

August 2008

133 Series Self-Operated Regulators



W1327

TYPES 133H, 133L, AND 133Z REGULATORS



W6803

TYPE 133HP REGULATOR

Figure 1. 133 Series Gas Regulators

Introduction



WARNING

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 personnel injury. Use qualified personnel when installing, operating and maintaining the 133 Series regulators.

If a leak develops in the system, the escaping gas may accumulate and become a fire or explosion hazard. Immediately call qualified service personnel in case of trouble.

Scope of Manual

This manual provides specifications, instructions for installation, adjustment, maintenance, and parts information for the 133 Series.

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.

Description

The 133 Series self-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 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.



133 Series

Specifications

End Connections

2-inch Cast iron NPT (internal), cast iron
CL125 FF flanged, steel NPT (internal). or steel
CL150 RF flanged

Outlet Pressure Ranges

See Table 1

Maximum Inlet Pressures⁽¹⁾

See Table 2

Maximum Outlet Pressures

See Table 2

Pressure Registration

External; downstream control line is required.

Construction Materials

Body: Cast iron or Steel

Orifice and Cage: Aluminum

Valve Disk: Aluminum/Neoprene (CR)

O-Rings: Nitrile (NBR)

Diaphragms: Nitrile (NBR)/Nylon (PA)
(neoprene (CR) in actuator)

Guide Bushing: Nylon

Stem and Stem Sleeve: Stainless steel

Diaphragm Plate: Steel

Balancing Diaphragm Plate: Plated Steel

Spring Case:

Type 133 HP: Cast Iron

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

Lower Casing: Aluminum

Closing Cap: Cast iron

Adjusting Screw: Steel

Optional Restriction Collar: Aluminum

Temperature Capabilities⁽¹⁾

-20° to 150°F (-29° to 66°C)

Control Line Connection

Types 133H, 133L, and 133Z: 3/4-inch 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-inch NPT (internal) connection
positioned directly over body outlet

Vent Connection

Types 133H, 133L, and 133Z: 1-inch 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-inch NPT (internal) connection
positioned directly over body inlet with a Fisher®
Type Y602-7

Approximate Weight

**Types 133H, 133L, and 133Z NPT End
Connections:** 35 pounds (15,9 kg)

**Types 133H, 133L, and 133Z Flanged End
Connections:** 40 pounds (18,1 kg)

Type 133HP NPT End Connections:
56.5 pounds (25,6 kg)

Type 133HP Flanged End Connections:
62.5 pounds (28,3 kg)

1. None of the pressure/temperature limits in this Instruction Manual, nor any applicable standard limitation, should not be exceeded.

Type Number Description

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-inches w.c. to 2 psig (5,00 mbar to 0,14 bar) springs of the Type 133L. The maximum operating inlet pressure is 60 psig (4,14 bar) with a maximum emergency inlet pressure of 125 psig (8,62 bar).

Type 133HP—Extra high pressure construction for outlet pressure range of 2 to 60 psig (0,14 to 4,14 bar). The maximum operating inlet pressure rating of 150 psig (10,3 bar) with a maximum emergency inlet pressure of 150 psig (10,3 bar).

Type 133L—Low pressure construction for outlet pressure range of 2-inches w.c. to 2 psig (5,00 mbar to 0,14 bar). The maximum operating inlet pressure is 60 psig (4,14 bar) with a maximum emergency inlet pressure of 125 psig (8,62 bar).

Type 133Z—Zero governor construction for outlet pressure range of -1 to 4-inches w.c. (-2,00 to 10,00 mbar). The maximum operating inlet pressure is 20 psig (1,38 bar) with a maximum emergency inlet pressure of 125 psig (8,62 bar).

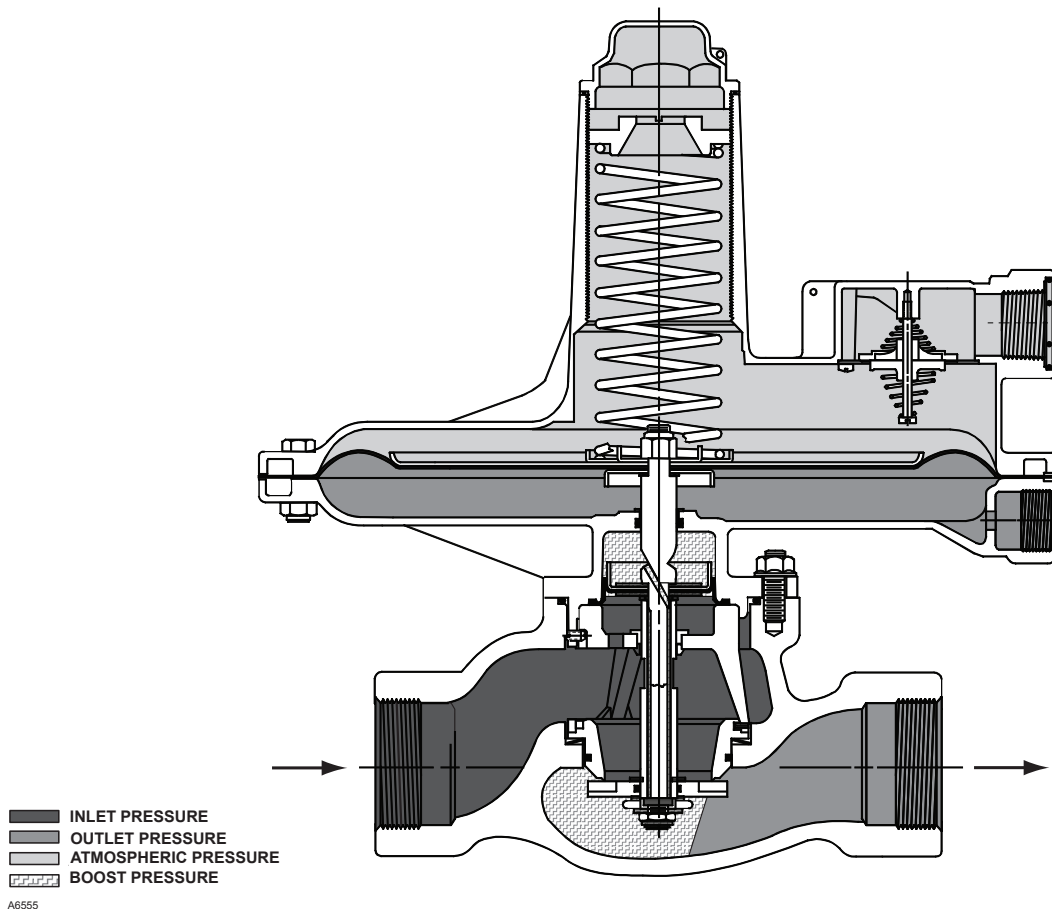


Figure 2. Operational Schematic of Type 133L Regulator (Also Typical of Type 133H)

Principle 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 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.

