ISO Registered Company

MODEL 31-N

Pressure Reducing Service Regulator

SECTION I

I. DESCRIPTION AND SCOPE

The Model 31-N is a pressure reducing service regulator used to control downstream (outlet or P_2) pressure to levels between 2" – 16 "WC (50–400 mm H_2O). Sizes are 1/2" 3/4", 1", 1-1/2" and 2" (DN15, 20, 25, 40 and 50).

The unit is designed for gaseous service only.

Refer to Technical Bulletin 31-N-TB for sizing, application and selection recommendations.

⚠ WARNING

1. **Model 31-N does not include an internal relief mechanism. Overpressure protection requires use of a downstream safety relief valve or rupture disc.**
2. **User to determine acceptance of non-relieving design by federal, state, and/or local codes.**
3. **IF GAS IS DETECTED BY SMELL, CONTACT YOUR GAS COMPANY IMMEDIATELY.**
4. **User to comply with instructions, operating requirements and maintenance requirements located herein the "IOM-31-N".**

SECTION II

II. INSTALLATION

1. An inlet block valve should always be installed. An outlet block valve is recommended.

2. If service application is continuous such that shutdown is not readily accomplished, it is recommended that an outlet block valve and a manual bypass valve be installed.

3. Pipe unions are recommended to be installed to allow removal from piping. Trim can be changed without removal from pipeline.

4. An outlet pressure gauge should be located approximately 10 pipe diameters downstream, and within sight.

5. All installations should include a downstream relief device if the inlet pressure could exceed the pressure rating of any downstream equipment.

   A downstream safety relief valve or a rupture disc is absolutely required if the inlet P_1 pressure exceeds 100 psig (6.9 Barg) under any normal or upset conditions.

⚠ CAUTION

Installation of adequate overpressure protection is recommended to protect the regulator from overpressure and all downstream equipment from damage in the event of regulator failure.

⚠ WARNING

The maximum outlet pressure listed on the nameplate is the "upper operative limit" for the sensing diaphragm. Higher pressures could damage the internals. (Field hydrostatic or pneumatic pressure tests frequently destroy diaphragms. DO NOT HYDROSTATIC OR PNEUMATIC PRESSURE TEST THROUGH AN INSTALLED UNIT EXPOSING THE OUTLET PORTION OF THE REGULATOR TO PRESSURES GREATER THAN 50 PSIG (3.45 BARG) FAILURE TO HEED MAY RESULT IN CATASTROPHIC FAILURE WITH FLYING PARTS AND POSSIBILITY OF PERSONAL INJURY! ISOLATE FROM TEST.)

⚠ CAUTION

For welded installations, all internal trim parts, seals and diaphragm(s) must be removed from regulator body prior to welding into pipeline. The heat of fusion welding will damage non-metallic parts if not removed. *NOTE: This does not apply to units equipped with extended pipe nipples.*

6. Clean the piping of all foreign material including chips, welding scale, oil, grease and dirt before installing the regulator. Strainers are recommended.

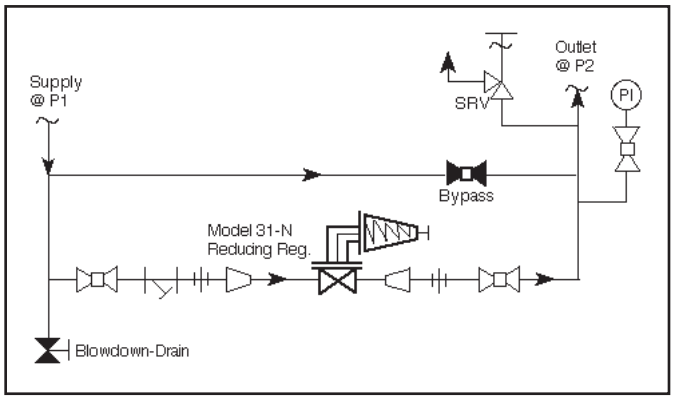

Figure 1
Recommended Piping Schematic For
Pressure Reducing Station

7. In placing thread sealant on pipe ends prior to engagement, assure that excess material is removed and not allowed to enter the regulator upon startup.

8. Flow Direction: Install so the flow direction matches the arrow cast on the regulator body.

9. Refer to Figure 2. Regulator may be rotated around the pipe axis 360°, and may be installed in a horizontal or vertical pipeline. Four orientation/ arrangement assembly positions are standard. Orient to prevent the spring chamber vent hole from collecting rainwater or debris. Reorient actuator around the stem axis 360° if necessary.

10. Regulators are not to be direct buried underground.

11. For insulated piping systems, recommendation is to not insulate regulator.

12. Cashco does not recommend field welding on the body of the regulator. If weld connections are desired, specify Opt-32, extended plain end pipe nipples.

