

# 133 Series Direct-Operated Regulators

## Table of Contents

Introduction.....	1
Specifications.....	2
Principle of Operation.....	2
Installation.....	3
Overpressure Protection.....	4
Startup.....	5
Adjustment.....	6
Shutdown.....	6
Maintenance.....	6
Parts Ordering.....	11
Parts List.....	11

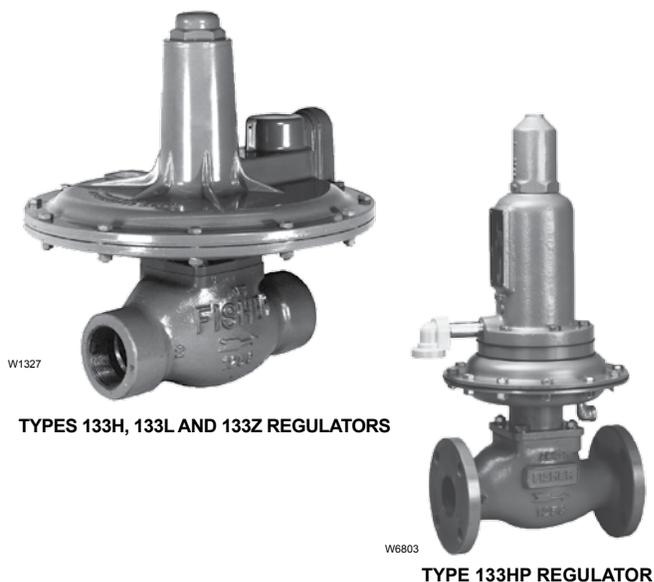


Figure 1. 133 Series Gas Regulators



## WARNING

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

Fisher® regulators must be installed, operated and maintained in accordance with federal, state and local codes, rules and regulations and Emerson Process Management Regulator Technologies, Inc. (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 gas service person to service the unit. Only a qualified person must install or service the regulator.

## Introduction

### Scope of the Manual

This manual provides specifications, installation, adjustment and maintenance instructions and parts ordering information for the 133 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 Sales Office before proceeding.

### Product Description

The 133 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 133 Series

# 133 Series

## Specifications

The Specifications section lists the specifications for the Type 133 Series direct-operated regulators. Factory specification is stamped on the nameplate fastened on the regulator at the factory.

### Available Constructions

#### Type 133H:

High pressure construction for outlet pressure range of 1.5 to 10 psig / 0.10 to 0.69 bar. The Type 133H can also use the 2 in. w.c. to 2 psig / 5 mbar to 0.14 bar springs of the Type 133L. The maximum operating inlet pressure is 60 psig / 4.1 bar with a maximum emergency inlet pressure of 125 psig / 8.6 bar.

#### Type 133HP:

Extra high pressure construction for outlet pressure range of 2 to 60 psig / 0.14 to 4.1 bar. The maximum operating and emergency inlet pressure rating is 150 psig / 10.3 bar.

#### Type 133L:

Low pressure construction for outlet pressure range of 2 in. w.c. to 2 psig / 5 mbar to 0.14 bar. The maximum operating inlet pressure is 60 psig / 4.1 bar with a maximum emergency inlet pressure of 125 psig / 8.6 bar.

#### Type 133Z:

Zero governor construction for outlet pressure range of -1 to 4 in. w.c. / -2 to 10 mbar. The maximum operating inlet pressure is 20 psig / 1.4 bar with a maximum emergency inlet pressure of 125 psig / 8.6 bar.

### Body Size and End Connection Styles

BODY SIZE		BODY MATERIAL	
IN.	DN	Cast Iron Body	WCC Steel Body
2	50	NPT or CL125 FF Flanged	NPT or CL150 RF Flanged

### Outlet Pressure Ranges

See Table 1

### Maximum Inlet Pressures<sup>(1)</sup>

See Table 2

### Maximum Outlet Pressures

See Table 2

### Pressure Registration

External; downstream control line is required.

### Temperature Capabilities<sup>(1)</sup>

-20 to 150°F / -29 to 66°C

### Control Line Connection

#### Types 133H, 133L and 133Z:

3/4 NPT (internal); connection will be positioned directly over body outlet (standard position) or 90 degrees right or left of standard position if specified.

#### Type 133HP:

1/4 NPT (internal) connection positioned directly over body outlet.

### Vent Connection

#### Types 133H, 133L and 133Z:

1 NPT (internal) with screen; standard position is in line with control line connection directly over body outlet. Vent will always be positioned over the control line connection.

#### Type 133HP:

1/2 NPT (internal) connection positioned directly over body inlet with a Fisher® Type Y602-7 vent assembly.

