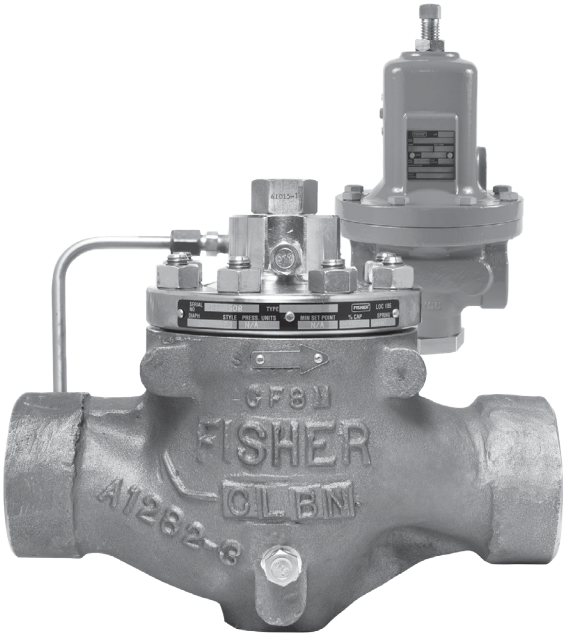
Type LR128 Relief Valve or Backpressure Liquid Regulator



TYPE LR128 REGULATOR

TYPE MR98H PILOT

Figure 1. *Type LR128 Relief Valve or Backpressure Regulator and Type MR98H Pilot*

WARNING

Failure to follow these instructions or to properly install and maintain this equipment could result in bursting of the equipment and/or chemical contamination causing property damage and personal injury or death.

Fisher™ relief valves and backpressure 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. (Emerson) instructions.

If the relief valve or backpressure regulator discharges process fluid or a if leak develops in the system, service to the unit may be required. Failure to correct trouble could result in a hazardous condition.

Call a qualified service person to service the unit. 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. Only a qualified person must install or service the relief valve or backpressure regulator.

The Type LR128 is designed for liquid service. Do not operate the regulator in applications where temperatures are below the process fluid's freezing point or above its boiling point which are dependent on the process fluid and the application pressures.

Specifications

Specifications for the Type LR128 relief valve or backpressure regulator are shown below. Other information for the main valve appears on the nameplate. The control spring range for the pilot is marked on the nameplate of Type MR98H pilot.

Main Valve Body Sizes, End Connection Styles and Structural Design Ratings(1)

See Table 1

Maximum Inlet Pressures(1)

Type LR128 Main Valve: See Table 1
Type MR98H Pilot: See Table 2
Type 112 Restrictor: 1500 psig / 103 bar

Maximum Outlet Pressure

Type LR128 Main Valve: See Table 1
Type MR98H Pilot: 450 psig / 31.0 bar

Relief Set Pressure/Backpressure Control Ranges

See Table 3

Main Valve Plug Travel

1 in. / DN 25: 0.37 in. / 9.4 mm
2 in. / DN 50: 0.68 in. / 17 mm
3 in. / DN 80: 0.98 in. / 25 mm
4 in. / DN 100: 1.19 in. / 30 mm

Main Valve Minimum Differential Pressures(1)

See Table 6

Main Valve Maximum Differential Pressures(1)

See Table 7

Main Valve Internal Inlet Strainer Sizes

1 in. / DN 25: 12 Mesh (0.0661 in. / 1.68 mm)(2)
2, 3 and 4 in. / DN 50, 80 and 100: 10 Mesh (0.0787 in. / 2.00 mm)(2)

Temperature Capabilities(1)

See Table 10

Pressure Registration

External: 1/8 NPT

Spring Case Vent

Type Y602-12

Construction Materials

Type LR128 Main Valve

Body: WCC Steel, CF8M or CF3M Stainless steel
Bonnet: LF2 Steel or 316/316L Stainless steel
Bonnet Bushing: 416 Hardened Stainless steel
Cage: 15-5 Stainless steel

Construction Materials (continued)

Type LR128 Main Valve (continued)

Spring: 302 Stainless steel or 17-7 Stainless steel
Top Plug: 17-4 Stainless steel
Bottom Plug: 416 Stainless steel
Inlet Strainer: Stainless steel
Diaphragm: Nitrile (NBR) or Fluorocarbon (FKM)
O-Rings: Nitrile (NBR) or Fluorocarbon (FKM)
Flanged Locknut: 17-4 Stainless steel
Backup Rings: Polytetrafluoroethylene (PTFE)
Upper Spring Seat: 416 Stainless steel
Indicator Protector and Cover: Plastic
Indicator Stem: 303 Stainless steel
Indicator Fitting: 416 Stainless steel
Travel Indicator Plug: 416 Stainless steel

Type MR98H Pilot

Body: WCC Steel or CF8M Stainless steel
Spring Case: WCC Steel or CF8M Stainless steel
Orifice: 416 Stainless steel
Valve Plug: 416 Stainless steel
Guide and Pusher Post: 416 Stainless steel
Gasket: Nitrile (NBR) or Fluorocarbon (FKM)
O-rings: Nitrile (NBR) or Fluorocarbon (FKM)
Diaphragm: Neoprene (CR) or Fluorocarbon (FKM)

Mounting Parts

Pilot Mounting Pipe Nipple: Plated steel or Stainless steel
Pipe Fittings: Plated steel or Stainless steel
Tubing: Stainless steel

Type 112 Restrictor

Body: 15-5 Stainless steel
Groove Valve: 416 Stainless steel
Retainer: 416 Stainless steel
Pipe Plug: 316 Stainless steel
O-rings: Nitrile (NBR) or Fluorocarbon (FKM)

Options

- Pre-piped Pilot Supply
- Travel Indicator

1. The pressure/temperature limits in this Instruction Manual and any applicable standard or code limitation should not be exceeded.
2. Nominal sieve opening.

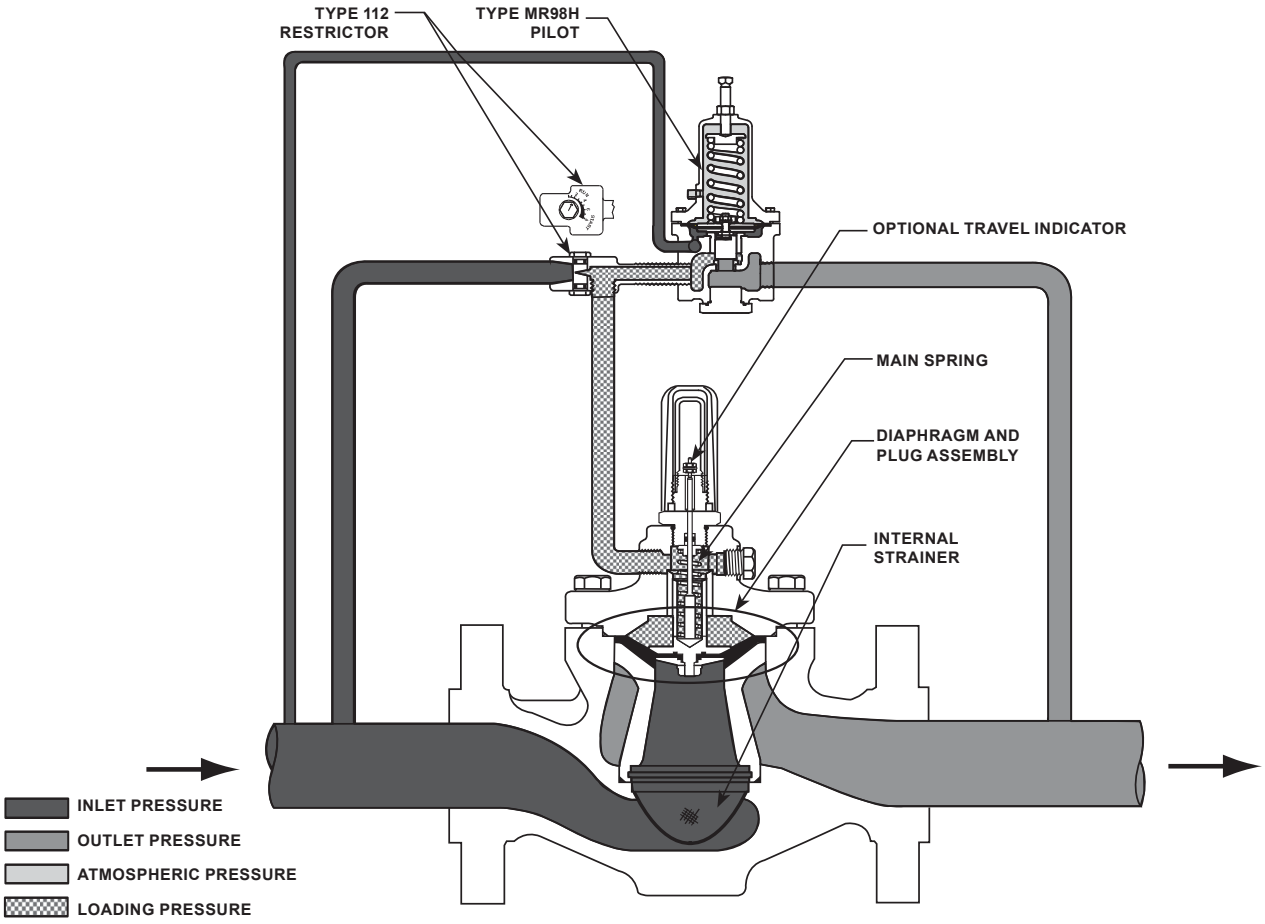


Figure 2. *Type LR128 Operational Schematic*

Introduction

Scope of the Manual

This Instruction Manual provides installation, startup, adjustment, maintenance and parts ordering information for Type LR128 relief valve or backpressure regulator, 1/2 NPT Type MR98H pilot and Type 112 restrictor.

Product Description

The Type LR128 pilot-operated, relief valve or backpressure regulator is used for liquid applications and include a Type 112 restrictor and a 1/2 NPT Type MR98H pilot.

Pilot Type Description

Type MR98H – High-pressure relief pilot for 25 to 375 psig / 1.7 to 25.9 bar set pressures. Designed to handle inlet pressures up to 450 psig / 31.0 bar.

Principle of Operation (Figure 2)

A pressure relief valve is a throttling pressure control device that limits pressure build-up, it opens to prevent the rise of internal pressure in excess of a specified value. Fisher™ relief valves cannot be used as ASME safety relief valves.

A backpressure regulator is a device that maintains a desired upstream pressure by varying the flow in response to changes in upstream pressure. It functions the same as a relief valve, i.e., it opens on increasing upstream pressure.

Relief Valve

As long as the inlet pressure is below the set pressure, the Type MR98H pilot control spring keeps the pilot valve plug closed. Inlet pressure passes through the Type 112 restrictor and registers as loading pressure on top of the Type LR128 diaphragm and plug assembly. Force from the main spring, in addition

Table 1. *Type LR128 Main Valve Body Sizes, End Connection Styles, Structural Design Ratings and Maximum Operating Inlet Pressures*[1]

MAIN VALVE BODY SIZE		MAIN VALVE BODY MATERIAL	END CONNECTION STYLE[2]	STRUCTURAL DESIGN RATING[3]		MAXIMUM OPERATING RELIEF (INLET) PRESSURE INCLUDING BUILD-UP[3]		MAXIMUM OPERATING OUTLET PRESSURE	
In.	DN			psig	bar	psig	bar	psig	bar
1, 2, 3 and 4	25, 50, 80 and 100	WCC Steel	NPT or SWE (1 and 2 in. only)	1500	103	450	31.0	450	31.0
			CL150 RF	290	20.0	290	20.0	290	20.0
			CL300 RF	750	51.7	450	31.0	450	31.0
			CL600 RF	1500	103				
			PN 16/25/40 RF	580	40.0				
		CF8M Stainless steel	NPT (1 and 2 in. only)	1440	99.2	450	31.0	450	31.0
			CL150 RF	275	19.0	275	19.0	275	19.0
			CL300 RF	720	49.6	450	31.0	450	31.0
			CL600 RF	1440	99.2				
			PN 16/25/40 RF	580	40.0				

1. The pressure/temperature limits in this Instruction Manual and any applicable standard or code limitation should not be exceeded.
2. Ratings and end connections for other than ASME standard can usually be provided. Contact your local Sales Office for assistance.
3. Maximum cold working pressure (CWP) per ASME B16.34 or product bulletin limit, whichever is lowest. Temperature may decrease these maximum pressures.

Table 2. *Type MR98H Pilot Maximum Cold Working Pressure*[1][2]

BODY SIZE	BODY AND SPRING CASE MATERIAL	MAXIMUM INLET PRESSURE	MAXIMUM OUTLET PRESSURE
1/2 NPT	Steel Stainless steel	450 psig / 31.0 bar	450 psig / 31.0 bar

1. The pressure/temperature limits in this Instruction Manual and any applicable standard or code limitation should not be exceeded.
2. Temperature and/or the body end connection may decrease these maximum pressures.