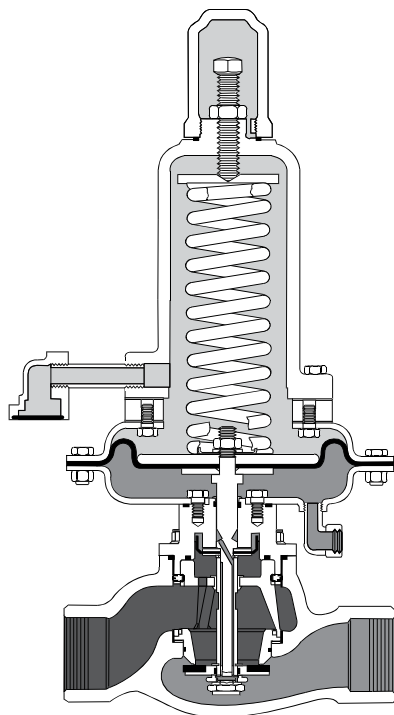
Boosting System

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.



■ INLET PRESSURE
■ OUTLET PRESSURE
■ ATMOSPHERIC PRESSURE
A6883

Figure 3. Operational Schematic of Type 133HP

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.

If the regulator has threaded end connections, coat male 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, as is the case with most regulators, has 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

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-inch (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-inch threaded NPT.

Vent

The 133 Series vent is screened to prevent insects or foreign material from entering. On indoor installations, if a vent to atmosphere is required, remove the snap ring and screen (keys 8J and 8H; Figure 10, 11, or 12) from the Types 133H, 133L, and 133Z. Remove the Type Y602-7 screened vent and pipe nipple (keys 50 and 49; Figure 14) from the spring case (key 8) and pipe the vent to the outside. The Types 133H, 133L, and 133Z have a 1-inch NPT (internal) connection and the Type 133HP has a 1/2-inch NPT (internal) construction.

The vent pipe should be as short as possible with a minimum of bends and elbows. The pipe should also have as large a diameter as possible. 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 see that the opening has not been plugged by 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 | | | |
|---|---|--|---|---|---|--|
| | Inches w.c./Psig | bar/mbar | Part Number | Color Code Stripe | Free Length, Inch (mm) | Wire Diameter, Inch (mm) |
| 133H ⁽¹⁾ | 1.5 to 3 psig 2 to 5 psig 5 to 10 psig | 0,10 to 0,21 bar 0,14 to 0,34 bar 0,34 to 0,69 bar | 1H975927032 10A9440X012 1J146927142 | Orange Yellow Blue | 7-3/8 (187) 6-15/32 (164) 6-3/16 (157) | 0.250 (6,35) 0.283 (7,19) 0.375 (9,53) |
| 133HP ⁽¹⁾ | 2 to 5 psig 4.5 to 10 psig 6 to 20 psig 16 to 30 psig 26 to 40 psig 36 to 50 psig 45 to 60 psig | 0,14 to 0,34 bar 0,31 to 0,69 bar 0,41 to 1,38 bar 1,10 to 2,07 bar 1,79 to 2,76 bar 2,48 to 3,45 bar 3,10 to 4,14 bar | 17B8632X012 17B8633X012 10C1238X012 10C1240X012 10C1241X012 10C1242X012 10C1243X012 | Yellow Orange Silver Red Blue Green White | 8-1/2 (216) 8-1/2 (216) 8-1/4 (210) 8-1/4 (210) 8-1/4 (210) 8-1/4 (210) 8-1/4 (210) | 0.281 (7,14) 0.343 (8,71) 0.406 (10,31) 0.500 (12,70) 0.500 (12,70) 0.531 (13,49) 0.225 (5,72) |
| 133L ⁽¹⁾ and 133H ⁽²⁾ | 2 to 4-inches w.c. 3.5 to 6-inches w.c. 5 to 9-inches w.c. 8.5 to 18-inches w.c. 14 to 28-inches w.c. 0.75 to 2 psig | 5,00 to 10,00 mbar 9,00 to 15,00 mbar 12,00 to 22,00 mbar 21,00 to 45,00 mbar 35,00 to 70,00 mbar 0,05 to 0,14 bar | 1D892527022 1D892627022 1D892727012 1D893227032 1D893327032 1H975827032 | Brown Red Black White Green Blue | 6-1/8 (156) 7-1/2 (190) 7-7/8 (200) 7-1/2 (190) 7-1/4 (184) 7-3/8 (187) | 0.109 (2,77) 0.120 (3,05) 0.130 (3,30) 0.156 (3,96) 0.182 (4,62) 0.225 (5,72) |
| 133Z ⁽¹⁾ | -1 to 1-inch w.c. | -2,00 to 2,00 mbar | 1K633427012 (Extension Spring) | Black | 2 (50,80) | 0.075 (1,91) |
| | 0 to 4-inches w.c. | 0 to 10,00 mbar | 1K633427012 (Extension Spring) and 1D892527022 (Composition Spring) | Black Brown | 2 (50,80) 6-1/8 (156) | 0.075 (1,91) 0.109 (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-inches w.c. (5,00 mbar) for the Type 133L and by approximately 3-inches w.c. (7,00 mbar) for the Types 133H and 133Z.
2. If the 2-inches w.c. to 2 psig (5,00 mbar to 0,14 bar) springs (all 6 ranges) are used in the Type 133H, the pressure ranges will increase by approximately 1-inch w.c. (2,00 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 Psig (bar) | 133HP Psig (bar) | 133L Psig (bar) | 133Z Psig (bar) |
| Maximum Operating Inlet Pressure | 60 (4,14) | 150 (10,34) | 60 (4,14) | 20 (1,38) |
| Maximum Emergency Inlet Pressure | 125 (8,62) | 150 (10,34) | 125 (8,62) | 125 (8,62) |
| Maximum Operating Outlet Pressure ⁽¹⁾ | 10 (0,69) | Setpoint Plus 40 psi (2,76) | 2 (0,14) | 4-inches w.c. (10,00 mbar) |
| Maximum Outlet Pressure Over Outlet Pressure Setting | 3 (0,21) | --- | 3 (0,21) | 3 (0,21) |
| Maximum Emergency Outlet (Casing) Pressure | 15 (1,03) | 150 (10,34) | 15 (1,03) | 15 (1,03) |

