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LS200 Series Direct-Operated Regulators

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WARNING

Failure to follow these instructions or to properly install and maintain this equipment could result in an explosion, fire 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. (Emerson) 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 qualified service person to service the unit. Installation, operation and maintenance procedures performed by unqualified person may result

in improper adjustment and unsafe operation. Either condition may result in equipment damage or personal injury. Only a qualified person shall install or service the regulator.



Figure 1. LS200 Series Regulator

Introduction

Scope of the Manual

This manual provides specifications, installation, adjustment, maintenance instructions and parts ordering information for the LS200 Series Regulators.

Only personnel qualified through training or experience should install, operate and maintain this regulator. If there are any questions concerning these instructions, contact your local Emerson Impact Partner Office before proceeding.

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Specifications

The Specifications section lists the specifications for the LS200 Series Direct-Operated Regulators. Factory specification is stamped on the nameplate fastened on the regulator at the factory.

Actuator Sizes

Types LS220 and LS224 (13.8 in. / 350 mm):

Medium pressure construction for outlet pressure range of 4.35 to 10 psig / 0.3 to 0.69 bar.

Maximum operating inlet pressure of 125 psi / 8.61 bar. Medium Pressure for outlet range of 10 to 21.75 psig / 0.69 to 1.5 bar has a maximum operating inlet up to 284 psig / 19.6 bar. The maximum operating and emergency inlet pressure rating is 284 psig / 19.6 bar at 100°F / 38°C⁽¹⁾.

Types LS250 and LS254 (10.0 in. / 255 mm):

High pressure construction for outlet pressure range of 20 to 60 psig / 1.37 to 4.2 bar. The maximum operating inlet pressure is 284 psig / 19.6 bar with a maximum emergency inlet pressure of 284 psig / 19.6 bar at 100°F / 38°C⁽¹⁾.

Body Sizes and End Connection Styles

See Table 3

Outlet Pressure Ranges⁽²⁾

See Table 4

Pressure Ratings⁽²⁾

See Table 4

Maximum Outlet Pressure⁽²⁾

See Table 5

Certifications

EN 334, EN 14382 and
Pressure Equipment Directive (PED)
DVGW
Up to 25% Hydrogen Blend (Pending 100%)
V9
Hydrogen Construction Available⁽⁴⁾

Pressure Registration

External; downstream control line is required

Temperature Capabilities⁽²⁾⁽³⁾

-20 to 150°F / -29 to 66°C

-4 to 140°F / -20 to 60°C for PED

Lockup and Function Tested to -40°F / -40°C

Control Line Connection

Without Slam-Shut:

1/4 NPT (internal); connection will be positioned directly over body outlet (standard position) or 90 degrees right or left of standard position if specified.

With Slam-Shut:

1/4 NPT (internal) connection right or left directly over slam-shut. Can be selected or changed after shipment.

Vent Connection

3/4 NPT (internal) vent assembly.

Approximate Weight

Body

NPT: 26.5 lbs / 12 kg

2x2: 30.4 lbs / 13.5 kg

2x4: 38.7 lbs / 17.55 kg

Slam-Shut Device: 16.4 lbs / 7.45 kg

Type LS220: 61.1 lbs / 27.7 kg

(Eye nuts included)

Type LS250: 44.9 lbs / 20.35 kg

(Eye nuts included)

1. Shown at ambient temperature 100°F / 38°C. Follow applicable flange pressure/temperature code limits.

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

3. The lock up and function were tested to -40°F / -40°C. Flow performance was tested at ambient temperature.

4. Contact your Emerson Impact Partner or the local Emerson sales office for more information.

PED Categories and Fluid Group

A single LS200 Regulator without Slam-shut cannot be used as a safety accessory according Pressure Equipment Directive PED 2014/68/EU to protect downstream pressure equipment.

According to EN 14382, only in integral strength type and Class A configuration (when both over and under pressure protections are set up), the possible built-in safety shut-off device can be classified like a safety accessory according to Pressure Equipment Directive PED 2014/68/EU.

Table 1. LS200 Series Regulators PED Category

PRODUCT SIZE	CATEGORY	FLUID GROUP
2	I	1
All sizes with slam shut	IV	

The minimum PS between slam shut device valve and slam-shut controller shall be the PS of the safety accessory to comply the provisions of EN 14382 about integral strength type.

Table 2. Available Configurations

TYPE NUMBER				OPTION			
L	S	2					
PRESSURE CONSTRUCTION							
0				Low Pressure Applications (<i>In Development</i>)			
2				Medium Pressure Applications (<i>Outlet Pressure: 0.3 to 1.5 bar / 4.35 to 21.75 psig</i>)			
5				High Pressure Applications (<i>Outlet Pressure: 1.38 to 4.14 bar / 20 to 60 psig</i>)			
OVERPRESSURE PROTECTION							
0				Without Overpressure Protection Module			
4				With Slam-shut Module ⁽¹⁾			
1. Reference Instruction Manual D103127X012 for Type VSX8 safety slam-shut module.							

Table 3. Body Sizes and End Connection Styles

BODY SIZE		END CONNECTION STYLE		
In.	DN	Cast iron Body	Ductile iron Body	WCC steel Body
2x2	50x50	NPT or CL125 FF	CL150 RF or PN 16	NPT, CL150 RF or PN 16
2x4	50x100	CL125 FF	CL150 RF or PN16	CL150 RF or PN 16

Table 4. LS200 Series Outlet Pressure Ranges and Control Spring Information

TYPE	ACTUATOR DIAMETER SIZE, in. / mm	SPRING RANGE		PART NUMBER	CONTROL SPRING		COLOR
		psig	bar		WIRE DIAMETER		
				in.	mm		
LS220 and LS224	13.8 / 350	4.35 to 5.1	0.3 to 0.35	ERAA07586A0	8.5	0.312	Light Green
		4.35 to 10.6	0.3 to 0.73	ERAA07589A0	10.5	0.406	Pink
		4.8 to 15.7	0.33 to 1.08	ERAA07283A0	12	0.438	Dark Blue
		8.3 to 21.75	0.57 to 1.5	ERAA07283A0	12.5	0.5	Orange
LS250 and LS254	10.0 / 255	20 to 30.3	1.38 to 2.09	ERAA07589A0	10.5	0.406	Pink
		20 to 44.8	1.38 to 3.09	ERAA07592A0	12	0.438	Dark Blue
		25 to 60	1.72 to 4.14	ERAA07283A0	12.5	0.5	Orange

Table 5. Maximum Inlet and Outlet Pressure

PRESSURE		TYPE LS220		TYPE LS250	
		psig	bar	psig	bar
Maximum Operating Inlet Pressure	<10 psi / 0.69 bar max. outlet pressure	125	8.61	----	----
	>10 psi / 0.69 bar max. outlet pressure	284	19.6	284	19.6
Maximum Emergency Inlet Pressure		284	19.6	284	19.6
Maximum Operating Outlet Pressure ⁽¹⁾		21.7	1.5	60	4.13
Maximum Outlet Pressure Over Outlet Pressure Setting		28.9	1.99	83.7	5.77
Maximum Emergency Outlet (Casing) Pressure		50	3.44	150	10.34
1. With highest spring range available only.					

Table 6. Wide Open Flow Coefficients

UNIT INFORMATION			FLOW COEFFICIENTS		
Regulator	Body	Type	C _g	C ₁	C _v
LS200 Series	2x2	LS220 and LS250	2083	29	72
	2x4		2461	33	74
	2x2	LS224 and LS254 with slam shut device	2001	28	28
	2x4		2304	34	67

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Table 7. Pressure Ranges and Body Pressure-Temperature Ratings Without PED Certification