### Approximate Weight

#### Types 133H, 133L and 133Z NPT End

Connections: 35 lbs / 16 kg

#### Types 133H, 133L and 133Z Flanged End

Connections: 40 lbs / 18 kg

#### Type 133HP NPT End Connections:

56.5 lbs / 26 kg

#### Type 133HP Flanged End Connections:

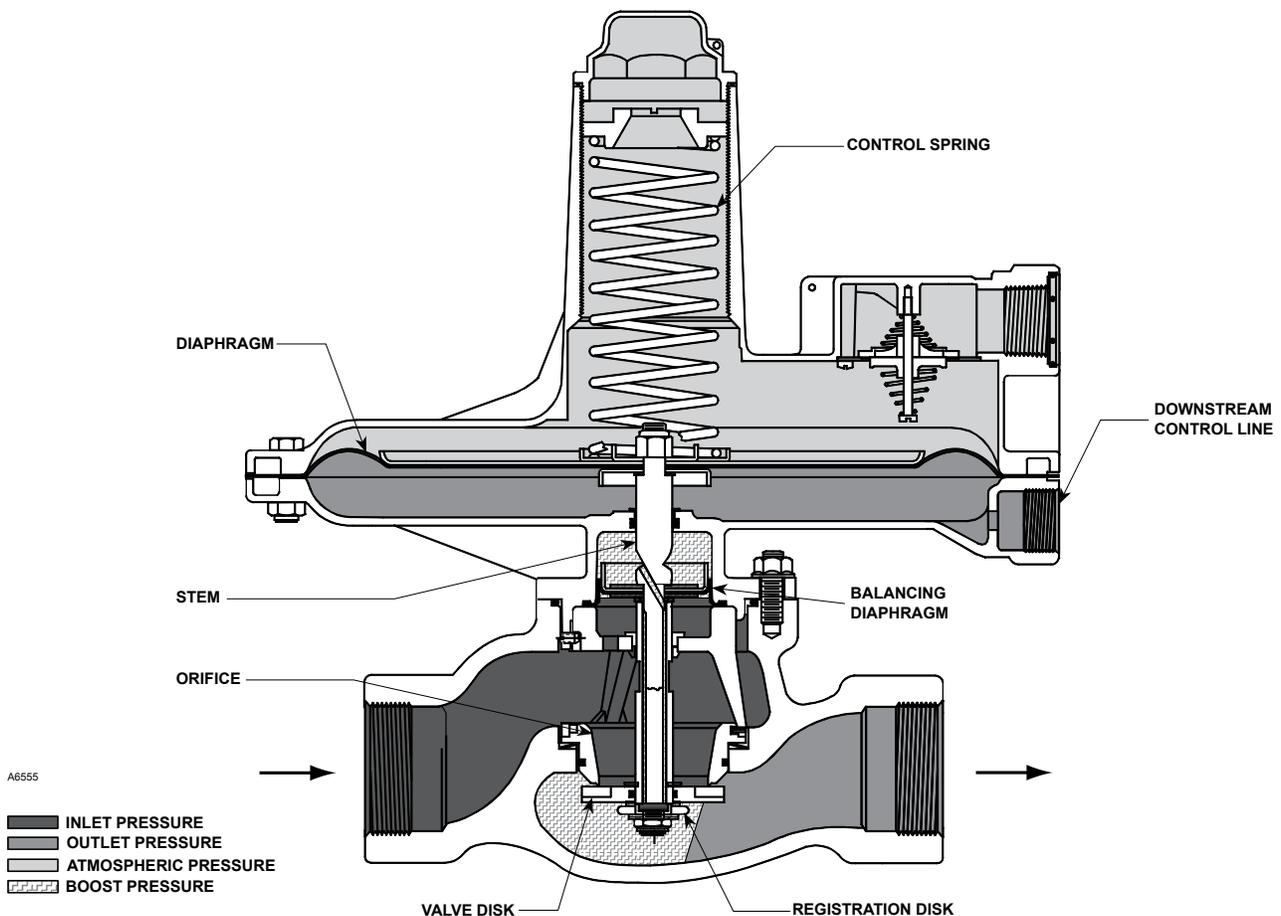
62.5 lbs / 28 kg

<sup>1</sup>. The pressure/temperature limits in this Instruction Manual or any applicable standard limitation should not be exceeded.

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. 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 Figures 2 and 3. In the 133 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



**Figure 2.** Operational Schematic of Type 133L Regulator (Also Typical of Type 133H)

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 133 Series incorporates a balancing diaphragm and a boosting system. When the regulator is locked up, inlet pressure is registered on the top of the valve disk and on the bottom of the balancing diaphragm through registration holes in the top of the cage. Also, downstream pressure is registered on the bottom of the valve disk and on the top of the balancing diaphragm through a passage formed by grooves in the registration disk and an annular space between the stem and stem sleeve.

When the valve disk is open, gas flows from the inlet over the edge of the valve disk to the outlet. Under the valve disk near the registration disk, there is little gas flow. The gas pressure near the registration disk 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 registration disk and the annular space between the stem and stem sleeve.

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

## Installation

Before installing the 133 Series regulators, inspect it for shipping damage and be certain 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 entrance of rain, ice and other foreign material.

# 133 Series

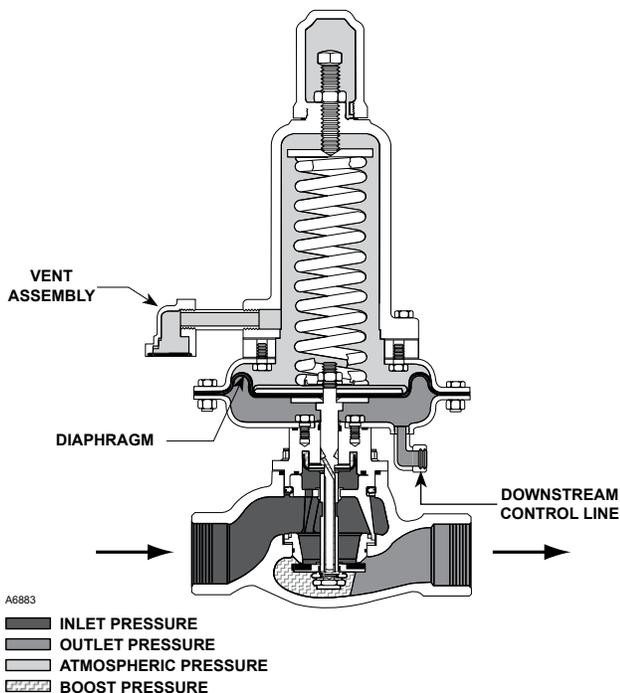


Figure 3. Operational Schematic of Type 133HP

If the regulator has threaded end connections, coat external threads with pipe compound. For flanged end connections, tighten the flange bolts evenly. Install a three valve bypass around the 133 Series if continuous operation is necessary.

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

## Overpressure Protection

The 133 Series regulators have an outlet pressure rating that is 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 133 Series regulators is given in Table 2. 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.

## Downstream Control Line



**Downstream control line is Srequired for proper operation of these regulators.**

An external downstream control line must be installed before putting the 133 Series regulators in operation. Without the control line, the regulator will remain wide-open. The downstream control line should be a pipe 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 Type 133HP is 1/4 NPT.

## Vent

The 133 Series vent is screened to prevent insects or foreign material from entering. The Types 133H, 133L and 133Z regulators have a 1 NPT (internal) connection and the Type 133HP has a 1/2 NPT internal connection. If a vent to the atmosphere is required for indoor installations, do the following:

- **For Types 133H, 133L and 133Z** — remove the snap ring and screen (keys 8J and 8H, Figure 10, 11 or 12) and pipe the vent to the outside.
- **For Type 133HP** — remove the Type Y602-7 screened vent assembly and pipe nipple (keys 50 and 49, Figure 14) from the spring case (key 8) 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 and eaves. 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.

**Table 1. 133 Series Outlet Pressure Ranges, Control Springs**

TYPE	OUTLET PRESSURE RANGE		CONTROL SPRINGS					
			Part Number	Color Code	Free Length		Wire Diameter	
	psig	bar			In.	mm	In.	mm
133H <sup>(1)</sup>	1.5 to 3	0.10 to 0.21	1H975927032	Orange	6.91	176	0.250	6.35
	2 to 5	0.14 to 0.34	10A9440X012	Yellow	6.47	164	0.283	7.19
	5 to 10	0.34 to 0.69	1J146927142	Blue	6.19	157	0.375	9.52
133HP <sup>(1)</sup>	2 to 5	0.14 to 0.34	17B8632X012	Yellow	8.50	216	0.282	7.16
	4.5 to 10	0.31 to 0.69	17B8633X012	Orange	8.50	216	0.343	8.71
	6 to 20	0.41 to 1.4	10C1238X012	Silver	8.25	210	0.375	9.53
	16 to 30	1.1 to 2.1	10C1240X012	Red	8.25	210	0.438	11.1
	26 to 40	1.8 to 2.8	10C1241X012	Blue	8.25	210	0.500	12.7
	36 to 50	2.5 to 3.4	10C1242X012	Green	8.25	210	0.500	12.7
	45 to 60	3.1 to 4.1	10C1243X012	White	8.25	210	0.531	13.5
133L <sup>(1)</sup> and 133H <sup>(2)</sup>	2 to 4 in. w.c.	5 to 10 mbar	1D892527022	Brown	6.13	156	0.109	2.77
	3.5 to 6 in. w.c.	9 to 15 mbar	1D892627022	Red	7.53	191	0.112	2.85
	5 to 9 in. w.c.	12 to 22 mbar	1D892727012	Black	7.88	200	0.130	3.30
	8.5 to 18 in. w.c.	21 to 45 mbar	1D893227032	White	7.50	190	0.156	3.96
	14 to 28 in. w.c.	35 to 70 mbar	1D893327032	Green	7.25	184	0.182	4.62
	0.75 to 2	0.05 to 0.14	1H975827032	Blue	7.09	180	0.225	5.72
133Z <sup>(1)</sup>	-1 to 1 in. w.c.	-3 to 3 mbar	1K633427012 (Extension Spring)	Unpainted	2.00	50.8	0.075	1.91
	0 to 4 in. w.c.	0 to 10 mbar	1K633427012 (Extension Spring) and 1D892527022 (Compression Spring)	Unpainted  Brown	2.00  6.13	50.8  156	0.075  0.109	1.91  2.77

1. Pressure ranges shown are correct if the regulator is installed with the actuator portion above the body portion. If the regulator is installed with the actuator portion below the body, the pressure ranges will be lowered by approximately 2 in. w.c. / 5 mbar for the Type 133L and by approximately 3 in. w.c. / 7 mbar for the Types 133H and 133Z.  
 2. If the 2 in. w.c. / 5 mbar to 2 psig / 0.14 bar springs (all 6 ranges) are used in the Type 133H, the pressure ranges will increase by approximately 1 in. w.c. / 2 mbar due to the weight of the Type 133H parts (assuming that the actuator is installed above the body).