Table 3. *Relief Set Pressure or Backpressure Control Ranges*

PILOT	SET PRESSURE RANGE		SPRING WIRE DIAMETER		SPRING FREE LENGTH		SPRING MATERIAL	SPRING PART NUMBER AND COLOR
	psig	bar	In.	mm	In.	mm		
Type MR98H	35 to 75	2.4 to 5.2	0.234	5.94	2.595	65.9	Powder-coated steel	ERAA01910A0, Green
	70 to 140	4.8 to 9.7	0.283	7.19	2.44	62.0	Powder-coated steel	ERAA01911A0, Red
	130 to 200	9.0 to 13.8	0.331	8.41	2.250	57.2	Powder-coated steel	ERAA02889A0, Blue
	100 to 375	6.9 to 25.9	0.375	9.53	2.60	66	Powder-coated steel	ERCA04293A0, Unpainted
	150 to 375[1]	10.3 to 25.9[1]	0.394	10.0	5.063	129	Powder-coated steel	1N943427142, Unpainted

1. 150 to 375 psig / 10.3 to 25.9 bar spring range is only for the Type MR98HH pilot construction; consult the local Sales Office for this option.

to inlet pressure bleeding through the Type 112 restrictor, provides a downward loading pressure to keep the main valve diaphragm and plug assembly tightly shutoff.

When the inlet pressure rises above the set pressure, the pressure on the pilot diaphragm overcomes the pilot control spring and opens the pilot valve plug. The pilot then exhausts the loading pressure from the top of the main valve diaphragm and plug assembly. The inlet pressure unbalance overcomes the main spring force and opens the diaphragm and plug assembly.

The pilot continuously exhausts process fluid when the inlet pressure is above the set pressure.

As the inlet pressure drops below the set pressure, the pilot control spring closes the pilot valve plug and the exhaust to atmosphere stops. Force from the main spring, along with pilot loading pressure, pushes the diaphragm and plug assembly onto the tapered edge seat, producing tight shutoff.

Backpressure Regulator

As long as inlet pressure remains below set pressure, the Type MR98H pilot control spring keeps the pilot valve plug closed. Force from the main spring, in addition to inlet pressure bleeding through the Type 112 restrictor, provides downward loading pressure to keep the main valve diaphragm and plug assembly tightly shutoff.

When inlet pressure rises above the set pressure, pressure on the pilot diaphragm overcomes the control spring to stroke the valve plug open. The pilot then exhausts loading pressure from the top of the main valve diaphragm. Inlet pressure unbalance overcomes the main spring force to open the main valve diaphragm and plug assembly.

As inlet pressure drops below set pressure, the pilot control spring overcomes the diaphragm force to stroke the valve plug down to close. Force from the main spring, along with pilot loading pressure, pushes the diaphragm and plug assembly onto the tapered edge seat, producing tight shutoff.

Installation

WARNING

Personal injury, equipment damage or leakage due to escaping process fluid or bursting of pressure-containing parts may result if the Type LR128 is overpressured or is installed where service conditions could exceed the limits given in Specifications section or where conditions exceed any ratings of the adjacent piping or piping connections.

To avoid such injury or damage, install a Type LR128 relief valve or backpressure regulator where:

- **Service conditions are within unit capabilities (including those in the Specifications section).**
- **Service conditions are within applicable codes, regulations or standards.**

Additionally, physical damage to the relief valve or backpressure regulator could break the pilot off the main valve, causing personal injury and property damage due to escaping process fluid. To avoid such injury and damage, install the regulator in a safe location.

WARNING

Liquid pressure control systems should be designed using engineering practices to eliminate quick control starting or stopping of the flow stream, which can produce water hammer.

The robust design of the Type LR128 allows this relief valve or backpressure regulator to be installed indoors or outdoors. Type LR128 is designed to withstand the elements. The powder paint coating protects against minor impacts, abrasions and corrosion. When installed outdoors, the Type LR128 does not require protective housing. However, the Type MR98H pilot should be oriented so that the pilot spring case vent is pointed down. Otherwise, make sure the vent is protected so that rain, moisture, insects or any debris will not accumulate inside or block the vent assembly.

When installed indoors, no remote venting is required except on the pilot spring case. Refer to Step 8 of the following procedure for the correct venting practices.

1. Only personnel qualified through training and experience should install, operate and maintain a relief valve or backpressure regulator. Before installation, make sure that there is no damage to or debris in the main valve body or pilot. Also, make sure that all tubing and piping are clean and unobstructed.

   Note

   The Type LR128 internal inlet strainer is intended to prevent occasional large particles from entering the main valve. If the flowing media contains continuous particles, upstream filtration is recommended before the main valve and in the pilot supply piping (reference Figure 3). See the Specifications section for the corresponding mesh size of the internal inlet strainer.

2. A Type LR128 relief valve or backpressure regulator may be installed in any orientation, as long as flow through the unit matches the direction of the arrow on the main valve body and the pilot vent is pointed down. However, for easier maintenance, install the regulator with the bonnet up.

CAUTION

Provide adequate support to the bonnet when disassembling Type LR128 relief valve or backpressure regulator installed in a vertical installation or other application where the bonnet is not oriented upward. Without adequate support, the bonnet may fall and cause physical injury when the cap screws are loosened.

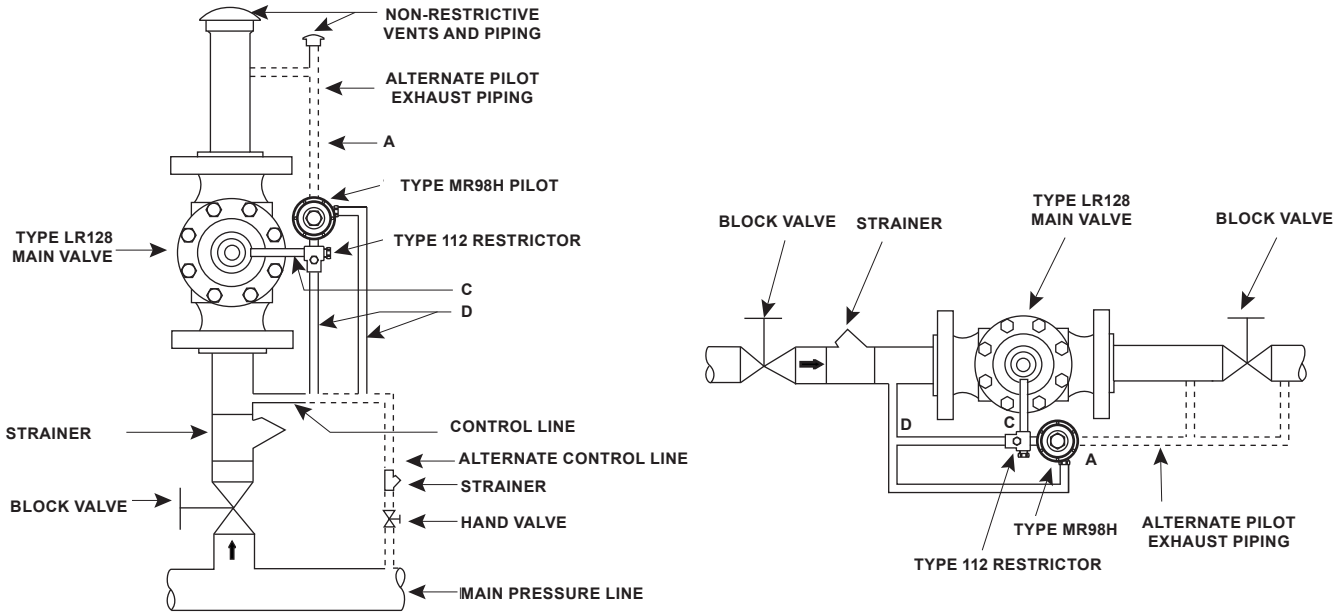


Figure 3. *Typical Type LR128 Installation Schematic*

3. The standard pilot mounting position is as shown in Figure 1. Rotate the bonnet (key 2, Figure 11) or the pilot (Figure 16) for other mounting positions.
4. An upstream control line is required and must be installed – as shown in Figure 3 – into the 1/8 NPT connection in the pilot body assembly (Figure 16). Do not make the upstream pipeline connection in or directly downstream of a turbulent area such as a swage or elbow. A filter or strainer may be installed in the control line upstream of the pilot to provide clean fluid. Inspect and clean this filter regularly to make sure it is not plugged, which can prevent proper pilot operation.
5. Run a supply pressure line from the upstream pipeline to the restrictor inlet (use 3/8 NPT outer diameter tubing or larger). Install a filter or strainer upstream of the restrictor, if needed, to keep the supply source from clogging the restrictor or pilot. Inspect and clean this filter regularly to make sure it has not been plugged which can prevent proper relief valve or backpressure operation.
6. Apply a good grade of pipe compound to the external pipeline threads for a threaded body or use suitable line gaskets for a flanged body. Use approved piping procedures when installing the relief valve or backpressure regulator.

WARNING

When used in relief valve service, the Type LR128 may leak toxic chemical to the environment. In toxic or hazardous liquid service, leaked chemical may accumulate and cause personal injury, death or property damage due to escaping fluid.

To prevent such injury or damage, provide piping or tubing to vent the hazardous liquid to a remote, safe location away from air intakes or any hazard-prone location. The exhaust piping must be designed and installed to guard against excessive flow restriction. Protect the vent line or stack opening against condensation or clogging.

For safety during shutdown, vent valves are required immediately upstream and downstream of the main valve on a backpressure or bypass installation.

7. If system operation during maintenance is required, install isolating and vent valves as needed.

8. The pilot spring case vent (key 54, Figure 16) must be kept open to atmospheric pressure. A clogged pilot spring case vent may cause the relief valve or backpressure regulator to function improperly. To prevent plugging (and to keep the spring case from collecting moisture, corrosive chemicals or other foreign material) point the vent down, orient it to the lowest possible point on the spring case or otherwise protect it. Protect the vent assembly from icing, moisture or debris that may cause blockage, as required. Inspect the vent regularly to make sure it has not been plugged. To change the vent orientation, twist the vent assembly in the spring case.
9. To remotely vent a spring case, remove the vent and install obstruction-free tubing or piping into the 1/4 NPT vent tapping. Provide protection on a remote vent by installing a screened vent cap onto the remote end of the vent pipe.

Startup and Shutdown

CAUTION

If pressure is introduced first to the main valve before the pilot, the main valve may go wide-open and subject the downstream system to full inlet pressure.

Note

The maximum inlet pressure for specific constructions are given in Tables 1 and 2. Use a pressure gauge to monitor inlet pressure during startup.

Relief Installation (Figure 3)

Startup

1. Close upstream vent valve (not shown).
2. Slowly open block valve and hand valve, if installed.
3. Adjust the pilot as needed.

Shutdown

1. Close block valve and hand valve, if installed.
2. Slowly open upstream vent valve (not shown).

Backpressure Installation (Figure 3)

Startup

1. Close upstream and downstream vent valves (not shown).
2. Slowly open upstream block valve first and then slowly open downstream block valve.
3. Adjust the pilot as needed. If the pilot is not piped downstream, make sure the pilot exhaust is pointed in the correct direction.

Shutdown

1. Close upstream block valve first and then close the downstream block valve.
2. Open downstream and upstream vent valves (not shown).

Pilot Adjustment

The factory setting of the regulator can be varied within the pressure range stamped on the nameplate. To change the set (control) pressure, loosen the jam nut (key 17, Figure 16) and turn the adjusting screw (key 15) clockwise to increase set (control) pressure or counterclockwise to decrease it. Monitor the set (control) pressure with a test gauge during the adjustment. Tighten the locknut to maintain the desired setting.

Recommended set (control) pressure ranges available and color codes of the respective springs are shown in Table 3.

Type 112 Restrictor Adjustment (Figure 5)

The Type 112 restrictor controls the relief valve or backpressure regulator's accuracy and speed of response. A restrictor setting of "6" for the 1, 2 and 3 in. sizes and "8" for the 4 in. size are recommended to optimize accuracy, speed of response and stability. However, the restrictor can be used to fine tune the relief valve or backpressure regulator for maximum performance by decreasing the restrictor setting for tighter control (increased opening speed, decreased closing speed); or increasing the restrictor setting for maximum stability (decreased opening speed, increased closing speed). A lower setting also provides a narrower proportional band for better accuracy. The "8" position has the largest flow, is most stable and easiest for startup. The "0" setting has the smallest (minimum) flow passage; at no point of rotation will the Type 112 restrictor be completely shut off.

Note

Mineral, dirt and sediments may gradually deposit and build up inside the spaces of the restrictor. This may cause the unit response to get slower and unit performance to decrease. If clogging of the restrictor is suspected, immediately check and clean the restrictor.

