning or replacing any other pilot parts. Key numbers are referenced in Figure 9.

1. Remove the closing cap (key 46) if used and unscrew the adjusting screw (key 45) to relieve control spring compression.
2. Disconnect the loading tubing (key 53) and pilot supply tubing (key 24).
3. Unscrew the eight cap screws (key 47) and remove the pilot assembly from the lower casing (key 29).
4. Use the projecting prong in the relay valve body (key 39) as the restraining member and remove the diaphragm nuts (keys 13 and 51). Separate the parts and inspect the diaphragms (keys 30 and 40) and O-ring seal (key 33). Replace if worn or damaged.
5. Unscrew the bleed orifice (key 52) from the yoke (key 37). Also removed with the bleed orifice are the relay disk assembly (key 48) and bleed valve (key 50). These parts can be unscrewed for inspection and replacement, if necessary.
6. When reassembling the pilot, the relay disk holder assembly and both diaphragms should be tightened on the yoke after it is placed in the body.

Note

Before putting the relay spring case over the diaphragm, make certain the yoke is square with respect to the prong in the relay body. (The yoke can bind on the prong if it is not square.)

7. Use care in reassembly to be sure the edges of the diaphragms slip properly into the recess on the lower casing and relay valve body. With the pilot in place, check to see if it can be rocked. If it does not rock, it is in place and the diaphragm is free of wrinkles. With both diaphragms firmly in place, install the cap screws using torque 150 inch-pounds (16,9 N•m) of torque. Tighten using a crisscross pattern to avoid placing a strain on the unit. Set the pilot control spring (key 43) according to the adjustment information in the Startup section.
8. Reinstall the closing cap (key 46, if used). If you have a plastic closing cap, be sure that you have a vent (key 60) in place of the pipe plug installed in the low pressure pilot spring case.

Type 61HP (Extra High Pressure) Pilot

This procedure is to be performed if changing the control spring for one of a different range, or if inspecting, cleaning, or replacing any other pilot parts. Key numbers are referenced in Figure 12.

1. Unscrew the adjusting screw (key 45) to relieve control spring compression.
2. Disconnect the loading tubing and pilot supply tubing.
3. Remove the six cap screws (key 123) which fasten the spring case (key 44) spring seat (key 68) and control spring (key 43) to the pilot body.
4. Unscrew the diaphragm nut (key 128) and remove a diaphragm plate (key 41), diaphragm (key 40), and another diaphragm plate.
5. Unscrew the eight cap screws and remove the pilot body (key 39) and gasket. Remove six cap screws, seal washers and the flange adapter.
6. Unscrew the relief valve body (key 119) and remove a diaphragm plate, diaphragm, and another diaphragm plate. Inspect the diaphragm inserts (key 150) and both diaphragms. Replace if worn or damaged.
7. The relief valve assembly can be further disassembled for inspection by unscrewing the relief valve cap (key 118).

8. Four machine screws (key 130) hold both yoke caps (keys 37 and 116) to the yoke legs (key 31). Separate these parts to expose the pilot valve.

9. Unscrew the inlet orifice (key 38) to inspect its seat, the inlet valve plug (key 117), and valve spring (key 124).

Note

Make certain that the yoke assembly is square with respect to the cross member of the body casting so that it will not bind on the body.

10. When reassembling, screw in the inlet orifice all the way and secure the yoke caps to the yoke legs. Replace two diaphragm plates, the diaphragms, and inserts, two more diaphragm plates, the hex nut, and the relief valve assembly.

11. Assemble the control spring and spring seat into the body and spring case, being careful that the diaphragms are free of wrinkles and properly in place, and evenly installing the cap screws in a crisscross pattern to avoid placing a strain on the unit. Install the body flange adapter with seal washers and cap screws. Install a new gasket and secure the pilot to the lower casing with eight cap screws. Set the control spring according to the adjustment information in the Startup section.

Converting the Pilot

Note

A complete pilot assembly rather than individual parts may be ordered for the following conversion procedure. When a low pressure pilot is ordered for field conversion of a high pressure pilot or vice versa, the replacement pilot assembly comes complete with a pilot cover (key 132, Figure 9). Remove this cover before installing replacement pilot on the existing regulator. The cover can then be installed on the removed pilot to form a complete Type 61 (low or high pressure) pilot for use elsewhere.

When changing one pilot construction (low pressure, high pressure, or extra high pressure) for another, all parts attached to the lower casing (key 29, Figure 9) may need to be replaced with those appropriate for the desired construction. At the very least, when changing from a low to high pressure pilot or vice versa, everything below the lower pilot diaphragm (key 40, Figure 9) except the cap screws and the hex nut (keys 47 and 13, Figure 9) will need to be replaced. Actuator and main valve parts may remain unchanged unless a change in service conditions requires a change in seat construction, main spring, or main spring seat. See the Parts List sections for obtaining the appropriate conversion parts.

Main Valve Trim with Disk or O-ring Seat

This procedure is to be performed if inspecting, cleaning, or replacing trim parts. Part key numbers for a Type 99 regulator with disk or O-ring seat are referenced in Figure 9, and part key numbers for the disk seat unique to the 1000 psig (69,0 bar) maximum inlet regulator are referenced in Figure 11.

Note

All trim maintenance may be performed with the valve body (key 17, Figure 9 or 11) in the line and with the elbow (key 23, Figure 9 or 11), pilot supply tubing (key 24, Figure 9 or 11), and pilot supply regulator (key 155, Figure 11, if used) attached to the valve body unless the valve body itself will be replaced.

1. Disconnect the pilot supply tubing and downstream control line.

2. Loosen the union nut (key 14, Figure 9) and remove the lower casing (key 29, Figure 9) with the cap screw (key 22, Figure 9) or disk and holder assembly (key 18, Figure 11) on disassembly or reassembly. A thin-walled socket may be used to remove the orifice.

3. Access to the disk or O-ring (key 19, Figure 9) can be gained by removing the cap screw and retainer (key 21, Figure 9), while on the 1000 psig (69,0 bar) maximum inlet regulator the entire disk and holder assembly is removed as a unit. If necessary, the holder (key 18, Figure 9 or 11) or adapter (key 157, Figure 11) can be removed by taking out the cotter pin (key 25, Figure 9 or 11).

4. Install a new body gasket (key 16, Figure 9) and a new disk, O-ring, or disk and holder assembly as necessary. Then slide the entire assembly into the valve body and secure with the union nut.