**Table 2. Maximum Inlet and Outlet Pressures**

PRESSURES	TYPE NUMBER							
	133H		133HP		133L		133Z	
	psig	bar	psig	bar	psig	bar	psig	bar
Maximum Operating Inlet Pressure	60	4.1	150	10.5	60	4.1	20	1.4
Maximum Emergency Inlet Pressure	125	8.6			125	8.6	125	8.6
Maximum Operating Outlet Pressure <sup>(1)</sup>	10	0.69	Setpoint plus 40	Setpoint plus 2.8	2	0.14	4 in. w.c.	10 mbar
Maximum Outlet Pressure Over Outlet Pressure Setting	3	0.21			3	0.21	3	0.21
Maximum Emergency Outlet (Casing) Pressure	15	1.0	150	10.5	15	1.0	15	1.0

1. With highest spring range available only.

## 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 133 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.

# 133 Series

## Adjustment

To increase the pressure setting, remove the closing cap (key 9, Figures 10, 11, 12 and 14) and turn the adjusting screw (key 11) 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 (key 38, not shown), located on the casing flange. If the required pressure setting is not within the range of the spring in use, substitute with the correct spring. Ranges of available springs are shown in Table 1. 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.

## Maintenance

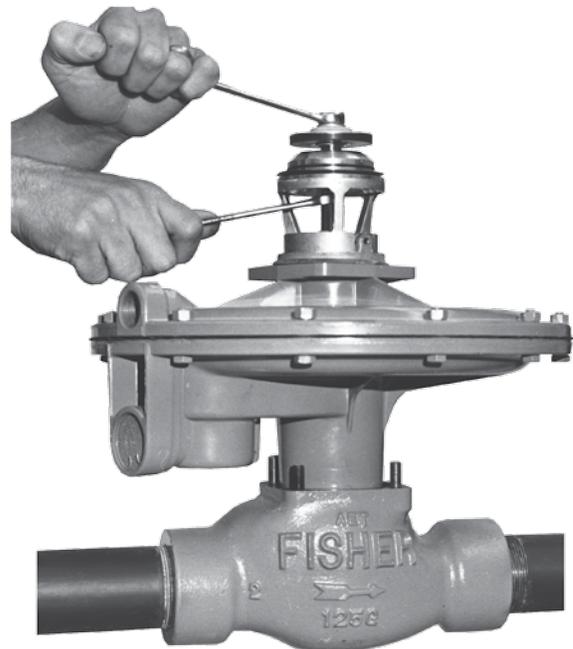
This section includes instructions for disassembly and replacement of parts. All key numbers refer to Figures 10, 11, 12 and 14, except where indicated.

### 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 equipment.**

**Do not loosen the diaphragm casing cap screws (keys 35 and 36) when the control spring (key 12) has spring force applied to it. Release the spring compression as described in step 7.**

Due to normal wear that may occur in gas regulators, parts must be periodically inspected and replaced if necessary. The frequency of inspection, maintenance and replacement of parts depend upon the severity of service conditions or requirements of local, state and federal regulations.



W13901L

**Figure 4.** Spring Case Inserted in Body for Disassembly. Note Proper Method of Holding Stem and Sleeve When Loosening or Tightening Stem Nut.

## Types 133H, 133L and 133Z

### Disassembly

1. Disconnect the downstream control line from the regulator and disconnect the remote vent pipe if one is used.

#### Note

**Allowing a slight amount of compression to remain in the regulator spring (key 12) will facilitate disassembly of the trim parts.**

2. Unscrew the four locknuts (key 34) and lift the actuator portion off the body (key 1). All of the trim parts will come out of the body with the actuator. Inspect the valve disk (key 28), orifice (key 2) and restriction collar (key 46, Figure 13), if used.
3. For further field disassembly and inspection, the actuator may be turned upside down and the spring case (key 8A) inserted into the body cavity (see Figure 4).

### CAUTION

**Use care in performing step 4 to guard against damage to the balancing diaphragm (key 22).**



W1372/IL

**Figure 5.** Inspecting Guide Bushing and Stem Seal O-ring



W1371/IL

**Figure 6.** Installing Balancing Diaphragm. The Side of Diaphragm Marked Piston Side Must Face Casing.

4. Insert a 1/2 in. / 13 mm open-end wrench between the legs of the cage (key 5) and place the wrench on the stem sleeve wrench flats. Hold this wrench while unscrewing the nut (key 31) to prevent stem and stem sleeve (keys 18 and 25) rotation and diaphragm (key 15) and balancing diaphragm (key 22) damage due to twisting (see Figure 4).
5. Remove the washer, registration disk and valve disk (keys 30, 29 and 28). To remove the restriction collar (key 46, Figure 13) (if used), loosen the set screw (key 47, Figure 13) and slip the E-ring (key 26, Figure 13) and collar off of the stem (key 18). Remove the orifice (key 2) by rotating it until the pins (key 5A) in the cage line up with the slots in the orifice; then, lift off the orifice. Replace the valve disk and orifice if necessary.
6. Loosen the set screws (key 39) in the cage (key 5) and remove the roll pin (key 27) from the stem (key 18). Remove the cage and stem sleeve (key 25), the sealing washer (key 17) under the balancing diaphragm (key 22), flat washers (key 23), balancing diaphragm and balancing diaphragm plate (key 21). Replace sealing washer and balancing diaphragm if necessary.



## WARNING

**To avoid personal injury due to the sudden uncontrolled movement of parts, do not loosen the diaphragm casing cap screws (keys 35 and 36) when the**

**control spring (key 12) has spring force applied to it.**

**Release the spring compression as described in step 7.**

7. To inspect or replace the upper stem seal O-ring (key 19) or main diaphragm (key 15) on the Type 133L or 133H (Figure 10 or 11), remove the closing cap (key 9) and inspect the closing cap gasket (key 10). Release spring compression by slowly turning the adjusting screw (key 11) counterclockwise and remove the spring (key 12).

For Type 133Z (Figure 12), remove the closing cap (key 9) and inspect the closing cap gasket (key 10). Release any spring compression by slowly turning the adjusting screw (key 11) counterclockwise. Lift the adjusting screw assembly (keys 11, 41, 42, 43 and 45) out of the spring case with pliers. Unhook the extension spring (key 44) from the spring retainer (key 42). Remove the compression spring (key 12) if one is used.

8. Unscrew the cap screws and nuts (keys 35 and 36) and remove the spring case (key 8A).
9. Pull out the diaphragm and stem as assembly; replace diaphragm (key 15) and sealing washer (key 17) if necessary. When removing or replacing the diaphragm, clamp the smallest diameter portion of the stem in a vise while turning the nut (key 20).
10. If necessary, replace the bearing (key 6) and the upper stem seal O-ring (key 19, Figure 5). Before reassembling, coat the O-ring with O-ring sealant and lubricant.