TYPE	OUTLET RANGE		BODY MATERIAL	END CONNECTION	TEMPERATURE RANGE		MAXIMUM OPERATING INLET		MAXIMUM BODY PRESSURE RATING			
	psig	bar			°F	°C	psig	bar	psig	bar		
LS220 and LS224	4.35 to 10	0.3 to 0.69	Ductile iron	PN 16	-20 to 100	-29 to 38	125	8.6	232	16		
					-20 to 150	-29 to 66						
				CL150 RF	-20 to 100	-29 to 38					249	17.2
					-20 to 150	-29 to 66					242	16.7
			Steel	PN 16	-20 to 100	-29 to 38			232	16		
					-20 to 150	-29 to 66						
				CL150 RF	-20 to 100	-29 to 38					284	19.6
					-20 to 150	-29 to 66					271	18.7
			NPT	-20 to 100	-29 to 38	284			19.6			
				-20 to 150	-29 to 66	271			18.7			
			Cast iron	CL125 FF	-20 to 100	-29 to 38			175	12.1		
					-20 to 150	-29 to 66						
NPT	-20 to 100	-29 to 38		175	12.1							
	-20 to 150	-29 to 66										
LS220 and LS224	10 to 21.7	0.69 to 1.5	Ductile iron	PN 16	-20 to 100	-29 to 38	232	16	232	16		
					-20 to 150	-29 to 66						
				CL150 RF	-20 to 100	-29 to 38					249	17.2
					-20 to 150	-29 to 66					242	16.7
			Steel	PN 16	-20 to 100	-29 to 38	232	16				
					-20 to 150	-29 to 66						
				CL150 RF	-20 to 100	-29 to 38			284	19.6		
					-20 to 150	-29 to 66			271	18.7		
			NPT	-20 to 100	-29 to 38	284	19.6					
				-20 to 150	-29 to 66	271	18.7					
			Cast iron	CL125 FF	-20 to 100	-29 to 38	175	12.1				
					-20 to 150	-29 to 66						
NPT	-20 to 100	-29 to 38		175	12.1							
	-20 to 150	-29 to 66										
LS250 and LS254	20 to 60	1.37 to 4.13	Ductile iron	PN 16	-20 to 100	-29 to 38	232	16	232	16		
					-20 to 150	-29 to 66						
				CL150 RF	-20 to 100	-29 to 38					249	17.2
					-20 to 150	-29 to 66					242	16.7
			Steel	PN 16	-20 to 100	-29 to 38	232	16				
					-20 to 150	-29 to 66						
				CL150 RF	-20 to 100	-29 to 38			284	19.6		
					-20 to 150	-29 to 66			271	18.7		
			NPT	-20 to 100	-29 to 38	284	19.6					
				-20 to 150	-29 to 66	271	18.7					
			Cast iron	CL125 FF	-20 to 100	-29 to 38	175	12.1				
					-20 to 150	-29 to 66						
NPT	-20 to 100	-29 to 38		175	12.1							
	-20 to 150	-29 to 66										

Table 8. Pressure Ranges and Body Pressure-Temperature Ratings With PED Certification

TYPE	OUTLET RANGE		BODY MATERIAL	END CONNECTION	TEMPERATURE RANGE		MAXIMUM OPERATING INLET		MAXIMUM BODY PRESSURE RATING					
	psig	bar			'F	'C	psig	bar	psig	bar				
LS220 and LS224	4.35 to 10	0.3 to 0.69	Ductile iron	PN 16	-4 to 100	-20 to 38	125	8.6	232	16				
					-4 to 140	-20 to 60								
				CL150 RF	-4 to 100	-20 to 38					249	17.2		
			-4 to 140		-20 to 60	242					16.7			
			Steel	PN 16	-4 to 100	-20 to 38					232	16		
					-4 to 140	-20 to 60					284	19.6		
	CL150 RF	-4 to 100		-20 to 38	271	18.7								
		-4 to 140	-20 to 60	284	19.6									
	NPT	-4 to 100	-20 to 38	271	18.7									
		-4 to 140	-20 to 60	271	18.7									
		LS220 and LS224	10 to 21.7	0.69 to 1.5	Ductile iron	PN 16			-4 to 100	-20 to 38	232	16	232	16
									-4 to 140	-20 to 60				
CL150 RF						-4 to 100	-20 to 38	249	17.2					
					-4 to 140	-20 to 60	242	16.7						
Steel	PN 16				-4 to 100	-20 to 38	232	16						
					-4 to 140	-20 to 60	284	19.6						
	CL150 RF	-4 to 100	-20 to 38	271	18.7									
-4 to 140		-20 to 60	271	18.7										
NPT	-4 to 100	-20 to 38	284	19.6										
	-4 to 140	-20 to 60	271	18.7										
	LS250 and LS254	20 to 60	1.37 to 4.13	Ductile iron	PN 16	-4 to 100	-20 to 38	232	16	232	16			
						-4 to 140	-20 to 60							
					CL150 RF	-4 to 100	-20 to 38					249	17.2	
				-4 to 140		-20 to 60	242			16.7				
Steel				PN 16	-4 to 100	-20 to 38	232			16				
					-4 to 140	-20 to 60	284			19.6				
	CL150 RF	-4 to 100	-20 to 38	271	18.7									
-4 to 140		-20 to 60	271	18.7										
NPT	-4 to 100	-20 to 38	284	19.6										
	-4 to 140	-20 to 60	271	18.7										

Downstream equipment, protected by possible built-in safety shut-off device (in its Class A and integral strength configuration) of this product, shall have technical features such as to be category per table below according to Pressure Equipment Directive PED 2014/68/EU.

The regulator and built-in pressure accessories (e.g. slam-shut controller Type VSX8) installed in all the available sizes of LS200 Series Regulators, conform to Pressure Equipment Directive PED 2014/68/EU Article 4 Section 3 and were designed and manufactured in accordance with Sound Engineering Practice (SEP).

Per Article 4 Section 3, these "SEP" products must not bear the CE marking.

Product Description

The LS200 Series Direct-Operated Gas Regulators, shown in Figure 1 are primarily designed for industrial and commercial applications supplying gas to furnaces, burners and other appliances. The LS200 Series Balancing System enables the regulator to provide accurate control gas pressure for maximum combustion efficiency despite varying inlet pressure conditions. The single port construction provides bubble-tight shutoff.

This product has been designed to be used with fuel gases of 1st and 2nd family according to EN 437 and with other nonaggressive and nonfuel gases. For any other gases, other than natural gas, please contact your local sales agent.

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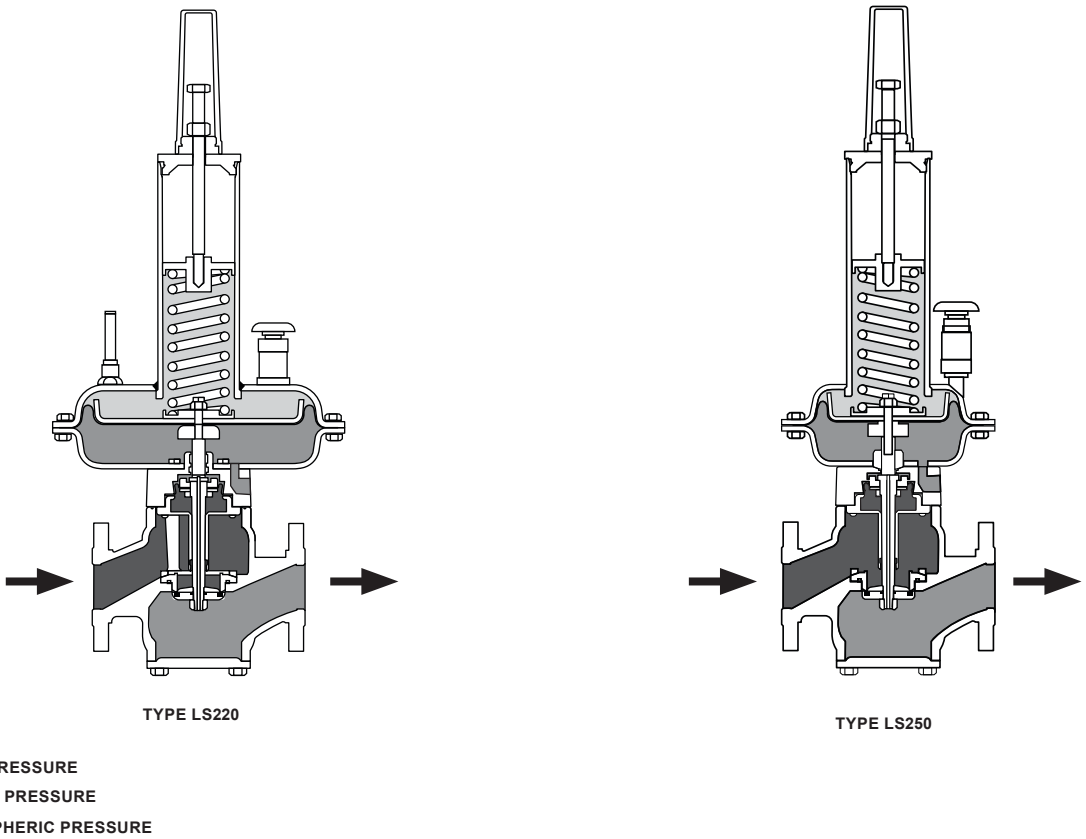