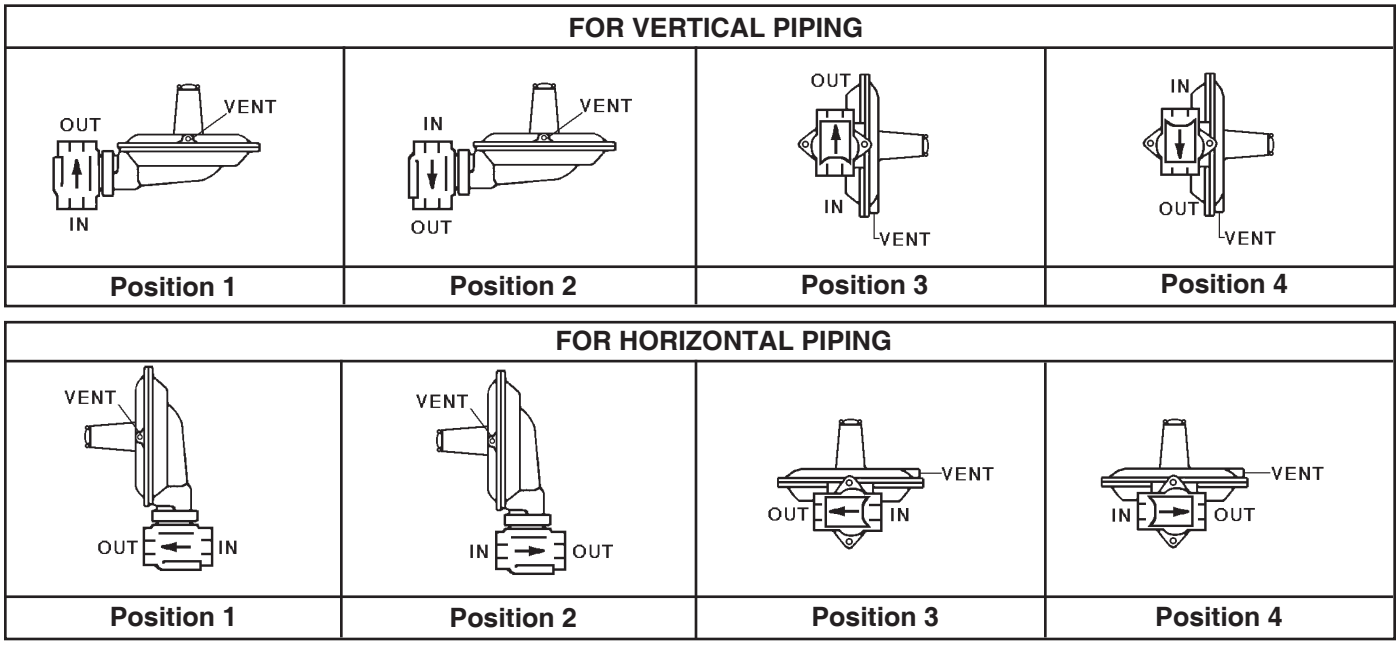

Figure 2

SECTION III

III. PRINCIPLE OF OPERATION

1. Refer to internals drawings Figures 5 through 8.

2. Internal trim movement occurs as pressure variations register on the diaphragm. The registering pressure is the controlled outlet pressure, P_2, or downstream pressure. The range spring opposes upwards movement of the diaphragm due to the P_2 pressure. As outlet pressure drops, the range spring pushes the diaphragm down, opening the regulator's port via the linkage lever travel. As outlet pressure increases, the diaphragm pushes up against the range spring and the port closes.

3. Model 31-N includes a linkage lever in its mechanism. The linkage lever allows the regulator to operate flow-to-open (FTO) and provides plug travel multiplication through the lever length ratio.

5. Aspiration (jet) effect is developed by properly locating the "windows" of the loading ring. When properly positioned, a high velocity path is introduced. This causes a corresponding decrease in static pressure to be developed at a location that allows this decreased pressure to register into the lower case and beneath the diaphragm. The net result is to pull the diaphragm down and open the valve port, providing higher unit capacity.

6. A complete diaphragm failure will cause the regulator to fail open.

SECTION IV

IV. STARTUP

1. Assure that the proper range spring is indicated to be within the regulator by inspection of the unit's nameplate. Apply setpoint pressures that are only within the stated range.

2. When stating direction of rotation of the adjustment screw, the view is with respect to looking down towards the closing cap or its normal location.

3. Start with the block valves closed. A bypass valve may be used to maintain outlet pressure in the downstream system without changing the following steps.

4. Remove closing cap on top of spring chamber. Relax the range spring by turning the adjustment screw CCW a minimum of three (3) full revolutions. This reduces the outlet (downstream) pressure setpoint.

5. Crack open the outlet (downstream) block valve.

6. Slowly open the inlet (upstream) block valve observing the outlet (downstream) pressure gauge. Partially close off the bypass valve, if open. Determine if the regulator is flowing. If not, slowly rotate the regulator adjustment screw CW until flow begins.

7. Continue to slowly open the inlet (upstream) block valve until fully open.

8. Continue to slowly open the outlet (downstream) block valve, especially when the downstream piping system isn't pressurized. If the outlet (downstream) pressure exceeds the desired pressure, close the inlet (upstream) block valve first, then the outlet (downstream) block valve, and go to Step 4, then return to Step 6.

9. When flow is established steady enough that the outlet (downstream) block valve is fully open, begin to slowly close the bypass valve if installed.

10. Develop system flow to a level near its expected normal rate, and reset the regulator setpoint per Section VII.

11. Reduce system flow to a minimum level and observe setpoint. Outlet pressure may rise from the setpoint of Step 10. The maximum rise in outlet pressure on decreasing flow should not exceed the stated upper limit of the range spring by greater than 10%; i.e. 5.5–8.0 "WC (140–200 mmH_2O) range spring, at low flow the outlet pressure should not exceed 8.8 "WC (224 mmH_2O). If it does, consult factory.

SECTION V

V. SHUTDOWN

1. On systems with a bypass valve, and where system pressure is to be maintained as the regulator is shut down, slowly open the bypass valve while closing the inlet (upstream) block valve. Fully close the inlet (upstream) block valve. (When on bypass, the system pressure must be constantly observed and manually regulated.) Close the outlet (downstream) block valve.

⚠ WARNING

Do not walk away and leave a bypassed regulator unattended.

2. If the regulator and system are to both be shutdown, slowly close the inlet (upstream) block valve. Close the outlet (downstream) valve only if regulator removal is required.

SECTION VI

VI. MAINTENANCE

A. General:

⚠ WARNING

SYSTEM UNDER PRESSURE. Prior to performing any maintenance, isolate the regulator from the system and relieve all pressure. (Including the External Sensing line when specified.) Failure to do so could result in personal injury.

1. Maintenance procedures hereinafter are based upon removal of the regulator from the pipeline where installed.

2. Owner should refer to owner's procedures for removal, handling and cleaning of reusable parts, the disposal of non-reusable parts, i.e. gaskets, suitable solvents, etc.

