

June 2011

61 Series Pilots for Pilot-Operated Pressure Reducing Regulators

WARNING

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

Fisher® regulators must be installed, operated, and maintained in accordance with federal, state, and local codes, rules and regulations, and Emerson Process Management Regulator Technologies, Inc. (Regulator Technologies) instructions.

If the regulator vents gas or a leak develops in the system, service to the unit may be required. Failure to correct trouble could result in a hazardous condition.

Call a gas service person to service the unit. Only a qualified person must install or service the regulator.

Installation, operation, and maintenance procedures performed by unqualified personnel may result in improper adjustment and unsafe operation. Either condition may result in equipment damage or personal injury. Use qualified personnel when installing, operating, and maintaining 61 Series Pilots.

Introduction

Scope of the Manual

This manual provides installation, startup, maintenance, and parts ordering information for the 61 Series Pilots used together with Pilot-Operated Pressure Reducing Regulators in a variety of

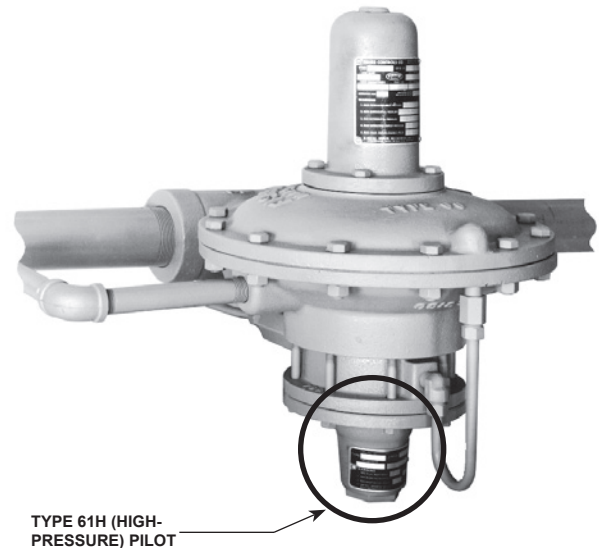


Figure 1. Type 99 Regulator with Type 61H (High-Pressure) Pilot

pressure applications. For information on mounting on pilot-operated regulators, refer to full product literature:

Type 1098-EGR: D100339X012

Type EZL: D103091X012

99 Series: D100260X012

Product Description

61 Series pilots are used with Types 1098-EGR and EZL pressure reducing regulators. These pilots can also be integrally mounted to the actuator casing as used with 99 Series regulators.

61 Series pilots are available in a variety of constructions for low-pressure (L), high-pressure (H), and extra high-pressure (HP) applications. The low-pressure version is also available with wide (LE) or narrow (LD) proportional band.



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Specifications

The Specifications section lists pressure limitations and other specifications for the various constructions of 61 Series Pilots. Please note that the pilot control spring range is stamped on the nameplate located on the pilot spring case, and the pilot restriction code is stamped on the pilot body (S=standard gain, L=low gain, H=high gain).

<p>Maximum Inlet Pressures⁽¹⁾⁽²⁾ Types 61L, 61LE, and 61H⁽⁴⁾: 300 psig / 20,7 bar Type 61LD: 160 psig / 11,0 bar Type 61HP: 600 psig / 41,4 bar</p> <p>Reduced Pressure Ranges See Table 1</p> <p>Material Temperature Capabilities⁽¹⁾ Standard Elastomers: -20° to 150°F / -29° to 66°C High-Temperature Elastomers: 0° to 300°F / -18° to 149°C, except 0° to 180°F / -18° to 82°C for water service</p>	<p>Pilot Restriction Code S - Standard gain L - Low gain H - High gain</p> <p>Pressure Connections⁽³⁾ 1/4 NPT (internal)</p> <p>Approximate Weight 2 pounds / 1 kg</p>
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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 pressure reducing regulator may be installed upstream of the pilot according to the Installation section.
3. Connections threaded to various national or international standards can usually be supplied. Contact your local Sales Office.
4. Type 61H pilot used with a 99 Series regulator can handle a maximum inlet pressure of 400 psig / 27,6 bar.