1. With highest spring range available only.

Startup



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 pressures 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. Slowly open the upstream shutoff valve.
2. Slowly open the downstream shutoff valve.
3. Check all connections for leaks.

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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), 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 (key 38), 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

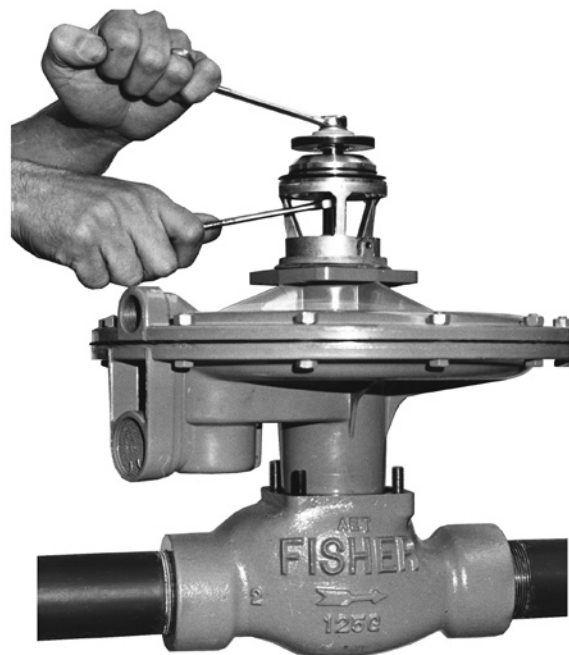


WARNING

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 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 6.

Due to normal wear that may occur in gas regulators, parts must be periodically inspected and replaced if necessary. The frequency of inspection depends on the severity of service conditions or state and federal laws. This section includes instructions for disassembly and replacement of parts. All key numbers refer to Figures 10, 11, 12, 14, and 15 except where indicated.



W1390/IL

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 will facilitate disassembly of the trim parts.

2. Unscrew the four nuts (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. The valve disk (key 28), orifice (key 2), and restriction collar (key 46, Figure 13), if used, can be inspected.
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

4. Insert a 1/2-inch (12,7 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 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 (if used), loosen the set screw (key 47, Figure 13) and slip the E-Ring (key 26) and collar off of the stem. 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 and remove the roll pin (key 27) from the stem. Remove the cage and stem sleeve, the sealing washer under the balancing diaphragm, flat washers (key 23), balancing diaphragm, and balancing diaphragm plate (key 21). Replace sealing washer and balancing diaphragm if necessary.
7. To inspect or replace the upper stem seal O-ring or main diaphragm (key 15) on the Type 133L or 133H (Figure 10 or 11), remove the closing cap (key 9), disengage the adjusting screw (key 11), and remove the spring (key 12).

For Type 133Z (Figure 12), remove the closing cap (key 9) and disengage the adjusting screw (key 11). 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.



W1371/IL

Figure 6. Installing Balancing Diaphragm. The Side of Diaphragm Marked PISTON SIDE Must Face Casing.

8. Unscrew the cap screws and nuts (keys 35 and 36) and remove the spring case.
9. Pull out the diaphragm and stem as assembly; replace diaphragm and sealing washer (key 17) if necessary. When removing or replacing the diaphragm, clamp the smallest diameter portion if the stem in a vise while turning the nut (key 20).
10. If necessary, replace the guide bushing (key 6) and the upper stem seal O-ring (see Figure 5). Before reassembling, coat the O-ring with Bell-ray No. 80 or an equivalent O-ring sealant and lubricant.

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 and to facilitate reassembly of the trim parts, tighten the casing cap screws finger-tight only. Then adjust the spring 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 Dow Corning No. 3 or an equivalent elastomer sealant and lubricant.
3. When installing the balancing diaphragm, 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

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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 no to puncture the diaphragm (see Figure 6).

4. When replacing the cage, 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.

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.

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, 14, and 15.

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. The valve disc (key 28), orifice (key 2), and restriction collar (key 46) can now be inspected.

CAUTION

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

3. Insert a 1/2-inch (12,70 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 damage due to twisting.
4. Remove the washer, registration disc and valve disc (keys 30, 29, and 28). To remove the restriction collar loosen the set screw (key 47) and slip the E-ring (key 26) and collar off the stem. Lift off the orifice (key 2) and replace the valve disc and orifice if necessary.
5. Loosen the set screws (key 39) in the cage and remove the roll pin (key 27) from the stem. Remove the cage and stem sleeve, the sealing washer under the balancing diaphragm, 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.**
6. To inspect or replace the upper stem seal O-ring 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.