3. If desired, gaskets may be oiled, or coated with gasket sealant or thread sealing compound, provided the sealant is compatible with the fluid. (See below for "oxygen cleaned" valves.)

4. Valves originally supplied as "special cleaned" (Opt-56) are assembled using special sealant, Fluorolube GR-362[1], or equivalent. Cashco recommends following factory cleaning specification #S-1542, or equivalent. Contact factory for details.

5. When directions such as upwards, downwards, leftwards or rightwards are given, they are with respect to Figures 5 and 6.

   When counter clockwise (CCW) or clockwise (CW) rotations are indicated, they are with respect to:

   a. Spring Chamber – as viewed from above looking down towards the closing cap or its normal location.

   b. Body – as viewed looking into the body cavity with the upper case assembly removed.

[1] Product of Fisher Scientific Company

B. Diaphragm Replacement:

⚠ WARNING

SPRING UNDER COMPRESSION. Prior to removing upper case, relieve spring compression by removing the adjusting screw. Failure to do so may result in flying parts that could cause personal injury.

1. Install the body (1) in a vise with the spring chamber (4) directed upwards.

2. Remove closing cap (5). Relax range spring (17) by turning adjustment screw (18) CCW until removed from spring chamber (4); count number of full revolutions and record below.

   No. of revolutions to remove adjustment screw (18) _____ .

3. Paint or embed a match mark between lower case (3) and spring chamber (4) at flange O.D.

4. Remove all diaphragm flange nuts (10) and screws (9).

5. Remove spring chamber (4) and range spring (17).

6. Pry up the edges of the diaphragm (12) from around the perimeter of the lower case (3) diaphragm flange to assure that the diaphragm (12) is not "sticking" to the lower case.

7. Grasp stop post (19) and with hand carefully lift upwards and to the right to disengage linkage lever (21) from circular opening of lower diaphragm plate (20). Fully remove diaphragm sub-assembly (DSA) from lower case.

8. Place the "ear" of the lower diaphragm plate (20) into a soft jawed vise and fully secure, with stop post (19) pointed upwards. Place a wrench on the hex surface of stop post (19) and loosen by rotating CCW (viewed from above).

9. Grasp upper diaphragm plate (13) with fingers and continue to loosen stop post (19) until removal. Finger remove washer (16), and nylon bushing (15). Lift upper diaphragm plate (13), together with stuck-on diaphragm (12) away from lower diaphragm plate (20), and place on bench top.

10. While holding upper diaphragm plate (13) by palm of hand, hand-pull diaphragm (12) away from upper diaphragm plate (13). ***NOTE:*** *The diaphragm (12) is adhered to the upper diaphragm plate (13) with adhesive.* Rotate and repeat until the diaphragm (12) is fully removed. Discard used diaphragm (12). Remove remaining adhesive from upper diaphragm plate (13).

11. Examine upper plate (13) for bending or distortion. Replace if deformation is present.

12. Spread a thin layer of compatible adhesive (DuPont 732 or equal) onto the cleaned upper pressure plate (13), staying away from the edges approximately 1/2" (12 mm). Place a new diaphragm (12) down onto a flat surface with the diaphragm's (12) flange edges up, forming a "bowl" with a hole in the center. Carefully lift the upper diaphragm plate (13), invert 180°, and lower into the diaphragm (12) "bowl" with the adhesive meeting the diaphragm (12); align the upper diaphragm plate (13) as concentrically as able. Carefully lift the adhered parts (12)(13) and invert 180°. Align the diaphragm (12) hole and upper diaphragm plate (13) hole concentrically. Work out any "bubbles" formed between the diaphragm (12) and the upper diaphragm plate (13) using a flat tool as necessary. Once aligned, set adhered parts (12)(13) back down to allow adhesive approximately 30 minutes setting/drying time.

13. Place the adhered diaphragm (12) and the upper diaphragm plate (13) back onto the lower diaphragm plate (20) still resting in the vise. Position/align the diaphragm (12) with respect to the lower diaphragm plate (20) as indicated in Figure 3; failure to align properly may cause poor unit performance.

14. Set nylon bushing (15) into hole in the top of the upper diaphragm plate (13). Place washer (16) on top of nylon bushing (15).

15. Insert stop post (19) through the center opening of stacked parts (16, 15, 13, 12) and engage threaded end of stop post (19) into lower diaphragm plate (20). Carefully tighten stop post (19) to ensure concentricity of stacked parts (16, 15, 13, 12). Tighten stop post (19) to 18–20 in-# (2.0–2.3 N-M) torque. This completes diaphragm sub-assembly (DSA); remove from vise.