Table 1. Reduced Pressure Ranges

TYPE	PILOT CONTROL SPRING							
	Part Number	Reduced Pressure Ranges		Color Code	Wire Diameter		Free Length	
		psig	bar		Inches	mm	Inches	mm
61LD ⁽¹⁾	1B558527052	0 to 4-inches w.c.	0 to 10 mbar	Orange	0.072	1,83	3.78	96,0
	1C680627222	3 to 12-inches w.c.	7 to 30 mbar	Unpainted	0.080	2,03	3.00	76,2
61L, 61LD ⁽¹⁾ , 61LE ⁽²⁾	1B886327022	0.25 to 2	17 mbar to 0,14	Red	0.109	2,77	2.75	69,9
	1J857827022	1 to 5	69 mbar to 0,35	Yellow	0.142	3,61	2.75	69,9
	1B886427022	2 to 10	0,14 to 0,69	Blue	0.172	4,37	2.88	73,2
	1J857927142	5 to 15	0,35 to 1,0	Brown	0.187	4,75	3.03	77,0
	1B886527022	10 to 20	0,69 to 1,4	Green	0.207	5,26	3.18	80,8
61H	0Y066427022	10 to 65	0,69 to 4,5	Green Stripe	0.363	9,22	6.00	152
61HP	1E392527022	15 to 45	1,0 to 3,1	Yellow	0.148	3,76	2.00	50,8
	1D387227022	35 to 100	2,4 to 6,9	Blue	0.200	5,08	1.69	42,9
	1D465127142	100 to 300	6,9 to 20,7	Red	0.243	6,17	1.69	42,9

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

Principle of Operation

Refer to Figure 2. Pilot-operated regulators such as Types 1098-EGR and EZL use 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.

In operation, assume that outlet pressure is below the pilot control setting. Control spring force on the pilot diaphragm thus opens the pilot valve plug providing additional loading pressure to the actuator diaphragm. This loading pressure forces

the actuator stem forward, opening the main valve plug via a bump connection. The upward motion of the plug allows gas to flow through the cage into the downstream system.

When downstream demand has been satisfied, outlet pressure tends to increase, acting on the pilot and actuator diaphragm. This pressure exceeds the pilot control spring setting, moving the pilot diaphragm away and letting the valve plug spring close the pilot valve plug (unbalanced in the 61 Series Pilots). Excess loading pressure on the actuator diaphragm escapes downstream through the bleed orifice.

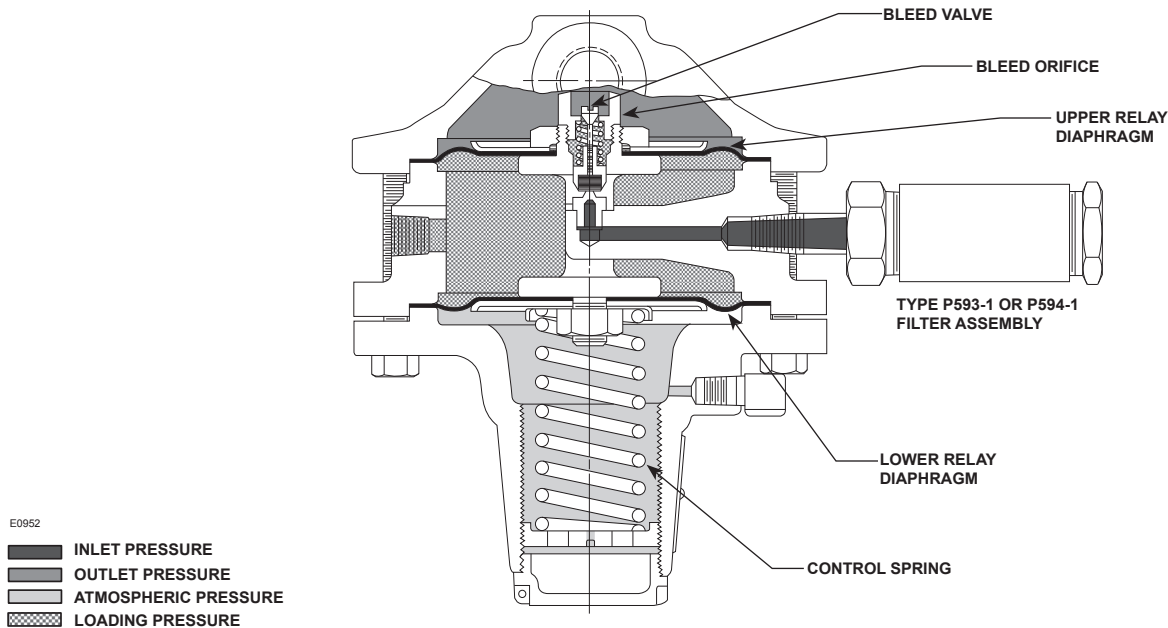


Figure 2. Type 61L Pilot Regulator Operational Schematic

Reduced actuator loading pressure permits the main valve to close. The combination of main valve spring force and valve plug unbalance provides positive valve plug shutoff against the port and upper seals. An external relief valve (Type 1806) is required when using the 61 Series pilots.