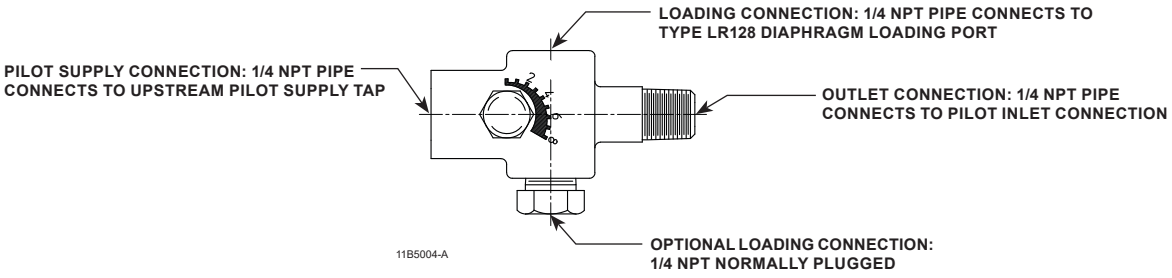


Figure 4. *Type 112 Restrictor*

Regular inspection of the restrictor is recommended to ensure optimum performance. Refer to the Type 112 Restrictor Maintenance section.

Likewise, debris in the process fluid may clog the restrictor. Install strainer upstream of the regulator to prevent debris from clogging the restrictor. Regular inspection, maintenance and cleaning of the strainer is recommended to ensure optimum performance.

Recommended Type 112 Restrictor Settings and Restrictor Setting Guide (Table 4 and Figure 5)

This guide can be used to adjust performance according to application conditions. The recommended initial setting is “6” for the 1, 2 and 3 in. sizes and “8” for the 4 in. size (see Table 4).

Maintenance

Relief valve or backpressure regulator parts are subject to normal wear and must be inspected periodically and replaced as necessary. Due to the care Emerson takes in meeting all manufacturing requirements (heat treating, dimensional tolerances, etc.), use only replacement parts manufactured or furnished by Emerson. Also, when lubrication is required, use a good quality lubricant and lightly coat the recommended part.

The frequency of inspection and parts replacement depends upon the severity of service conditions, applicable codes and government regulations and company inspection procedures. Table 8 lists possible relief valve or backpressure regulator issues and solutions for them.

Type LR128 Main Valve Trim Parts Maintenance

Instructions are given for complete disassembly and assembly. The main valve may remain in the pipeline during maintenance procedures. Key numbers are referenced in Figures 11 through 15.

WARNING

Avoid personal injury or damage to property from sudden release of pressure or uncontrolled process fluid. Before starting to disassemble, carefully release all pressures according to the Shutdown procedure. Use gauges to monitor inlet, loading and outlet pressures while releasing these pressures.

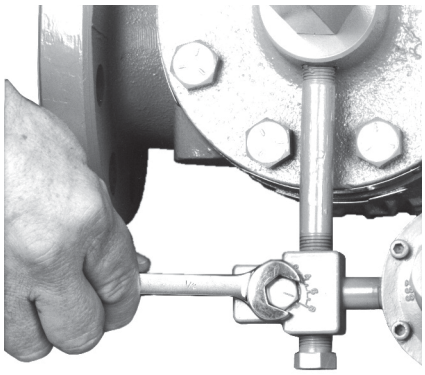
Disassembly

Disassembly of Type LR128

1. Shutdown, isolate and depressurize the main valve and pilot according to the shutdown procedure.
2. Remove the cap screws (key 3). Lift up and remove the bonnet (key 2) from the body (key 1).

CAUTION

Provide adequate support to the bonnet when disassembling Type LR128 relief valve or backpressure regulator installed in a vertical installation or other application where the bonnet is not oriented upward. Without adequate support, the bonnet may fall and cause physical injury when the cap screws are loosened.



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RESTRICTOR ADJUSTMENT

	TYPE 112 RESTRICTOR ADJUSTMENT GUIDE(1)			
Regulator Performance	*2*	*4*	*6*	*8*
Accuracy				
Hysteresis				
Stability				
Speed of Response (Main Valve Closing)				
Speed of Response (Main Valve Opening)				

Increased performance
Decreased performance
1. See Table 4 for recommended restriction settings.

RESTRICTOR SETTING GUIDE

Figure 5. *Restrictor Adjustment and Restrictor Setting Guide*

Table 4. *Recommended Setting for Type 112 Restrictor*

BODY SIZE		RECOMMENDED RESTRICTION SETTING
In.	DN	
1 and 2	25 and 50	“6” (other restriction settings may be used)
3	80	“6” or “8” (lower settings are not recommended)
4	100	“8” (lower settings are not recommended)

3. Remove the diaphragm (key 9) and plug (key 11) assembly and bonnet O-ring (key 28).
4. Pull out the cage (key 7), O-ring (key 8) and inlet strainer (key 23).
5. Clean parts and replace if necessary.

Assembly

1. Install the inlet strainer (key 23) into the body (key 1).

Note

When installing in a vertical orientation, apply lubricant to the bottom of the inlet strainer (key 23) to help hold parts in place while installing cage.

2. Lightly lubricate and install the cage O-ring (key 8).
3. Apply lubricant lightly to all O-rings or the mating part before installing them.
4. Install the cage (key 7) and lightly lubricate and install the bonnet O-ring (key 28).
5. Lubricate the top and bottom of the outer edge (bead area) of the diaphragm (key 9) and place diaphragm and plug (key 11) assembly on the cage (key 7).
6. Lubricate the top plug O-ring (key 14).
7. If travel indicator was removed, lightly lubricate the travel indicator assembly threads (key 19) and screw it into the bonnet (key 2). See Travel Indicator Assembly Maintenance for maintenance.

Table 5. *Build-up Pressure Needed to Begin Opening and Fully Open Main Valve and Pressure Drop Needed to Reseat Pilot*

SPRING RANGE, SPRING PART NUMBER AND SPRING COLOR	SET PRESSURE[1]		BUILDUP OVER SET PRESSURE NEEDED TO BEGIN OPENING OF MAIN VALVE[2]		BUILDUP OVER SET PRESSURE NEEDED TO FULLY OPEN MAIN VALVE[3]		PRESSURE DROP BELOW SET PRESSURE NEEDED TO RESEAT PILOT	
	psig	bar	psig	bar	psig	bar	psig	bar
35 to 75 psig / 2.4 to 5.2 bar ERAA01910A0 (Green)	35	2.4	1	0.07	1	0.07	2	0.14
	50	3.4	1	0.07	1	0.07	2	0.14
	75	5.2	1	0.07	6	0.41	2	0.14
70 to 140 psig / 4.8 to 9.7 bar ERAA01911A0 (Red)	70	4.8	1	0.07	4	0.28	5	0.34
	100	6.9	1	0.07	10	0.69	5	0.34
	125	8.6	1	0.07	13	0.90	5	0.34
	140	9.7	1	0.07	16	1.1	5	0.34
130 to 200 psig / 9.0 to 13.8 bar ERAA02889A0 (Blue)	130	9.0	1	0.07	14	0.97	6	0.41
	150	10.3	1	0.07	14	0.97	6	0.41
	175	12.1	1	0.07	17	1.2	6	0.41
	200	13.8	1	0.07	17	1.2	6	0.41
100 to 375 psig / 6.9 to 25.9 bar ERCA04293A0 (Unpainted)	150	10.3	1	0.07	9	0.62	7	0.48
	200	13.8	1	0.07	10	0.69	7	0.48
	250	17.2	1	0.07	11	0.76	7	0.48
	300	20.7	1	0.07	15	1.03	7	0.48
	350	24.1	1	0.07	15	1.03	7	0.48
	375	25.9	1	0.07	25	1.7	7	0.48

1. Set pressure is defined as the pressure at which the pilot starts-to-discharge.
2. Inlet pressure buildup over the set pressure at which the main valve starts audible flow.
3. Inlet pressure buildup over the set pressure for the main valve to achieve wide-open flow capacity.

Table 6. *Type LR128 Main Valve Minimum Differential Pressures[1]*

MAIN VALVE BODY SIZE		DIAPHRAGM		MINIMUM DIFFERENTIAL, PERCENT OF CAPACITY			
				For 90% Capacity		For 100% Capacity	
In.	DN	Diaphragm Code	Diaphragm Material	psid	bar d	psid	bar d
1	25	17E68 (standard)	Nitrile (NBR), Low Minimum Differential	30	2.1	30	2.1
		17E97	Nitrile (NBR), High Erosion Resistance	35	2.5	35	2.5
		17E88	Fluorocarbon (FKM), High Temperature Capability	30	2.1	30	2.1
2	50	17E68 (standard)	Nitrile (NBR), Low Minimum Differential	18	1.2	19	1.3
		17E97	Nitrile (NBR), High Erosion Resistance	24	1.7	24	1.7
		17E88	Fluorocarbon (FKM), High Temperature Capability	18	1.2	19	1.3
3	80	17E68 (standard)	Nitrile (NBR), Low Minimum Differential	21	1.5	28	1.9
		17E97	Nitrile (NBR), High Erosion Resistance	23	1.6	23	1.6
		17E88	Fluorocarbon (FKM), High Temperature Capability	21	1.5	28	1.9
4	100	17E68 (standard)	Nitrile (NBR), Low Minimum Differential	16	1.1	30	2.1
		17E97	Nitrile (NBR), High Erosion Resistance	16	1.1	34	2.3
		17E88	Fluorocarbon (FKM), High Temperature Capability	16	1.1	30	2.1

1. See Table 1 for Type LR128 main valve structural design ratings and Table 2 for Type MR98H pilot rating.

Table 7. *Type LR128 Maximum Pressure Ratings and Diaphragm Selection Information*[1]

BODY SIZE		DIAPHRAGM MATERIAL	MAXIMUM OPERATING INLET PRESSURE[3]		MAXIMUM OPERATING DIFFERENTIAL PRESSURE[3]		MAXIMUM EMERGENCY INLET AND DIFFERENTIAL PRESSURE		DIAPHRAGM STYLE
In.	DN		psig	bar	psid	bar d	psid	bar d	
1	25	17E68 Nitrile (NBR), Low temperature	450	31.0	400	27.6	450	31.0	130
		17E97 Nitrile (NBR), High-pressure and/or erosion resistance	450	31.0	450[2]	31.0[2]	450	31.0	
		17E88 Fluorocarbon (FKM), High aromatic hydrocarbon content resistance	450	31.0	450[2]	31.0[2]	450	31.0	
2	50	17E68 Nitrile (NBR), Low temperature	450	31.0	400	27.6	450	31.0	
		17E97 Nitrile (NBR), High-pressure and/or erosion resistance	450	31.0	450[2]	31.0[2]	450	31.0	
		17E88 Fluorocarbon (FKM), High aromatic hydrocarbon content resistance	450	31.0	450[2]	31.0[2]	450	31.0	
3	80	17E68 Nitrile (NBR), Low temperature	360	24.8	300	20.7	450	31.0	
		17E97 Nitrile (NBR), High-pressure and/or erosion resistance	450	31.0	450[2]	31.0[2]	450	31.0	
		17E88 Fluorocarbon (FKM), High aromatic hydrocarbon content resistance	450	31.0	450[2]	31.0[2]	450	31.0	
4	100	17E68 Nitrile (NBR), Low temperature	360	24.8	300	20.7	450	31.0	
		17E97 Nitrile (NBR), High-pressure and/or erosion resistance	450	31.0	450[2]	31.0[2]	450	31.0	
		17E88 Fluorocarbon (FKM), High aromatic hydrocarbon content resistance	450	31.0	450[2]	31.0[2]	450	31.0	

1. See Table 1 for main valve structural design ratings and Table 3 for pilot ratings.
2. For differential pressure above 400 psid / 27.6 bar d diaphragm temperatures are limited to 150°F / 66°C.
3. These are recommendations that provide the best regulator performance for a typical application. Please contact your local Sales Office for further information if a deviation from the standard recommendations are required.

Table 8. *Troubleshooting Guide*

ISSUE	POSSIBLE SOLUTION (SEE FIGURES 11 AND 16 FOR PARTS LOCATION)
Unit does not provide tight shutoff when inlet pressure is below set pressure	Check for: • damage or improper installation of the main valve O-rings • erosion or trapped debris on the cage and diaphragm surfaces • damage or debris on the surfaces of the pilot plug and seat • mineral deposits or sediment buildup inside the spaces of the restrictor and/or pilot supply strainer/filter • debris clogging the gaps inside the restrictor
Main valve is wide-open when inlet pressure is below set pressure	Check for: • debris in the restrictor, pilot or pilot supply strainer/filter • debris in the main valve • main valve and pilot diaphragms for damage
Liquid escapes from pilot spring case	• Replace pilot diaphragm assembly
Liquid escapes from travel indicator	• Replace indicator stem O-ring, if indicator is not desired, convert to a non-travel indicator assembly
Unit does not open when inlet pressure is above set pressure	Check for: • clogged main valve inlet strainer (if used) or pilot supply strainer/filter (if used) • main valve diaphragm damage • proper control line connection and make sure control line hand valve (if used) is open
Inlet pressure rises higher than expected	Check for: • correct main valve sizing • clogged main valve inlet strainer • restrictive inlet or outlet piping • plugged or restricted control line • proper control line location (should not be installed in or directly downstream of an elbow or swage) • proper springs in the main valve and pilot
Unit response gets slower and performance starts to decrease	Check for: • mineral deposits or sediment buildup inside the spaces of the restrictor • debris clogging the gaps inside the restrictor • clogged pilot supply filter/strainer

8. Install the bonnet (key 2) in proper orientation.
9. Lubricate cap screws (key 3) and secure the bonnet (key 2), using an even crisscross pattern. It may be necessary to push down on bonnet to start cap screws. Tighten cap screws to proper torque (see Table 11).