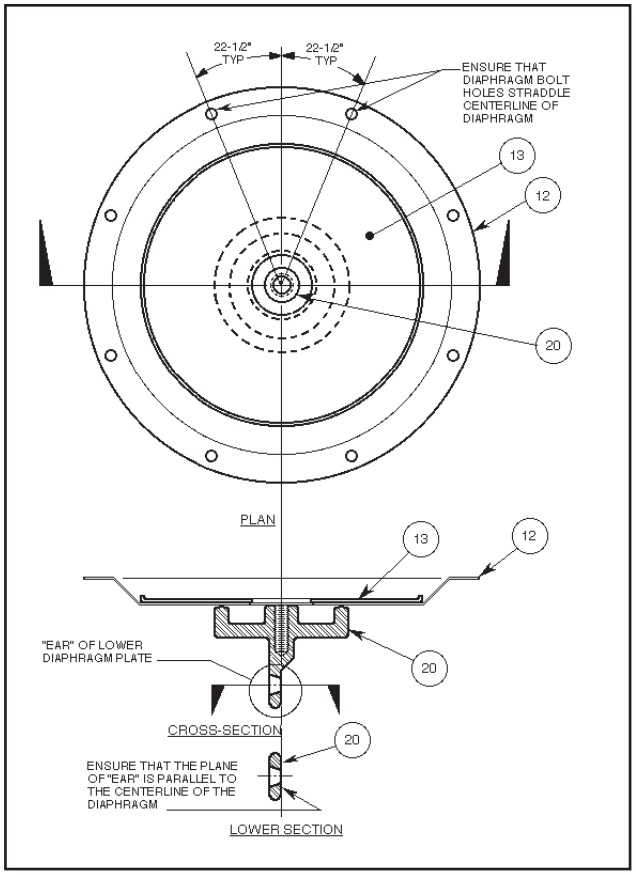

Figure 3

16. Position the diaphragm sub-assembly (DSA) towards the rightwards of center of the lower case (3) with the opening of the lower diaphragm plate (20) oriented perpendicular to the linkage lever (21). Insert the linkage lever (21) through the opening of the lower diaphragm plate (20). Align the bolt holes of diaphragm (12) with the bolt holes of the lower case (3).

17. Place range spring (17) over stop post (19), and align properly by setting spring (17) over washer (16) and nylon bushing (15) so that the spring (17) rests on upper diaphragm plate (13).

18. Clean threads of spring chamber (4) "barrel" thoroughly using suitable solvent.

19. Set spring chamber (4) onto lower case (3) aligning matchmarks of Step 3 previous.

20. Insert screws (9) into flange bolt holes. Engage nuts (10). Align and push nuts (10) up against the underneath side of the lower case (3) flange, ensuring that the "tips" of the nuts are not improperly positioned due to the small "lugs" on the lower case flange. Hand-tighten all screws (9) and nuts (10).

21. In an alternating cross-pattern, tighten screws (9) in one revolution increments. Repeat pattern until torque reaches 25–30 in-# (2.8–3.4 N-M).

22. Engage adjustment screw (18) the same number of revolutions as recorded from Step 2 previous.

23. Remove and replace closing cap gasket (6). Replace closing cap (5) and finger tighten only.

C. Trim Replacement:

1. Place body (1) into a vise and secure. Paint or embed a match mark between lower case (3) and body (1).

2. Loosen both cap screws (11) bolting the actuator assembly (AA) to the body (1). Holding the actuator assembly (AA) in hand, rotate cap screws (11) to removal. ***NOTE:*** *The actuator assembly (AA) may be rotated around the stem (24) axis during this procedure.*

3. Place actuator assembly (AA) in a vise or on a workbench to allow cleaning of the gasket (8) surface of the lower case (3) with a flat tool. Use spray solvent as necessary (do not immerse).

4. Remove "rubber" seat (27) from end of stem (24); examine and discard. Place new seat (27) onto end of stem (24). For sizes 1-1/2" and 2" (DN40 & 50), a deflector ring (32) is included. Ensure the proper orientation of the deflector ring (32) when pushing the new seat (27) into position. (See Figure 6.)

5. Return to the body (1) in vise. Observe position of "split" in loading ring (25, 33) with respect to proper location as indicated in Figure 4. Using both thumbs, push the interior walls to pry apart the split of the loading ring (25, 33), until the ring (25, 33) slips off the orifice (26). Remove the loading ring (25, 33).

6. Remove the body (1) from the vise. Clean the gasket (8) recess of the body (1) with a flat tool. Solvent clean body (1). Replace body (1) into vise.

7. Examine orifice (26) for damage to the seating edge. Replace orifice (26) if damaged. To remove orifice (26), place a socket over the orifice (26) hex, and rotate CCW to loosen/ remove. When replacing orifice (26) use pipe sealant PLS-2 or PST Loctite. Rotate CW to tighten orifice (26); tighten to 35–40 ft-# (47.4–54.2 N-M). ***NOTE:*** *Do not replace orifice (26) without replacing seat (27).*

8a. Examine glass-filled nylon loading ring (25) for sizes 1/2" through 1" (DN15 through 25). This piece may wear "notches" at the location where the loading ring (25) touches the orifice (26) "hex points". It is necessary that the loading ring (25) be "clamped snugly" to the orifice (26); replace loading ring (25) if fit is loose.

8b. Examine SST loading ring (33) for sizes 1-1/2" and 2" (DN40 & 50). Assure that the three impression points (2 rectangular, 1 circular) are still present; if an impression point is missing, replace loading ring (33). It is necessary that the loading ring (33) "clamp snugly" to the orifice (26) to prevent rotation; replace loading ring (33) if fit is loose.

9. Refer to Figure 4 for proper alignment of loading ring (25, 33) split. Using both thumbs, push the interior walls of the loading ring (25, 33) apart and lower the loading ring (25, 33) down into the body (1) cavity, and over the orifice (26). Release thumbs. Assure loading ring (25, 33) "clamps snuggly". Repeat until loading ring (25, 33) is properly located per Figure 4. The "split" of the loading ring (25) is factory assembled along the body (1) axial centerline for body sizes 1/2" - 1" (DN15 - 25), and for loading ring (33) at the 21° mark on the body (1) for body sizes 1-1/2" and 2" (DN40 & 50). <u>For all body sizes the "split" in the loading ring (25, 33) is located opposite the flow direction</u>.

10. Place gasket (8) into body (1) recess.

11. Reposition actuator assembly (AA) into position by hand, aligning body (1) bolt holes with bolt holes in lower case (3). Insert two cap screws (11) and finger tighten in an alternating cross pattern.