5. Connect the pilot supply tubing and downstream control line, then refer to the Startup section for putting the regulator into operation.

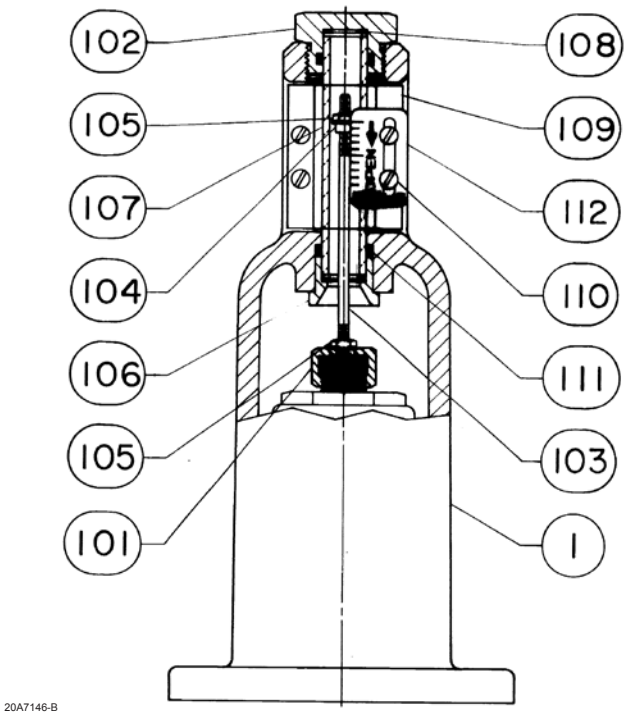


Figure 6. *Travel Indicator Assembly*

Parts Ordering

A serial number is assigned to each regulator, and it is stamped on both the actuator and pilot nameplates. If the pilot is replaced, the new pilot will have its own serial number different from the main valve serial number. Always indicate one or both serial numbers when communicating with your local Sales Office. When ordering a replacement part, be sure to include the complete eleven-character part number.

Parts List

Key	Description	Part Number
	Repair kits include parts for regulator with composition trim only, key numbers 7, 11, 16, 19, 20, and 57. Also included are parts for pilot, key numbers 30, 33, 38, 40, 48, 49, 50, 52, 71, 117, 126, 129, 150, 153, and P590 Series filter, key numbers 2 and 7.	
	With low pressure pilot	
	7/8-inch (22,2 mm) orifice	R99LX000012
	1-1/8-inch (28,6 mm) orifice	R99LX000022
	With high pressure pilot	
	7/8-inch (22,2 mm) orifice	R99HX000012
	1-1/8-inch (28,6 mm) orifice	R99HX000022
	With extra high pressure pilot	
	7/8-inch (22,2 mm) orifice	R99HPX00012
	1-1/8-inch (28,6 mm) orifice	R99HPX00022

*Recommended Spare Parts

Travel Indicator Assembly (Figure 6)

Key	Description	Part Number
	Complete Assembly (includes individual parts listed below)	20A7146X0C2
1	Spring Case, Cast iron	2L296219012
101	Indicator Stem Adaptor, Aluminum	1R395909012
102	Indicator Cap, Aluminum	1L290809012
103	Indicator Stem, Aluminum	1L296509022
104	Disk Nut, Plastic	1F730506992
105	Machine Screw Nut, Plated steel (2 required)	1A342024152
106	Retainer, Aluminum	1L291009012
107	Indicator Window, Glass	1L296706992
108*	Gasket, Neoprene (CR) (2 required)	1L291103012
109*	Indicator Cover, Plastic (2 required)	1L296405032
110	Machine Screw, Plated steel (8 required)	1A899028982
111*	O-ring, Nitrile (NBR) (2 required)	1E591406992
112	Indicator Scale, Stainless steel	1J511638982

Actuator and Main Body Assembly (Figures 6, 7, 8, 9, 10, and 11)

Key	Description	Part Number
1	Standard Spring Case without travel indicator, Cast iron	1B883119012
2	Main Spring Seat, Plated steel	
	250 psid (17,2 bar d) maximum allowable pressure drop, Cast iron	1B883219042
	1000 psid (69,0 bar d) maximum allowable pressure drop	1E242724092

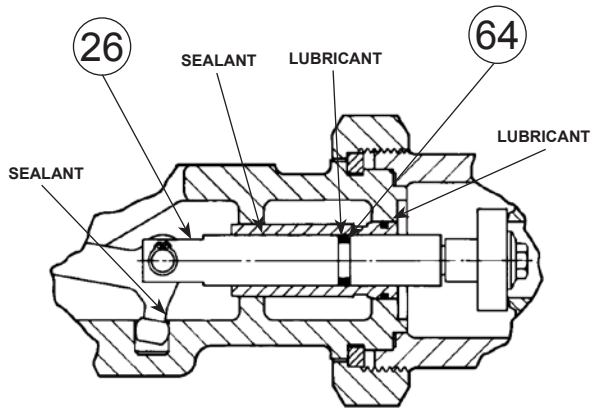


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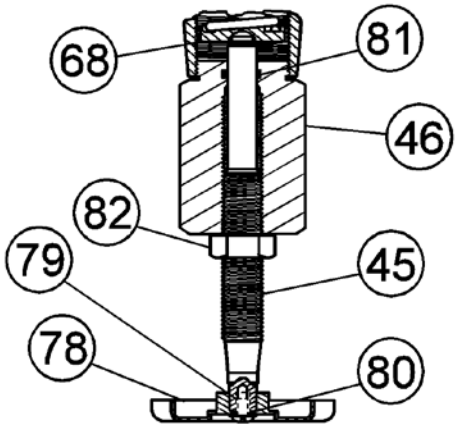
Figure 7. *O-ring Stem Seal*