Diaphragm and Plug Assembly Maintenance

The diaphragm and plug assembly can be replaced as a single unit (a diaphragm cartridge) or individual components within the assembly can be replaced. When replacing individual components, inspect each component for damage and wear and replace parts as needed. See Figure 10 and Table 9 for the Diaphragm Markings and Diaphragm Imprint Codes. Key numbers for the following assembly and disassembly procedure are referenced in Figures 7 and 13.

1. Place a screwdriver or similar tool through the hole in the top plug (key 5).
2. Remove the flanged nut (key 13) from the bottom plug (key 11). This loosens the entire assembly.

Note

On 1 in. / DN 25 body remove the socket head screw (key 129) and lock washer (key 130) from the bottom plug.

3. Remove the bottom plug (key 11) and the bottom plug O-ring (key 10).
4. Remove the diaphragm (key 9).
5. Remove the top plug O-rings (keys 14 and 70).
6. Check all components for damage or wear and replace as necessary.
7. When reassembling, be sure to lubricate all O-rings before installing and add a thread locking compound to the threads of the top plug.
8. Reassemble in the reverse order. Hold the top plug (key 5). Place the parts on the top plug in the following order:
   - O-ring (key 14)
   - O-ring (key 70)
   - Diaphragm (key 9)
   - O-ring (key 10)
   - Bottom Plug (key 11)
   - Flanged Nut (key 13) [On 1 in. / DN 25 body, lock washer (key 130) then socket head screw (key 129)]

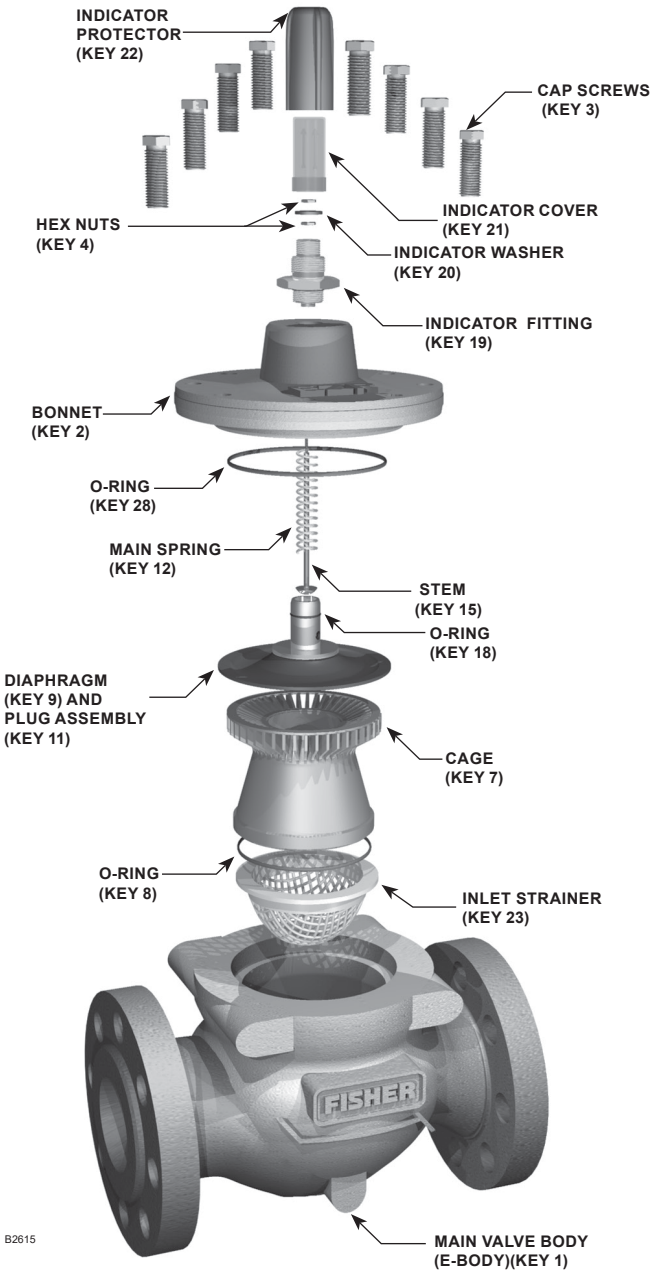

Figure 6. *Type LR128 Main Body Assembly Diagram*

9. Tighten flanged nut (key 13) to proper torque (see Table 11).
10. Completely reassemble the unit according to the assembly procedures provided on page 12.

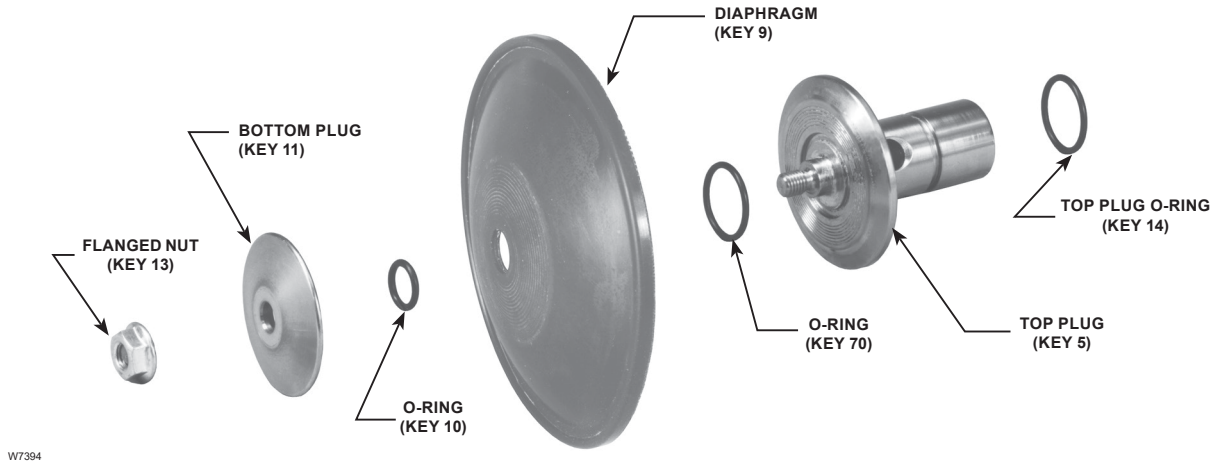

Figure 7. *Diaphragm and Plug Assembly Components*

Travel Indicator Assembly Maintenance

Travel indicator assembly key numbers are referenced in Figures 8, 11 and 15. The indicator assembly can be removed and installed without removing the bonnet (key 2) from the body (key 1). Travel indicator maintenance is performed for two reasons:

a. When damaged or worn parts need replacing.

b. When travel indicator is removed and replaced with a travel indicator plug assembly.

WARNING

Avoid personal injury or damage to property from sudden release of pressure or uncontrolled process fluid. Before starting to disassemble, carefully release all pressures according to the shutdown procedure. Use gauges to monitor inlet, loading and outlet pressures while releasing these pressures.

1. Remove the indicator protector (key 22, Figure 7) and indicator cover (key 21).
2. Remove the first hex nut (key 4) and the indicator washer (key 20).
3. Unscrew but do not completely remove the second hex nut (key 4) on the top of the indicator stem (key 15).
4. Use a wrench to remove indicator fitting (key 19).
5. Lift out travel indicator assembly. If replacing travel indicator with travel indicator plug, skip to step 9.
6. Compress the main spring (key 12). Remove the second hex nut (key 4). Parts will separate easily when the hex nut is removed.
7. Slide the indicator stem (key 15) out of the indicator fitting (key 19). The main spring (key 12) and upper spring seat (key 17) will disengage.
8. If necessary, use the indicator stem (key 15) to pry the back-up rings (key 16) and O-ring (key 18) out of the indicator fitting (key 19).
9. Check the indicator fitting O-ring (key 6). Lubricate and replace if necessary.
10. To replace travel indicator parts, lubricate all O-rings, back-up rings and threads. To reassemble, hold the indicator stem (key 15) and place the parts on the stem in the following order (see Figure 8).
    - Main Spring (key 12), small end first
    - Upper Spring Seat (key 17), make sure to place the large end toward the spring
    - First Back-up Ring (key 16)
    - O-ring (key 18)
    - Second Back-up Ring (key 16)
    - Indicator Fitting (key 19), the back-up rings (key 16) and O-ring (key 18) should slide into the indicator fitting and the small end of the upper spring seat (key 17) should slide into the indicator fitting.
    - First Hex Nut (key 4)
    - Indicator Washer (key 20)
    - Second Hex Nut (key 4)

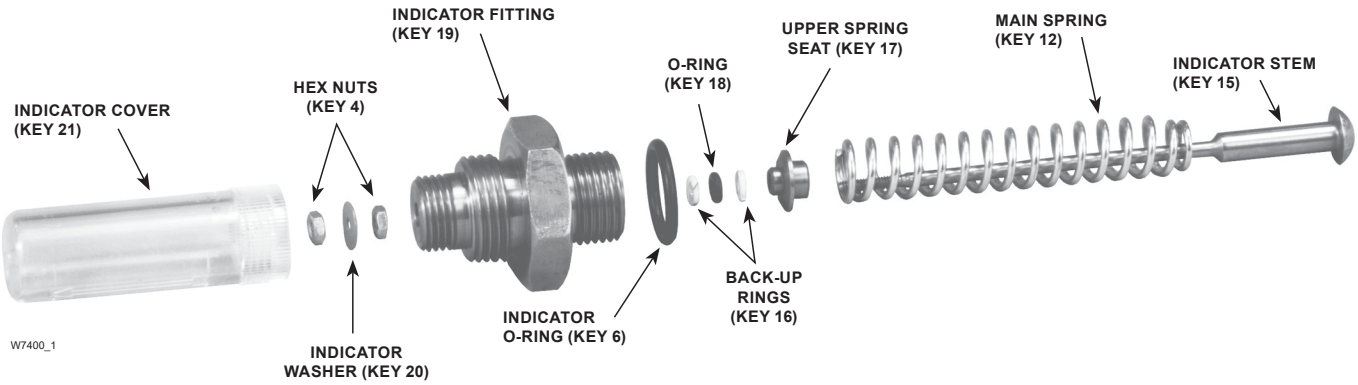

Figure 8. *Travel Indicator Parts*

11. Install the indicator fitting (key 19) into the bonnet (key 2, Figure 7), tighten to the proper torque (see Table 11). To set the travel indicator, hold the indicator cover (key 21) next to the indicator fitting (key 19). Screw the hex nuts (key 4) and the indicator washer (key 20) down on the indicator stem (key 15) until the washer is even with the lowest marking on the indicator cover. Lightly lubricate the indicator cover threads and install. Replace the indicator protector (key 22). **To replace the travel indicator with the non-travel indicator option,** place the main spring (key 12) into the bonnet. Install the indicator plug (key 19, Figure 15) and tighten to proper torque (see Table 11).

Type MR98H Pilot Maintenance

WARNING

To avoid personal injury, property damage or equipment damage caused by sudden release of pressure or uncontrolled process fluid, do not attempt any maintenance or disassembly without first isolating the regulator from system pressure and relieving all internal pressure from the regulator.

Relief valves or regulators that have been disassembled for repair must be tested for proper operation before being returned to service. Only parts manufactured by Emerson should be used for repairing Fisher™ relief valves and regulators.

Due to normal wear and damage that may occur from external sources, relief valve parts such as the O-rings, gaskets, diaphragm, orifice and valve plug should be inspected periodically and replaced as necessary. The frequency of inspection and replacement depends upon the severity of service conditions or the requirements of state and federal laws.

The following instructions explain the disassembly of the Type MR98H relief or backpressure pilot. Lightly apply a good quality lubricant when reassembling. Key numbers are referenced in Figure 16.

1. Shut down the backpressure regulator or relief valve.
2. Relieve the spring tension by loosening the jam nut (key 17) and turning the adjusting screw (key 15) counterclockwise. Remove cap screws (key 16) and lift off the spring case (key 2), upper spring seat (key 9) and relief valve spring (key 11).
3. Lift out the diaphragm unit which includes the lock nut (key 31), lock washer (key 28), pusher post (key 10), gasket (key 29), lower spring seat (key 8), diaphragm (key 12), valve plug (key 4) and an O-ring (key 45).
4. Check the orifice (key 3) for wear or damage. If it needs to be replaced, unscrew the valve plug guide (key 7) and then the orifice. The valve plug (key 4) can be removed by sliding it off of the pusher post (key 10).
5. Place a small amount of sealant on the threads of the orifice (key 3) and valve plug guide (key 7) and reinstall these to the body (key 1).
6. To replace the valve plug O-ring (key 53), remove the machine screw (key 24) and O-ring retainer (key 25) from the plug. Remove and replace the O-ring.