12. Wrench tighten cap screws (11) in an alternating cross pattern to a torque of 8–10 ft.-# (10.8–13.5N-M).

D. Linkage Lever and Stem Replacement:

1. Remove diaphragm sub-assembly (DSA) as described in Section VI.B., Steps 1 through 7.

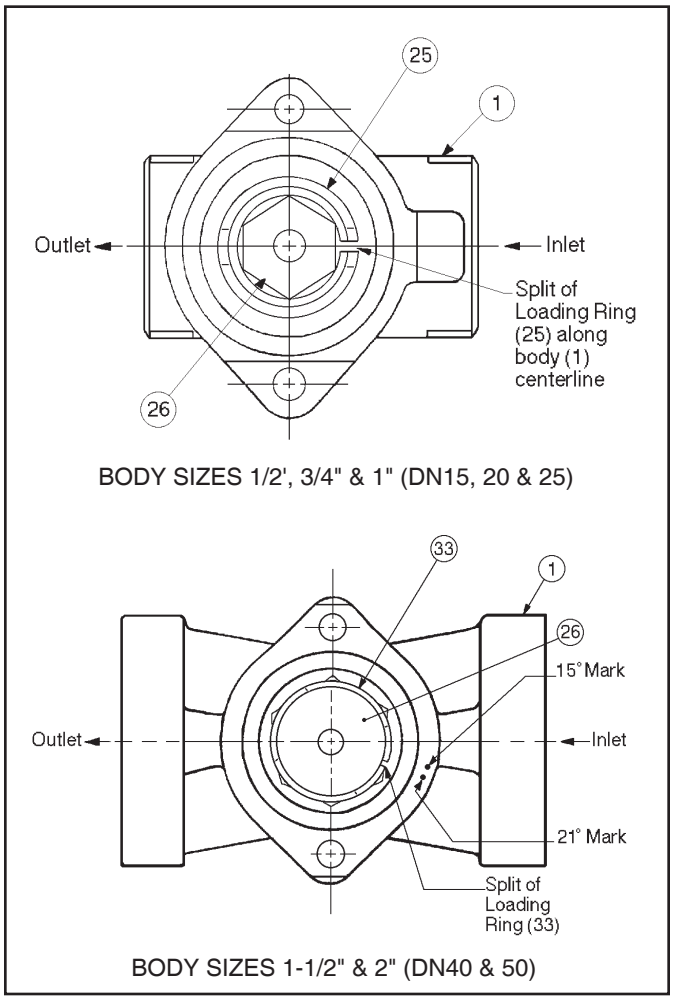

Figure 4

2. Remove lower casing (3) from body (1) as described in Section VI.C., Steps 1 and 2.

3. Remove both machine screws (22), washers (37) and retaining linkage pivot pin (23). (See Figure 8.) Lift linkage lever (21) from its position of engagement with stem (24) bringing linkage pivot pin (23) along. Remove pin (23) and inspect for wear, bending, etc. Replace pin (23) if required.

4. Inspect linkage lever (21) for bending, distortion, etc. Replace lever (21) if required.

5. Withdraw stem (24) through the neck of the lower case. Inspect stem to assure that there is no bending in the "slot" area where the stem and linkage lever (21) engage. Replace stem if there are any signs of bending or friction in the stem guide or engagement zones. ***NOTE:*** *If regulator has external sensing* - replace *the o-ring (44). Re-insert stem back into lower casing.*

6. Insert linkage pivot pin (23) through hole in linkage lever (21). Simultaneously engage the linkage lever (21) and the stem (24), and place pin (23) ends back into the “cradles” of the pedestal supports of the lower casing (3), replace washer (37), engage and tighten both machine screws (22).

7. Reinstall diaphragm sub-assembly (DSA) and spring chamber (4) as described in Section VI.B., Steps 16 through 23.

8. Reinstall actuator assembly (AA) to body (1) as described in Section VI.C., Steps 11 and 12.

E. Range Spring Replacement:

1. Remove closing cap (5) from spring chamber (4).

2. Rotate adjustment screw (18) CCW to removal.

3. Remove existing range spring (17).

4. Install new range spring (17) (refer to Table 2).

5. Put thread locking compound on threads of spring chamber (4) and on adjustment screw (18).

6. Engage adjustment screw (18) into spring chamber (4) by rotating CW until the range spring (17) begins to compress.

7. Shop calibrate the setpoint per Section VII.

8. Remove old nameplate (28) and drive screws (29); install new nameplate with correct range

SECTION VII

spring indicated.

VII. SETPOINT ADJUSTMENT/CALIBRATION

1. Establish flow through the regulator, preferably a relatively low flow rate, approximately 50 SCFH.

2. Remove closing cap (6) by rotating CCW.

3. If P_2 outlet pressure is less than desired, rotate adjustment screw (18) CW; if higher than desired, rotate adjustment screw (18) CCW.

4. Reinstall closing cap (6) using pipe joint lubricant/ sealant on threads; finger tighten only.

5. Increase flow rate to near maximum. Check for adequate P_2. Repeat Steps 2 through 4. as required. ***NOTE:*** *At higher flow rates, removal of the closing cap (6) can induce an instability. If this occurs, make adjustment, and quickly replace closing cap (6), then observe the new setpoint.*

SECTION VIII

VIII. TROUBLE SHOOTING GUIDE

1. Variation in outlet P_2 pressure.

Possible Cause		Remedy	
A.	Oversized valve, insufficient rangeability.	A1. A2.	Check actual flow conditions; consider use of smaller orifice. Reduce P_1 pressure if possible.
B.	Undersized valve, insufficient rangeability.	B1. B2.	Check actual flow conditions; consider use of larger orifice. Increase P_1 pressure if possible.
C.	High Inlet P_1 pressure.	C.	Reduce P_1 pressure to 60 psig (4.14 Barg) or lower.
D.	Loading ring is “loose”.	D.	Replace loading ring.
E.	Variation of Inlet P_1 pressure.	E.	P_2 pressure setpoint will vary as P_1 pressure varies; provide stable P_1 inlet pressure.
F.	Dirty service gas; unit becomes unresponsive.	F1. F2.	Clean gas stream with liquid separators, strainers, etc. Disassemble and clean buildup on a routine basis.
G.	Downstream over-pressurization.	G1. G2. G3. G4. G5. G6.	Install safety relief valve or rupture disc with a 50 psig (3.45 Barg) setting or lower. Disassemble actuator assembly and check for bent upper diaphragm plate. Check for relief cap distortion. Flow is tightly shutoff downstream of regulator; relocate shutoff valve. Seat leakage; replace seat. Failure of orifice thread sealant; reinstall orifice. Correct process conditions/controls that cause P_2 pressure to become greater than 50 psig (3.45 Barg).
H.	Process pressure pulsations – inlet or outlet.	H1. H2.	Stabilize process pressures at source or end use. Install volume tanks to reduce pulsation effects.
J.	Adjustment screw loosening, P_2 outlet pressure decreasing.	J1. J2.	Place locking compound on threads of adjustment screw. Stabilize flow to reduce vibrations.