# 133 Series

## Reassembly

Reassemble in reverse order of the above steps. When reassembling, observe the following steps and cautions.

1. If the spring case was disassembled, reassemble it first. To ensure proper slack in the diaphragm (key 15) and to facilitate reassembly of the trim parts, tighten the casing cap screws and nuts (keys 35 and 36) finger-tight only. Then adjust the spring (key 12) to stroke the diaphragm assembly fully. Final tightening of the casing cap screws and nuts must be done alternately in equal increments to ensure a proper seal without crushing the diaphragm.
2. During reassembly, check all O-rings to be certain they are in good condition; replace if necessary. Lubricate the O-rings (keys 4, 19 and 32) with elastomer sealant and lubricant. Apply anti-seize compound liberally to the adjusting screw threads (key 11), as indicated in Figures 10 to 12.
3. When installing the balancing diaphragm (key 22), be certain the side marked PISTON SIDE is facing the spring case. Carefully tuck the slack diaphragm material into the space between the diaphragm plate (key 21) and the lower casing (key 7) until the diaphragm fits smoothly over the diaphragm plate without wrinkles and the bead fits snugly and evenly in the groove provided in the lower casing. This can be done with a small screwdriver, but be careful not to puncture the diaphragm (see Figure 6).
4. When replacing the cage (key 5), insert the set screws (key 39) only far enough to retain the cage. Do not tighten.
5. The registration disk (key 29) is marked for proper placement; be certain it is positioned correctly on the stem (key 18).

### CAUTION

**Always use the stem sleeve wrench flats when loosening or tightening the nuts (key 20 or 31) to prevent twisting of the main and balancing diaphragms (keys 15 and 22).**

6. Be certain the Belleville spring washer (key 3) is in good condition and is in place before placing the actuator on the body (key 1).

## Type 133HP

### Disassembly

### 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 equipment.**

**Do not loosen the diaphragm casing cap screws (Figure 9, keys 35 and 36) when the control spring (key 12) has spring force applied to it. Release the spring compression as described in step 6.**

This section includes instructions for disassembly and replacement of parts for the Type 133HP. All key numbers refer to Figures 7, 8, 9 and 14, except where indicated.

1. Disconnect the downstream control line from the regulator and disconnect the remote vent pipe if one is used.
2. Unscrew the four locknuts (key 34) and lift the actuator portion off the body (key 1). All of the trim parts will come out of the body with the actuator. Inspect the valve disk (key 28), orifice (key 2) and restriction collar (key 46), if used.

### CAUTION

**Use care in performing step 3 to guard against damage to the balancing diaphragm (key 22).**

3. Insert a 1/2 in. / 13 mm open-end wrench between the legs of the cage (key 5) and place the wrench on the stem sleeve wrench flats. Hold this wrench while unscrewing the nut (key 31) to prevent stem and stem sleeve (keys 18 and 25) rotation and diaphragm (key 15) and balancing diaphragm (key 22) damage due to twisting.
4. Remove the washer, registration disk and valve disk (keys 30, 29 and 28). To remove the restriction collar (key 46, Figure 13) (if used), loosen the set screw (key 47, Figure 13) and slip the E-ring (key 26, Figure 13) and collar off

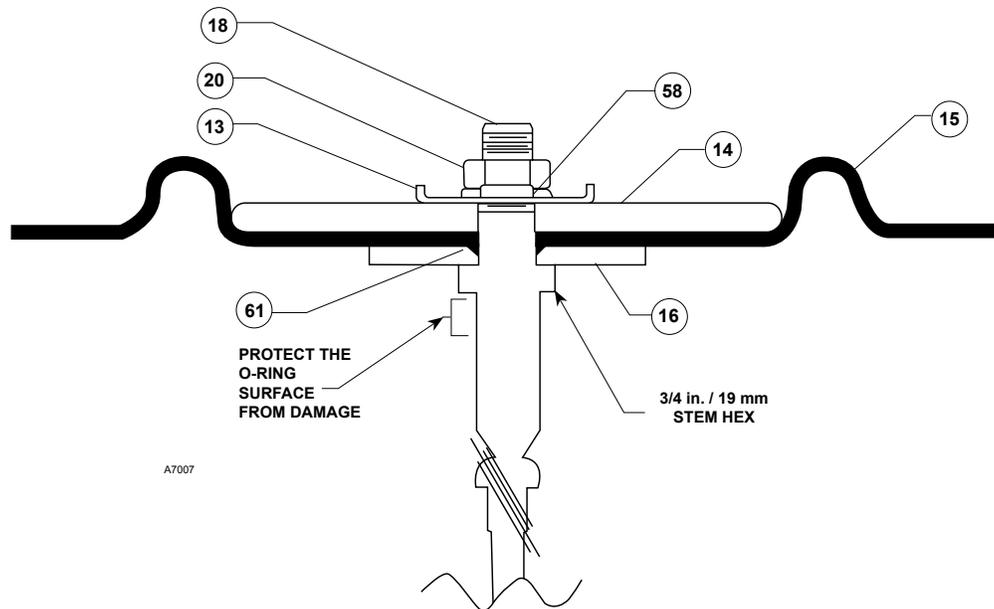


Figure 7. Stem and Diaphragm Assembly

the stem (key 18). Lift off the orifice (key 2) and replace the valve disk and orifice if necessary.

- Loosen the set screws (key 39) in the cage (key 5) and remove the roll pin (key 27) from the stem (key 18). Remove the cage and stem sleeve (key 25), the sealing washer (key 17) under the balancing diaphragm (key 22), flat washers (key 23), balancing diaphragm and balancing diaphragm plate (key 21). Replace the sealing washer and balancing diaphragm if necessary.

### WARNING

- To avoid personal injury due to the sudden uncontrolled movement of parts, do not loosen the diaphragm casing cap screws (keys 35 and 36) when the control spring (key 12) has spring force applied to it.
- Release the spring compression as described in step 6 below.

- To inspect or replace the upper stem seal O-ring (key 19) or main diaphragm (key 15), remove the closing cap (key 9) and inspect the closing cap gasket (key 10). Release the spring compression completely by loosening the hex nut (key 59) and turning the adjusting screw (key 11) counterclockwise.
- Remove the six cap screws (key 62) from the spring case (key 8). Lift off the spring case, upper spring seat (key 41) and spring (key 12). Remove

the diaphragm casing cap screws and hex nuts (keys 35 and 36) and lift off the upper diaphragm casing (key 52). Remove the cap screws (key 55) and mounting bracket (key 56). Inspect the two mounting bracket gaskets (key 57) and replace if necessary.