7. Separate the remainder of the diaphragm unit parts. Take the lock nut (key 31) off of the pusher post (key 10). Slide off the lock washer (key 28), lower spring seat (key 8), diaphragm (key 12), washer (key 58) and gasket (key 29).
8. Slip the valve plug (key 4) onto the pusher post (key 10). Place a gasket (key 29) on the shaft of the pusher post over the threaded portion until it rests on the base of the post. The printed side should be facing upwards when installed. Place a metal washer (key 58) on top of the gasket.
9. Slip the lower spring seat (key 8) and lock washer (key 28) back onto the pusher post (key 10). Lubricate the threads of the pusher post and tighten the pusher post lock nut (key 31) until the lock washer is flat and then turn the nut an additional 1/8 to 1/4 turn. Return the diaphragm (key 12), spring seat and pusher post assembly to the body (key 1).
10. Set the relief valve spring (key 11) in the lower spring seat and place the upper spring seat (key 9) on the spring.
11. Put the spring case (key 2) over the spring (key 11) and onto the body (key 1). Tighten the cap screws (key 16) finger tight only.
12. To ensure proper slack in the diaphragm (key 12), apply some spring compression by turning the adjusting screw (key 15) clockwise. Finish tightening the cap screws (key 16) with 10 to 13 ft-lbs / 13.56 to 17.63 N•m of torque.

Type 112 Restrictor Maintenance

WARNING

Avoid personal injury or damage to property from sudden release of pressure or uncontrolled process fluid. Before starting to disassemble, carefully release all pressures according to the shutdown procedure. Use gauges to monitor inlet, loading and outlet pressures while releasing these pressures.

Note

Accumulated dirt, mineral deposit, clogged debris or sediment buildup inside the restrictor may cause the unit response to get slower and unit performance to decrease. If any of these is suspected, immediately inspect and clean the restrictor.

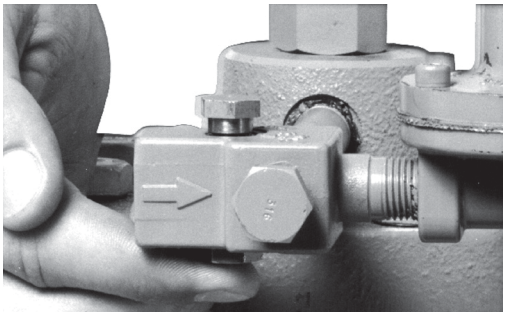

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Figure 9. *Pushing Groove Valve Up With Retainer*

Perform the following procedure if O-rings are leaking or if there is a need to inspect and remove accumulated dirt, mineral deposit, clogged debris or sediment buildup inside the restrictor. Key numbers are referenced in Figure 17.

1. Unscrew the groove valve (key 22) and retainer (key 23) just enough to loosen them, but do not completely separate.
2. As shown in Figure 9, push on the retainer (key 23) to push the groove valve (key 22) out of the body (key 21), then complete disassembly.
3. Inspect the gaps and small spaces inside the restrictor. Check and remove any debris, accumulated dirt, mineral deposit or sediment buildup that clogs the restrictor.
4. Replace the groove valve O-rings (key 24) if necessary, being sure to lightly apply lubricant to the replacement O-rings before installing them in the groove valve and retainer.
5. Install the groove valve (key 22) into the same side of the body where the scale appears. Install the retainer into the opposite side of the body and tighten until both are secure.
6. When all maintenance is complete, refer to the Startup and Adjustment section to put the regulator back into operation.

Parts Ordering

When corresponding with your local Sales Office about this equipment, reference the equipment serial number or FS number found on a nameplate attached to the bonnet. When ordering replacement parts, reference the key number of each needed part as found in the following parts list. Separate kit containing all recommended spare parts is available.

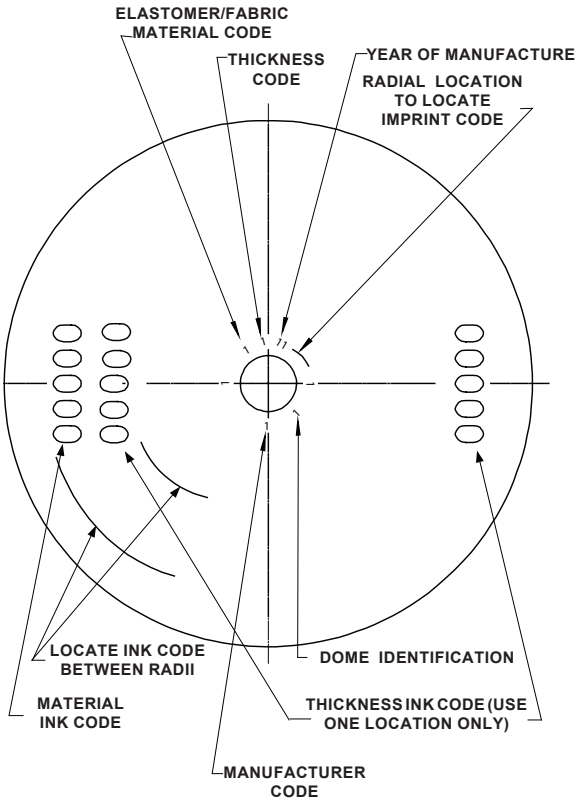


Figure 10. *Diaphragm Markings*

Table 9. *Diaphragm Imprint Codes*

THICKNESS		MATERIAL		DIAPHRAGM MATERIAL
Imprint	Ink Code	Imprint	Ink Code	
2	130	2	17E68	17E68 – Nitrile (NBR) (Low differential)
		4	17E88	17E88 – Fluorocarbon (FKM) (High temperature)
		5	17E97	17E97 – Nitrile (NBR) (High erosion resistance)

Table 10. *Diaphragm Material Selection Information*

CRITERIA	17E68 NITRILE (NBR) (STANDARD)	17E97 NITRILE (NBR)	17E88 FLUOROCARBON (FKM)
Liquid Temperature	-20 to 150°F / -29 to 66°C	0 to 150°F / -18 to 66°C	0 to 250°F / -18 to 121°C(1)
General Applications	Best for low pressure differential and cold temperature service applications.	Best for abrasive or erosive service applications.	Best for high temperature applications.
Heavy Particle Erosion	Fair	Excellent	Good

1. Fluorocarbon (FKM) is limited to 200°F / 93°C in hot water.

Table 11. *Type LR128 Torque Values*

BODY SIZE		CAP SCREWS (KEY 3) OR HEX NUTS (KEY 47)	FLANGED NUT (KEY 13) OR SOCKET HEAD SCREW (KEY 129, 1 IN. / DN 25 ONLY)	INDICATOR FITTING OR INDICATOR PLUG (KEY 19)
In.	DN	Ft-lbs / N•m		
1	25	75 to 95 / 102 to 129	4 to 6 / 5.5 to 8	90 to 160 / 122 to 217
2	50	55 to 70 / 75 to 95	10 to 14/ 14 to 19	90 to 160 / 122 to 217
3	80	100 to 130 / 136 to 176	32 to 40 / 44 to 54	200 to 300 / 271 to 407
4	100	160 to 210 / 217 to 285	32 to 40 / 44 to 54	200 to 300 / 271 to 407

Table 12. *Type LR128 Main Valve Body Part Numbers (Key 1, Figure 7)*

BODY SIZE		BODY MATERIAL	END CONNECTION STYLE	PART NUMBER
In.	DN			
1	25	WCC Steel	NPT	GE11581X012
			SWE	GE11440X012
			CL150 RF	GE11583X012
			CL300 RF	GE11607X012
			CL600 RF	GE11608X012
			PN 16/25/40 RF	GE13625X012
		CF8M Stainless steel	NPT	GE11581X022
			CL150 RF	GE11583X022
			CL300 RF	GE11607X022
			CL600 RF	GE11608X022
			PN 16/25/40 RF	GE13625X022
		CF3M Stainless steel	CL150 RF	GE11583X032
2	50	WCC Steel	NPT	GE10588X012
			SWE	GE10682X012
			CL150 RF	GE10676X012
			CL300 RF	GE10678X012
			CL600 RF	GE10679X012
			PN 16/25/40 RF	GE12898X012
		CF8M Stainless steel	NPT	GE10588X022
			CL150 RF	GE10676X022
			CL300 RF	GE10678X022
			CL600 RF	GE10679X022
			PN 16/25/40 RF	GE12898X022
		CF3M Stainless steel	CL150 RF	GE10676X042
3	80	WCC Steel	CL150 RF	GE10699X012
			CL300 RF	GE10700X012
			CL600 RF	GE10701X012
			PN 16/25/40 RF	GE13594X012
		CF8M Stainless steel	CL150 RF	GE10699X022
			CL300 RF	GE10700X022
			CL600 RF	GE10701X022
			PN 16/25/40 RF	GE13594X022
4	100	WCC Steel	CL150 RF	GE10835X012
			CL300 RF	GE10839X012
			CL600 RF	GE10842X012
		CF8M Stainless steel	CL150 RF	GE10835X022
			CL300 RF	GE10839X022
			CL600 RF	GE10842X022

Main Valve (Figures 6 to 13)

Key	Description	Part Number
	Parts Kits	
	Diaphragm Cartridge and O-rings (Included are keys 5, 6, 8, 9, 10, 11, 13, 14, 16, 18, 28, 70, 129 and 130)	
	1 in. / DN 25	
	17E68 Nitrile (NBR)	RLR1258N182
	17E97 Nitrile (NBR)	RLR1258N172
	17E88 Fluorocarbon (FKM)	RLR1258F182
	2 in. / DN 50	
	17E68 Nitrile (NBR)	RLR1258N282
	17E97 Nitrile (NBR)	RLR1258N272
	17E88 Fluorocarbon (FKM)	RLR1258F282
	3 in. / DN 80	
	17E68 Nitrile (NBR)	RLR1258N382
	17E97 Nitrile (NBR)	RLR1258N372
	17E88 Fluorocarbon (FKM)	RLR1258F382
	4 in. / DN 100	
	17E68 Nitrile (NBR)	RLR1258N482
	17E97 Nitrile (NBR)	RLR1258N472
	17E88 Fluorocarbon (FKM)	RLR1258F482
1	Valve Body	See Table 12
2	Bonnet Assembly	
	1 in. / DN 25 body	
	Steel	39B2403X022
	Stainless steel	ERAA00892A1
	2 in. / DN 50 body	
	Steel	38B2122X022
	Stainless steel	ERAA00893A1
	3 in. / DN 80 body	
	Steel	38B5963X022
	Stainless steel	ERAA00894A1
	4 in. / DN 100 body	
	Steel	38B2133X022
	Stainless steel	ERAA00895A1
3	Cap Screw (For Steel Bonnet)	
	1 in. / DN 25 body (4 required)	1R281124052
	2 in. / DN 50 body (8 required)	1A453324052
	3 in. / DN 80 body (8 required)	1A454124052
	4 in. / DN 100 body (8 required)	1A440224052
4	Hex Nut	
	(For bodies with travel indicator, 2 required)	
	1 and 2 in. / DN 25 and 50 bodies, Zinc-plated Carbon steel	1H322228982
	3 and 4 in. / DN 80 and 100 bodies, Stainless steel	1L286338992
5	Top Plug, Stainless steel	
	1 in. / DN 25 body	29B2404X012
	2 in. / DN 50 body	28B2130X012
	3 in. / DN 80 body	28B8511X012
	4 in. / DN 100 body	28B5964X012
6*	O-ring	
	1 and 2 in. / DN 25 and 50 bodies	
	Nitrile (NBR)	18B3438X012
	Fluorocarbon (FKM)	1N430306382
	3 and 4 in. / DN 80 and 100 bodies	
	Nitrile (NBR)	10A8931X012
	Fluorocarbon (FKM)	10A8931X052
7	Cage	
	1 in. / DN 25 body	39B2413X012
	2 in. / DN 50 body	37B9748X012
	3 in. / DN 80 body	48B5961X012
	4 in. / DN 100 body	48B2135X012
8*	Cage O-ring	
	1 in. / DN 25 body	
	Nitrile (NBR)	14A5713X012
	Fluorocarbon (FKM)	13A2351X012
	2 in. / DN 50 body	
	Nitrile (NBR)	10B4428X012
	Fluorocarbon (FKM)	10B4428X022
	3 in. / DN 80 body	
	Nitrile (NBR)	10B4366X012
	Fluorocarbon (FKM)	10B4366X022
	4 in. / DN 100 body	
	Nitrile (NBR)	10B4373X012
	Fluorocarbon (FKM)	10B4373X022
9*	Diaphragm	
	1 in. / DN 25 body	
	17E68 Nitrile (NBR), low differential	30C1009X012
	17E97 Nitrile (NBR), high erosion	GE11960X012
	17E88 Fluorocarbon (FKM), high temperature	39B2397X022
	2 in. / DN 50 body	
	17E68 Nitrile (NBR), low differential	29B1909X012
	17E97 Nitrile (NBR), high erosion	28B2123X052
	17E88 Fluorocarbon (FKM), high temperature	29B2715X012
	3 in. / DN 80 body	
	17E68 Nitrile (NBR), low differential	38B9886X012
	17E97 Nitrile (NBR), high erosion	39B2726X012
	17E88 Fluorocarbon (FKM), high temperature	38B8512X022
	4 in. / DN 100 body	
	17E68 Nitrile (NBR), low differential	38B8509X012
	17E97 Nitrile (NBR), high erosion	39B3996X012
	17E88 Fluorocarbon (FKM), high temperature	39B1154X012
10*	O-ring	
	1 and 2 in. / DN 25 and 50 bodies	
	Nitrile (NBR)	1E216306992
	Fluorocarbon (FKM)	1L949306382
	3 and 4 in. / DN 80 and 100 bodies	
	Nitrile (NBR)	1J4888X0052
	Fluorocarbon (FKM)	1J4888X0032
11	Bottom Plug, Stainless steel	
	1 in. / DN 25 body	19B2407X012
	2 in. / DN 50 body	18B2127X012
	3 in. / DN 80 body	18B8513X012
	4 in. / DN 100 body	18B5966X012
12	Main Valve Spring, Stainless steel	
	1 in. / DN 25 body, Black and Yellow	GE12727X022
	2 in. / DN 50 body, Green and White	18B2126X022
	3 in. / DN 80 body, Light Blue and White	19B0781X022
	4 in. / DN 100 body, Green and White	18B8501X022
13	Flanged Hex Nut, Stainless steel	
	2 in. / DN 50 body	ERAA00905A0
	3 and 4 in. / DN 80 and 100 bodies	GG01972X012
14*	Top Plug O-ring	
	1 and 2 in. / DN 25 and 50 bodies	
	Nitrile (NBR)	13A1584X052
	Fluorocarbon (FKM)	13A1584X022
	3 and 4 in. / DN 80 and 100 bodies	
	Nitrile (NBR)	10A3803X062
	Fluorocarbon (FKM)	10A3803X032

- continued -

* Recommended spare part.