2. External leakage.

Possible Cause	Remedy
A. Diaphragm failure.	A. Replace diaphragm.
B. Downstream over-pressurization.	B1. Correct process conditions/controls that cause P_2 pressure to become greater than 50 psig (3.45 Barg). B2. Install safety relief valve or rupture disc with a 50 psig (3.45 Barg) setting or lower. B3. Disassemble actuator assembly and check for bent upper diaphragm plate. Check for relief cap distortion. B4. Flow is tightly shutoff downstream of regulator; relocate shutoff valve. B5. Seat leakage; replace seat.
C. Body gasket failure.	C1. Replace body gasket.

3. Unstable Operation.

Possible Cause	Remedy
A. Closing cap removed.	A. Reinstall gasketed closing cap.
B. Plug vent.	B. Clean vent opening in spring chamber.

SECTION IX

IX. ORDERING INFORMATION

NEW REPLACEMENT UNIT vs PARTS "KIT" FOR FIELD REPAIR

To obtain a quotation or place an order, please retrieve the Serial Number and Product Code that was stamped on the metal name plate and attached to the unit. This information can also be found on the Bill of Material ("BOM"), a parts list that was provided when unit was originally shipped. (Serial Number typically 6 digits). Product Code typical format as follows: (last digit is alpha character that reflects revision level for the product).

□□□-□□□7-□□□□□□□□□

NEW REPLACEMENT UNIT:

Contact your local Cashco Sales Representative with the Serial Number and Product code. With this information they can provide a quotation for a new unit including a complete description, price and availability.

⚠ CAUTION

Do not attempt to alter the original construction of any unit without assistance and approval from the factory. All purposed changes will require a new name plate with appropriate ratings and new product code to accommodate the recommended part(s) changes.

PARTS "KIT" for FIELD REPAIR:

Contact your local Cashco Sales Representative with the Serial Number and Product code. Identify the parts and the quantity required to repair the unit from the "BOM" sheet that was provided when unit was originally shipped.

NOTE: *Those part numbers that have a quantity indicated under "Spare Parts" in column "A" reflect minimum parts required for inspection and rebuild, - "Soft Goods Kit". Those in column "B" include minimum trim replacement parts needed plus those "Soft Goods" parts from column "A".*

If the "BOM" is not available, refer to the cross-sectional drawings included in this manual for part identification and selection.

A Local Sales Representative will provide quotation for appropriate Kit Number, Price and Availability.

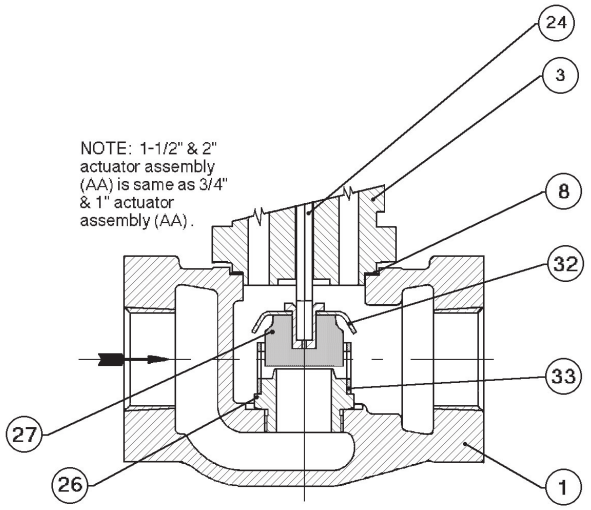

Figure 6
1-1/2" & 2" Body Sizes

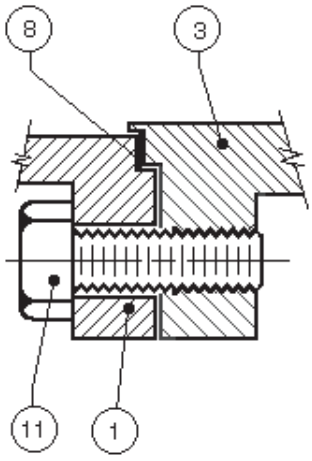

Figure 7
Partial Section:
Body Assembly (BA)-to-Actuator Assembly (AA) Connection