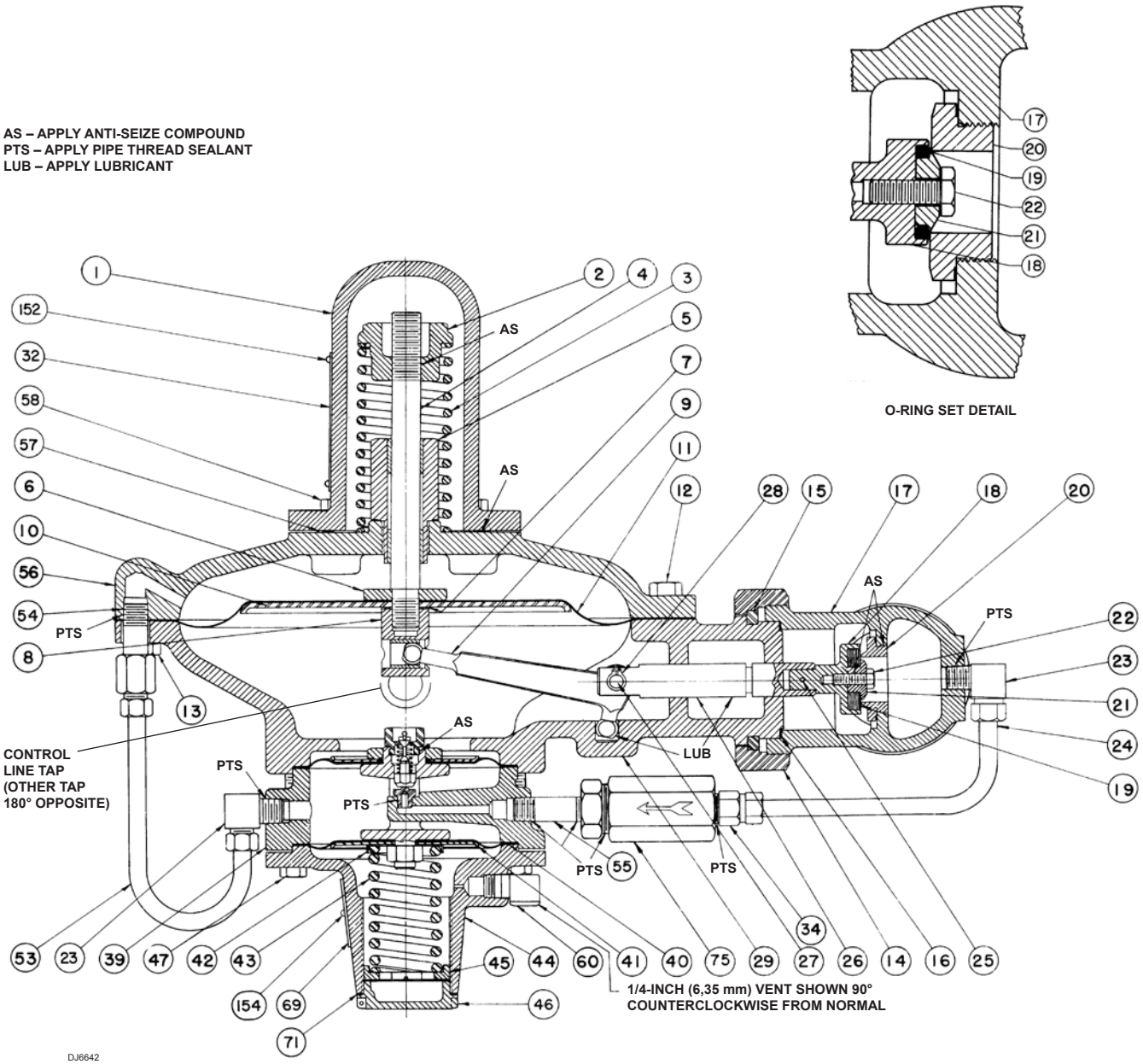
A6802

Figure 8. *O-ring Sealed Handwheel*

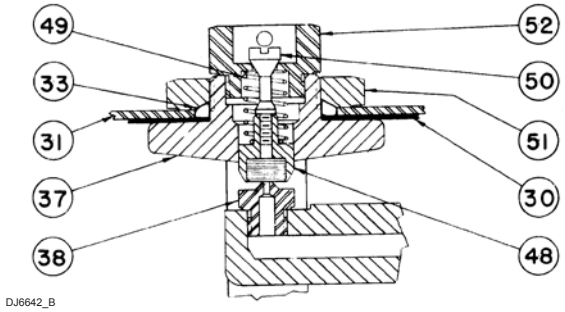
Key	Description	Part Number
3	Main Spring, Plated steel	
	25 psid (1,72 bar d) maximum allowable pressure drop	1C277127022
	50 psid (3,45 bar d) maximum allowable pressure drop	1N801927022
	250 psid (17,2 bar d) maximum allowable pressure drop	1B883327022
	1000 psid (69,0 bar d) maximum allowable pressure drop–requires main spring seat 1E242724092	0W019127022
4	Diaphragm Rod, 416 Stainless steel	1B883435232
5	Diaphragm Rod Guide Assembly	
	Brass with bronze insert	1D9712000A2
	316 Stainless steel	1B883535072
6	Collar	
	Brass	1B883614012
	316 Stainless steel	1B883635072
7*	Pusher Post Gasket	
	Composition - for standard construction	1B883704022
	Fluorocarbon (FKM) - for oxygen service	1N430306382
8	Pusher Post Assembly	
	Brass with bronze insert	1D9714000A2
	316 Stainless steel	1B883835072
	316 Stainless steel - for oxygen service	14B1320X012
9	Lever, Steel	2F823423072
10	Diaphragm Plate, Plated steel	1B989225072
11*	Diaphragm	
	Nitrile (NBR)	1B884102052
	Fluorocarbon (FKM)	1N378902312
12	Cap Screw, Plated steel (12 required)	1B884224052
13	Hex Nut, Plated steel (13 required)	1A340324122
14	Union Nut, Iron	0Z0176X0032
15	Body Snap Ring, Plated steel	0Y095828982
16*	Body Gasket	
	Composition	1A348004032
	Graphite - for oxygen service	1A3480X0022
17	Valve Body	
	2-inch NPT	
	Cast iron	1C254619012
	Steel	2N153522012
	Brass	1C254612012
	Brass - for oxygen service	1C2546X0012
	2-inch (DN 50) CL125 FF flanged, Cast iron	2D986519012
	2-inch (DN 50) CL250 RF flanged, Cast iron	2D986619012