Figure 2. LS200 Series Operational Schematics

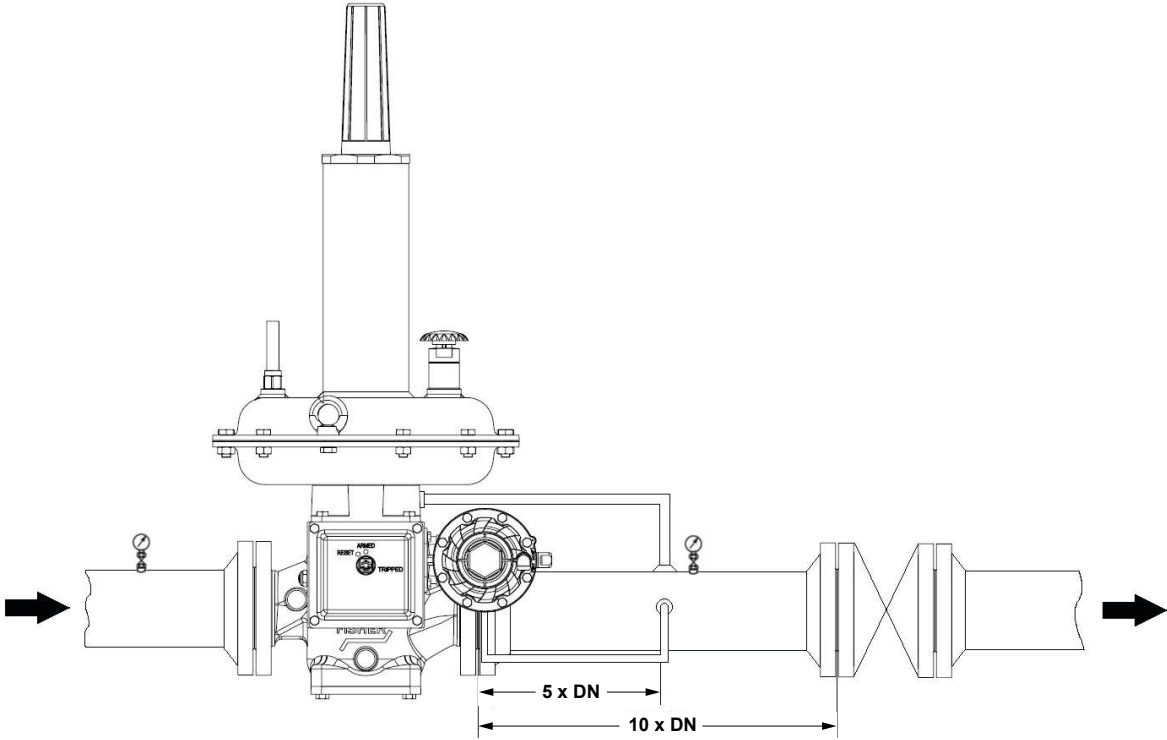


Figure 3a. LS200 Series Installation Schematic

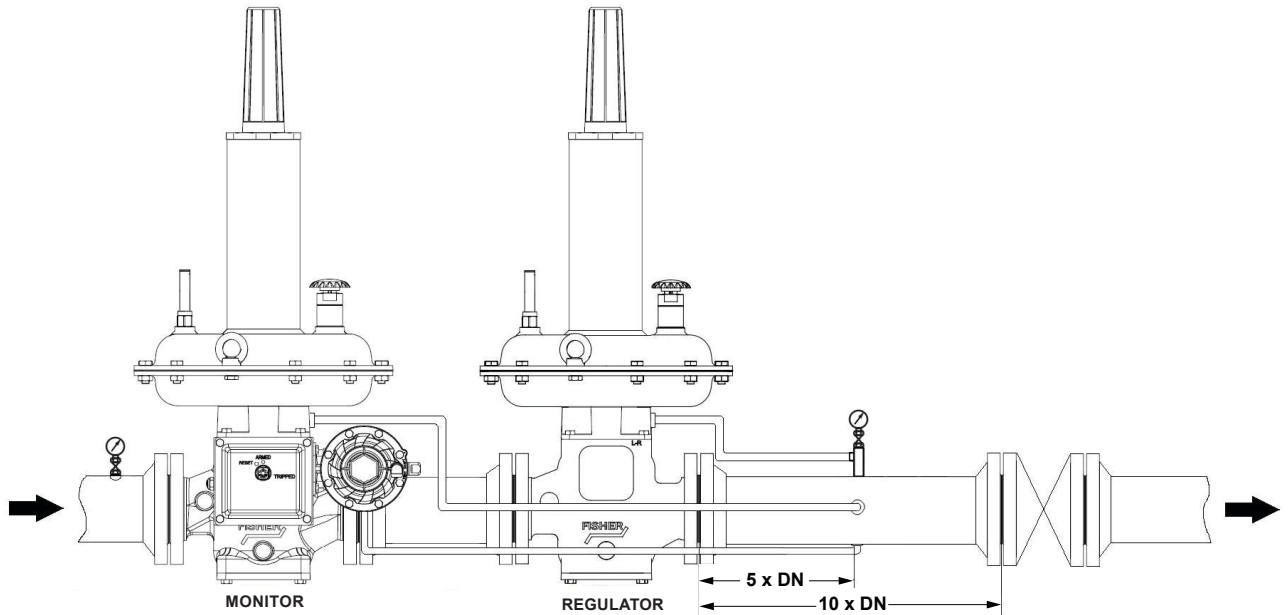


Figure 3b. LS200 Series Monitor Configuration Installation Schematic

The standard gas pressure devices (regulators and safety shut-off devices) are those used in the assemblies dealt with into EN 12186 and EN 12279 and their use has to be under the provisions into ENs 12186 and 12279.

If additional pressure accessories (e.g. slam shut controller) are needed, it is recommended to use Emerson products.

Emerson will not be responsible for any possible inefficiency due to installation of non-Emerson production additional pressure accessories (e.g. slam-shut controller).

An external downstream control line is required for the operation of the regulator. A restriction collar is available to reduce the flow capacity of the regulator.

Principle of Operation

Refer to the operational schematics in Figure 3. The LS200 Series downstream pressure is registered under the diaphragm via the external control line and is used as the operating medium. Increased demand lowers the downstream pressure and allows the spring to move the diaphragm and stem assembly down, opening the valve disk and supplying more gas to the downstream system.

Decreased demand increases the downstream pressure and moves the diaphragm and stem assembly up, closing the valve disk and decreasing the gas supply to the downstream system.

Boosting System

The LS200 Series incorporates a balancing diaphragm and a boosting system. When the regulator is locked up, inlet pressure is registered on the top of the disk and on the bottom of the balancing diaphragm through space between the stem and cage. Also, downstream pressure is registered on the bottom of the disk and on the top of the balancing diaphragm through a passage in the stem.

When the trim is open, gas flows from the inlet over the edge of the disk to the outlet. Under the disk, there is little gas flow. The gas pressure is higher than it is in the flow path where gas velocity tends to lower the pressure. The higher pressure near the disk is registered on the top of the balancing diaphragm through the space between the stem and the cage.

This pressure registered on the top of the balancing diaphragm aids downward disk travel and compensates for spring and diaphragm effect. This improves regulator rangeability and performance.