Key	Description	Part Number
15	Stem, Stainless steel	
	(For bodies with travel indicator)	
	1 and 2 in. / DN 25 and 50 bodies	T14185T0012
	3 and 4 in. / DN 80 and 100 bodies	T21074T0012
16*	Back-up Ring, PTFE	
	(For bodies with travel indicator, 2 required)	
	1 and 2 in. / DN 25 and 50 bodies	1N659106242
	3 and 4 in. / DN 80 and 100 bodies	1J418806992
17	Upper Spring Seat, Stainless steel	
	(For bodies with travel indicator)	
	1 and 2 in. / DN 25 and 50 bodies	18B2129X012
	3 and 4 in. / DN 80 and 100 bodies	18B5968X012
18*	O-ring (For bodies with travel indicator)	
	1 and 2 in. / DN 25 and 50 bodies	
	Nitrile (NBR)	1H2926X0032
	Fluorocarbon (FKM)	1H2926X0022
	3 and 4 in. / DN 80 and 100 bodies	
	Nitrile (NBR)	1D191706992
	Fluorocarbon (FKM)	1N423906382
19	Indicator Fitting, Stainless steel	
	(For bodies with travel indicator)	
	1 and 2 in. / DN 25 and 50 bodies	28B2128X012
	3 and 4 in. / DN 80 and 100 bodies	28B5969X012
19	Travel Indicator Plug, Stainless steel	
	(For bodies without travel indicator)	
	1 in. / DN 25 body	19B2409X012
	2 in. / DN 50 body	GE17585X012
	3 and 4 in. / DN 80 and 100 bodies	28B5970X012
20	Indicator Washer (For bodies with travel indicator)	
	1 and 2 in. / DN 25 and 50 bodies	18B2138X012
	3 and 4 in. / DN 80 and 100 bodies	18B8503X012
21	Indicator Cover, Plastic	
	(For bodies with travel indicator)	
	1 and 2 in. / DN 25 and 50 bodies	T14188T0012
	3 and 4 in. / DN 80 and 100 bodies	19B2270X012
22	Indicator Protector, Plastic	
	(For bodies with travel indicator)	
	1 and 2 in. / DN 25 and 50 bodies	24B1301X012
	3 and 4 in. / DN 80 and 100 bodies	29B2269X012
23	Inlet Strainer, Stainless steel	
	1 in. / DN 25 body	20B8004X012
	2 in. / DN 50 body	10B4409X012
	3 in. / DN 80 body	20B4367X012
	4 in. / DN 100 body	20B4374X012
24	Nameplate	- - - - - - - - - - -
25	Flow Arrow	- - - - - - - - - - -
26	Drive Screw, Stainless steel	
	1 in. / DN 25 body (4 required)	1A368228982
	2, 3 and 4 in. / DN 50, 80 and 100 (5 required)	1A368228982

Key	Description	Part Number
28*	O-ring	
	1 in. / DN 25 body	
	Nitrile (NBR)	19B2838X012
	Fluorocarbon (FKM)	19B2838X022
	2 in. / DN 50 body	
	Nitrile (NBR)	18B2124X012
	Fluorocarbon (FKM)	18B2124X022
	3 in. / DN 80 body	
	Nitrile (NBR)	18B8514X012
	Fluorocarbon (FKM)	18B8514X022
	4 in. / DN 100 body	
	Nitrile (NBR)	18B2140X012
	Fluorocarbon (FKM)	18B2140X022
29	Pipe Nipple	
	Steel	- - - - - - - - - - -
	Stainless steel	- - - - - - - - - - -
45	Bushing	
	Steel	- - - - - - - - - - -
	Stainless steel	- - - - - - - - - - -
47	Hex Nut (For Stainless steel Bonnet)	
	SA194 GRADE 8M Stainless steel	
	1 in. / DN 25 body (4 required)	1C330635252
	2 in. / DN 50 body (8 required)	1A377235252
	3 in. / DN 80 body (8 required)	1A376035252
	4 in. / DN 100 body (8 required)	1A352035252
63	Pipe Plug, Steel/Stainless steel	
	Standard Piping (3 required)	- - - - - - - - - - -
	Pre-piped Pilot Supply (2 required)	- - - - - - - - - - -
70*	O-ring	
	1 and 2 in. / DN 25 and bodies	
	Nitrile (NBR)	13A1584X052
	Fluorocarbon (FKM)	13A1584X022
	3 and 4 in. / DN 80 and 100 bodies	
	Nitrile (NBR)	10A3803X062
	Fluorocarbon (FKM)	10A3803X032
129	Socket Head Screw, Stainless steel	
	For 1 in. / DN 25 body only	1D6170X0012
130	Lock Washer, Stainless steel	
	For 1 in. / DN 25 body only	1A3291X0012
136	Stud (For Stainless steel Bonnet)	
	B8M Class 2 Stainless steel	
	1 in. / DN 25 body (4 required)	1R284835222
	2 in. / DN 50 body (8 required)	1K242935222
	3 in. / DN 80 body (8 required)	1A378135222
	4 in. / DN 100 body (8 required)	1R369035222

* Recommended spare part.

Type MR98H Pilot (Figure 16)

Key	Description	Part Number
	Parts Kit (includes keys: 3, 4, 12, 29, 59 and 63)	
	With Stainless steel diaphragm and trim	RMR98HX0052
	With Neoprene (CR) diaphragm and Nitrile (NBR)/416 Stainless steel trim	RMR98HX0022
1	Regulator Body, 1/2 NPT	
	WCC Steel	ERAA01934A1
	CF8M Stainless steel	ERAA01934A3
2	Spring Case, 1/4 NPT Tapped Vent	
	Use with all other springs	
	WCC Steel	ERAA01886A0
	CF8M Stainless steel	ERAA01886A1
	Use with 150 to 375 psig / 10.3 to 25.9 bar spring	
	WCC Steel	ERCA00619A0
	CF8M Stainless steel	ERCA00619A2
3*	Orifice, 416 Stainless steel	GF04841X022
4*	Valve Plug, 416 Stainless steel	ERCA01305A0
5	Bottom Plug, 416 Stainless steel	GF05532X022
7	Valve Plug Guide, 416 Stainless steel	GF05534X022
8	Lower Spring Seat	
	Use with all other springs	
	Aluminum	1L339708012
	Stainless steel	1L3397X0012
	Use with 150 to 375 psig / 10.3 to 25.9 bar spring	
	Aluminum	1N943024272
	Stainless steel	1N9430X0012
9	Upper Spring Seat	
	Use with all other springs	
	Steel	ERCA00823A0
	Stainless steel	ERCA00823A1
	Use with 150 to 375 psig / 10.3 to 25.9 bar spring	
	Steel	ERCA00430A0
	Stainless steel	ERCA00430A1
10*	Pusher Post, 416 Stainless steel	ERCA01344A0
11	Control Spring	
	35 to 75 psig / 2.4 to 5.2 bar, Powder-coated steel, Green	ERAA01910A0
	70 to 140 psig / 4.8 to 9.7 bar, Powder-coated steel, Red	ERAA01911A0
	130 to 200 psig / 9.0 to 13.8 bar, Powder-coated steel, Blue	ERAA02889A0
	100 to 375 psig / 6.9 to 25.9 bar, Powder-coated steel, Unpainted	ERCA04293A0
12*	Diaphragm	
	Neoprene (CR)	ERCA00512A0
	Fluorocarbon (FKM) (2 required)	ERCA00512A1
13	Nameplate	- - - - - - - - - -
15	Adjusting Screw	
	Use with all other springs	GF05553X012
	Use with 150 to 375 psig / 10.3 to 25.9 bar spring	ERAA02340A0
16	Cap Screw (8 required)	
	Steel	ERCA00100A0
	Stainless steel	ERCA00100A1

Type MR98H Pilot (Figure 16) (continued)

Key	Description	Part Number
17	Jam Nut	
	Steel	ERCA00380A0
	Stainless steel	ERCA00380A1
18	Drive Screw, (4 required)	ERAA01884A0
23	Lock Washer, Zinc-plated Carbon steel	1C225628982
24	Machine Screw, 18-8 Stainless steel	1J4159X0012
25	O-ring Retainer, 416 Stainless steel	1L341535232
28	Lock Washer	
	Steel	ERAA01919A0
	Stainless steel	ERAA01919A1
29*	Gasket, Composition	ERAA02651A0
31	Locknut, Steel	ERCA00663A0
51	Vent, Type Y602-12	ERAA02123A0
53*	Valve Plug Sealing O-ring	
	Nitrile (NBR)	ERCA02968A0
	Fluorocarbon (FKM)	ERCA02968A1
55	Spacer, Zinc-plated steel	
	Use with 100 to 375 psig / 6.9 to 26.0 bar spring	17B6530X012
58	Washer	
	416 Stainless steel	GF05050X012
	316 Stainless steel	GF05050X022
59*	Valve Plug O-ring	
	Nitrile (NBR)	1D2888X0032
	Fluorocarbon (FKM)	1D2888X0052
63*	Bottom Plug Seal	
	Nitrile (NBR)	ERCA03016A0
	Fluorocarbon (FKM)	ERCA03016A1

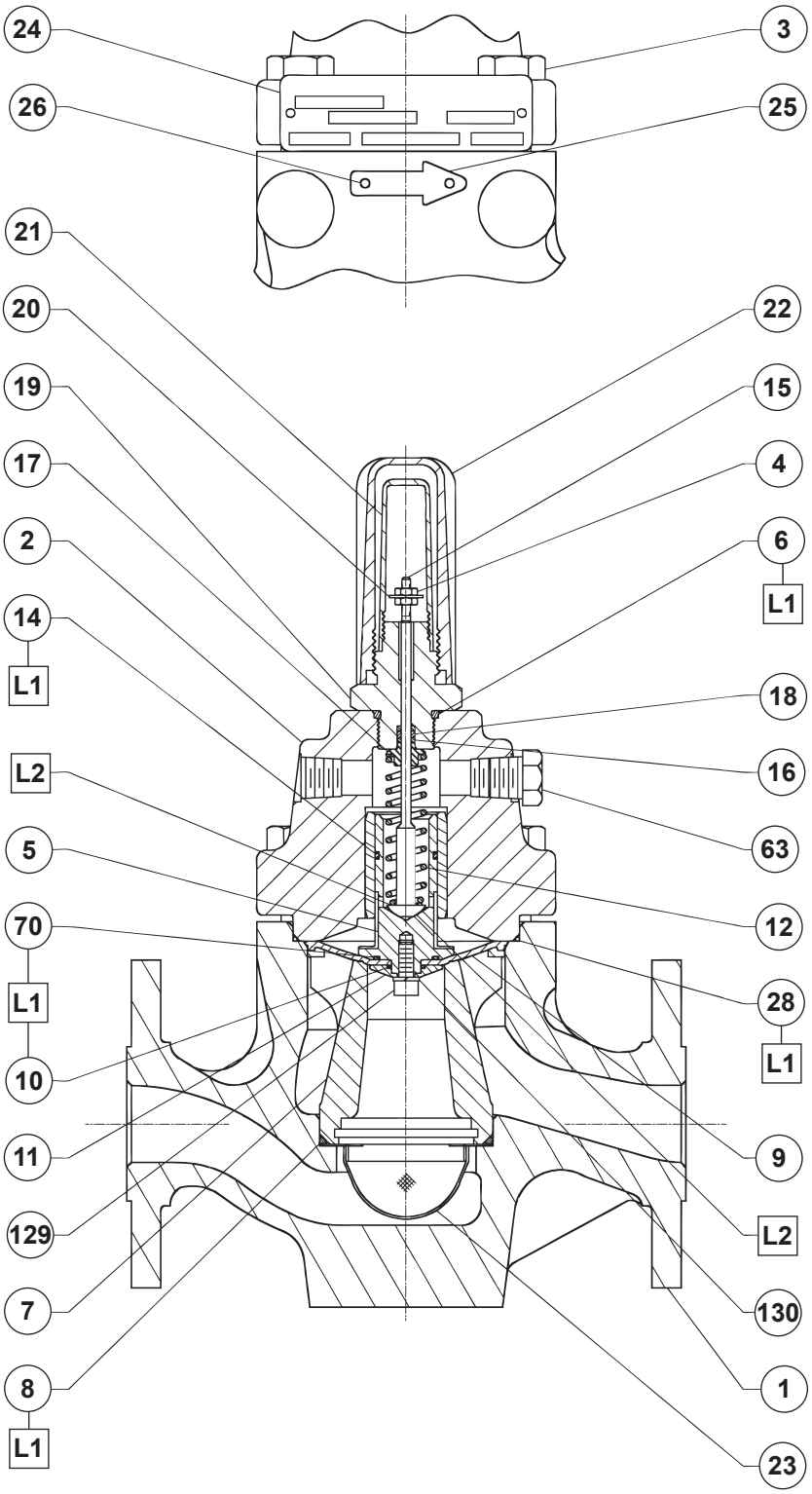
Type 112 Restrictor (Figure 17)