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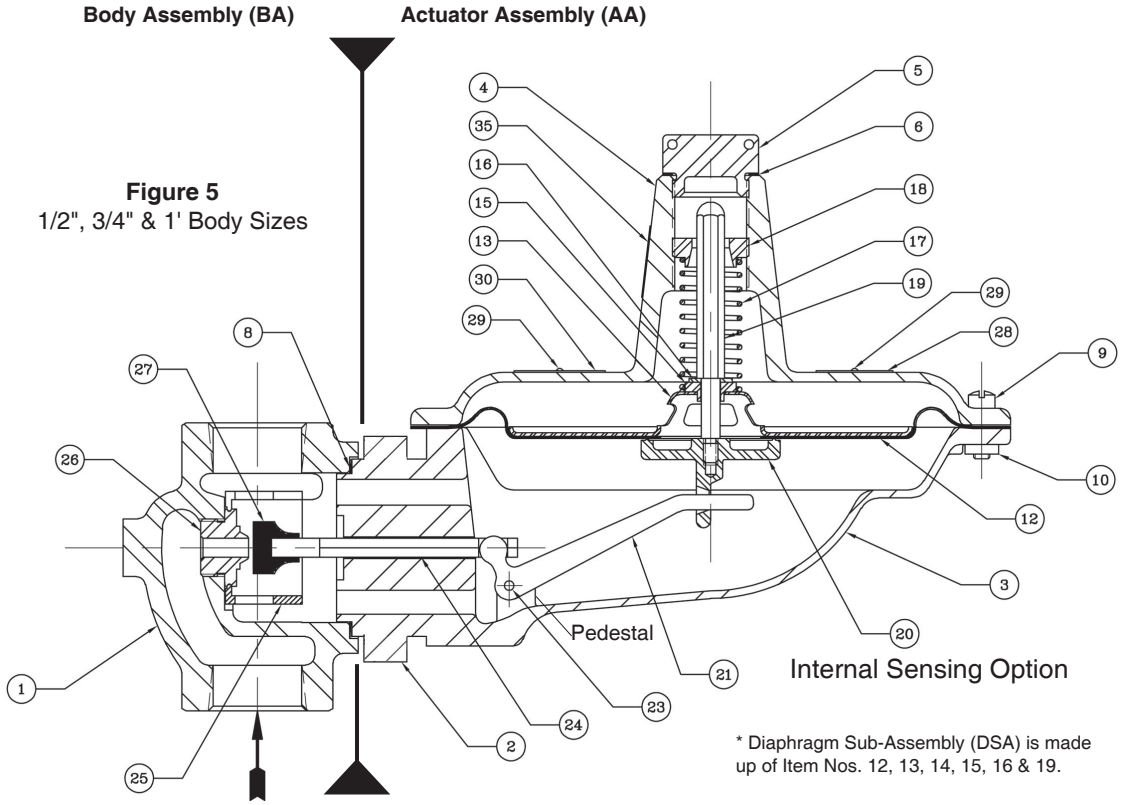
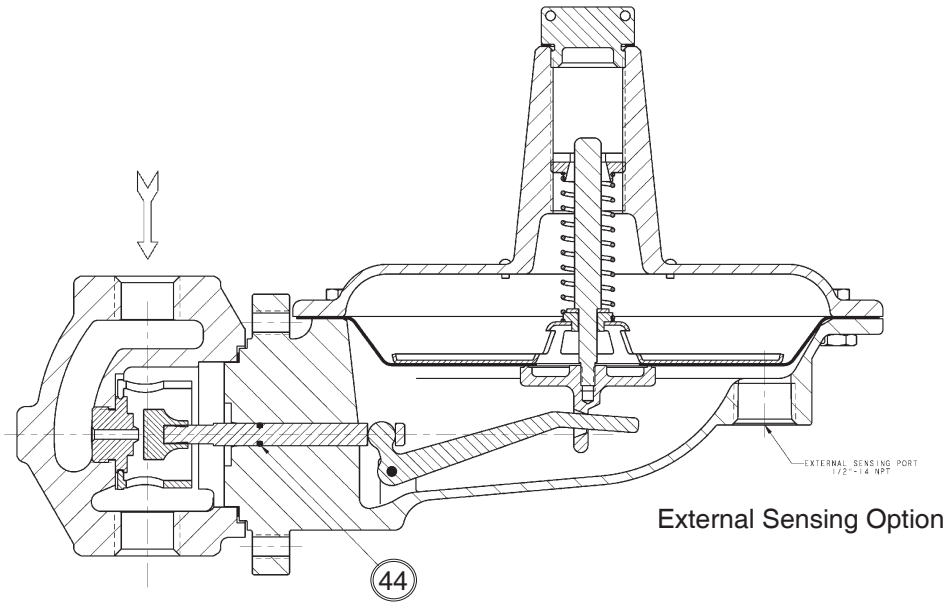


Figure 5
1/2", 3/4" & 1' Body Sizes

Item No.	Description
1	Body
3	Lower Case
4	Spring Chamber
5	Closing Cap
6	Gasket (Closing Cap)
8	Gasket (Body)
9	Machine Screw
10	Nut, Hex.
11	Cap Screw
12	Diaphragm
13	Upper Diaphragm Plate
15	Nylon Bushing
16	Washer
17	Range Spring
18	Adjustment Screw
19	Stop Post
20	Lower Diaphragm Plate
21	Linkage Lever
22	Machine Screw
23	Linkage Pivot Pin
24	Stem
25	Nylon Loading Ring
26	Orifice
27	Seat
28	Nameplate
29	Drive Screw
30	Warning Plate
32	Deflector Ring
33	SST Loading Ring
34	Bug Proof Vent Plug (not shown)
37	Washer (flat)
44	O-ring (Stem) (Ext'l Sensing)
* DSA	Diaphragm Sub-Assembly



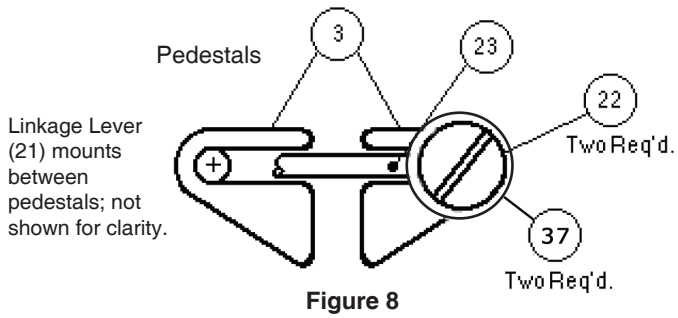


Figure 8
Partial Plan: Linkage Lever (21) Pedestals

IOM ADDENDUM:

ATEX DIRECTIVE 2014/34/EU and THE EQUIPMENT AND PROTECTIVE SYSTEMS INTENDED FOR USE IN POTENTIALLY EXPLOSIVE ATMOSPHERES REGULATIONS 2016