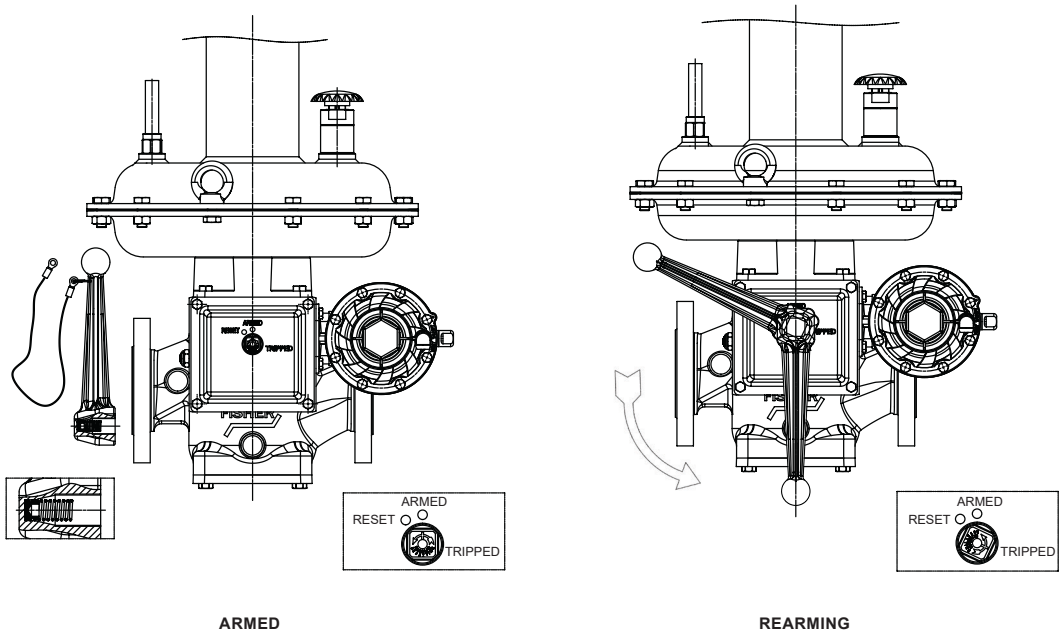


Figure 4. Rearming Process

Installation

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 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 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.

Before installing the LS200 Series Regulator, inspect it for shipping damage and ensure that the body and orifice are clean. Blow out the pipeline to remove pipe scale and other foreign material.

The regulator may be installed in any position as long as the flow through the body is the same as indicated by the flow direction arrow on the body and the vent opening is unobstructed and protected from the rain, ice and other foreign material.

If the regulator has threaded end connections, coat external threads with pipe compound. For flanged end connections, tighten the flange bolts evenly.

Parallel run with LS200 Series is recommended to ensure continued operation during maintenance windows.

The regulator must be protected from damage by vehicles and other outside sources.

Overpressure Protection

The LS200 Series Regulator has an outlet pressure rating lower than the inlet pressure rating. Some type of overpressure protection is needed if the actual inlet pressure exceeds the outlet pressure rating.

Maximum operating inlet pressure for the LS200 Series Regulators is given in Table 4. All models must be protected against inlet pressure above their listed maximum.

Regulator operation below these emergency pressure limitations does not preclude the possibility of damage from external sources or from debris in the gas line.

The regulator should be inspected for damage after any overpressure condition.

Reset Procedure

See Figure 4 for the rearming process. The rearm tool is included with all LS200 Series units with slam-shut option. If the tool is not readily available, a 17 mm wrench can be used to rearm.

Rotate counterclockwise until the lever is pointed down. Continue rotating past this point to rearm. The lever should point to the Reset Point on the cover. The lever should no longer rotate back to the tripped position.

Downstream Control Line



WARNING

Downstream control line is required for proper operation of these regulators.

An external downstream control line must be installed before putting the LS200 Series Regulators in operation. Without the control line, the regulator will remain wide open. The downstream control line should be a pipe or tubing of at least 1/2 in. / 12.7 mm diameter; connect it to the downstream pipe line at least 5 to 10 pipe diameters from the regulator and in a straight section of pipe.

The external downstream control line connection on the LS200 Series Regulator is 1/4 NPT.

Vent

The LS200 Series vent uses a dampening assembly to improve performance. The damper is connected to the spring case with 1/2 NPT connection. It is screened to prevent insects or foreign material from entering.

If a vent to the atmosphere is required for indoor installations, remove the damper assembly and pipe the vent to the outside.

The vent pipe should be as short as possible with minimum number of bends or elbows. The pipe should also have the largest practical diameter. Install a weather and bug resistant vent assembly on the outside end of the vent pipe.

For indoor installation that have been piped to the outside and for outdoor installations, the vent opening must be positioned so that water, ice and other foreign material cannot enter the spring case. Use care not to place the vent opening below downspouts, eaves, doors, windows or air intakes. The vent opening

should be checked periodically to be sure that the opening has not been plugged with foreign material. On some installations it may be necessary to provide additional protection from the elements.

Startup



WARNING

If the downstream system is already pressured by another regulator or by a manual bypass, then extra precautions must be taken when placing the LS200 Series in service.

The outlet of the regulator must never be subjected to pressure higher than the inlet pressure or the balancing diaphragm may be damaged. Also, the control line pressure must never exceed the set point dictated by the spring setting by more than 3 psig / 0.21 bar or the valve seat or diaphragm plates can be damaged.

The procedure used in putting the regulator in service must be planned accordingly. Pressure gauges should always be used to monitor downstream and control line pressures during startup.

If the downstream system is not pressured by another regulator or by manual bypass, use the following procedure:

1. Check to see that all appliances are turned off.
2. Slowly open the upstream shutoff valve.
3. Slowly open the downstream shutoff valve.
4. Check all connections for leaks.
5. Make final control spring adjustments according to the adjustment procedures.

Adjustment



WARNING

To avoid personal injury, property damage or equipment damage caused by bursting of pressure containing parts or explosion of accumulated gas, never adjust the control spring to maintain a control pressure higher than the upper limit of the control pressure

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Table 9. Torque Requirement for Regulator Maintenance

KEY	PART NUMBER	DESCRIPTION	SIZE	TORQUE	
				Ft-lb	N•m
15	ERAA51785A0	Hex locknut	20 mm / 3/4 in. Socket	26	35
31	ERAA07626A0	Hex	30 mm / 1-1/4 in. Wrench	23	30
54	ERAA12336A0	Hex locknut/Nylon	20 mm / 3/4 in. Socket	26	39
34	ERAA12017A0	Torx screw - Orifice, Cage and Int Flange	T20 Torx	3	3.2
21	ERAA07751A0	Travel Indicator	21 mm / 13/16 in. Socket	15	20
58	M0236660X12	Hex	3/4 NPT	14	18
17	M5009027X12	255 and 350 mm actuator - Hex cap screw	17 mm / 11/16 in Socket	18	24
22	ERAA12023A0	Hex cap screw	13 mm / 1/2 in. Socket	17	22

Table 10. Torque Requirement for Slam-Shut Maintenance

KEY	PART NUMBER	DESCRIPTION	SIZE	TORQUE	
				Ft-lb	N•m
202	GE38176X012	Hex cap screw	10 mm / 13/32 in. Socket	12	15
202	GE38176X012	Hex cap screw	10 mm / 13/32 in. Socket	6	8
228	M5011006X12	Hex socket cap screw	4 mm / 5/32 in. Hex Key	5	6
224	M5011019X12	Hex cap screw	5 mm / 3/16 in. Hex Key	8	10
216	ERAA49756A0	Hex socket set screw	2.5 mm Hex Key	3	3

range for that particular spring. If the desired control pressure is not within the range of the spring, install a spring of the proper range according to the Diaphragm and Spring Case Area section of the maintenance procedure.

To increase the pressure setting, remove the closing cap (key 6, Figures 5, 6 and 7) and turn the adjusting screw (key 10) clockwise; to lower the setting, turn the adjusting screw counterclockwise.

A pressure gauge should always be used when adjustments are being made. Do not adjust the spring to produce an outlet pressure setting above the limit stamped on the nameplate, located on the casing. If the required pressure setting is not within the range of the spring in use, substitute with the correct spring or a different actuator might be needed, refer to Table 4 for spring ranges and actuator sizes. When changing the spring, also change the nameplate, located on the casing flange, to indicate the outlet pressure range.

Shutdown

Isolate the regulator from the pressure system and release pressure from the outlet and the control line. Inlet pressure will then automatically be released as the regulator opens up in response to the lowered pressure on the diaphragm. If the unit or station has a slam-shut, ensure the slam-shut has not isolated pressure upstream or downstream before beginning maintenance.

Maintenance

This section includes instructions for disassembly and replacement of parts. All key numbers refer to Figures 5, 6 and 7, except where indicated. Reference Torque Values Table 9 for specific values of each key number.

WARNING

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

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™ regulators. Restart gas utilization equipment according to normal startup procedures.

To avoid personal injury due to the sudden uncontrolled movement of parts, do not loosen the diaphragm casing cap screws (key 17 and 19) when the control spring (key 13) has spring

force applied to it. Release the spring compression as described in step 2 of Actuator Maintenance and Balance Diaphragm Replacement.