Installation and Startup



WARNING

Personal injury, property damage, equipment damage, or leakage due to escaping gas or 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, 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.

Additionally, physical damage to the regulator could cause personal injury or property damage due to escaping gas.

To avoid such injury or damage, install the regulator in a safe location.

1. Use qualified personnel when installing, operating, and maintaining pilots. Before installing, inspect the pilot and tubing for any shipment damage or foreign material that may have collected during crating and shipment. Make certain that the body is clean and the pipelines are free of foreign material.



WARNING

A regulator may vent some gas to the atmosphere. In hazardous or flammable gas service, vented gas may accumulate, and cause personal injury, death, or property damage due to fire or explosion.

Regulators installed for hazardous gas service should be vented 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.

2. To keep the pilot spring case vent from being plugged or the spring case from collecting moisture, corrosive chemicals, or other foreign material, point the vent down or otherwise protect it. To remotely vent the standard pilot, remove the vent and install obstruction-free tubing or piping into the 1/4 NPT vent tapping. Provide protection on a remote vent

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by installing a screened vent cap into the remote end of the vent pipe.

3. Run a 3/8-inch / 9,53 mm outer diameter or larger pilot supply line from the upstream pipeline to the filter inlet. Do not locate the upstream pipeline connection in a turbulent area, such as near a nipple, swage, or elbow. If the maximum pilot inlet pressure could exceed the pilot rating, install a separate pressure reducing regulator in the pilot supply line. Install a hand valve in the pilot supply line, and provide vent valves to properly isolate and relieve the pressure from the regulator.
4. Attach a 1/2 NPT pressure control line downstream of the regulator in a straight run of pipe. Do not locate the tap near any elbow, swage, or nipple that might cause turbulence. Connect the other end of the control line to the bonnet connection. Install a hand valve in the control line to shut off the control pressure when the bypass is in use.



CAUTION

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

5. Follow the startup procedure as detailed in the instruction manual of the pilot-operated pressure reducing regulator (Type EZL, 1098-EGR, or 99 Series regulator). Set the pilot control spring pressure setting according to the procedure in Pilot Adjustment section.

Pilot Adjustment



WARNING

To avoid possible personal injury from a pressure-loaded pilot, carefully vent the spring case pressure before removing the closing cap. Otherwise, trapped loading pressure could forcefully eject the freed closing cap.

Remove the closing cap. To adjust the pressure setting of the pilot control spring, turn the adjusting screw clockwise into the spring case to increase the spring compression and pressure setting. Turn the adjusting screw counterclockwise to decrease spring compression and pressure setting.

Any adjustments made should set the controlled pressure within the appropriate spring range shown in the Table 1.

Maintenance

Pilot parts are subject to normal wear and must be inspected and replaced as necessary. The frequency of inspection and replacement of parts depends upon the severity of service conditions or the requirements of local, state, and federal rules and regulations. Due to the care Regulator Technologies takes in meeting all manufacturing requirements (heat treating, dimensional tolerances, etc.), use only replacement parts manufactured or furnished by Regulator Technologies.

All O-rings, gaskets, and seals should be lubricated with a good grade of general-purpose grease and installed gently rather than forced into position. Be certain that the nameplates are updated to accurately indicate any field changes in equipment, materials, service conditions, or pressure settings.



WARNING

To avoid personal injury resulting from sudden release of pressure, isolate the pilot from all pressure and cautiously release trapped pressure from the pilot before attempting disassembly.

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Perform this procedure if changing the control spring for one of a different range, or if inspecting, cleaning, or replacing relief valve or any other pilot parts. Pilot part key numbers are referenced in Figures 3, 4, and 5.