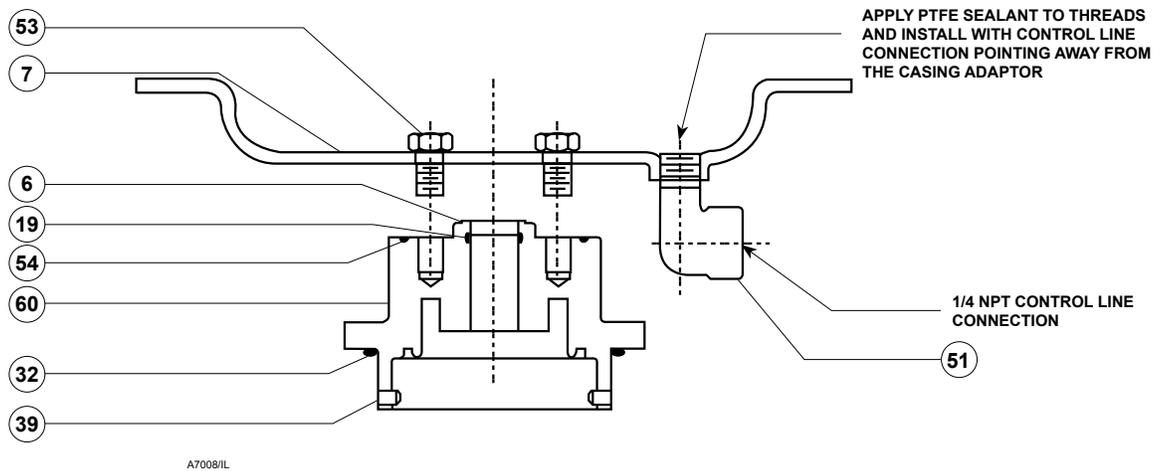
- Remove the hex nut (key 20), lock washer (key 58) and spring seat (key 13) from the stem (key 18).
- Remove the diaphragm plate (key 14), diaphragm (key 15), diaphragm washer O-ring (key 61) and sealing diaphragm plate (key 16). Replace the diaphragm and diaphragm washer O-ring if necessary.
- Remove the cap screws (key 53) and lift the lower diaphragm casing (key 7) off the casing adaptor (key 60). If necessary, replace the bearing (key 6) and upper stem seal O-ring (key 19). Before reassembling, coat the O-ring with a O-ring sealant and lubricant.

### Reassembly

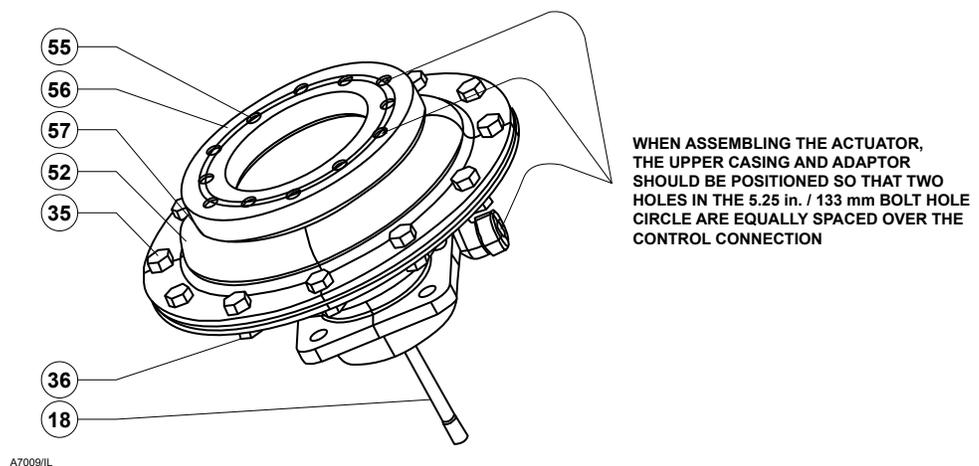
When reassembling, observe the following steps and cautions. During reassembly, check all O-rings to be certain they are in good condition and replace if necessary. Coat O-rings (keys 4, 19 and 32) with Multi-Purpose Polytetrafluoroethylene (PTFE) lubricant or an equivalent elastomer sealant and lubricant.

All key numbers refer to Figures 7, 8, 9 and 14, except where indicated.

# 133 Series



**Figure 8. Lower Casing and Casing Adaptor Assembly**



**Figure 9. Diaphragm Casing Assembly**

1. With the Type 133HP completely disassembled, start the reassembly by applying Multi-Purpose PTFE lubricant or an equivalent to the stem threads (key 18) and diaphragm washer O-ring (key 61). Place the sealing diaphragm plate (key 16) on the stem followed by the O-ring (key 61), diaphragm (key 15), diaphragm plate (key 14), spring seat (key 13), lock washer (key 58) and hex nut (key 20) as shown in Figure 7. To prevent diaphragm damage, torque the hex nut (key 20) to 25 to 30 ft-lbs / 34 to 41 N•m, while using 3/4 in. / 19 mm wrench flats on the stem.
2. If the street elbow (key 51) was removed, it must be reassembled before mounting the casing adaptor (key 60). Apply PTFE sealant or equivalent around the external threads of the street elbow and tighten to a torque of 20 to 35 ft-lbs / 27 to 47 N•m. Position the control line connection (street elbow) so that it points away from the casing adaptor.
3. Lubricate the O-rings (keys 19, 32 and 54) and install as shown in Figure 8. Install the casing adaptor (key 60) to the lower casing (key 7) and tighten the cap screws (key 53) to 20 to 30 ft-lbs / 27 to 41 N•m of torque.
4. Insert the stem bearing (key 6) and carefully insert the stem (key 18) into the lower casing (key 7) and casing adaptor (key 60) assembly.
5. Assemble the upper diaphragm casing (key 52), mounting plate adaptor (key 56) and mounting plate gasket (key 57) as shown in Figure 9. Tighten the cap screws (key 55) to 20 to 30 ft-lbs / 27 to 41 N•m of torque.
6. Assemble the upper and lower casings, noting that two of the holes in the 5-1/4 in. / 133 mm diameter

bolt circle in the mounting plate adaptor (key 56) must be spaced (aligned) an equal distance over the downstream control line connection. Install cap screws and hex nuts (keys 35 and 36) with a torque of 20 to 30 ft-lbs / 27 to 41 N•m.

- Place the balancing plate washer (key 23), balancing diaphragm plate (key 21), balancing diaphragm (key 22) and a second balancing plate washer (key 23), onto the stem (key 18).

### Note

**When installing the balancing diaphragm (key 22), be certain the side marked PISTON SIDE is facing the spring case. Carefully tuck the slack diaphragm material into the space between the diaphragm plate (key 21) and lower casing (key 7) until the diaphragm fits smoothly over the diaphragm plate without wrinkles and the bead fits snugly and evenly in the groove provided in the lower casing. This can be done with a small screw screwdriver, but be careful not to puncture the diaphragm (see Figure 6).**

- Apply Multi-Purpose PTFE lubricant or equivalent to the sealing washer (key 17) and carefully slide over the threaded end of the stem (key 18).
- Insert the guide bushing (key 24) into the cage (key 5) and slide the cage up onto the stem (key 18). Insert the set screws (key 39) only far enough to retain the cage. Do not tighten.
- Lubricate and install the O-rings (keys 19 and 4) as indicated in Figure 14. Install the orifice (key 2) onto the cage (key 5). Install the Belleville spring washer (key 3) so that the concave face of the washer faces away from the orifice.
- Install the E-ring (key 26) on the stem sleeve (key 25) and slide the stem sleeve over the stem (key 18) aligning the slotted end of the stem sleeve so that the roll pin (key 27) can be inserted through the cross-drilled hole in the end of the stem.