Key	Description	Part Number
14	Pipe Plug, 316 Stainless steel	1A767535072
21	Restrictor Body, CB7Cu-2 Stainless steel	20B4429X012
22	Groove Valve, 416 Stainless steel	20B4403X012
23	Valve Retainer, 416 Stainless steel	10B4402X012
24*	Groove Valve O-ring (2 required)	
	Nitrile (NBR)	1C853806992
	Fluorocarbon (FKM)	1C8538X0052

Pre-piped Pilot Supply (Figure 19)

Key	Description	Part Number
59	Nipple	- - - - - - - - - -
	Steel	- - - - - - - - - -
	Stainless steel	- - - - - - - - - -
60	Pipe Elbow	
	Steel	- - - - - - - - - -
	Stainless steel	- - - - - - - - - -
61	Tube Connector (2 required)	
	Steel	- - - - - - - - - -
	Stainless steel	- - - - - - - - - -
62	Tubing, 316 Stainless steel	- - - - - - - - - -

* Recommended spare part.



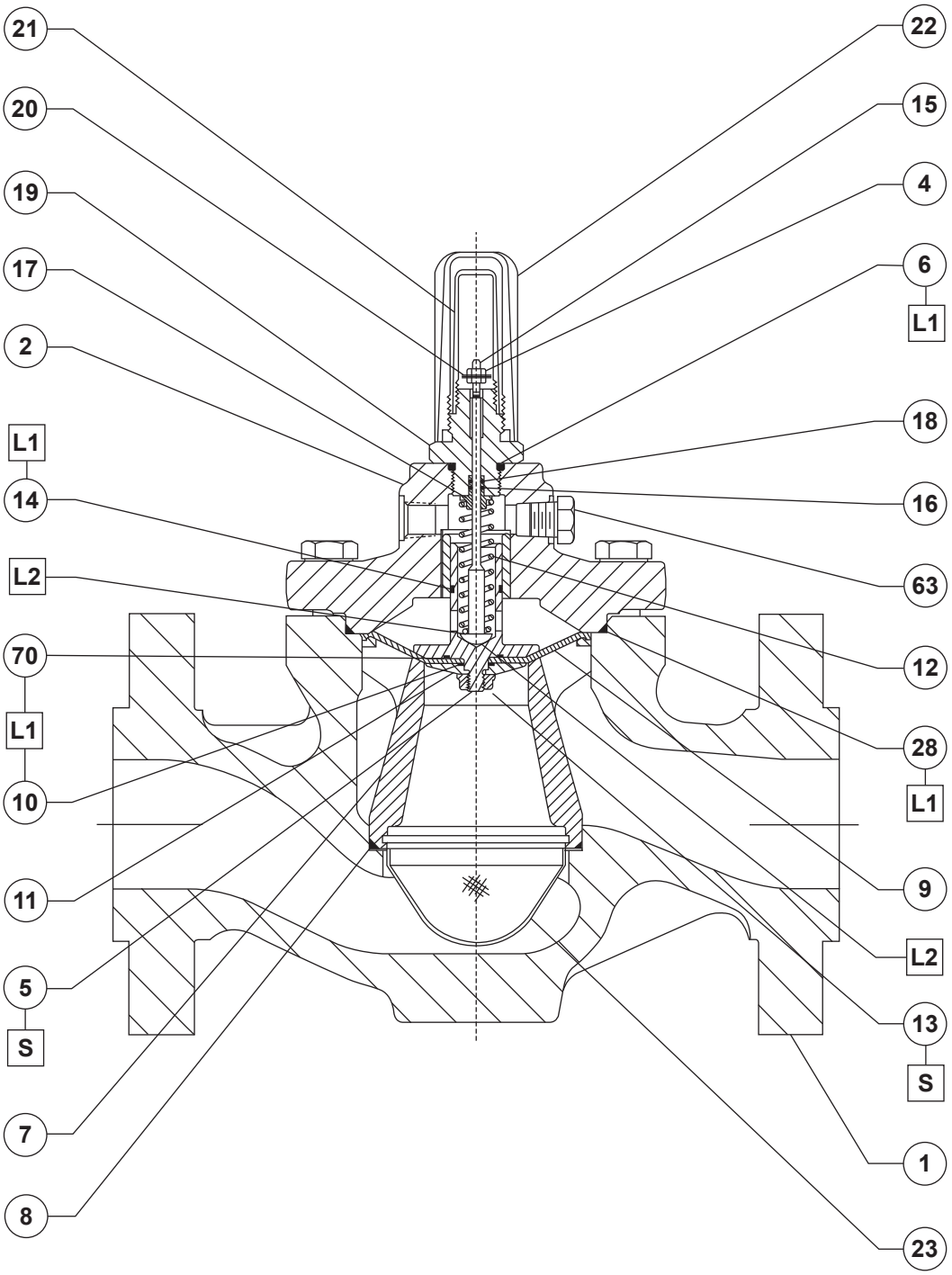
49B6019_A

☐ **APPLY LUBRICANT(1):**
L1 = LITHIUM POLYMER TYPE LUBRICANT (MULTI-PURPOSE GREASE)
L2 = ANTI-SEIZE LUBRICANT

1. Lubricants must be selected such that they meet the temperature requirements.

MAIN VALVE ASSEMBLY FOR 1 IN. / DN 25 BODY SIZE

Figure 11. *Type LR128 Main Valve*



48B2142_C

☐ **APPLY LUBRICANT / SEALANT(1):**
L1 = LITHIUM POLYMER TYPE LUBRICANT (MULTI-PURPOSE GREASE)
L2 = ANTI-SEIZE LUBRICANT
S = MEDIUM STRENGTH THREADLOCKER

1. Lubricants and sealant must be selected such that they meet the temperature requirements.

MAIN VALVE ASSEMBLY FOR 2, 3 AND 4 IN. / DN 50, 80 AND 100 BODY SIZES

Figure 11. *Type LR128 Main Valve (continued)*

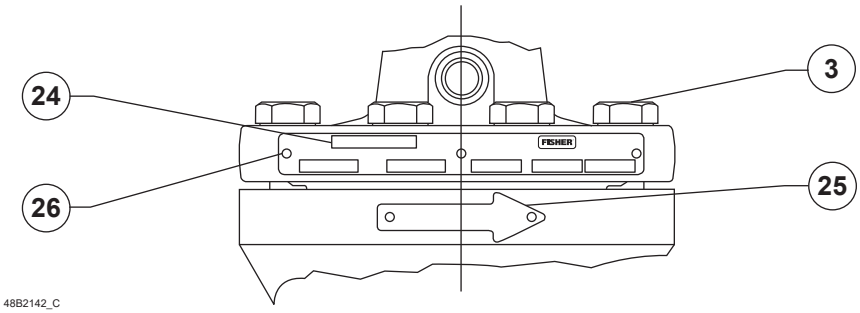


Figure 12. *Type LR128 Nameplate and Flow Arrow*

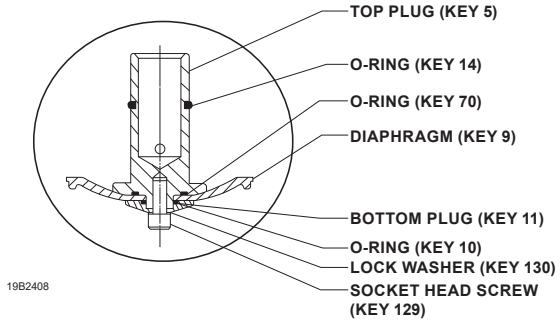


Figure 13. *Type LR128 1 in. / DN 25 Diaphragm Assembly*

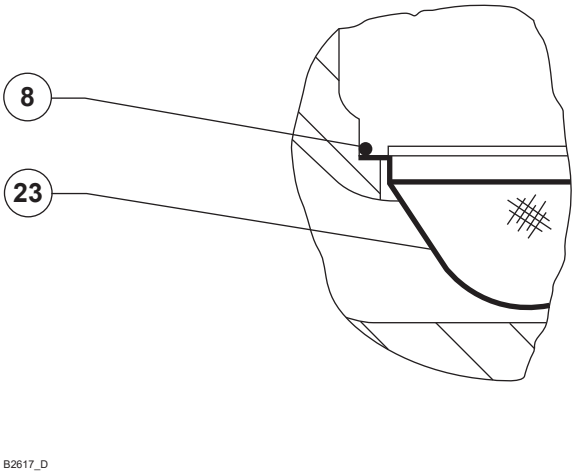
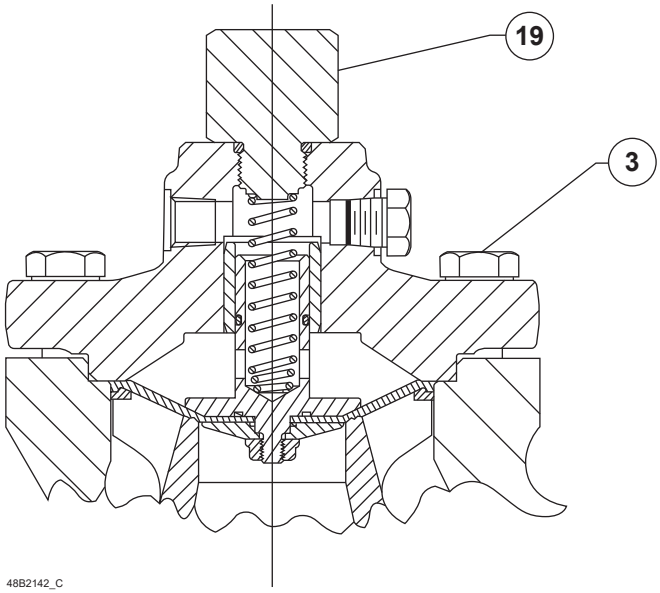
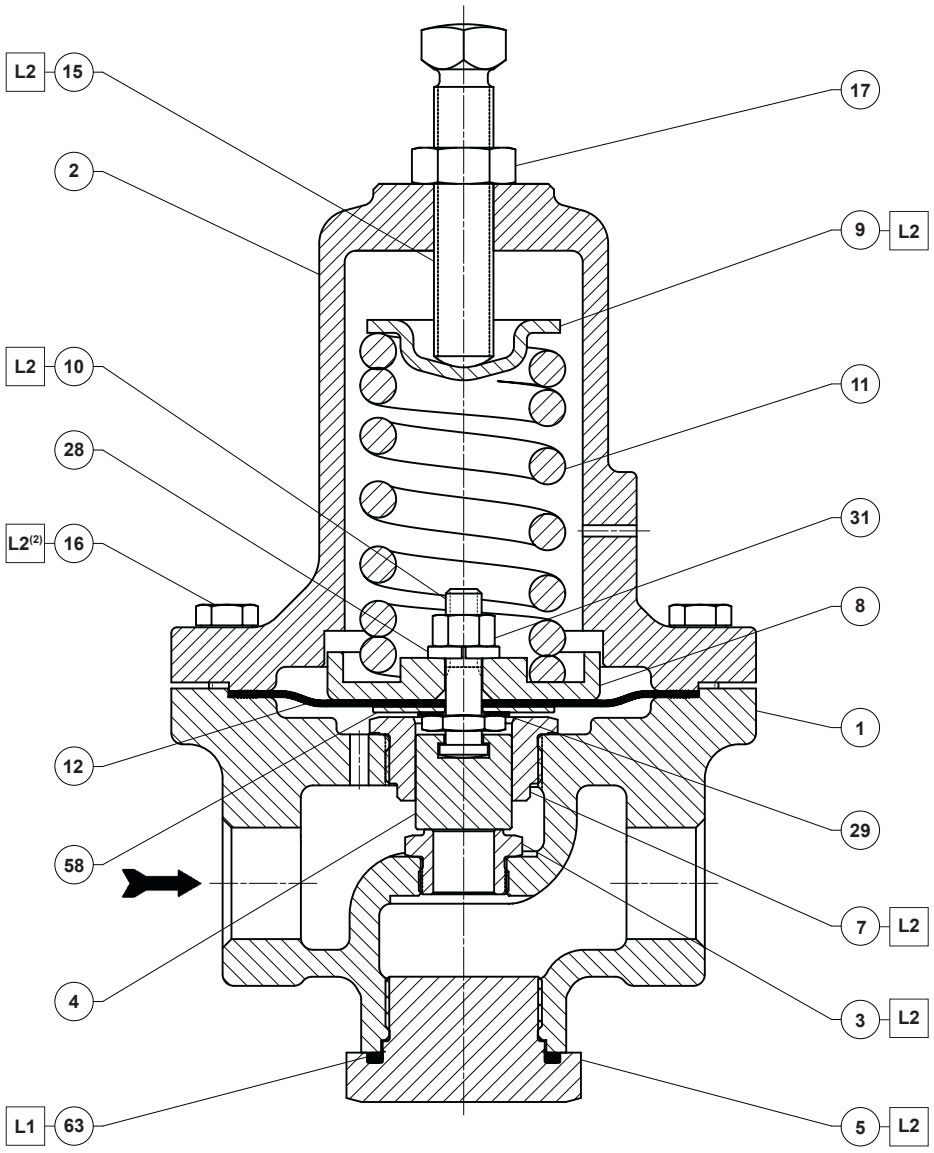