1. Remove the pilot from the pipe nipple (key 24) unless just the control spring (key 7) is to be changed.
2. To gain access to the control spring (key 7) or other internal parts, remove the closing cap assembly (key 5) and relieve control spring compression by turning the adjusting screw (key 6) counterclockwise. Change the control spring and install the adjusting screw and closing cap assembly if no other maintenance will be performed. Set the pilot to the proper control spring setting according to the Pilot Adjustment section, and restamp the nameplate if necessary.
3. For any other internal maintenance, relieve control spring compression according to step 2. Then remove the cap screw (key 20) and separate the pilot into three sections: spring case (key 1), body (key 2), and bottom cover (key 3).

4. To inspect the two diaphragms (keys 14 and 15) thoroughly, remove the diaphragm nut (key 11), hex nut (key 19), and the upper and lower relay heads (keys 16 and 17). The projecting prong in the body (key 2) may be used as the restraining member to keep the yoke (key 4) from turning while removing the nuts. Also inspect the O-ring seal (key 12), and replace any parts as necessary.
5. Take the relay yoke (key 4) and attached parts out of the body (key 2) to examine the disk holder assembly (key 9). Remove the relay orifice (key 8) to check for clogging and replace if necessary.
6. To replace the disk holder assembly (key 9), first unscrew the bleed orifice (key 10). Remove the bleed orifice and the associated parts. Then unscrew the disk holder assembly from the bleed valve (key 26) to gain access to the relay spring (key 13). Clean or replace any parts as necessary before reassembling.
7. Upon reassembly, pay particular attention to the following assembly suggestions:
 - a. Before replacing the bottom cover (key 3) or spring case (key 1), be sure the yoke assembly is positioned so that it will not bind or rub on the prong in the relay body (key 2).
 - b. Avoid wrinkling the diaphragms (keys 14 and 15) when replacing the bottom cover (key 3) case and spring case (key 1).
 - c. Replace the bottom cover (key 3), carefully working the upper relay diaphragm (key 14) into the recess in the bottom cover. If the bottom cover rocks with respect to the pilot body (key 2), the diaphragm is probably wrinkled.
 - d. Replace the spring case (key 1), using care to smooth the lower relay diaphragm (key 15) evenly into the recess in the pilot body (key 2).
 - e. Install the eight cap screws (key 20), tightening them down evenly in a crisscross pattern to avoid crushing the diaphragm. Recommended final torque on these cap screws is 10 to 12 foot-pounds / 14 to 16 N•m.
8. After reassembly, set the pilot to the proper control spring setting according to the Pilot Adjustment section, and restamp the nameplate (key 27) if necessary.
9. To gain access to the Type 1806 relief valve, disconnect the relief tubing at the connector fitting and unscrew the relief valve. Make sure the spring closes the ball, or replace the relief valve if necessary. Install the relief valve back in the pipe tee and reconnect the relief tubing and connector fitting.

Parts Ordering

Each 61 Series pilot is assigned a serial number or FS number which can be found on the nameplates. Refer to this number when contacting your local Sales Office for assistance, or when ordering replacement parts.

When ordering a replacement part, be sure to include the complete 11-character part number from the following parts list. Some commonly used trim packages can be ordered according to the 11-character assembly number given in the parts kits listed in the Parts List.