Disk or Pad Maintenance

1. Isolate the regulator and bleed downstream pressure to atmosphere.
2. Remove bolts (key 22) and diaphragm plate (key 30).
3. Unscrew locknut (key 54) with 19 mm socket and remove the disc (key 43) and O-ring (key 42). No need to remove the actuator or hold the stem during maintenance. Inspect the disc for damage and replace if needed. Replace O-ring and locknut from the kit.
4. Reassemble in reverse order. Replace disk (key 43) and tighten locknut (key 54). Install the bottom flange (key 44) with O-ring (key 32) and 4 bolts (key 22).
5. During reassembly, check all O-rings (key 32) to be certain they are in good condition; replace if necessary. Lubricate the O-ring with elastomer sealant and lubricant. Apply anti-seize compound liberally to the adjusting screw threads (key 10), as indicated in Figures 5 to 6.

Actuator Maintenance (Figures 5 to 6)



Ensure to take extra care during aligning of bolt holes as threads of bolts will damage the diaphragm.

1. Isolate the regulator and bleed downstream pressure to atmosphere.
2. Remove closing cap (key 6), rotate the adjusting screw (key 10) counterclockwise until there is no compression on the control spring (key 13).
3. Remove cap screws (key 17) from the actuator (key 2).
4. Lift the spring case (key 2) and set aside. Remove the control spring (key 13) and spring seat (key 12).
5. Unscrew locknut (key 15), remove the lower spring seat (key 14). Then remove diaphragm plate (key 5).
6. Diaphragm (key 4) should now be loose and can be replaced.
7. Align bolt holes before tightening down locknut (key 15).
8. Set diaphragm (key 4), diaphragm head (key 5) and spring seat (key 14). Align bolts (key 17), lift stem (key 37) and allow full assembly to settle which aligns the balance diaphragm (key 28) and main diaphragm. Once aligned with bolts, tighten down locknut (key 15) to 25.1 ft-lb / 30 N•m. Do not overtighten.
9. During reassembly, ensure that all O-rings (keys 24, 25, 33, 48, 47 and 57) are in good condition; replace if necessary. Lubricate with elastomer sealant and lubricant. Apply anti-seize compound liberally to the adjusting screw threads (key 10), as indicated in Figures 5 to 6.

Balance Diaphragm Replacement

1. Isolate the regulator and bleed downstream pressure to atmosphere. Once pressure upstream and downstream have bled to 0, manually trip the slam-shut to release the spring energy in the trim.
2. Remove closing cap (key 6), rotate the adjusting screw (key 10) counterclockwise until there is no compression on the control spring (key 13).
3. If slam-shut is included, remove the slam-shut mechanism from the body. Remove 4 bolts (key 224) from the box and pull entire slam-shut off the body. Careful of the O-ring seal between the body to avoid damage. Set aside protecting the cam and sealing surface.
4. Remove cap screws (key 17) from the actuator (key 2).
5. Lift the spring case (key 2) and set aside. Remove the control spring (key 13) and spring seat (key 12).
6. Unscrew locknut (key 15), remove the lower spring seat (key 14). Then remove diaphragm plate (key 5).
7. Diaphragm (key 4) should now be loose and can be replaced.
8. Remove the 4 intermediary flange screws (key 22) and lift actuator assembly and trim out of the body (key 1).
9. Carefully place the lower casing edge (key 3) on a surface protecting the sealing area.

LS200 Series

10. Remove locknut (key 54) on the disk assembly (key 43) and remove disk.
11. Remove screws (key 34) then remove the orifice (key 38) and cage (key 35) from the intermediary flange (key 26).
12. Remove locknut (key 31) using a 30 mm key and hold the stem (key 37) in place by the hex feature using a 16 mm key.
13. Remove the balance diaphragm plate (key 30).
14. Remove and replace balance diaphragm (key 28). Lightly grease the outside and inside of the balance diaphragm before reassembly.
15. Reassemble the locknut (key 31) using a 30 mm key and hold the stem (key 37) in place by the hex feature using a 16 mm key at 25.1 ft-lb / 30 N•m torque.
16. Insert stem (key 37) into cage (key 35), make sure that balance diaphragm (key 28) is mounted correctly on intermediary flange (key 26) inner groove.
17. Mount the cage (key 35) on balance diaphragm (key 28) on indicated position, make sure the stem hex feature engages with the one on the cage (upper diameter edge should enter below intermediary flange top diameter).
18. Assemble screws (key 34) to fix the cage (key 35) and orifice (key 38) from the intermediary flange (key 26). Make sure the gap between cage and intermediary flange is equal on outside circle diameter.
19. Put the trim back into body (key 1) and assemble the 4 intermediary flange screws (key 22).
20. Ensure that the serrated washer (key 29) and O-ring (key 57) are in right position.
21. Assemble main diaphragm (key 4), replace with a new one if necessary.
22. Reassemble in reverse order parts above main diaphragm (key 4).
23. During reassembly, ensure that all O-rings (keys 24, 25, 33, 48, 47 and 57) are in good condition; replace if necessary. Lubricate with elastomer sealant and lubricant. Apply anti-seize compound liberally to the adjusting screw threads (key 10), as indicated in Figures 5 to 6.

Replacing Orifice or Seat

1. Isolate the regulator and bleed downstream pressure to atmosphere. Once pressure upstream and downstream have bled to 0, manually trip the slam-shut to release the spring energy in the trim.
2. Remove closing cap (key 6), rotate the adjusting screw (key 10) counterclockwise until there is no compression on the control spring (key 13).
3. If slam-shut is included, remove the slam-shut mechanism from the body. Remove 4 bolts (key 224) from the box and pull entire slam-shut off the body. Careful of the O-ring seal between the body to avoid damage. Set aside protecting the cam and sealing surface.
4. Remove the 4 bonnet screws (key 22) and lift actuator assembly and trim out of the body (key 1).
5. Carefully place the actuator on a surface protecting the travel indicator (key 21) and the vent assembly.
6. Remove locknut (key 54) on the disc assembly (key 43) and remove disk.
7. Remove the two torx screws (key 34) to remove the orifice (key 38) from the cage (key 35). Keep the cage connected to the bonnet (key 26). If unit has a slam-shut option, inspect the slam-shut disc (key 204) for damage or cuts.
8. Change out the orifice (key 38) with new part and reassemble.
9. During reassembly, ensure that all O-rings (keys 32, 40 and 42) are in good condition; replace if necessary. Lubricate the O-ring with elastomer sealant and lubricant. Apply anti-seize compound liberally to the adjusting screw threads (key 10), as indicated in Figures 5 to 6.

Parts Ordering

When corresponding with your local Sales Office about this regulator, include the type number, serial number and other information stamped on the nameplate.

When ordering replacement parts, reference the key number of each needed part and specify the eleven character part number as found in the following parts list.