**Always use the stem sleeve wrench flats when loosening or tightening the nuts (key 20 or 31) to prevent twisting of the main and balancing diaphragms (keys 15 and 22).**

- Install the valve disk (key 28), registration disk (key 29), washer (key 30) and hex nut (key 31) onto the stem. The registration disk (key 29) is marked for proper placement; be certain it is positioned correctly on the stem (key 18). Tighten the hex nut (key 31) using the 1/2 in. / 13 mm wrench flats on the stem sleeve.
- Insert the valve trim assembly into the body and position the downstream control line connection (key 51) so it is pointing directly over the body outlet.
- Screw the studs (key 33) into the body (key 1). Install and tighten the hex nuts (key 34) to 20 to 35 ft-lbs / 27 to 47 N•m of torque.
- Apply anti-seize to the adjusting screw (key 11) and upper spring seat (key 41). Install the adjusting screw and hex jam nut (key 59) into the spring case (key 8). Position the control spring (key 12) and upper spring seat on the diaphragm plate (key 14) and lower spring seat (key 13).
- Install the mounting plate gasket (key 57) and place the spring case on the mounting bracket (key 56). Install the cap screws (key 62) and torque to 20 to 30 ft-lbs / 27 to 41 N•m.
- Screw in the pipe nipple (key 49) and vent (key 50). Install the closing cap gasket (key 10) and closing cap (key 9).

## Parts Ordering

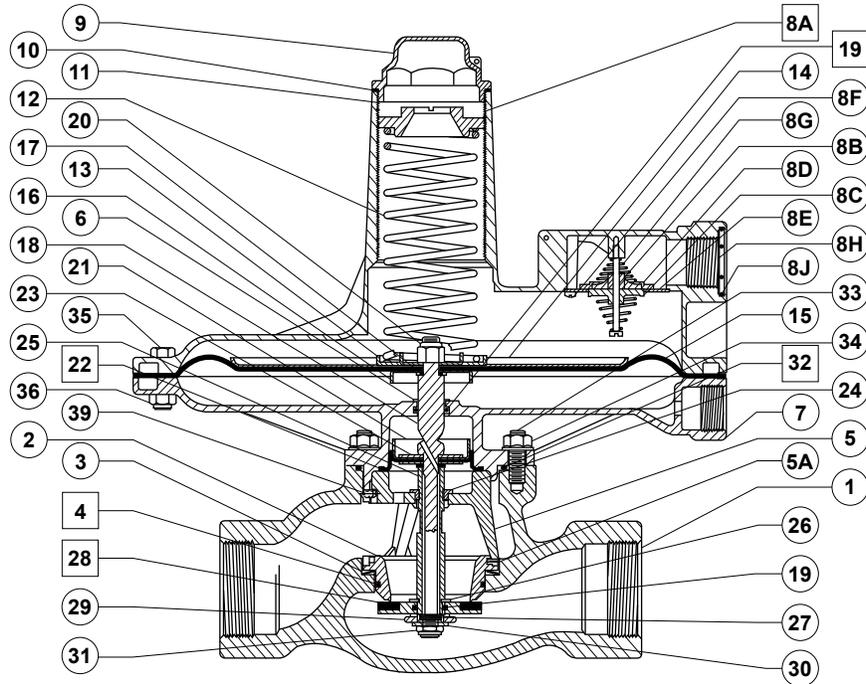
When corresponding with your local Sales Office about this equipment, be sure to include the type number and other information stamped on the nameplate.

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
	Parts kit for Types 133H, 133L and 133Z (included are keys 2, 4, 6, 10, 15, 17, 19, 22, 24, 28, 32 and 40)	R133HX00012
1	Body Cast iron 2 NPT NPS 2 / DN 50, CL125 FF WCC Steel	30A3044X012 30A3045X012
	2 NPT NPS 2 / DN 50, CL150 RF	30B0855X012 30B0854X012

# 133 Series



40A3066

□ APPLY LUBRICANT (L) OR SEALANT (S)<sup>(1)</sup>

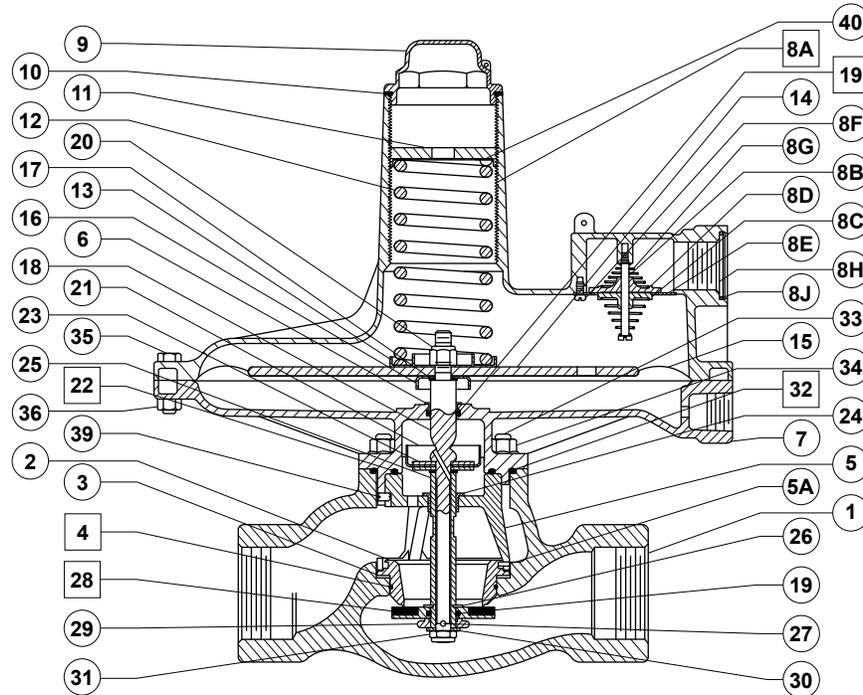
1. Lubricant and sealant must be selected such that they meet the temperature requirements.

**Figure 10. Type 133L Assembly**

Key	Description	Part Number	Key	Description	Part Number
2*	Orifice, Aluminum	20A3046X012	11	Adjusting Screw	
3	Belleville Spring Washer, 17-4PH Stainless steel	10A3047X012		Type 133H, Brass	1V9069X0012
4*	O-ring			Type 133L, Aluminum	1L928608012
	Nitrile (NBR)	10A9339X012		Type 133Z, Brass	1K633714012
	Fluorocarbon (FKM)	10A9339X022		Type 133HP, Steel	1H139731012
5*	Cage/Pin Assembly, Aluminum/Steel		12	Spring Steel	
	(including roll pins, key 5A)	20A3048X012		Type 133H	
6*	Bearing, Nylon (PA)	10A3049X012		Zinc-plated steel	
7	Lower Casing			1.5 to 3 psig / 0.10 to 0.21 bar, Orange	1H975927032
	Types 133H, 133L and 133Z, Aluminum	40A3050X012		2 to 5 psig / 0.14 to 0.34 bar, Yellow	10A9440X012
	Type 133HP, Steel	32B3499X012		17-7 PH Stainless steel	
8	Spring Case			5 to 10 psig / 0.34 to 0.69, Blue	1J146927142
	Type 133HP, Cast iron	2H140619012		Types 133L and 133H <sup>(1)</sup>	
	Parts 8A through 8J are used on			Zinc-plated steel	
	Types 133H, 133L and 133Z only			2 to 4 in. w.c. / 5 to 10 mbar, Brown	1D892527022
8A	Spring Case, Aluminum	4L142308032		3.5 to 6 in. w.c. / 9 to 15 mbar, Red	1D892627022
8B	Stabilizer Stem, 302 Stainless steel	1H976335022		Plated steel	
8C	Lower Stabilizer, Nylon (PA)	1H976406992		5 to 9 in. w.c. / 12 to 22 mbar, Black	1D892727012
8D	Upper Stabilizer, Polyethylene	1H976506992		8.5 to 18 in. w.c. / 21 to 45 mbar, White	1D893227032
8E	Orifice, Stainless steel	T13609T0012		14 to 28 in. w.c. / 35 to 70 mbar, Green	1D893327032
8F	Screw, Steel (3 required)	1H976728982		0.75 to 2 psig / 0.05 to 0.14 bar, Blue	1H975827032
8G	Spring, 302 Stainless steel (2 required)	1H976837022		Type 133Z (Extension spring, key 44, also required)	
8H	Screen, Stainless steel	1E564843122		Zinc-plated steel	
8J	Snap Ring, 302 Stainless steel	1E564937022		-1 to 1 in. w.c. / -2 to 2 mbar, see key 44	
9	Closing Cap			0 to 4 in. w.c. / 0 to 10 mbar, Brown	1D892527022
	Types 133H, 133L and 133Z, Aluminum	1L928308012		Type 133HP	
	Type 133HP, Cast iron	00288819012		17-7 PH Stainless steel	
10*	Closing Cap Gasket			2 to 5 psig / 0.14 to 0.34 bar, Yellow	17B8632X012
	Types 133H, 133L and 133Z, Neoprene (CR)	1N446206992		302 Stainless steel	
	Type 133HP, Composition	1R742604022		4.5 to 10 psig / 0.31 to 0.69 bar, Orange	17B8633X012