Parts List

61 Series Pilots (Figures 3, 4, and 5)

Key	Description	Part Number
	Repair Part Kits, Nitrile (NBR) (Includes keys 8, 9, 10, 12, 13, 14, 15, 26, and 28)	
	Types 61L and 61LE	R61LX000012
	Type 61LD	R61LDX00012
	Repair Part Kits, Nitrile (NBR) (Includes keys 8, 9, 10, 12, 13, 14, 15, and 26)	
	Type 61H	R61HX000012
1	Relay Spring Case, Cast Iron Types 61L, 61LD, and 61LE	1B983919012
	Type 61H	
	Standard adjusting screw	1B984119012
	Capped adjusting screw or for Type 662	1H232619012
	Type 61HP	
	Standard adjusting screw	2P969419012
2	Relay Valve Body, Cast Iron Types 61L, 61LD, 61LE, and 61H	2J581919012
	Type 61HP	33A9845X012
3	Bottom Cover Types 61L, 61LD, 61LE, and 61H, Cast Iron	2C518619012
	Type 61HP, Steel	13A9843X012
4	Relay Yoke Types 61L, 61LD, 61LE, and 61H, Zinc Die Casting	1D662544012
	Type 61HP (2 required), 410/416 Stainless Steel	13A9838X012
5	Closing Cap Assembly Types 61L, 61LD, and 61LE	
	For all except pilots with handwheel adjusting screw and pressure-loaded pilots, Plastic	T11069X0012
	Pressure-loaded corrosion resistant trim, Steel	1E422724092
	Standard trim with handwheel adjusting screw, Brass	1R759314012
	Type 61H	
	Capped adjusting screw, Brass	1H236514012
6	Adjusting Screw Types 61L, 61LD, and 61LE	
	For all except handwheel adjusting screw, Zinc Die Casting	1B537944012
	For use with handwheel adjusting screw, Brass	1R759414012
	Type 61H, Steel	
	Standard	
	For 10 to 35 psig / 0,69 to 2,4 bar range	1A500528982
	For 10 to 50 psig / 0,69 to 3,4 bar range	1B212028982
	For 10 to 65 psig / 0,69 to 4,5 bar range	1A279128982
	Pressure-loaded/capped adjusting screw	1J881524102
	Type 662 mounting	18B3500X072
	Type 61HP, Steel	
	Standard	1C216032992

*Recommended Spare Part

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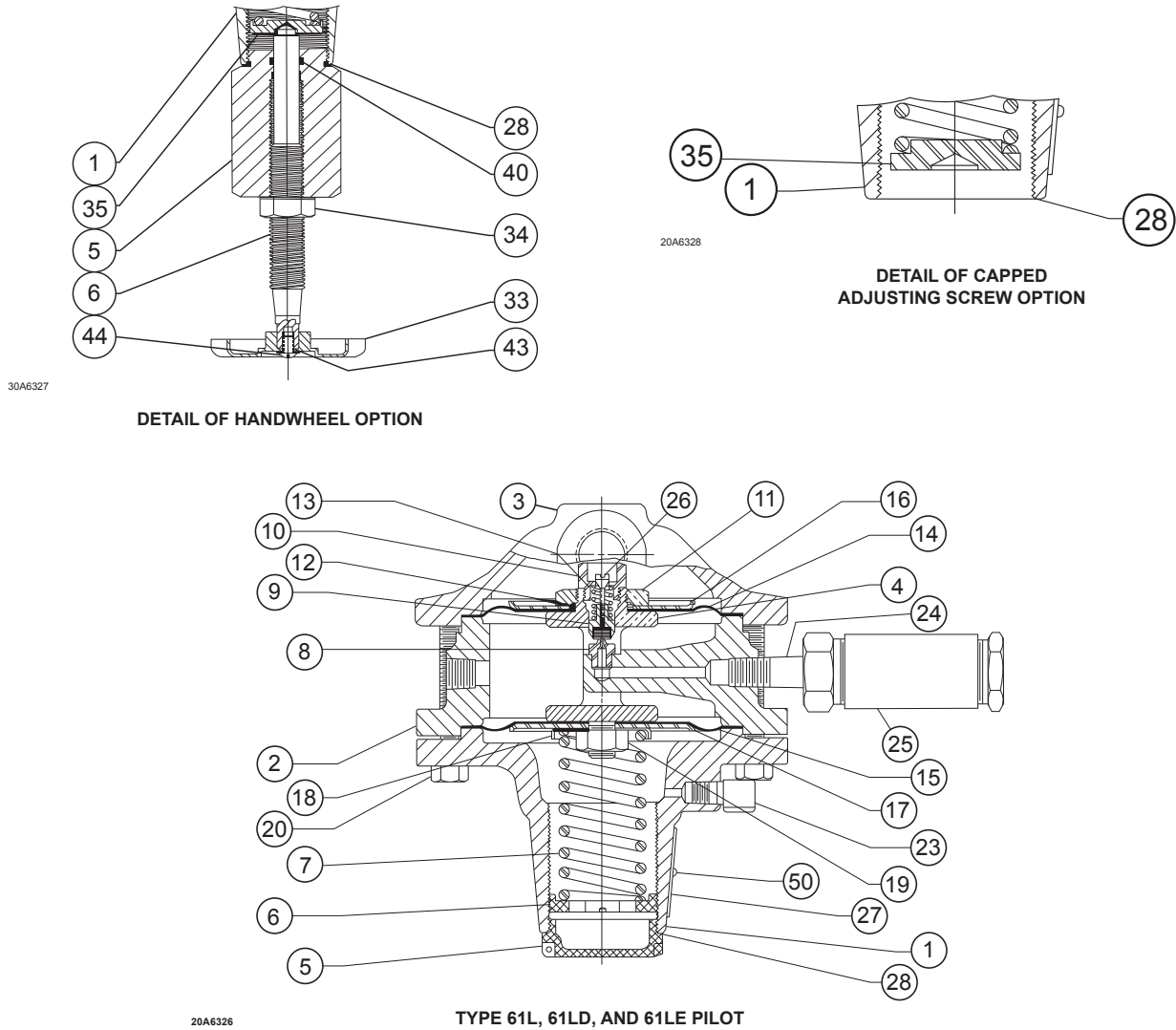
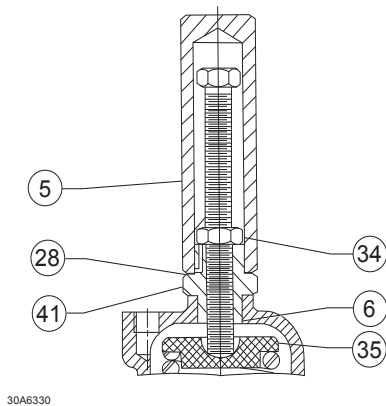