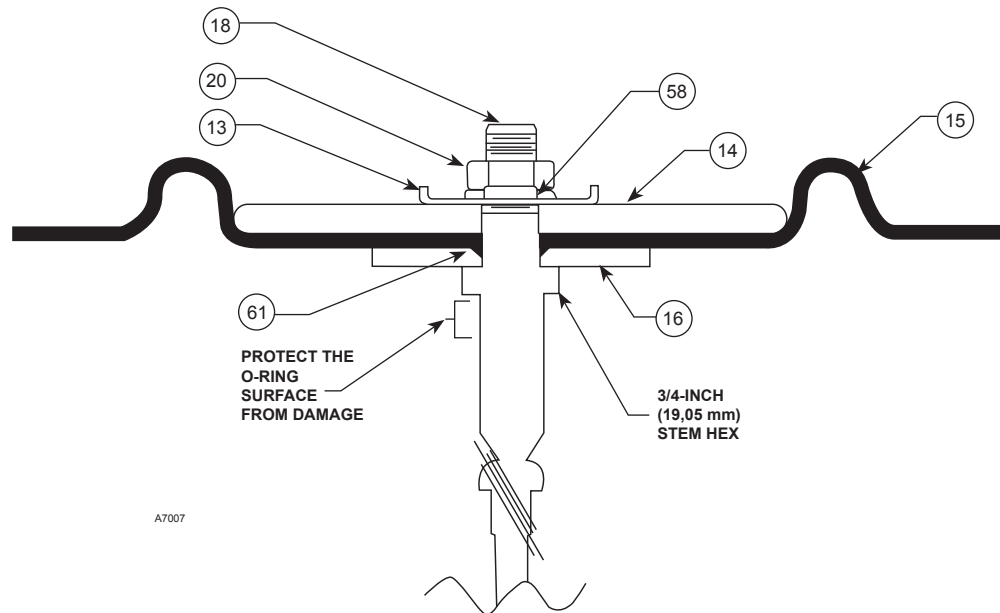
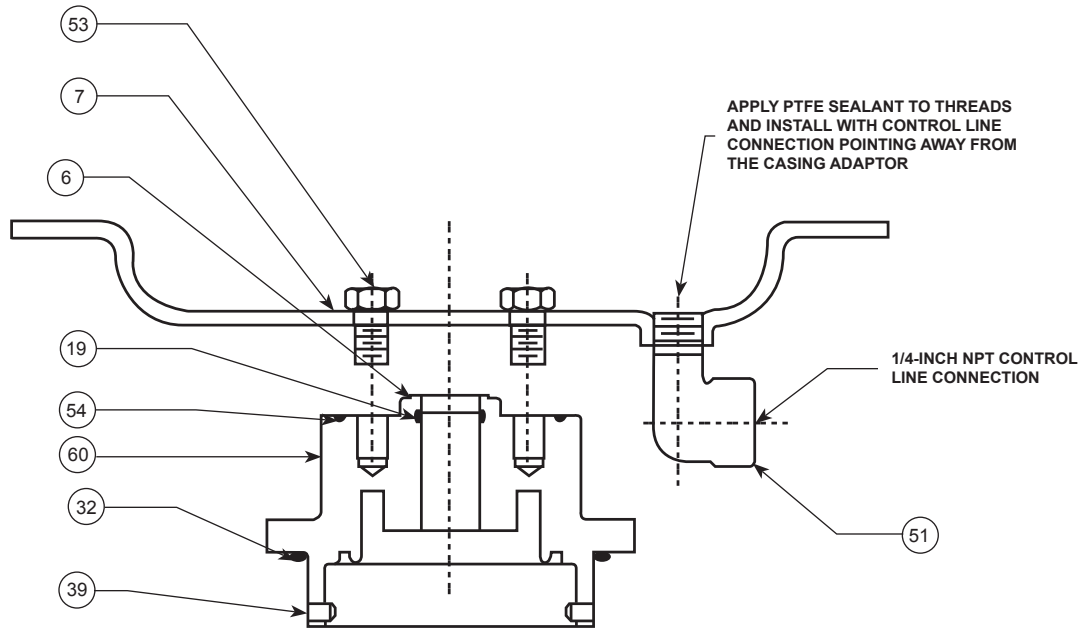


Figure 7. Stem and Diaphragm Assembly

7. 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.
8. Remove the hex nut (key 20), lock washer (key 58) and spring seat (key 13) from the stem (key 18).
9. 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.
10. Remove the cap screws (key 53) and lift the lower diaphragm casing (key 7) off the casing adaptor (key 60). If necessary, replace the guide bushing (key 6) and upper stem seal O-ring (key 19). Before reassembling, coat the O-ring with a O-ring sealant and lubricant.
1. With the Type 133HP completely disassembled, start the reassembly by applying Magnalube-G or an equivalent to the stem threads (key 18) and 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), lockwasher (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 foot-pounds, while using 3/4-inch (19,05 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). 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 foot-pounds.
4. Insert the stem bearing (key 6) and carefully insert the stem (key 18).
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 foot-pounds of torque.