Key	Description	Part Number
17	Valve Body (continued)	
	2-inch (DN 50) CL150 RF flanged Steel	2E275622012
	2-inch (DN 50) CL300 RF flanged Steel	2E275722012
18	Holder for Type 99 regulator	
	Disk seat	
	Brass	1B884314012
	316 Stainless steel	1B884335072
	O-ring Seat	
	7/8-inch (22,2 mm) orifice	
	Brass	1E603214012
	316 Stainless steel	1E603235072
	1-1/8-inch (28,6 mm) orifice	
	Brass	1E342414012
	316 Stainless steel	1E342435072
18*	Disk and Holder Assembly for 1000 psig (69,0 bar) maximum inlet regulator, Nylon (PA)/ 316 Stainless steel	1C1860000B2
19	Disk for Type 99 Regulator	
	250 psid (17,2 bar d) maximum allowable pressure drop	
	Neoprene (CR)	1C997403032
	Nitrile (NBR)	1C158703332
	Fluorocarbon (FKM)	1C9974X0012
	400 psid (27,6 bar d) maximum allowable pressure drop	
	Nylon (PA)	1E480603152
	Polytetrafluoroethylene (PTFE)	1C997406242
19*	O-ring	
	7/8-inch (22,2 mm) orifice	
	Nitrile (NBR)	1D237506992
	Fluorocarbon (FKM)	1D237506382
	1-1/8-inch (28,6 mm) orifice	
	Nitrile (NBR)	1H8498X0012
	Fluorocarbon (FKM)	1H8498X0032
20*	Orifice	
	Disk seat for all regulators	
	3/8-inch (9,52 mm) orifice, 416 Stainless steel	19A7390X012
	1/2-inch (12,7 mm) orifice, 416 Stainless steel	14A8410X012
	5/8-inch (15,9 mm) orifice, 416 Stainless steel	19A7391X012
	7/8-inch x 3/8-inch (22,2 x 9,52 mm) orifice	
	Brass	1N878114012
	316 Stainless steel	1N8781X0012

*Recommended Spare Parts

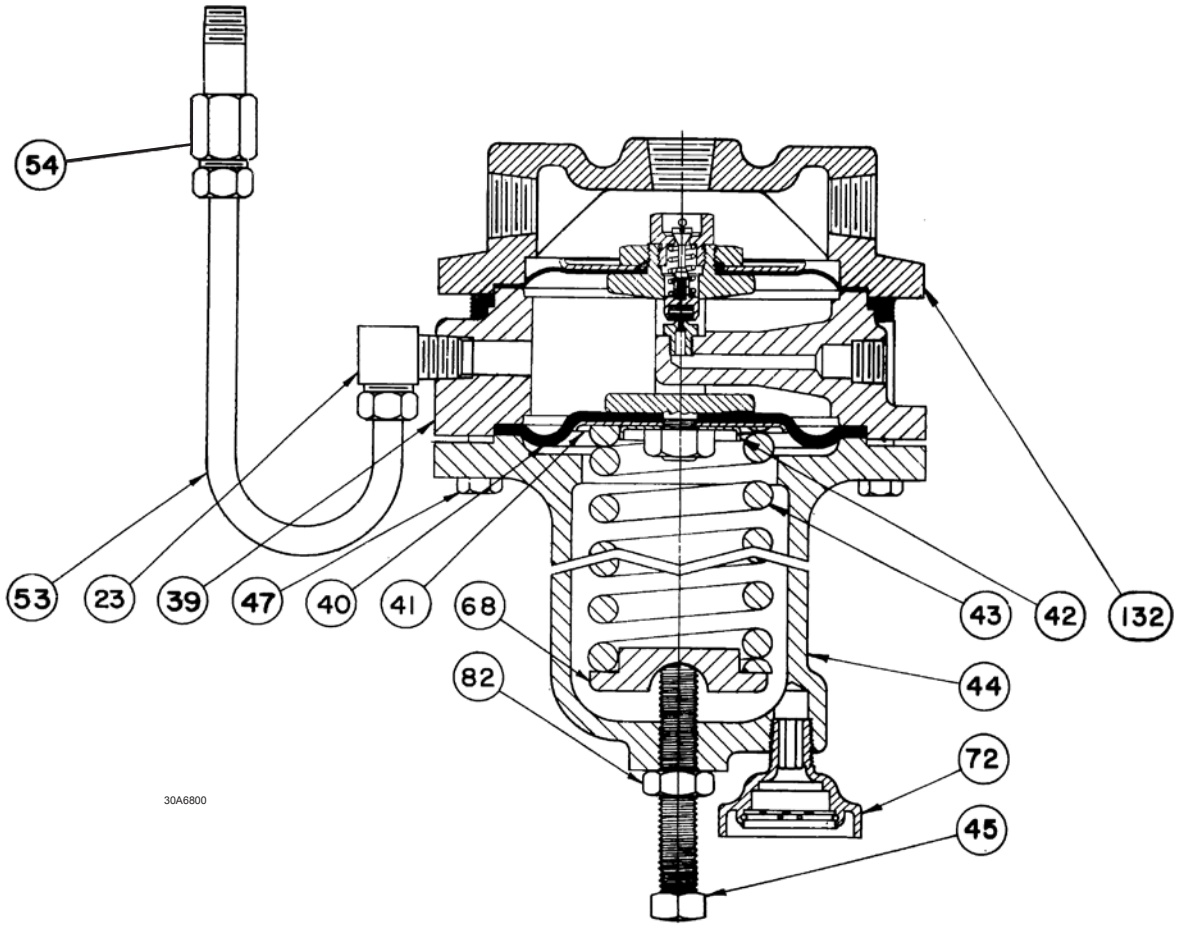


COMPLETE REGULATOR SHOWING TYPE 61L PILOT AND DISK SEAT

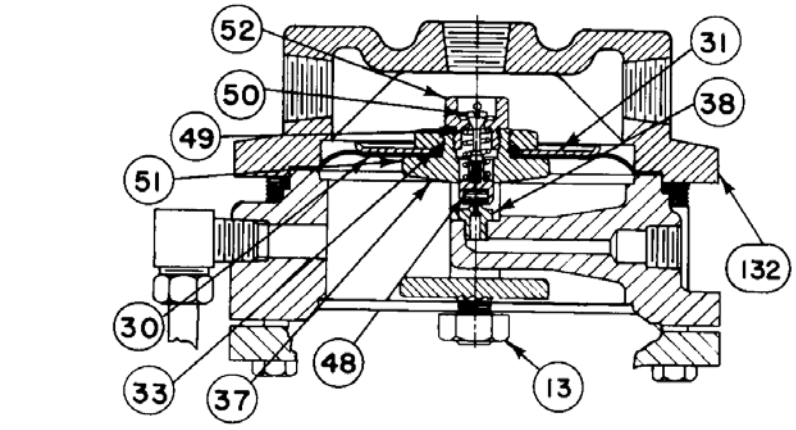


PILOT RELAY ASSEMBLY

Figure 9. *Type 99 Regulator with Type 61L (Low) or 61H (High Pressure) Pilot*



HIGH PRESSURE PILOT PARTS



PILOT RELAY AND COVER ASSEMBLY

Figure 9. *Type 99 Regulator with Type 61L (Low) or 61H (High Pressure) Pilot (continued)*