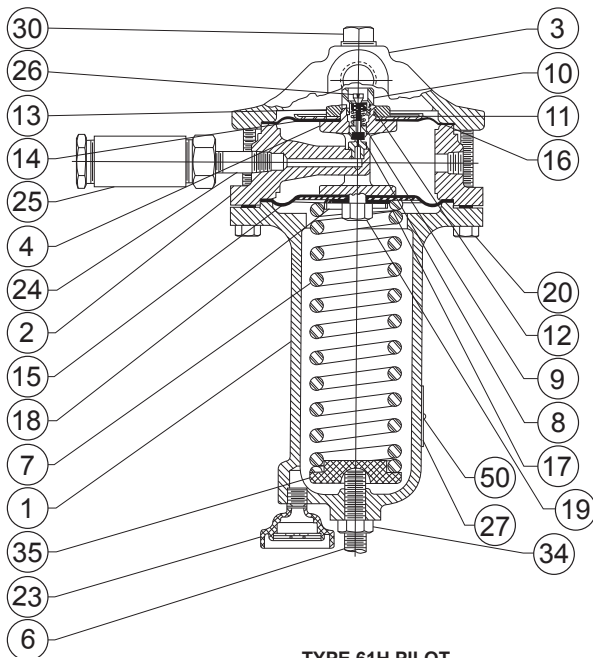
Figure 3. Types 61L, 61LD, and 61LE Pilot Assemblies

Key	Description	Part Number	Key	Description	Part Number
7	Control Spring, Steel		8	Relay Orifice, 303 Stainless Steel	
	Type 61LD			(For 61 Series except Type 61HP)	
	0 to 4-inches w.c. / 0 to 10 mbar, Orange	1B558527052		Standard applications	1C520135032
	3 to 12-inches w.c. / 7 to 30 mbar, Unpainted	1C680627222		Fast close and open, open only, or close only	
	Types 61L, 61LD, and 61LE			(For Types 61L and 61LD only)	1D373735032
	0.25 to 2 psig / 17 mbar to 0,14 bar, Red	1B886327022		Special orifice, fast open only application	
	1 to 5 psig / 69 mbar to 0,35 bar, Yellow	1J857827022		(For Types 61L and 61LD only)	1E874235132
	2 to 10 psig / 0,14 to 0,69 bar, Blue	1B886427022	9*	Disk Holder Assembly	
	5 to 15 psig / 0,35 to 1,0 bar, Brown	1J857927142		(For 61 Series except Type 61HP)	
	10 to 20 psig / 0,69 to 1,4 bar, Green	1B886527022		Standard trim, Brass/Nitrile (NBR)	1B8868000A2
	Type 61H			Corrosion resistant trim, 303 Stainless Steel	1B8868000B2
	10 to 65 psig / 0,69 to 4,5 bar, Green Stripe	0Y066427022		Oxygen service and pressure-loaded corrosion resistant trim, Brass/Fluorocarbon (FKM)	1N3638000A2
	Type 61HP		10*	Bleed Orifice, 303 Stainless Steel	
	15 to 45 psig / 1,03 to 3,1 bar, Yellow	1E392527022		Types 61L, 61LD, 61LE, and 61H	
	35 to 100 psig / 2,41 to 6,9 bar, Blue	1D387227022		Standard bleed	1B887335032
	100 to 300 psig / 6,9 to 20,7 bar, Red	1D465127142		Special bleed	1C831435032
				Capped bleed (for Types 61L and 61LD only)	1D777135032