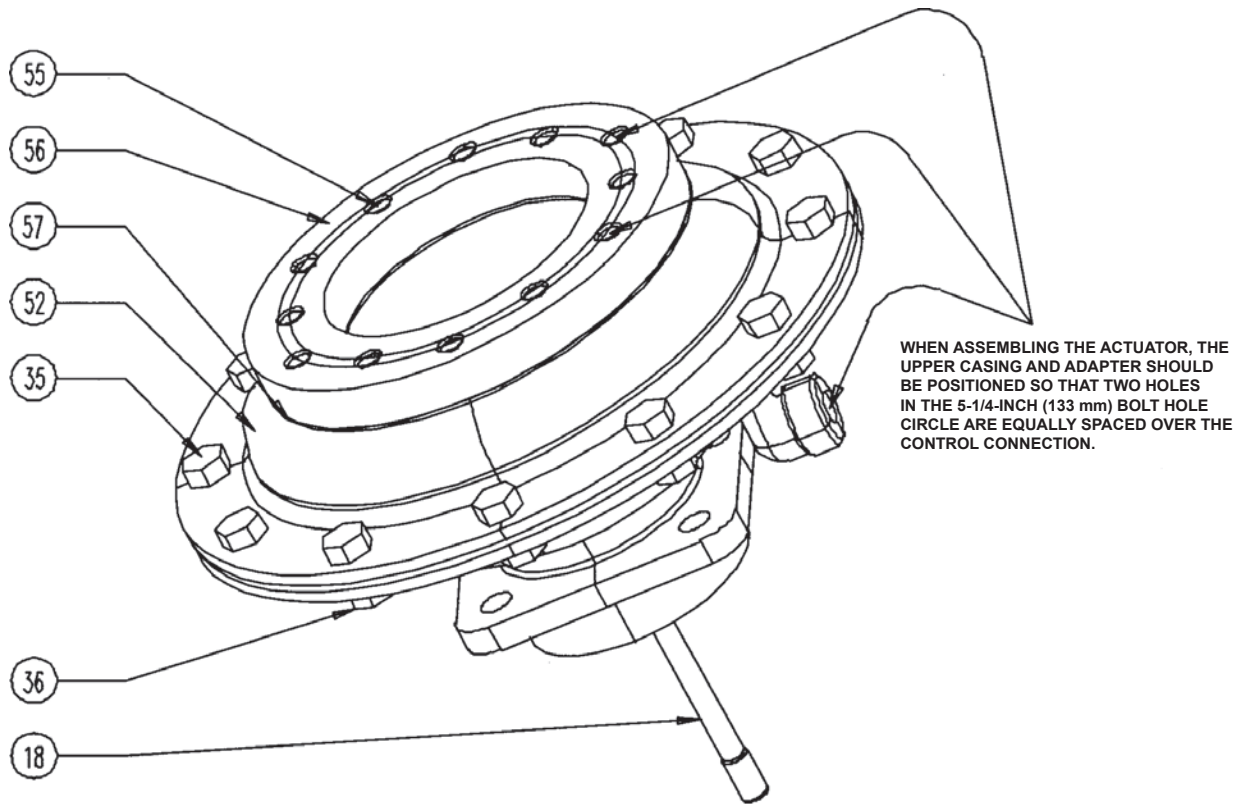
Reassembly

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 Magnalube-G or an equivalent elastomer sealant and lubricant.



A7008/IL

Figure 8. Lower Casing and Casing Adaptor Assembly



A7009/IL

Figure 9. Diaphragm Casing Assembly

6. Assemble the upper and lower casings, noting that two of the holes in the 5-1/4-inch (133 mm) diameter bolt circle in the mounting plate adaptor 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 foot-pounds.
7. Place the balancing plate washer (Figure 15, 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, 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 and lower casing (Figure 6, 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.

8. Apply Magnalube-G or equivalent to the sealing washer (key 17) and carefully slide over the threaded end of the stem (key 18).
9. Insert the guide bushing (key 24) into the cage (key 5), and slide the cage up onto the stem. Insert the set screws (key 39) only far enough to retain the cage. Do not tighten.
10. 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.
11. Install the E-ring (key 26) on the stem sleeve (key 25) and slide the stem sleeve over the stem 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.



CAUTION

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

12. 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-inch (12,7 mm) wrench flats on the stem sleeve.
13. 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.
14. Install and tighten the hex nuts (key 34) to 28 to 32 foot-pounds of torque.
15. 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).
16. 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 18 to 22 foot-pounds.
17. 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.

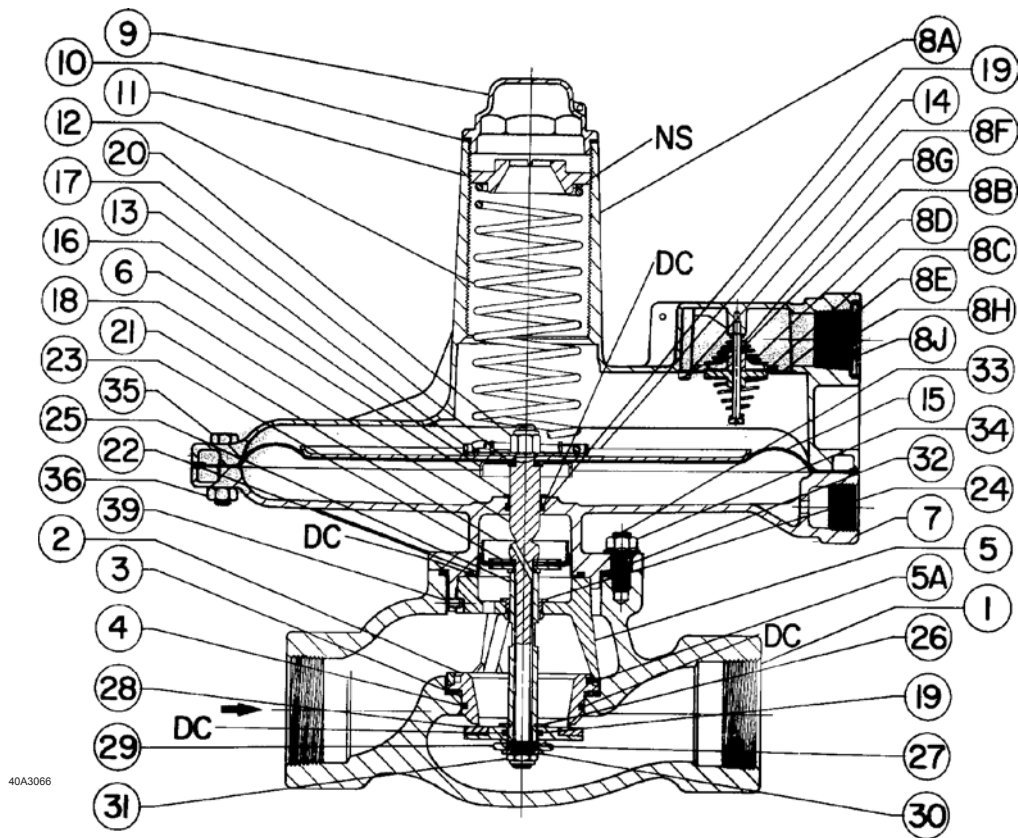
When ordering replacement parts, reference the key number of each needed part and specify the eleven character part number as found in the following parts list.

Parts List

| Key | Description | Part Number |
|-----|--|--|
| | Parts kit for Types 133H, 133L, and 133Z (included are keys 2, 4, 6, 10, 15, 17, 19, 24, 28, 32, and 40) | R133HX00012 |
| 1 | Body Cast iron NPT CL125 FF Steel NPT CL150 RF | 30A3044X012 30A3045X012 30B0855X012 30B0854X012 |
| 2* | Orifice, aluminum | 20A3046X012 |
| 3 | Belleville Spring Washer, 17-4PH | 10A3047X012 |
| 4* | O-Ring, Nitrile (NBR) | 10A9339X012 |

* Recommended spare parts.