Figure 14. *Type LR128 Cage O-ring Placement*



2, 3 AND 4 IN. / DN 50, 80 AND 100 BODY SIZES

Figure 15. *Type LR128 Travel Indicator Plug Option*



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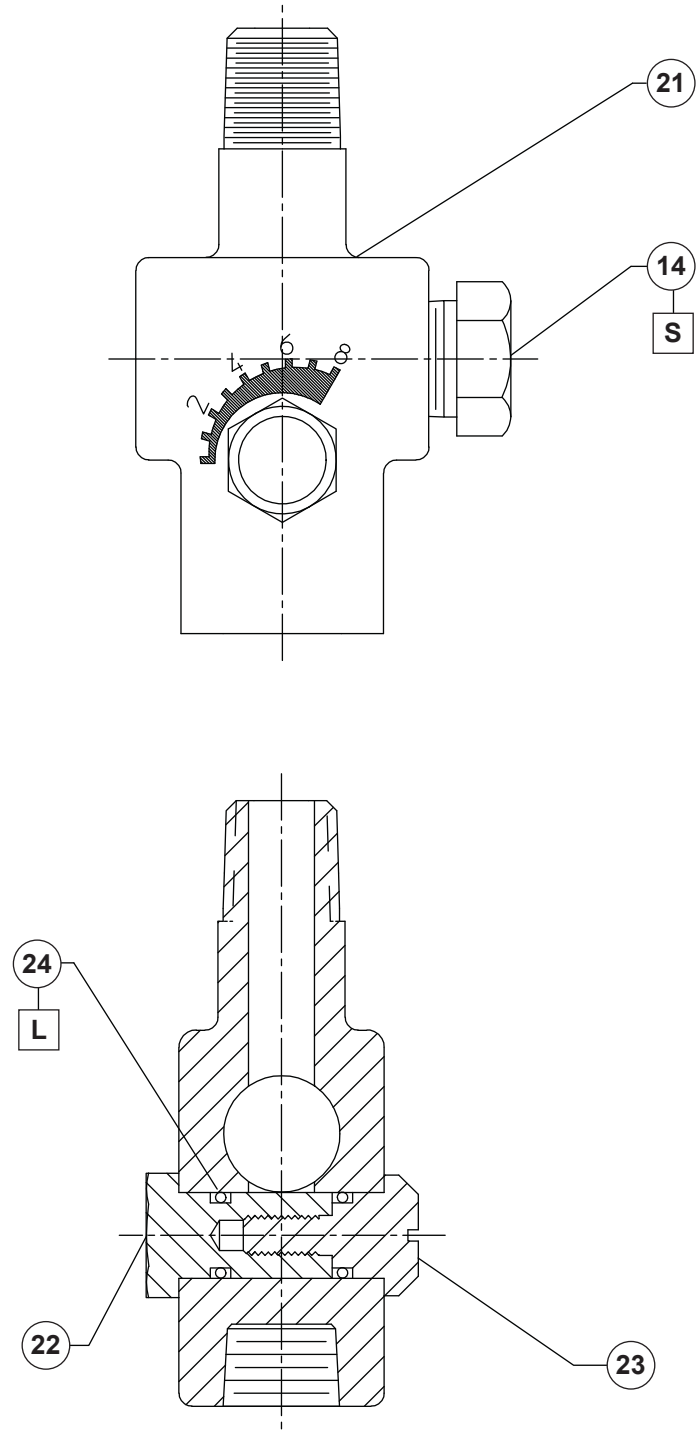
☐ **APPLY LUBRICANT / SEALANT(1):**
L1 = GENERAL PURPOSE PTFE OR LITHIUM GREASE FOR O-RINGS
L2 = ANTI - SEIZE COMPOUND

1. Lubricants and sealants must be selected such that they meet the temperature requirements.
2. Apply L2 (anti-seize compound) on key 16 for stainless steel bolts.

Figure 16. *Type MR98H Pilot Assembly*



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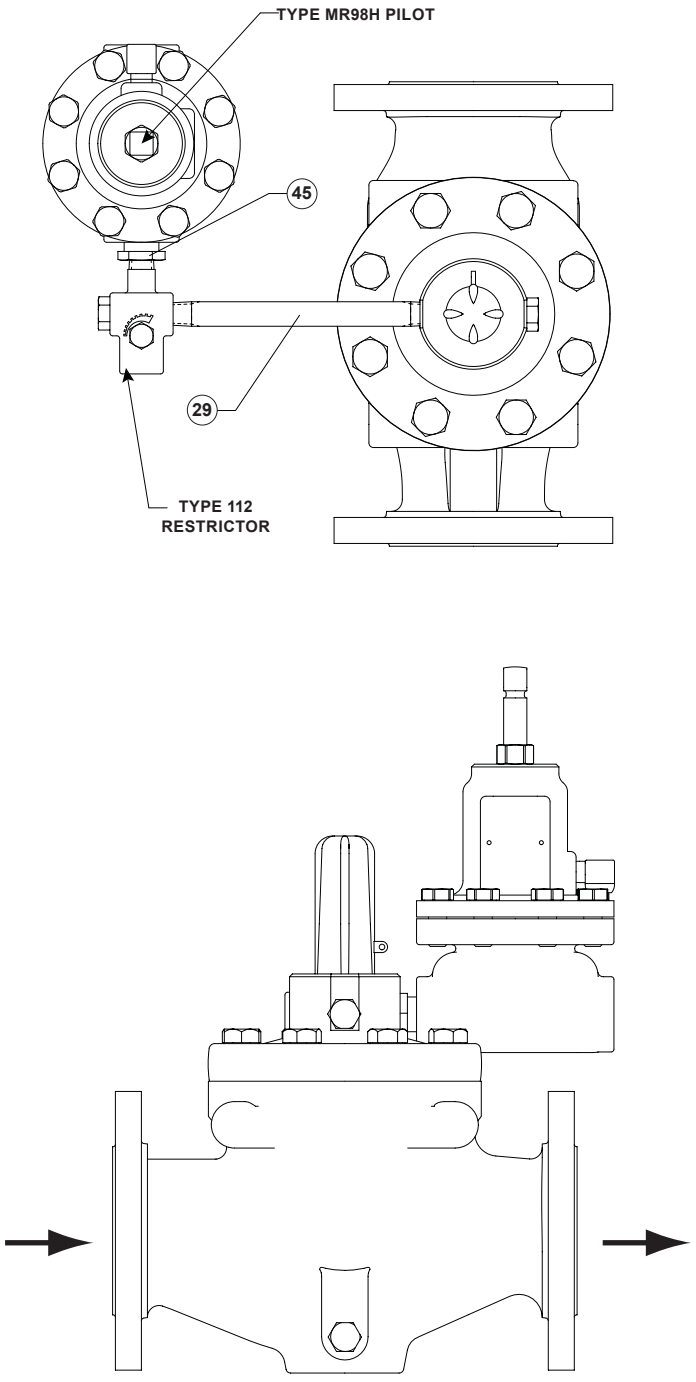
☐ **APPLY LUBRICANT / SEALANT(1):**
S = THREAD SEALANT
L = ANTI-SEIZE LUBRICANT

1. Lubricant and sealant must be selected such that they meet the temperature requirements.

Figure 17. *Type 112 Restrictor*



ERAA03109

Figure 18. *Standard Type LR128 with Type MR98H Pilot and Type 112 Restrictor*

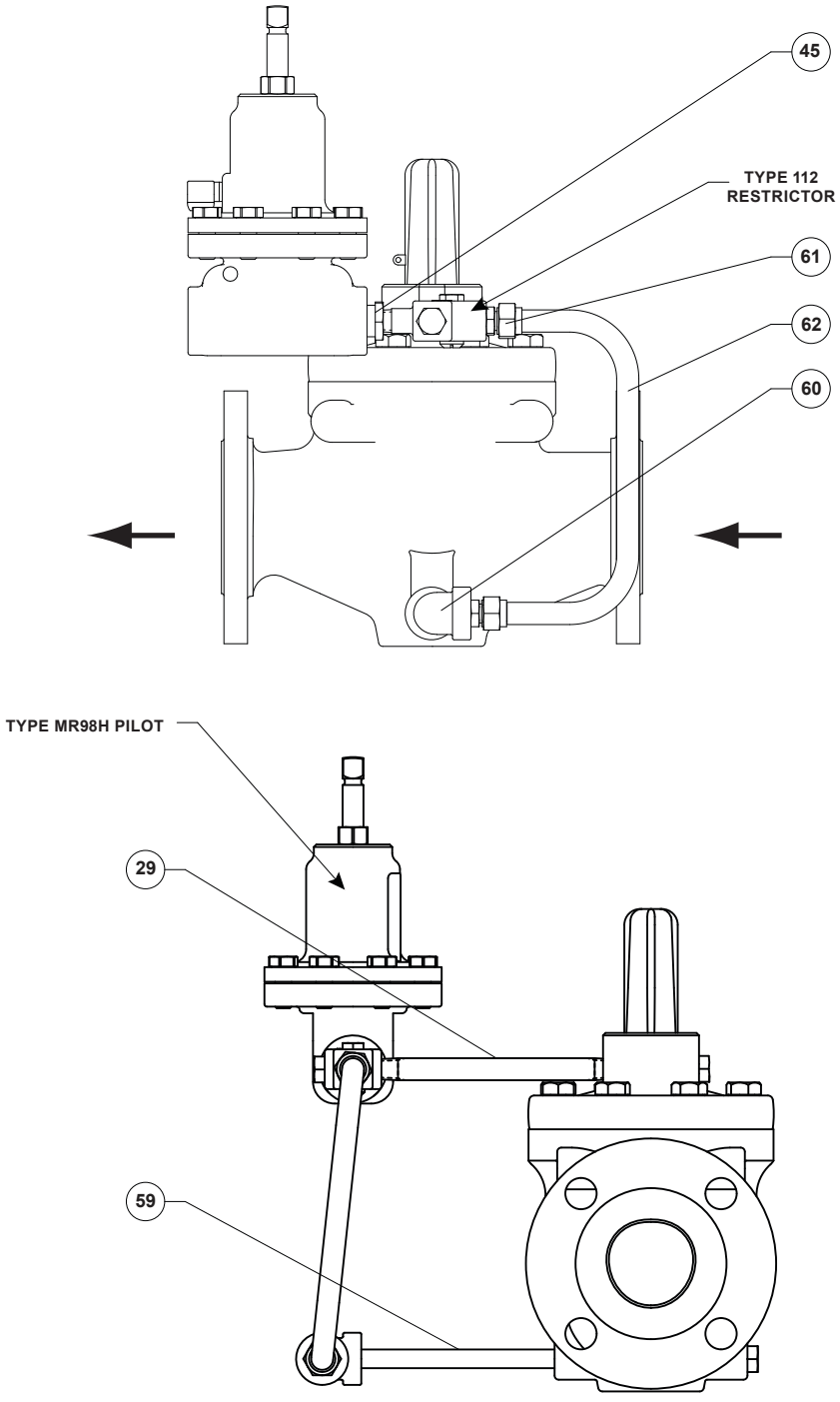


Figure 19. *Type LR128 with Type MR98H Pilot and Type 112 Restrictor with Pre-piped Pilot Supply*

Type LR128

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