*Recommended Spare Part



**DETAIL OF CAPPED
ADJUSTING SCREW OPTION**



TYPE 61H PILOT

Figure 4. Type 61H Pilot Assembly

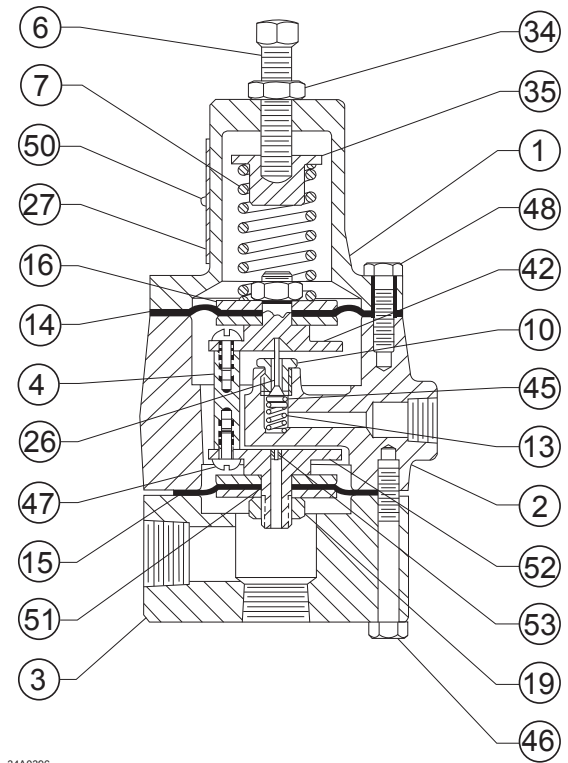
Key	Description	Part Number
13	Relay Spring, 302 Stainless Steel Types 61L and 61LE Type 61LD Type 61H Up to 300 psig / 20,7 bar inlet pressure 300 to 400 psig / 20,7 to 27,6 bar inlet pressure	1C911537022 1E643637022 1C911537022 1N859137022 1B797937022
14*	Upper Relay Diaphragm Types 61L, 61LD, 61LE, and 61H Standard and corrosion resistant trim, Nitrile (NBR) Oxygen service and pressure-loaded corrosion resistant trim, Fluorocarbon (FKM) Type 61HP Standard, Neoprene (CR) Oxygen service, Fluorocarbon (FKM)	1B885202052 1N162802332 13A9841X022 13A9841X012
15*	Lower Relay Diaphragm Types 61L, 61LD, and 61LE Standard and corrosion resistant trim, Nitrile (NBR) Oxygen service and pressure-loaded corrosion resistant trim, Fluorocarbon (FKM) Type 61H Standard and corrosion resistant trim, Neoprene (CR) Oxygen service, Fluorocarbon (FKM) (2 required) Type 61HP Standard, Neoprene (CR) Oxygen service, Fluorocarbon (FKM)	1B886002052 1N536102332 1B894202192 1N162702302 13A9840X012 13A9840X022
16	Upper Relay Head, Zinc-plated Steel Types 61L and 61LD Type 61LE Type 61H Diaphragm Plate, 410/416 Stainless Steel Type 61HP (4 required)	1B989325072 1D558425072 1D558425072 1D558425072 13A9839X012
17	Lower Relay Head, Zinc-plated Steel Types 61L, 61LD, and 61LE Type 61H	1B989425072 1D558325072
18	Spring Seat, Zinc-plated Steel Types 61L, 61LD, and 61LE Type 61H	1B886225072 1D558525072
19	Hex Nut, Zinc-plated Steel Types 61L, 61LD, 61LE, and 61H Type 61HP (2 required)	1A340324122 1A346524122
20	Cap Screw, Zinc-plated Steel (8 required) (For 61 Series except Type 61HP)	1B989624052
23	Pipe Plug or Vent Assembly Pipe Plug for Types 61L, 61LD, and 61LE, Steel Vent Assembly for Type 61H	1A649528982 Type Y602-1
24	Pipe Nipple, Galvanized/Zinc-plated Steel	1C488226232
25	Filter Assembly Standard trim Corrosive trim	Type P594-1 Type P593-1
26	Bleed Valve Types 61L, 61LE, and 61H, 416 Stainless Steel Type 61LD, 416 Stainless Steel Type 61HP Standard Trim, Stainless Steel/Nitrile (NBR) Oxygen Service, Stainless Steel/ Fluorocarbon (FKM)	1D986735132 1H951635132 1D5604000B2 1N3798000C2
27	Nameplate	-----
28*	Gasket Types 61L, 61LD, and 61LE, Neoprene (CR) Type 61H, Plated Steel/Composition	1P753306992 1B487099202
30	Pipe Plug, Zinc-plated Steel (For 61 Series except Type 61HP)	1A369224492
32	Bleed Orifice Cap, 303 Stainless Steel (For Types 61L and 61LD with capped bleed only)	1D777235032