133 Series



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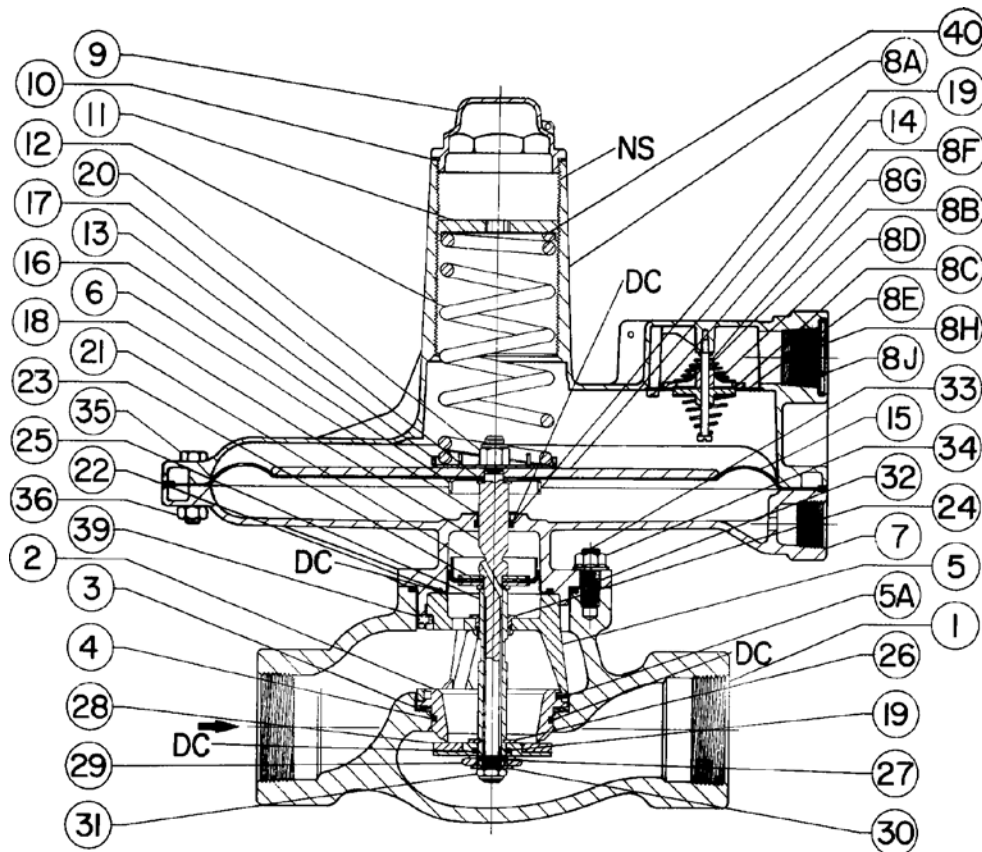
Figure 10. Type 133L Assembly

| Key | Description | Part Number | Key | Description | Part Number |
|-----|--|----------------------------|-----|--|---|
| 5* | Cage, aluminum (including roll pins, key 5A) | 20A3048X012 | 10* | Closing Cap Gasket, neoprene (CR) Types 133H, 133L, and 133Z | 1N446206992 |
| 6* | Bearing, nylon (PA) | 10A3049X012 | | Type 133HP, | 1R742604022 |
| 7 | Lower Casing Types 133H, 133L, and 133Z, aluminum Type 133HP, steel | 40A3050X012 32B3499X012 | 11 | Adjusting Screw Type 133H, brass Type 133L, aluminum Type 133Z, brass Type 133HP, steel | 1V9069X0012 1L928608012 1K633714012 1H139731012 |
| 8 | Spring Case Type 133HP, cast iron Parts 8A through 8J are used on Types 133H, 133L, and 133Z only | 2H140619012 | 12 | Spring, steel Type 133H 1.5 to 3 psig (0,10 to 0,21 bar) Orange 2 to 5 psig (0,14 to 0,34 bar) Yellow 5 to 10 psig (0,34 to 0,69) Blue Type 133L and 133H ⁽¹⁾ 2 to 4-inches w.c. (5,00 to 10,00 mbar) Brown 3.5 to 6-inches w.c. (9,00 to 15,00 mbar) Red | 1H975927032 10A9440X012 1J146927142 1D892527022 1D892627022 |
| 8A | Spring Case, aluminum | 4L142308032 | | | |
| 8B | Flapper Stem, 302 stainless steel | 1H976335022 | | | |
| 8C | Lower Flapper, Nylon (PA) | 1H976406992 | | | |
| 8D | Upper Flapper, polyethylene | 1H976506992 | | | |
| 8E | Orifice, 302 stainless steel | 1H976636012 | | | |
| 8F | Screw, zinc plated steel (3 required) | 1H976728982 | | | |
| 8G | Spring, 302 stainless steel (2 required) | 1H976837022 | | | |
| 8H | Screen, Monel® | 1E564843122 | | | |
| 8J | Snap Ring, 302 stainless steel | 1E564937022 | | | |
| 9 | Closing Cap, aluminum Types 133H, 133L, and 133Z Type 133HP | 1L928308012 00288819012 | | | |

* Recommended spare parts.

Monel® is a mark owned by Special Metals Corporation.

1. If the 2-inches w.c. to 2 psig (5,00 mbar to 0,14 bar) springs listed under Type 133L are used in the Type 133H, the pressure ranges will increase by approximately 1-inch w.c. (2,00 mbar) due to the weight of the Type 133H parts (assuming that the actuator is installed above the body).