Actuator and Main Body Assembly (Figures 6, 7, 8, 9, 10, and 11) (continued)

Key	Description	Part Number
20*	Orifice (continued)	
	Disk seat for all regulators	
	7/8-inch x 1/2-inch (22,2 x 12,7 mm) orifice	
	Brass	1C942314012
	316 Stainless steel	1C942335072
	7/8-inch x 5/8-inch (22,2 x 15,9 mm) orifice	
	Brass	1C942414012
	316 Stainless steel	1C9424X0012
	3/4-inch (19,1 mm) orifice	
	Brass	1C780414012
	316 Stainless steel	1C780435072
	7/8-inch (22,2 mm) orifice	
	Brass	1C394714012
	316 Stainless steel	1C394735072
	1-inch (25,4 mm) orifice, Brass	13A5017X012
	1-1/8-inch (28,6 mm) orifice	
	Brass	1B884414012
	316 Stainless steel	1B884435072
	1/2-inch (12,7 mm) disk seat for 1000 psig (69,0 bar) maximum inlet regulator, 416 Stainless steel	14A8410X012
	O-ring seat for all regulators	
	7/8-inch (22,2 mm) orifice	
	Brass	1E603014012
	316 Stainless steel	1E603035072
	1-1/8-inch (28,6 mm) orifice	
	Brass	1E342514012
	316 Stainless steel	1E342535072
21	Retainer	
	Disk seat 3/4-inch (19,1 mm)	
	All except 3/4-inch (19,1 mm) or 1-1/8-inch (28,6 mm) orifice or 1000 psig (69,0 bar) maximum inlet regulator	
	Brass	1C394814012
	303 Stainless steel	1C394835032
	3/4-inch (19,1 mm) orifice	
	Brass	1C780314012
	316 Stainless steel	1C7803X0012
	1-1/8-inch (28,6 mm) orifice	
	Brass	1B884514012
	316 Stainless steel	1B884535072
	O-ring seat for all regulators	
	7/8-inch (22,2 mm) orifice	
	Brass	1E603114012
	316 Stainless steel	1E603135072
	1-1/8-inch (28,6 mm) orifice	
	Brass	1E342614012
	316 Stainless steel	1E342635072
22	Cap Screw, Plated steel	1A391724052
25	Cotter Pin, 316 Stainless steel	1B108438992
26	Valve Carrier	
	Brass	1E597114072
	416 Stainless steel	1E597135132
27	Lever Pin	
	316 Stainless steel	1B884935162
	303 Stainless steel	1C911635032
28	Retaining Ring for brass trim, Plated steel (2 required)	1B8850X0012
	Cotter Pin for Stainless steel trim, 316 Stainless steel (2 required)	1A866537022

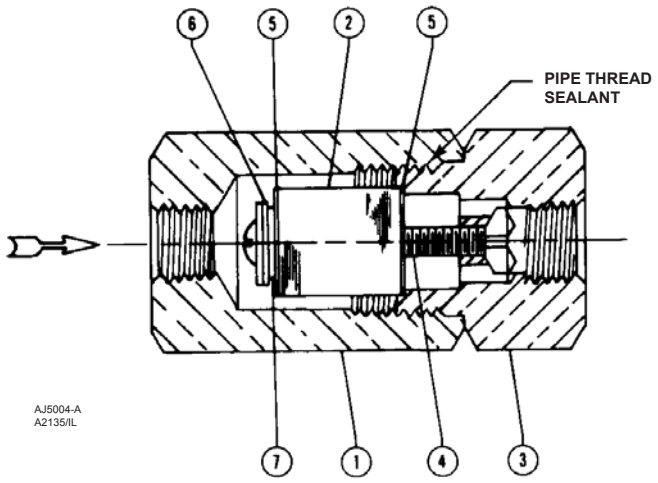


Figure 10. *Standard P590 Series Filter Assembly*

Key	Description	Part Number
29	Lower Casing, Cast iron	
	Standard	4B983719012
	For use with optional protector, spring washer, and machine screw (keys 61, 62, and 63)	2N379419012
	Lower Casing Assembly for use with O-ring stem seal, Cast iron with SST guide bushing	
	Complete with Nitrile (NBR) O-ring	2R7230000A2
	Complete with Fluorocarbon (FKM) O-ring	2R7230X0022
32	Nameplate, Aluminum	- - - - - - - - - -
56	Upper Casing, Cast iron	3B887619012
57*	Spring Case Gasket	
	Composition	1B8877X0012
	Graphite - for oxygen service	1B8877X0022
58	Cap Screw, Plated steel (4 required)	1A675124052
61(1)	Lower casing protector (not shown), Brass	1N379514012
62(1)	Optional Spring Washer (not shown)	
	Plated brass (2 required)	1N339518992
63(1)	Optional Machine Screw (not shown)	
	Plated brass (2 required)	1H340518992
64*	O-ring (for use only with O-ring stem seal)	
	Nitrile (NBR)	1E220206992
	Fluorocarbon (FKM)	1R620106382
73	Pipe plug, Plated steel (not shown)	1A767524662
75	Standard P590 Series Filter Assembly (parts listed under separate heading)	
	Type P594-1, Brass	FSP594-1
	Type P593-1, Aluminum	FSP593-1
133	Pipe Elbow, Plated steel	1B860828992
134	Pipe Nipple, Plated steel	1B218826232
152	Drive Screw, 18-8 Stainless steel (4 required for low pressure pilot and 6 required for high pressure pilot)	1A368228982
155	Type 1301F Pilot Supply Regulator(2) (for use only with extra high pressure pilot)	See footnote 2
156	Type H110 Pop Relief Valve, (for use only with extra high pressure pilot) brass with Nitrile (NBR) disk and 316 Stainless steel spring	Consult Factory
159	Tag (for use only with O-ring stem seal and extra high pressure pilot) alloy 1100 (not shown)	16A0957X012

*Recommended Spare Parts
1. Required with lower casing 2N379419012
2. Pilot supply regulator parts are found in Types 1301F and 1301G Instruction manual.