Parts List

Key	Description	Part Number	Key	Description	Part Number
	Spare Parts Kit	See Repair Kit Table	39	Hole Plug, Brass	ERAA11283A0
1	Body	See Key 1 Table	40*	Gasket, Nitrile (NBR)	ERAA12018A0
2	Upper Casing, Steel		41	Pad Retainer, Steel	
	Types LS220 and LS224	ERAA10668A0		100% capacity, Types LS220 and LS224	ERAA51481A0
	Types LS250 and LS254	ERAA10667A0		100% capacity, Types LS250 and LS254	ERAA52946A0
3	Lower Casing, Steel			60% capacity, All types	ERAA51820A0
	Types LS220 and LS224	ERAA09262A0		40% capacity, All types	ERAA52867A0
	Types LS250 and LS254	ERAA09273A0		78% capacity, All types	ERAA53097A0
4*	Diaphragm, Nitrile (NBR)		42*	O-ring, Nitrile (NBR)	1F2613X0012
	Types LS220 and LS224	ERAA07476A0	43*	Pad Assembly, Steel and Nitrile (NBR)	
	Types LS250 and LS254	ERAA07454A0		Single sided	ERAA07637A1
5	Diaphragm Head, Steel			Double sided	ERAA12823A1
	Types LS220 and LS224	ERAA10663A0	44	Bottom Flange, Steel	ERAA07518A0
	Types LS250 and LS254	ERAA10662A0	45	Nut, Steel	ERAA53059A0
6	Protective Cap, Nylon	ERAA50712A0	46	Sealing Washer, Nitrile (NBR)	11A9681X012
7	Bonnet, Steel	ERAA50689A0	47*	O-ring	GE18400X022
10	Adjusting Screw, Steel	ERAA07799A0	48	Plug	1A369235072
11	Ball, Stainless steel	M4500530X12	53	Lock Pin, Stainless steel	ERAA51580A0
12	Upper Spring Seat, Steel	ERAA50770A0	54*	Locknut, Steel	ERAA12336A0
13	Spring, Steel		56*	Stem Guide, Nylon	ERAA50073A0
	0.3 to 0.35 bar / 4.35 to 5.1 psig, Light Green	ERAA07586A0	57*	O-ring, Nitrile (NBR)	1F113906992
	0.3 to 0.73 bar / 4.35 to 10.6 psig, Pink	ERAA07589A0	58*	Damper Assembly	M8090197X12
	0.33 to 1.08 bar / 4.8 to 15.7 psig, Dark Blue	ERAA07592A0			
	0.57 to 1.5 bar / 8.3 to 21.75 psig, Orange	ERAA07283A0			
14	Lower Spring Seat, Steel	ERAA50696A0			
15*	Locknut, Steel	ERAA51785A0			
16	Nameplate	-----			
17	Bolt, Steel	ERAA53025A0			
18	Eyenuit Nut, Steel	M5043007X12			
19	Nut, Steel	ERAA12217A0			
20*	O-ring, Nitrile (NBR)	ERAA42931A2			
21*	Travel Indicator Assembly, Brass				
	Types LS220 and LS224	ERAA14511A0			
	Types LS250 and LS254	ERAA14798A0			
21a	Fitting	ERAA07751A0			
21b	Stem, Stainless steel	ERAA07781A0			
21c*	O-ring, Nitrile (NBR)	ERAA12026A0			
21d	O-ring, Nitrile (NBR)	1H2926X0032			
21e	Bushing Indicator, Brass	ERSA02798A0			
21f	Cover Assembly, Polymer	M0210910X12			
21g	Nameplate, Polymer	-----			
21h	End Piece, Brass				
	Types LS220 and LS224	ERAA07793A0			
	Types LS250 and LS254	ERAA51739A0			
21j	Spring, Brass	ERAA51766A0			
21k	Pointer, Brass	M0229000X12			
22	Screw, Steel	ERAA12023A0			
23*	Backup Ring	ERAA12012A0			
24*	O-ring, Nitrile (NBR)	ERAA12013A0			
25*	O-ring, Nitrile (NBR)	ERAA12008A0			
26	Intermediate Flange, Nitrile (NBR)				
	Types LS220 and LS224	ERAA10701A0			
	Types LS250 and LS254	ERAA52058A0			
27	Balance Diaphragm Head, Nitrile (NBR)	ERAA51970A0			
28*	Balance Diaphragm, Nitrile (NBR)	ERAA07724A0			
29	Serrated Washer, Steel	ERAA51778A0			
30	Balance Diaphragm Plate, Steel	ERAA51960A0			
31	Retaining Nut, Steel	ERAA07626A0			
32*	O-ring, Nitrile (NBR)	ERAA52798A0			
33*	O-ring, Nitrile	ERAA51959A0			
34	Screw, Steel	ERAA52386A0			
35	Cage, Stainless steel	ERAA10702A0			
36*	Stem Bushing	ERAA49971A0			
37	Stem, Stainless steel	ERAA50684A0			
38*	Orifice, Stainless steel	ERAA13221A0			

*Recommended Spare Part.

Slam Shut Device

Key	Description	Part Number
26*	Gland Sleeve, Brass	ERAA52345A0
30*	Protective Cap, Brass	ERAA52346A0
110*	Shutter, Steel	ERAA09134A0
199	Type VSX8 Assembly	See Type VSX8 Instruction Manual
200	Blanking Plug, Aluminum	GE31255X012
201	Half Ring Flange, Steel	GF01942X012
202	Screw, Steel	GE38176X012
203*	O-ring, Nitrile (NBR)	GF03443X012
204*	Pad Assembly, Steel or Nitrile (NBR)	M0236560X32
205	Spring Holder, Brass	ERAA49374A0
206*	Anti friction Ring, Bronze filled Polytetrafluoroethylene (PTFE)	M0236980X12
207*	O-ring, Nitrile (NBR)	FA400519X12
208	Main Spring, Steel	ERAA09265A0
209*	Snap Ring	M4500515X12
210	Spring, Steel	ERAA53299A0
211	Mechanism Box, Ductile iron	ERAA46519A0
212	Lever 2	ERAA52158A0
213	Latching Pin, Stainless steel	ERAA46552A0
214	Lever 1, Cast steel	ERAA46523A0
215	Shaft, Stainless steel	ERAA46550A0
216*	Threaded Pin, Steel	ERAA49756A0
217	Bushing, Brass	ERAA50286A0
218*	O-ring, Nitrile (NBR)	ERAA49833A0
219*	Baseplate Bushing, Polymer	ERAA50072A0
220	Cam, Stainless steel	ERAA49540A0
221*	O-ring, Nitrile (NBR)	M6010013X12
222	Lid, Ductile iron	ERAA51898A0
223*	Gasket, Nitrile (NBR)	ERAA51913A0
224	Screw, Steel	M5011019X12
225	Base Plate, Steel	ERAA50038A0
226	Torsion Spring, Steel	ERAA46779A0
227*	O-ring, Nitrile (NBR)	ERAA50661A0
228	Screw, Steel	M5011006X12
229*	Gasket, Nitrile (NBR)	ERAA51439A0
230	Reloading Nameplate, Aluminum	ERAA53509A0
231	Drive screw, Stainless steel	M4500027X12
232	Wrench, Aluminum	M0193731X12
233	Silencer, Brass	M4500367X12

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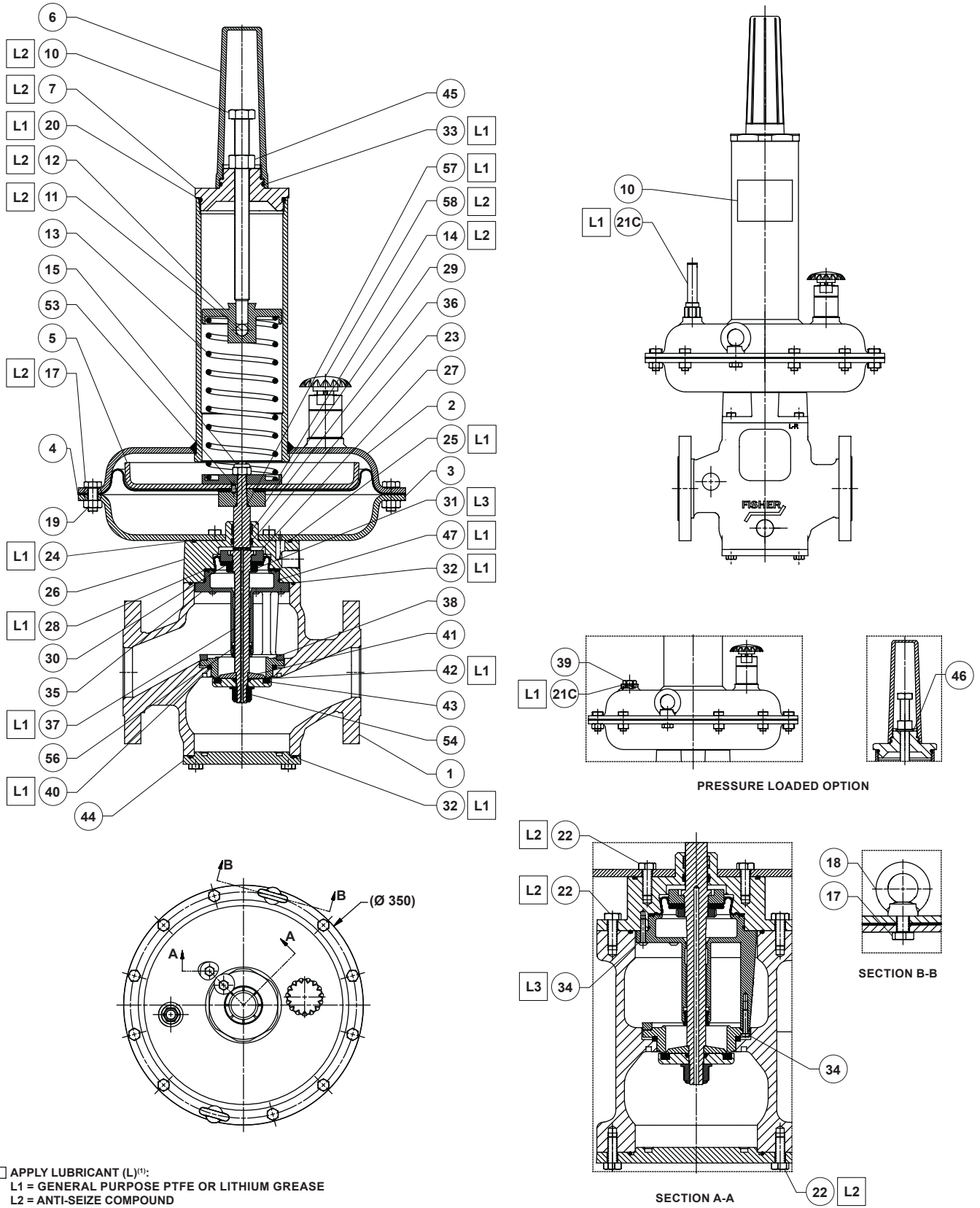
Repair Kit