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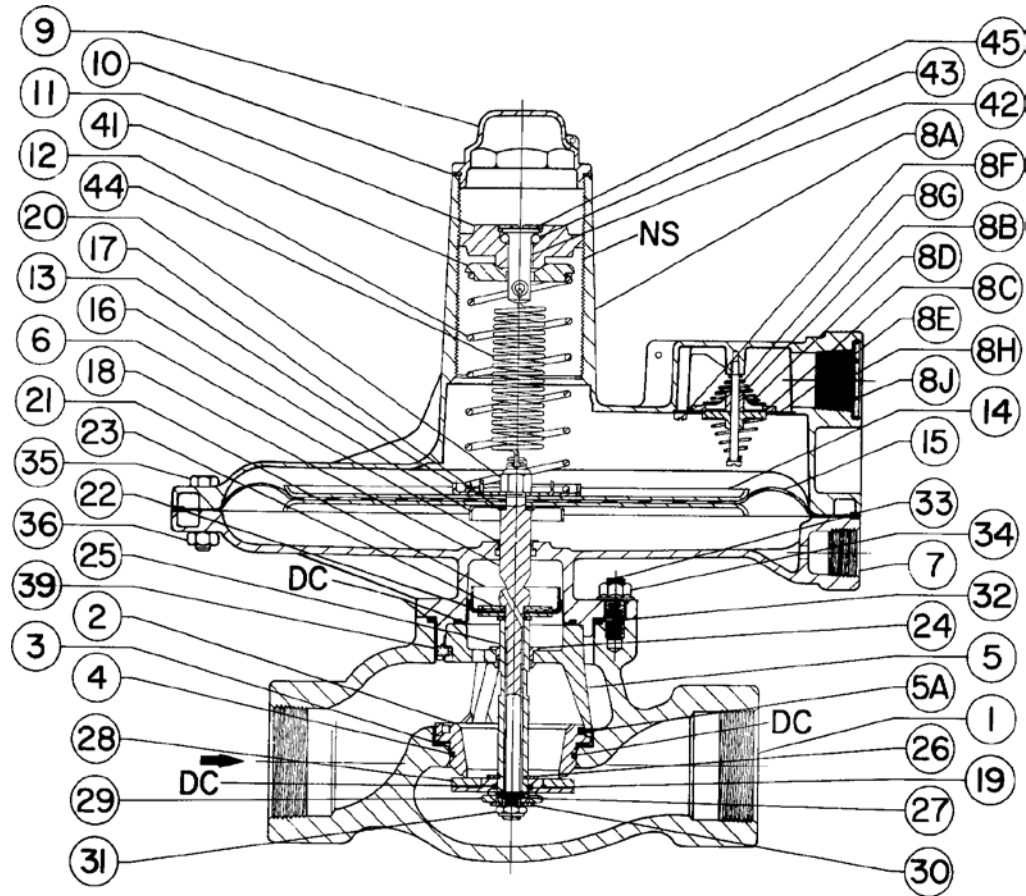
DC - DOW CORNING NO.3
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Figure 11. Type 133H Assembly

| Key | Description | Part Number | Key | Description | Part Number |
|-----|---|-------------|-----|--|-------------|
| 12 | Spring, steel (continued) | | 12 | Spring, steel (continued) | |
| | 5 to 9-inches w.c. (12,00 to 22,00 mbar) | | | Blue | 10C1241X012 |
| | Black | 1D892727012 | | 36 to 50 psig (2,48 to 3,45 bar) | |
| | 8.5 to 18-inches w.c. (21,00 to 45,00 mbar) | | | Green | 10C1242X012 |
| | White | 1D893227032 | | 45 to 60 psig (3,10 to 4,14 bar) | |
| | 14 to 28-inches w.c. (35,00 to 70,00 mbar) | | | White | 10C1243X012 |
| | Green | 1D893327032 | 13 | Spring Seat, plated steel | |
| | 0.75 to 2 psig (0,05 to 0,14 bar) | | | Types 133H, 133L, and 133Z | 10A3052X012 |
| | Blue | 1H975827032 | | Type 133HP | 12B3518X012 |
| | Type 133Z | | 14 | Diaphragm Plate, steel | |
| | (Extension spring, key 44, also required) | | | Type 133H (1 required) | 1D555725012 |
| | 0 to 4-inches w.c. (0 to 10,00 mbar) | | | Type 133L (1 required) | 1J881725072 |
| | Brown | 1D892527022 | | Type 133Z (2 required) | 1J881725072 |
| | (Extension spring, key 44, silver, also required) | | | Type 133HP (1 required) | 1D555725012 |
| | Type 133HP | | 15* | Diaphragm, nitrile (NBR) and nylon (PA) | |
| | 2 to 5 psig (0,14 to 0,34 bar) | | | Types 133H, 133L, and 133Z | 1N150802052 |
| | Yellow | 17B8632X012 | | Type 133HP | 32B3520X012 |
| | 4.5 to 10 psig (0,31 to 0,69 bar) | | 16 | Sealing Diaphragm Plate, zinc plated steel | |
| | Orange | 17B8633X012 | | Types 133H, 133L, and 133Z | 1D475725062 |
| | 6 to 20 psig (0,41 to 1,38 bar) | | | Type 133HP | 12B3517X012 |
| | Silver | 10C1238X012 | 17* | Sealing Washer, steel and synthetic rubber | |
| | 16 to 30 psig (1,10 to 2,07 bar) | | | (2 required) | 1F990428982 |
| | Red | 10C1240X012 | 18 | Stem, 416 stainless steel | |
| | 26 to 40 psig (1,79 to 2,76 bar) | | | Types 133H and 133L | 20A3053X012 |
| | | | | Type 133Z | 10A3069X012 |
| | | | | Type 133HP | 37B3942X012 |

* Recommended spare parts.

133 Series



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Figure 12. Type 133Z Assembly