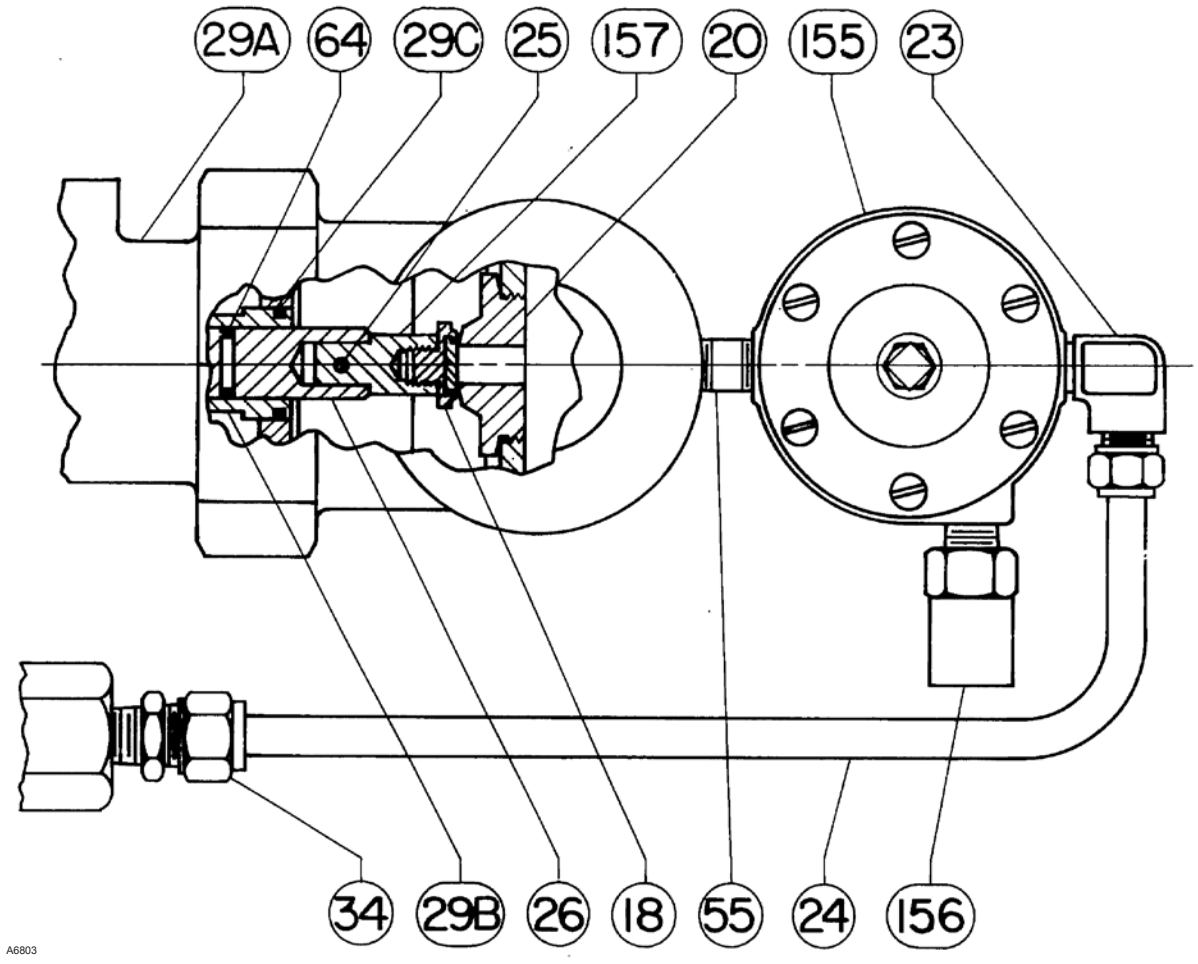


Figure 11. *1000 Psig (69,0 bar) Maximum Inlet Regulator Partial Detail*

Standard P590 Series Filter Assembly (Figure 10)

Key	Description	Part Number
1	Filter Body	
	Type P594-1, Brass	1E312414012
	Type P593-1, Aluminum	1E3124X0022
2*	Filter Element, Cellulose	1E312606992
3	Filter Head	
	Type P594-1, Brass	1E312514012
	Type P593-1, Aluminum	1E3125X0022
4	Machine Screw	
	Type P594-1, Brass	1J500218992
	Type P593-1, Aluminum	1J500209012
5	Washer (2 required)	
	Type P594-1, Brass	1J500018992
	Type P593-1, Aluminum	1J500010062
6	Spring Washer, Plated carbon steel	1H885128982
7*	Gasket, Composition	1F826804022

Pilot and Tubing Parts[3] Low or High Pressure Pilot (Figure 9)

Key	Description	Part Number
13	Hex Nut, Plated steel (13 required)	1A340324122
23	Elbow (2 required)	
	Brass	15A6002X292
	316 Stainless steel	15A6002X612
24	Pilot Supply Tubing, disk or O-ring main valve seat	
	Copper	1D8793000A2
	Copper - for oxygen service	0500201701W
	316 Stainless steel	0500213809W
30*	Upper Relay Diaphragm	
	Nitrile (NBR)	1B885202052
	Fluorocarbon (FKM)	1N162802332
31	Upper Relay Diaphragm Plate, Plated steel	
	For use with all low pressure pilots except LE	1B989225072
	For use with all high pressure pilots and LE low pressure pilot	1D558425072

*Recommended Spare Parts

3. An entire pilot assembly may be ordered from your local Sales Office. by specifying a Type 61L, a 61H, or a 61HP pilot for field conversion.