Key	Description	Part Number
11	Diaphragm Nut (For 61 Series except Type 61HP) Standard trim, oxygen service and pressure-loaded corrosion resistant trim, 316 Stainless Steel	1B989514012
	Corrosion resistant trim, 18-8 Stainless Steel	1B989535072
12*	O-ring Seal (For 61 Series except Type 61HP) Standard and corrosion resistant trim, Nitrile (NBR)	1B885506992
	Oxygen service and pressure-loaded corrosion resistant trim, Fluorocarbon (FKM)	1B8855X0012

*Recommended Spare Part

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Key	Description	Part Number
33	Handwheel, Zinc Die Cast (For Types 61L, 61LD, and 61LE only)	1J496144012
34	Hex Nut, Zinc-plated Steel Types 61L, 61LD, and 61LE Type 61H Type 61HP	1A351124122 1A352424122 1A352224122
35	Spring Seat, Zinc-plated Steel Types 61L, 61LD, and 61LE Type 61H Type 61HP	1J618124092 16A9812X012 10A3963X012
40*	O-ring, Nitrile (NBR) (For Types 61L, 61LD, and 61LE only)	1D541506992
41	Adaptor, Brass (For Type 61H only)	1J881624092
42	Yoke Cap, 410/416 Stainless Steel (For Type 61HP only)	13A9836X012
43	Lockwasher, Steel (For Types 61L, 61LD, and 61LE only)	1A352332992
44	Machine Screw, Steel (For Types 61L, 61LD, and 61LE only)	16A5763X012
45	Valve Spring Seat, 316 Stainless Steel (For Type 61HP only)	1L251135072
46	Cap Screw (6 required) (For Type 61HP only)	15A0690X012
47	Machine Screw, 303 Stainless Steel (4 required) (For Type 61HP only)	1A866935032
48	Cap Screw (6 required) (For Type 61HP only)	1P327028982
50	Drive Screw, 18-8 Stainless Steel (2 required)	1A368228982
51*	Diaphragm Insert (2 required) (For Type 61HP only) Standard, Nitrile (NBR) Oxygen service, Fluorocarbon (FKM)	13A9842X012 13A9842X022
52	Lower Yoke Cap, 410/416 Stainless Steel (For Type 61HP only)	13A9837X012
53	Bleed Plug, Brass (For Type 61HP only)	1V211514012



34A0396

Figure 5. Type 61HP Pilot Assembly

*Recommended Spare Part

Industrial Regulators

Emerson Process Management Regulator Technologies, Inc.

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

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

Europe
Bologna 40013, Italy
Tel: +39 051 419 0611

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

For further information visit www.fisherregulators.com

Natural Gas Technologies

Emerson Process Management Regulator Technologies, Inc.

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

Asia-Pacific
Singapore 128461, Singapore
Tel: +65 6770 8337

Europe
Bologna 40013, Italy
Tel: +39 051 419 0611
Gallardon 28320, France
Tel: +33 2 37 33 47 00

TESCOM

Emerson Process Management Tescom Corporation

USA - Headquarters
Elk River, Minnesota 55330-2445, USA
Tels: +1 763 241 3238
+1 800 447 1250

Europe
Selmsdorf 23923, Germany
Tels: +49 38823 31 287

Asia-Pacific
Shanghai 201206, China
Tel: +86 21 2892 9499

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