SPARE PART KITS	ACTUATOR TYPE (SIZE)	KEY	KIT PART NUMBER
Pad Repair Kit	All (single side)	32, 42, 43, 54	RLS2PAD10A0
	All (double side)	32, 42, 43, 54	RLS2PAD20A0
Orifice Kit	All	32, 38, 40, 42, 54	RLS2ORFC0A0
	All with slam shut device	32, 38, 40, 42, 54, 203, 206, 207, 223	RLS24ORFCA0
Balance Port Kit	All	15, 20, 23, 24, 28, 32, 33, 42, 47, 54, 57	RLS2BALN0A0
	All with slam shut device	15, 20, 23, 24, 28, 32, 33, 42, 47, 54, 57, 203, 223	RLS2XBALNA0
Actuator Kit	LS220 (350 mm)	4, 15, 20, 21C, 33, 57	RLS220ACTA0
	LS250 (255 mm)	4, 15, 20, 21C, 33, 57	RLS250ACTA0
Full Rebuild Kit	LS220 (350 mm)	4, 15, 20, 21C, 23, 24, 25, 28, 32, 33, 36, 38, 40, 42, 43, 47, 54, 56, 57	RLS220REBA0
	LS250 (255 mm)	4, 15, 20, 21C, 23, 24, 25, 28, 32, 33, 36, 38, 40, 42, 43, 47, 54, 56, 57	RLS250REBA0
	LS200 (475 mm) with slam shut device	4, 15, 20, 21C, 23, 24, 25, 28, 32, 33, 36, 38, 40, 42, 43, 47, 54, 56, 57	RLS204REBA0
	LS220 (350 mm) with slam shut device	4, 15, 20, 21C, 23, 24, 25, 28, 32, 33, 36, 38, 40, 42, 43, 47, 54, 56, 57, 203, 204, 206, 207, 209, 216, 218, 219, 221, 223, 227, 229, 21C	RLS224REBA0
	LS250 (255 mm) with slam shut device	4, 15, 20, 21C, 23, 24, 25, 28, 32, 33, 36, 38, 40, 42, 43, 47, 54, 56, 57, 203, 204, 206, 207, 209, 216, 218, 219, 221, 223, 227, 229, 21C	RLS254REBA0
Travel Indicator	LS220 (350 mm)	21	RLS220TVLA0
	LS250 (255 mm)	21	RLS250TVLA0
Vent	All	58	RLS20VENTA0
Slam Shut Device VSX8	All	203	RLS20VSX8A0

Key 1, Body Materials and Part Numbers

BODY SIZE	BODY MATERIAL	END CONNECTION STYLE ⁽¹⁾	SLAM-SHUT POSITION	PART NUMBER
2x2	Ductile iron	CL150 RF	L-R	ERAA52444A0
			R-L	ERAA52446A0
			W/O	ERAA52448A0
			L-R and R-L	ERAA09111A0
		PN 16	L-R	ERAA52432A0
			R-L	ERAA52445A0
			L-R and R-L	ERAA09124A0
			W/O	ERAA52447A0
	WCC	CL150 RF	L-R	ERAA52451A0
			R-L	ERAA52452A0
			L-R and R-L	ERAA07381A0
			W/O	ERAA08618A0
		PN 16	L-R	ERAA52449A0
			R-L	ERAA52450A0
			L-R and R-L	ERAA07419A0
			W/O	ERAA52453A0
		NPT	L-R	ERAA52473A0
			R-L	ERAA52473A0
			L-R and R-L	ERAA12504A0
			W/O	ERAA08366A0
Cast iron	CL125 FF	W/O	ERAA09046A0	
	NPT	W/O	ERAA09096A0	
2x4	Ductile iron	CL150 RF	L-R	ERAA52476A0
			R-L	ERAA52478A0
			L-R and R-L	ERAA09149A0
			W/O	ERAA52492A0
		PN 16	L-R	ERAA52475A0
			R-L	ERAA52477A0
			L-R and R-L	ERAA09157A0
			W/O	ERAA52489A0
	WCC	CL150 RF	L-R	ERAA52480A0
			R-L	ERAA52484A0
			L-R and R-L	ERAA08233A0
			W/O	ERAA08630A0
		PN 16	L-R	ERAA52479A0
			R-L	ERAA52481A0
			L-R and R-L	ERAA08234A0
			W/O	ERAA09121A0
Cast iron	CL125 FF	W/O	ERAA09121A0	