Pilot and Tubing Parts[3] Low or High Pressure Pilot (Figure 9) (continued)

Key	Description	Part Number
33*	O-ring Seal	
	Nitrile (NBR)	1B885506992
	Fluorocarbon (FKM)	1B8855X0012
34	Connector	
	Brass	1D692214012
	316 Stainless steel	15A6002X602
37	Yoke	
	Zinc	1D662544012
38*	Relay Orifice, Stainless steel	
	For use with 25 psi (1,72 bar) maximum allowable pressure drop actuator main spring	1D373735032
	For use with all other main springs	1C520135032
	For use with oxygen service	1N162314042
39	Relay Valve Body, Cast iron	2J581919012
40*	Lower Relay Diaphragm	
	Low pressure pilot	
	Nitrile (NBR)	1B886002052
	Fluorocarbon (FKM)	1N536102332
	High pressure pilot	
	Nitrile (NBR)	1B894202192
	Fluorocarbon (FKM)	1N162702302
41	Lower Relay Diaphragm Plate, Plated steel	
	Low pressure pilot	1B989425072
	High pressure pilot	1D558325072
42	Spring Seat, Plated steel	
	Low pressure pilot	1B886225072
	High pressure pilot	1D558525072
43	Control Spring, Plated steel	
	For use only with LD low pressure pilot	
	0 to 4-inches w.c. (0 to 10 mbar), Orange	1B558527052
	3 to 12-inches w.c. (7 to 30 mbar), Silver	1C680627222
	For use with all low pressure pilots	
	0.25 to 2 psig (0,02 to 0,14 bar), Red	1B886327022
	1 to 5 psig (0,07 to 0,34 bar), Yellow	1J857827022
	2 to 10 psig (0,14 to 0,69 bar), Blue	1B886427022
	5 to 15 psig (0,34 to 1,03 bar), Brown	1J857927142
	10 to 20 psig (0,69 to 1,38 bar), Green	1B886527022
	For use with high pressure pilot, Green stripe	0Y066427022
44	Spring Case, Cast iron	
	Low pressure pilot	1B983919012
	High pressure pilot, Standard	1B984119012
	For use with closing cap (not shown)	1H232619012
45	Adjusting Screw	
	Low pressure pilot, Standard, Zinc	1B537944012
	Handwheel-style, Plated steel	1J496428982
	O-ring seated handwheel assembly	1R759414012
	High pressure pilot, Standard, Plated steel	1A279128982
	For use with closing cap 1H236514012	1J881524102
46	Closing Cap	
	For use with standard low pressure pilot, Plastic	T11069X0012
	For use with handwheel-style low pressure pilot, Brass (not shown)	1A926114012
	For use with O-ring sealed handwheel	1R759314012
	For use with high pressure pilot with spring case 1H232619012, Brass (not shown)	1H236514012
47	Cap Screw, Plated steel (8 required)	1B989624052
48*	Relay Disk Assembly	
	Brass/Nitrile (NBR)	1B8868000A2
	303 Stainless steel/Nitrile (NBR)	1B8868000B2
48*	Relay Disk Assembly (continued)	
	Brass/Fluorocarbon (FKM)	1B8868X0012
	303 Stainless steel/Fluorocarbon (FKM)	1B8868X0022
49*	Bleed Valve Spring, Stainless steel	
	For use with low pressure pilot with relay orifice 1D373735032 or bleed valve 1H951635132	1E643637022
	For use with all low and high pressure pilots	
	Inlet pressure up to 250 psig (17,2 bar)	1C911537022
	Inlet pressure over 250 psig (17,2 bar)	1N859137022
50*	Bleed Valve, Stainless steel	
	For use with LD low pressure pilot with bleed valve spring 1E643637022	1H951635132
	For use with all low and high pressure pilots	1D986735132
51	Diaphragm Nut	
	Brass	1B989514012
	316 Stainless steel	1B989535072
52*	Bleed Orifice, 316 Stainless steel	1B887335032
53	Loading Tubing	
	Copper	1J4928000A2
	316 Stainless steel	0500213809W
54	Connector	
	Brass	1H628114012
	316 Stainless steel	15A6002X992
55	Pipe Nipple	
	Plated steel (1 required with copper tubing and 2 required with aluminum tubing)	1C488226232
	316 Stainless steel	1C488238982
59	Pipe plug, Steel (not shown)	1A369224492
60	Type Y602-1 Vent Assembly	27A5516X012
68	Spring Seat	
	Handwheel-style low pressure pilot, Steel, (not shown)	1J618124092
	High pressure pilot, Zinc	16A9812X012
71*	Closing Cap Gasket (for use only with low pressure pilot), Neoprene (CR)	1P753306992
72	Type Y602-1 Vent Assembly (for use only with standard high pressure pilot spring case), Zinc/18-8 Stainless steel	17A6570X012
78	Handwheel (for use only with handwheel-style low pressure pilot), Zinc	1J496144012
79	Machine Screw (for use only with handwheel-style low pressure pilot), Plated steel	16A5763X012
80	Lockwasher (for use only with handwheel-style low pressure pilot), Steel	1A352332992
81	O-ring (for use only with O-ring sealed handwheel assembly)	1D541506992
82	Hex nut	
	For use only with O-ring sealed handwheel assembly	1A351124122
	For use with high pressure pilot, Plated steel	1A352224122
114*	Gasket (for use only with high pressure pilot with spring case 1H232619012), Steel/ Composition (not shown)	1B487099202
115	Adaptor (for use only with high pressure pilot with spring case 1H232619012), Steel (not shown)	1J881624092
132	Pilot Cover (used only with complete replacement pilot assembly for field conversion), Cast iron	2C518619012
152	Drive Screw, 18-8 Stainless steel (4 required for low pressure pilot and 6 required for high pressure pilot)	1A368228982
154	Drive Screw (for use only with low pressure pilot), 18-8 Stainless steel (2 required)	1A368228982

*Recommended Spare Parts

3. An entire pilot assembly may be ordered from your local Sales Office. by specifying a Type 61L, a 61H, or a 61HP pilot for field conversion.