\*Recommended spare parts.

1. If the 2 in. w.c. to 2 psig / 5 mbar to 0.14 bar springs listed under Type 133L are used in the Type 133H, the pressure ranges will increase by approximately 1 in. w.c. / 2 mbar due to the weight of the Type 133H parts (assuming that the actuator is installed above the body).



40A3070

□ APPLY LUBRICANT (L) OR SEALANT (S)<sup>(1)</sup>

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

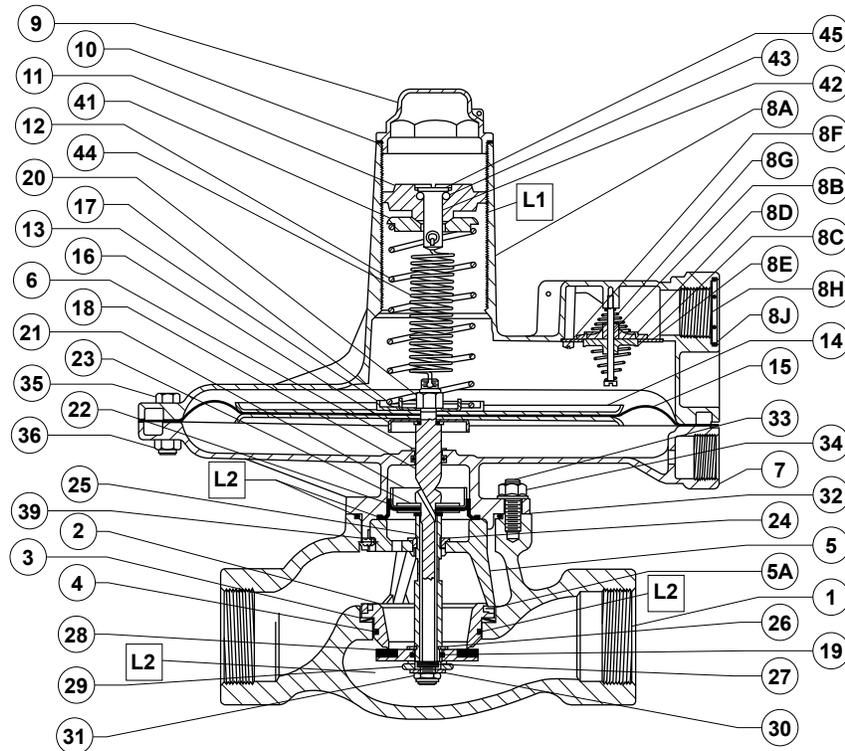
**Figure 11. Type 133H Assembly**

Key	Description	Part Number	Key	Description	Part Number
12	Spring Steel (continued) Type 133HP (continued) Steel		19*	O-ring Nitrile (NBR) (2 required for Types 133L, 133H and 133HP; 1 required for Type 133Z)	F1367806562
	6 to 20 psig / 0.41 to 1.4 bar, Silver	10C1238X012		Fluorocarbon (FKM) (2 required for Types 133L and 133H only)	1E5914X0062
	16 to 30 psig / 1.1 to 2.1 bar, Red	10C1240X012	20	Hex Nut Types 133H, 133L and 133Z, Aluminum	1D5297X0012
	26 to 40 psig / 1.8 to 2.8 bar, Blue	10C1241X012		Type 133HP, Zinc-plated steel	1A413224122
	36 to 50 psig / 2.5 to 3.5 bar, Green	10C1242X012	21	Diaphragm Plate, Plated steel	10A3054X012
	45 to 60 psig / 3.1 to 4.1 bar, White	10C1243X012	22*	Diaphragm Nitrile (NBR) and Nylon (PA) Fluorocarbon (FKM) (for Types 133L and 133H only)	10A3055X012 10A3055X022
13	Spring Seat, Plated steel Types 133H, 133L and 133Z	10A3052X012	23	Washer, Steel (2 required)	10A3056X012
	Type 133HP	1P787724152	24*	Guide Bushing, Nylon (PA)	10A3057X012
14	Diaphragm Plate, Steel Type 133H (1 required)	1D555725012	25	Stem Sleeve, 303 Stainless steel	10A3061X012
	Type 133L (1 required)	1J881725072	26	E-ring, Plated steel	1F599428982
	Type 133Z (2 required)	1J881725072	27	Roll Pin, 420 Stainless steel	1E954028992
	Type 133HP (1 required)	22B3514X012	28*	Valve Disk Assembly Aluminum / Neoprene (CR) Aluminum / Fluorocarbon (FKM) (for Types 133L and 133H only)	10A3058X012 10A3058X032
15*	Diaphragm, Nitrile (NBR) and Nylon (PA) Types 133H, 133L and 133Z	1N150802052	29	Registration Disk, Nylon (PA)	10A3060X012
	Type 133HP	32B3520X012	30	Washer, Zinc-plated steel	1H723125072
	Fluorocarbon (FKM) (for Types 133L and 133H only)	1N150802402	31	Hex Nut, Zinc-plated steel	1C121928982
16	Sealing Diaphragm Plate, Zinc-plated steel Types 133H, 133L and 133Z	1D475725062	32*	O-ring Nitrile (NBR) Fluorocarbon (FKM) (for Types 133L and 133H only)	1J1079X0012 1J1079X0022
	Type 133HP	12B3517X012	33	Stud, Alloy steel (4 required)	10A3062X012
17*	Sealing Washer, Zinc-plated steel (2 required for Types 133L, 133H and 133Z; 1 required for Type 133HP)	1F990428982			
18	Stem, Stainless steel Types 133H and 133L	20A3053X012			
	Type 133Z	10A3069X012			
	Type 133HP	37B3942X012			

\*Recommended spare parts.

1. If the 2 in. w.c. to 2 psig / 5 mbar to 0.14 bar springs listed under Type 133L are used in the Type 133H, the pressure ranges will increase by approximately 1 in. w.c. / 2 mbar due to the weight of the Type 133H parts (assuming that the actuator is installed above the body).