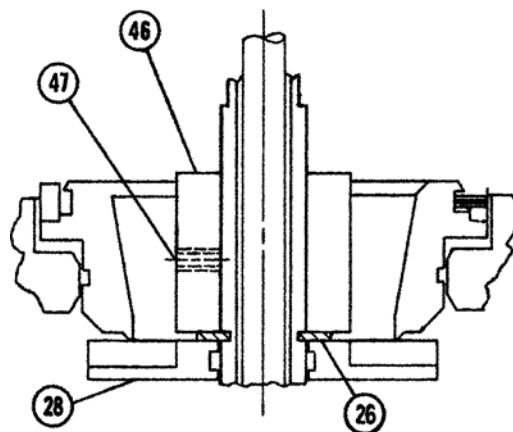
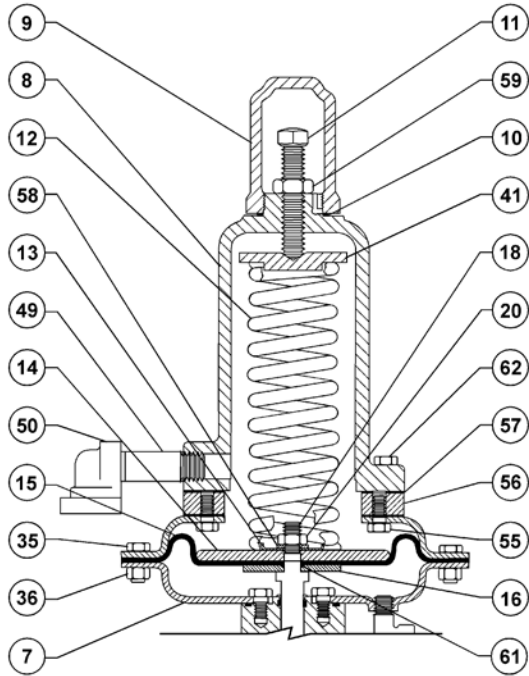
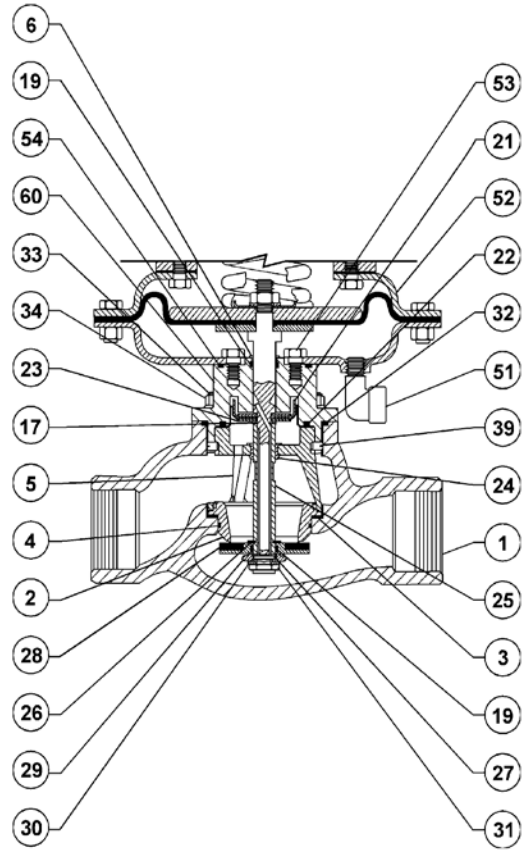


Figure 13. Optional Restriction Collar Assembly



A7010/IL



A7011/IL

Figure 14. Type 133HP Actuator Assembly

133 Series

| Key | Description | Part Number | Key | Description | Part Number |
|-----|--|---|-----|--|---|
| 19* | O-Ring, nitrile (NBR) Types 133L and 133H (2 required) Type 133Z (1 required) Type 133HP (2 required) | 1E5914X0042 1E5914X0042 F1367806562 | 41 | Upper Spring Seat, brass Type 133Z only Type 133HP | 1K633514012 1H140124092 |
| 20 | Hex Nut Types 133H, 133L, and 133Z, aluminum Type 133HP | 1D5297X0012 1A413224122 | 42 | Spring Retainer, brass Type 133Z only | 1K633814012 |
| 21 | Diaphragm Plate, plated steel | 10A3054X012 | 43 | Ball, 440C stainless steel (10 required) Type 133Z only | 1B793546202 |
| 22* | Diaphragm, nitrile (NBR) and nylon (PA) | 10A3055X012 | 44 | Extension Spring, steel Type 133Z only, Black stripe | 1K633427012 |
| 23 | Washer, plated steel (2 required) | 10A3056X012 | 45 | Retaining Ring, plated steel Type 133Z only | 10A3074X012 |
| 24* | Guide Bushing, nylon (PA) | 10A3057X012 | 46 | Restriction Collar, aluminum 25% capacity 40% capacity 60% capacity | 12A7404X012 12A7402X012 12A7403X012 |
| 25 | Stem Sleeve, 303 stainless steel | 10A3061X012 | 47 | Set Screw | 1N830528992 |
| 26 | E-Ring, plated steel | 1F599428982 | 49 | Pipe Nipple, plated steel | 1A473526012 |
| 27 | Roll Pin, steel | 1E954028992 | 50 | Vent Assembly, Type Y602-7 | 17A6572X022 |
| 28* | Valve Disk Assembly, aluminum/neoprene (CR) | 10A3058X012 | 51 | Street Elbow, plated steel | 1A913221992 |
| 29 | Registration Disk, nylon (PA) | 10A3060X012 | 52 | Upper Diaphragm Casing, steel | 2F581125062 |
| 30 | Washer, zinc plated steel | 1D716228982 | 53 | Cap Screw, (4 required) plated steel | 1D529824052 |
| 31 | Hex Nut, zinc plated steel | 1C121928982 | 54* | Adaptor O-Ring, nitrile (NBR) | 1F914106992 |
| 32* | O-Ring, nitrile (NBR) | 1J1079X0012 | 55 | Cap Screw, (6 required) plated steel | 1A368424052 |
| 33 | Stud, alloy steel (4 required) | 10A3062X012 | 56 | Mounting Bracket, plated steel | 1H140025032 |
| 34 | Locknut, plated alloy steel (4 required) | 10A3063X012 | 57* | Mounting Bracket Gasket, neoprene (CR) (2 required) | 1H140404022 |
| 35 | Cap Screw, plated steel Types 133H, 133L, and 133Z (12 required) Type 133HP (12 required) | 1B136324052 1E760324052 | 58 | Lock Washer, plated steel | 1A487828992 |
| 36 | Hex Nut, plated steel Types 133H, 133L, and 133Z (12 required) Type 133HP | 1A309324122 1A346524122 | 59 | Hex Jam Nut, plated steel | 1A319224122 |
| 37 | NamePlate, aluminum | 11A0470X0A2 | 60 | Casing Adaptor, steel | 37B4486X012 |
| 38 | NamePlate, brass | 13A0496X0A2 | 61* | Diaphragm Washer O-Ring, nitrile (NBR) | 1C782206992 |
| 39 | Set Screw, alloy steel (2 required) | 10A3051X012 | 62 | Cap Screw, (6 required) plated steel | 1A341824052 |
| 40* | Thrust Washer, nylon (PA) Type 133H only | 1V9661X0012 | | | |

*Recommended spare parts.

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