A.S. – APPLY ANTI-SEIZE COMPOUND

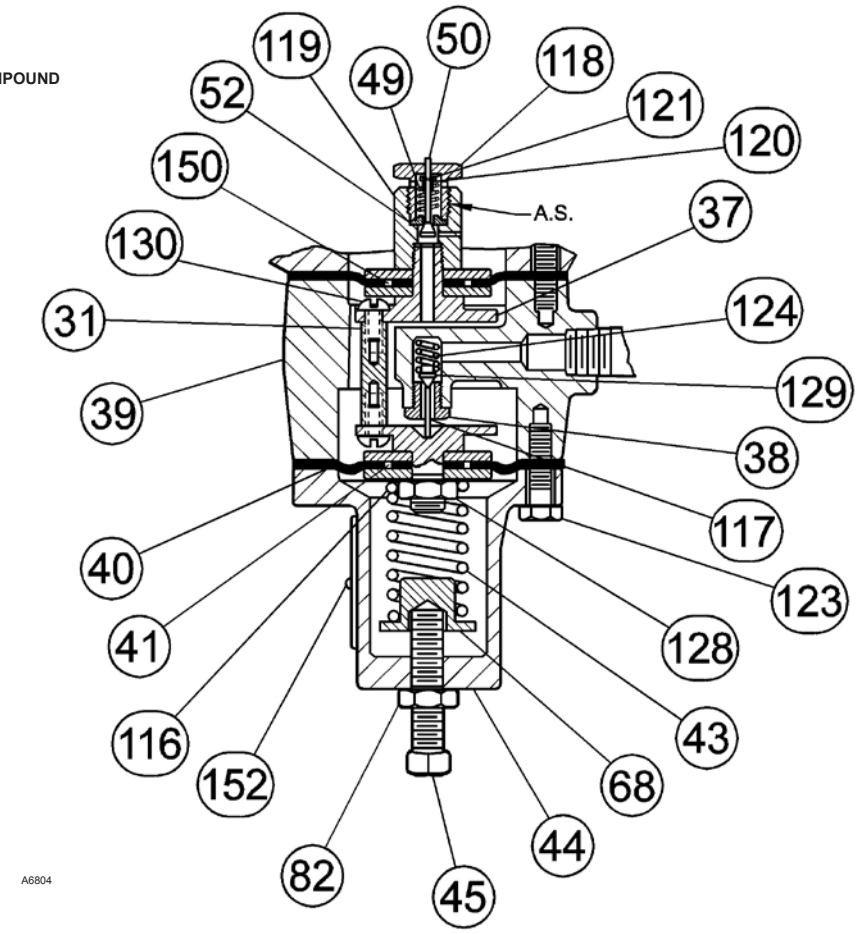


Figure 12. *Type 61HP (Extra High Pilot) Pilot*

Type 61HP (Extra High Pressure) Pilot (Figure 12)

Key	Description	Part Number
23	Elbow	
	For use with all standard regulators	
	Brass	15A6002X292
	316 Stainless steel	15A6002X202
	For use with 1000 psig (69,0 bar) maximum inlet regulator, Steel	1J139628982
24	Pilot Supply Tubing	
	For use with all standard regulators	
	Copper	1D7703000A2
	316 Stainless steel	0500213809W
	For use with 1000 psig (69,0 bar) maximum inlet regulator, Steel	0500213809W
30*	Diaphragm	
	Neoprene (CR)	13A9840X012
	Fluorocarbon (FKM)/Dacron®	13A9840X022
31	Yoke Leg, 416 Stainless steel (2 required)	13A9838X012
34	Connector (3 required)	
	For use with all standard regulators	
	Brass	1D692214012
	316 Stainless steel	15A6002X602
	For use with 1000 psig (69,0 bar) maximum inlet regulator, Steel	15A6002XW22
35	Cap Screw, Plated steel (6 required)	1A930424052
36	Elbow, Plated steel	1B860828992
37	Yoke Cap, 416 Stainless steel	13A9837X012
38	Inlet Orifice	
	303 Stainless steel	1D318135032
39	Pilot Body, Cast iron	33A9845X012
40*	Diaphragm	
	Neoprene (CR)	13A9841X022
	Fluorocarbon (FKM)/Dacron(4)	13A9841X012
41	Diaphragm Plate, 416 Stainless steel (4 required)	13A9839X012
43	Control Spring, Plated steel (blue)	1D387227022
44	Spring Case, Cast iron	
	Standard	2P969419012

*Recommended Spare Parts

4. Dacron® is a mark owned by E.I. du Pont de Nemours and Co.

Type 61HP (Extra High Pressure) Pilot (Figure 12) (continued)

Key	Description	Part Number
45	Adjusting Screw, Plated carbon steel	
	Standard	1C216032992
47	Cap Screw, Plated steel (8 required)	1B787724052
49	Relief Valve Spring, 316 Stainless steel	1C374037022
50	Relief Valve Plug, 316 Stainless steel	1K377535162
52	Bleed Orifice	
	Brass	1B329014012
53	Loading Tubing	
	For use with all standard regulators	
	Copper	1D7702000A2
	317 Stainless steel	0500213809W
	For use with 1000 psig (69,0 bar) maximum inlet regulator, Steel	1K5466X0042
55	Pipe Nipple, Plated steel (2 required)	1C488226232
60	Pipe plug, Steel (not shown)	1A649528982
68	Spring Seat, Plated steel	10A3963X012
72	Type Y602-12 Vent Assembly (for use only with tapped spring case 20A4735X012), Zinc with 18-8 Stainless steel screen	27A5516X012
82	Locknut, Plated steel	1A352224122
116	Yoke Cap, 416 Stainless steel	13A9836X012
117*	Inlet Valve Plug	
	304 Stainless steel/Nitrile (NBR)	1D5604000B2
	304 Stainless steel/Fluorocarbon (FKM)	1N3798000C2
118	Relief Valve Cap	
	Brass	1D904914012
	303 Stainless steel	1D904935072
119	Relief Valve Body	
	Brass	1D904814012
	316 Stainless steel	1D904835072
120	Spring Seat	
	Brass	1K377718992
	316 Stainless steel	1K377735072
121	Spring Seat Washer	
	Brass	1B495118992
	316 Stainless steel	1K377835072
122	Pipe Bushing, Carbon-plated steel	1C379026232
123	Cap Screw, Plated steel (6 required)	1P327028982
124	Valve Spring, 316 Stainless steel	1B797937022
125	Flange Adaptor, Steel	23A9846X012
126*	Gasket, Composition	0U0365X0032
128	Diaphragm Nut, Plated steel	1A346524122
129*	Valve Spring Seat, Aluminum	1L251135072
130	Machine Screw, 303 Stainless steel (4 required)	1A866935032
131	Pipe plug, Steel (not shown)	1A369224492
150	Diaphragm Insert (2 required)	
	Nitrile (NBR)	13A9842X012
	Fluorocarbon (FKM)	13A9842X022
152	Drive Screw, 18-8 Stainless steel (2 required)	1A368228982
153	Seal Washer, Nitrile (NBR)/Plated steel (6 required)	13A9849X012

*Recommended Spare Parts

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