# 133 Series



40A3071

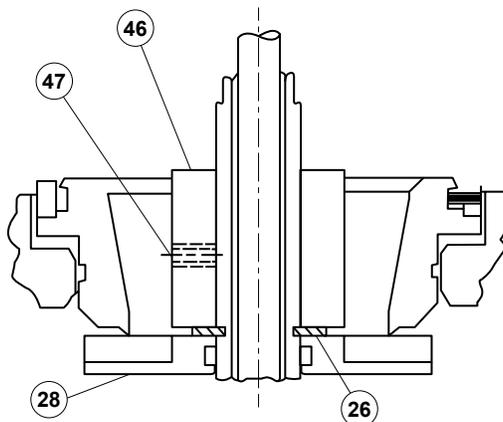
□ APPLY LUBRICANT (L)<sup>(1)</sup>

L1 = Anti-Seeze Compound

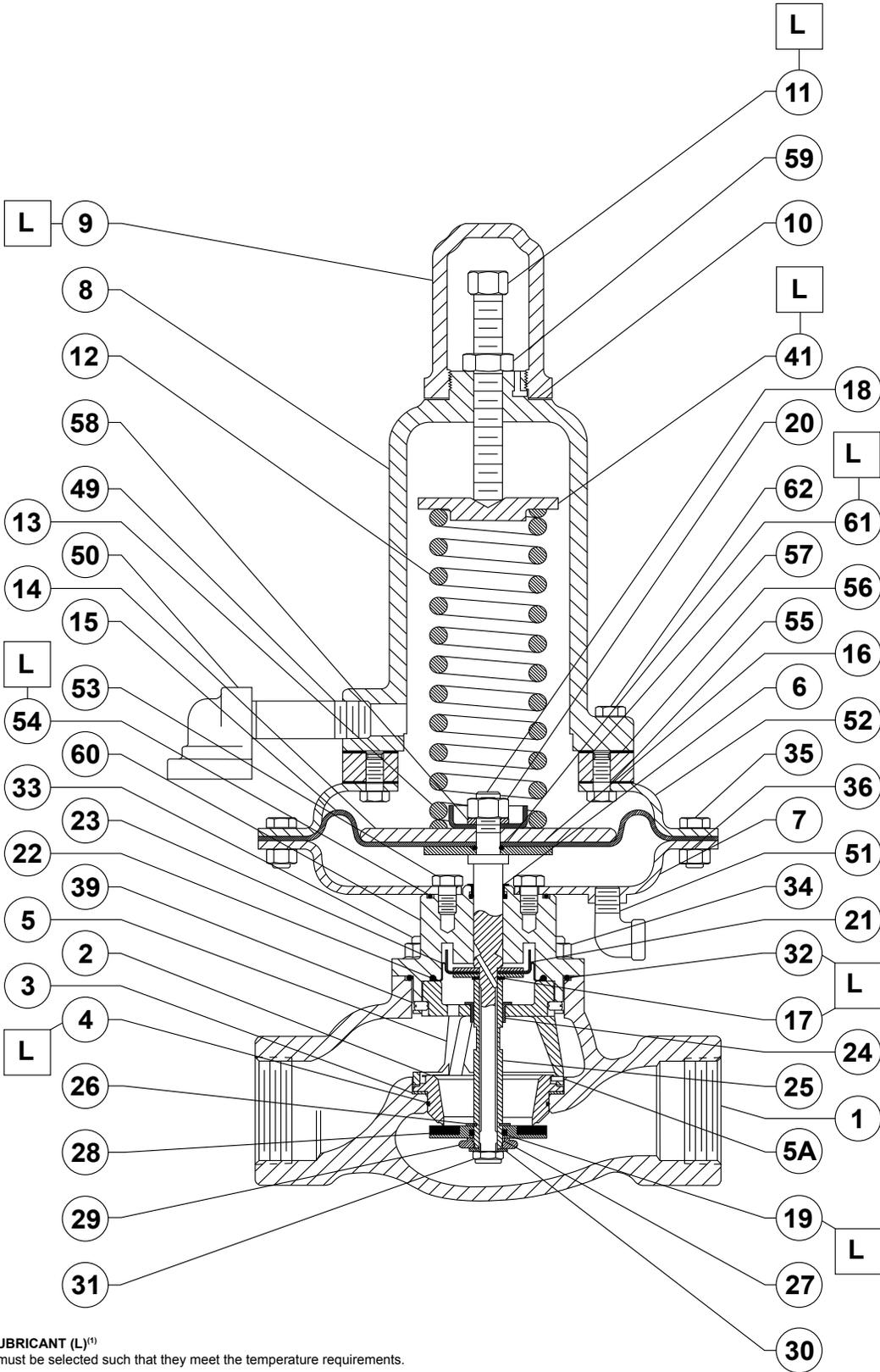
L2 = Silicone Grease

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

**Figure 12. Type 133Z Assembly**



**Figure 13. Optional Restriction Collar Assembly**



A7011/IL

APPLY LUBRICANT (L)<sup>(1)</sup>

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

Figure 14. Type 133HP Actuator Assembly

# 133 Series

Key	Description	Part Number
34	Locknut, Plated alloy steel (4 required)	10A3063X012
35	Cap Screw, Zinc-plated steel Types 133H, 133L and 133Z (12 required) Type 133HP (12 required)	1B136324052 1E760324052
36	Hex Nut, Zinc-plated steel Types 133H, 133L and 133Z (12 required) Type 133HP (12 required)	1A309324122 1A346524122
37	Nameplate (for Types 133L, 133H and 133Z only) (not shown)	-----
38	Nameplate (for Types 133L, 133H and 133Z only) (not shown)	-----
39	Set Screw, Alloy steel (2 required)	10A3051X012
40*	Thrust Washer, Nylon (PA) Type 133H only	1V9661X0012
41	Upper Spring Seat Type 133Z, Brass Type 133HP, Zinc-plated steel	1K633514012 1H140124092
42	Spring Retainer, Brass Type 133Z only	1K633814012
43	Ball, 440C Stainless steel (10 required) Type 133Z only	1B793546202
44	Extension Spring, Zinc-plated steel Type 133Z only, Unpainted	1K633427012
45	Retaining Ring, Plated steel Type 133Z only	10A3074X012
46	Restriction Collar, Aluminum 25% capacity 40% capacity 60% capacity	12A7404X012 12A7402X012 12A7403X012
47	Set Screw, Steel	1N830528992
50	Flow Arrow, 18-8 Stainless steel	-----
51	Drive Screw, 18-8 Stainless steel (2 required)	-----

## Type 133HP only

Key	Description	Part Number
49	Pipe Nipple, Zinc-plated steel	1A473526012
50	Vent Assembly Type Y602-7	1A913221992
51	Street Elbow, Malleable iron	2F581125062
52	Upper Diaphragm Casing, Steel	1D529824052
53	Cap Screw, Zinc-plated steel (4 required)	1F914106992
54*	Adaptor O-ring, Nitrile (NBR)	1A368424052
55	Cap Screw, Zinc-plated steel (6 required)	1H140025032
56	Mounting Bracket, Steel	1H140404022
57*	Mounting Bracket Gasket, Neoprene (CR) (2 required)	1A487828992
58	Lock Washer, Steel	1A319224122
59	Hex Jam Nut, Zinc-plated steel	37B4486X012
60	Casing Adaptor, Steel	1C782206992
61*	Diaphragm Washer O-ring, Nitrile (NBR)	1A341824052
62	Cap Screw, Zinc-plated steel (6 required)	-----
63	Nameplate	-----
64	Drive Screw	1A368228982

\*Recommended spare parts.

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