LS200 Series



□ APPLY LUBRICANT (L)⁽¹⁾:
 L1 = GENERAL PURPOSE PTFE OR LITHIUM GREASE
 L2 = ANTI-SEIZE COMPOUND
 L3 = THREAD LOCKER

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

Figure 5. Type LS220 Assembly

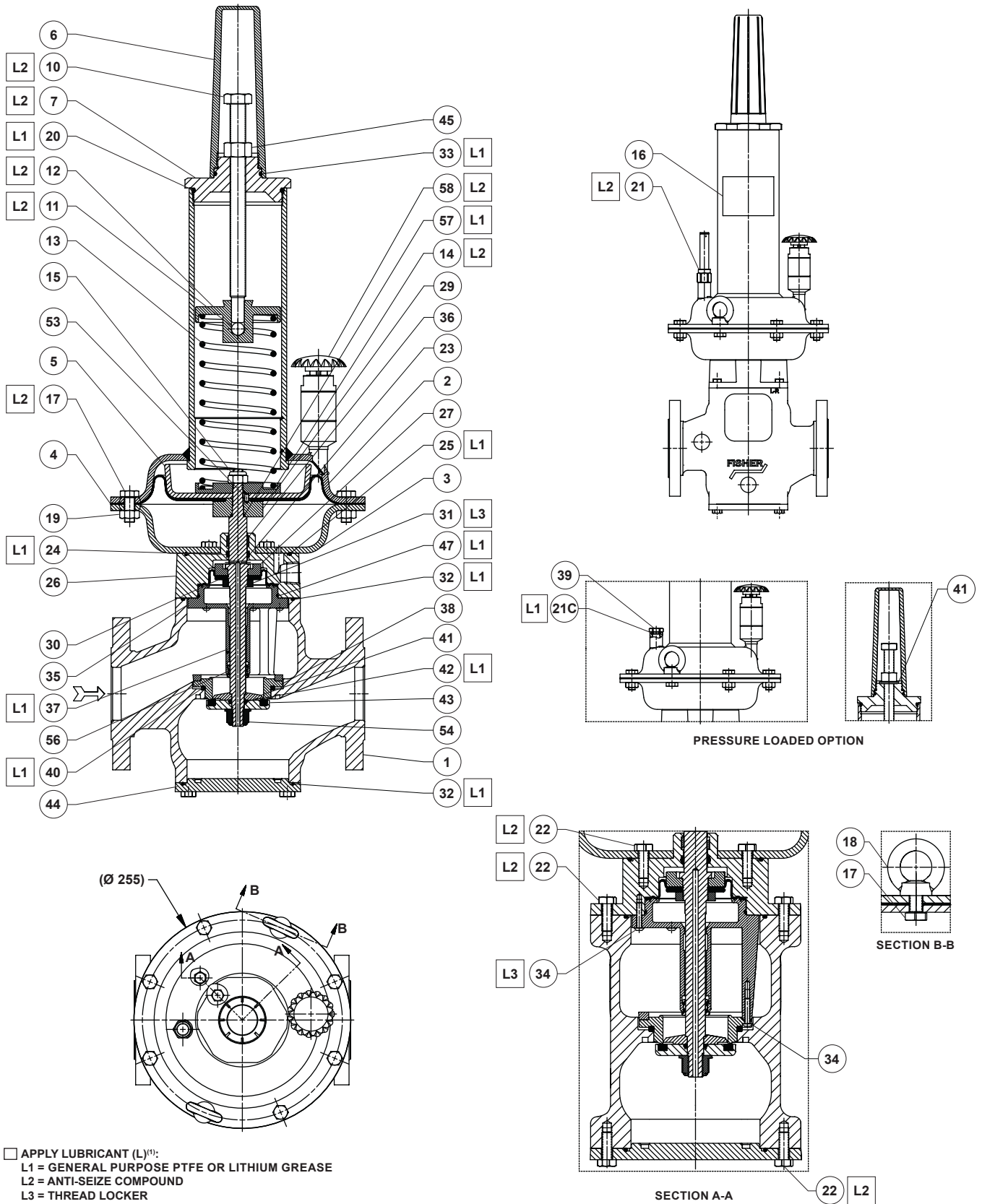
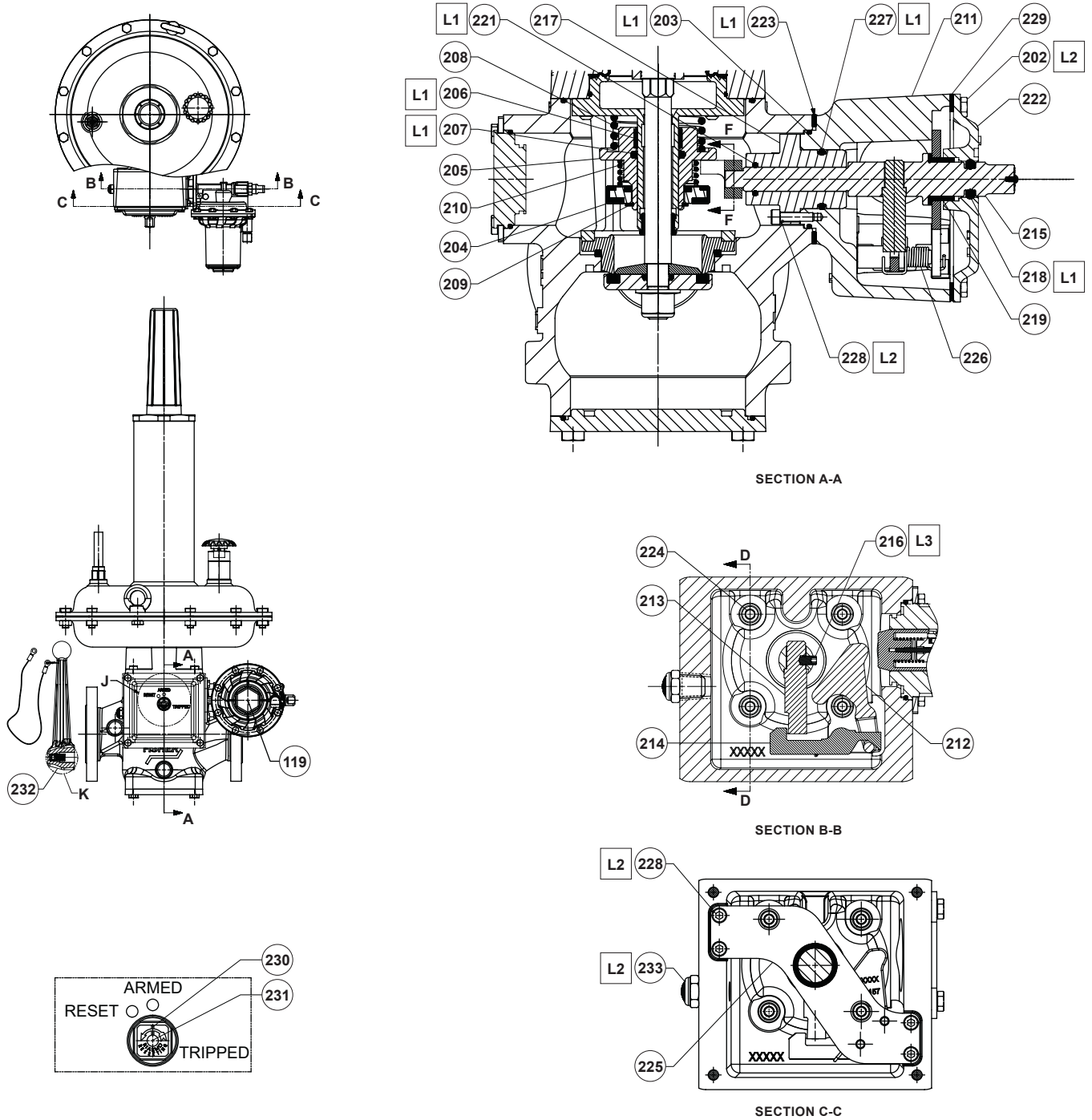


Figure 6. Type LS250 Assembly

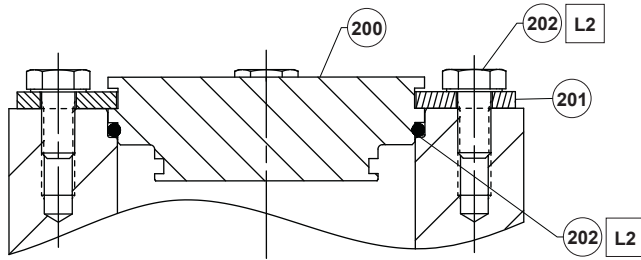
LS200 Series



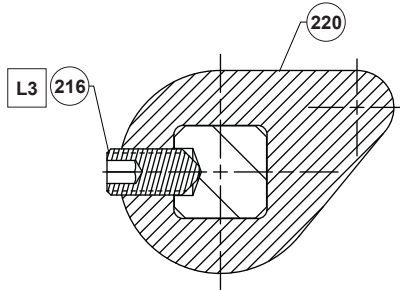
- APPLY LUBRICANT (L)⁽¹⁾:
 L1 = GENERAL PURPOSE PTFE OR LITHIUM GREASE
 L2 = ANTI-SEIZE COMPOUND
 L3 = THREAD LOCKER

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

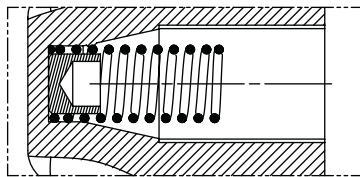
Figure 7. LS200 Series Slam-Shut Device Assembly



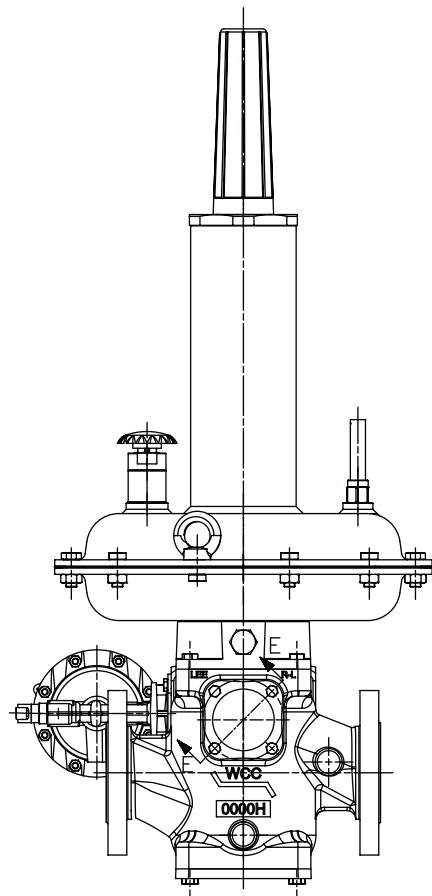
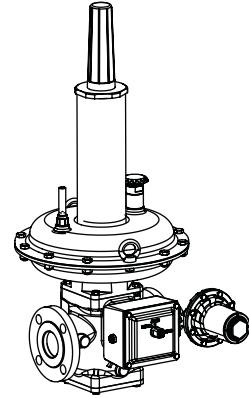
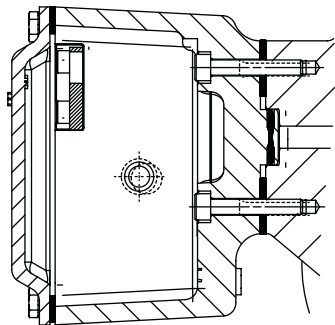
SECTION E-E



SECTION F-F



SECTION K



- APPLY LUBRICANT (L)⁽¹⁾:
- L2 = ANTI-SEIZE COMPOUND
- L3 = THREAD LOCKER

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

Figure 7. LS200 Series Slam-Shut Device Assembly

LS200 Series

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