Cashco declares that the products listed in the table below has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of products intended for use in potentially explosive atmospheres given in Annex II of the ATEX Directive 2014/34/EU and given in Schedule 1 of The Equipment and Protective Systems Indented for Use in Potentially Explosive Atmospheres Regulations 2016. Compliance with the Essential Health and Safety Requirements has been assured by compliance with EN ISO 80079-36:2016 and EN ISO 80079-37:2016. The product will be marked as follows:

II 2 G
Ex h IIB T6... T1 Gb
1000ATEXR1 X

The 'X' placed after the technical file number indicates that the product is subject to specific conditions of use as follows:

1. The maximum surface temperature depends entirely on the operating conditions and not the equipment itself. The combination of the maximum ambient and the maximum process medium temperature shall be used to determine the maximum surface temperature and corresponding temperature classification, considering the safety margins described prescribed in EN ISO 80079-36:2016, Clause 8.2. Additionally, the system designer and users must take precautions to prevent rapid system pressurization which may raise the surface temperature of system components and tubing due to adiabatic compression of the system gas. Furthermore, the Joule-Thomson effect may cause process gases to rise in temperature as they expand going through a regulator. This could raise the external surface temperature of the regulator body and the downstream piping creating a potential source of ignition. Whether the Joule-Thomson effect leads to heating or cooling of the process gas depends on the process gas and the inlet and outlet pressures. The system designer is responsible for determining whether the process gas temperature may raise under any operating conditions.

2. Where the process medium is a liquid or semi-solid material with a surface resistance in excess of 1GΩ, special precautions shall be taken to ensure the process does not generate electrostatic discharge.

3. Special consideration shall be made regarding the filtration of the process medium if there is a potential for the process medium to contain solid particles. Where particles are present, the process flow shall be <1m/s (<3.3 ft/s) in order to prevent friction between the process medium and internal surfaces.

4. Effective earthing (grounding) of the product shall be ensured during installation.

5. The valve body/housing shall be regularly cleaned to prevent build up of dust deposits.

6. Regulators must be ordered with the non-relieving option (instead of the self-relieving option) if the process gas they are to be used with is hazardous (flammable, toxic, etc.). The self-relieving option vents process gas through the regulator cap directly into the atmosphere while the non-relieving option does not. Using regulators with the self-relieving option in a flammable gas system could create an explosive atmosphere in the vicinity of the regulator.

7. Tied diaphragm regulators with outlet ranges greater than 7 barg (100 psig) should be preset to minimize the risk that improper operation might lead to an outboard leak and a potentially explosive atmosphere.

8. All equipment must only be fitted with manufacturer's original spare parts.

9. Ensure that only non-sparking tools are used, as per EN 1127-1, Annex A.

	PRODUCT
REGULATORS	31-B, 31-N
	1164, 1164(OPT-45)
	1171, 1171(OPT-45), 1171(CRYO)
	2171, 2171(OPT-45), 2171(CRYO), 3171
	1465, 3381, 3381(OPT-45), 3381(OPT-40)
	4381, 4381(OPT-37), 4381(CRYO), 4381(OPT-45), 5381
	MPRV-H, MPRV-L
	PBE, PBE-L, PBE-H
	CA-1, CA-2
	CA1, SA1, CA4, SA4, CA5, SA5
	DA2, DA4, DA5, DA6, DA8
	DA0, DA1, DAP, SAP
	SLR-1, SLR-2, PTR-1
	ALR-1, ULR-1, PGR-1
	BQ, BQ(OPT-45), BQ(CRYO)
	123, 123(CRYO), 123(OPT-45), 123(OPT-46G)
	123-1+6, 123-1+6(OPT-45), 123-1+6(OPT-46G), 123-1+6+S, 123-1+6+S(OPT-40)
	1000HP, 1000HP(OPT-37), 1000HP(OPT-45), 1000HP(OPT-45G), 1000HP(CRYO)
	1000HP-1+6, 1000HP-1+8, 1000LP, 1000LP(OPT-45), 1000LP(OPT-46G)
	6987
	8310HP, 8310HP-1+6, 8310HP-1+8, 8310LP, 8311HP, 8311LP
	345, 345(OPT-45)
	BA1/BL1, PA1/PL1
	C-BPV, C-PRV, C-CS
	D, D(CRYO), D(OPT-37), D(OPT-20), D(OPT-45)
	DL, DL(LCC), DL(OPT-45)
	BR, BR(CRYO)
	HP, HP(LCC), HP(OPT-45), HP(OPT46G), HP-1+6+S(OPT-40), HP-1+6+S
	P1, P2, P3, P4, P5, P7
	B2, B7
	POSR-1, POSR-2
	5200P, 5300P
	135
	NW-PL, NW-SO
	CG-PILOT
	FG1
CONTROL VALVES	RANGER, 987, PREMIER
	964, 521, 988, 988-MB, 989
	2296/2296HF
	SCV-30, SCV-S
TANK BLANKETING	8700, 8910, 8920, 8930, 8940
	2100, 2199
	3100, 3200, 3300, 3400, 3500, 3600, 3700
	1078, 1088, 1100, 1049
	5100, 5200, 5400 ,5500
	4100, 4200, 4300, 4400, 4500, 4600
MISC	764P/PD, 764-37, 764T

Cashco
P.O. Box 6
Ellsworth, KS 67439-0006
PH (785) 472-4461
Fax. # (785) 472-3539
www.cashco.com
email: sales@cashco.com

Cashco GmbH
Handwerkerstrasse 15
15366 Hoppegarten, Germany
PH +49 3342 30968 0
Fax. No. +49 3342 30968 29
www.cashco.com
email: germany@cashco.com

Cashco do Brasil, Ltda.
Al.Venus, 340
Indaiatuba - Sao Paulo, Brazil
PH +55 11 99677 7177
Fax. No.
www.cashco.com
email: brazil@cashco.com

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