MODEL DAP

DAP - DIRECT-ACTING, PRESSURE LOADED, DIAPHRAGMLESS PRESSURE REDUCING REGULATOR

SECTION I

I. DESCRIPTION AND SCOPE

Model DAP is a pressure reducing regulator used to control downstream (outlet or P2) pressure. Sizes are 1/2" (DN15), 3/4" (DN20), 1" (DN25), 1-1/2" (DN40), and 2" (DN50). With proper trim utilization, the unit is suitable for liquid, gaseous, or steam service. Refer to Technical Bulletin DAP-TB for design conditions and selection recommendations. *(**NOTE:** This product was formerly identified as a Model DP.)*

This manual does not include any instructions related to the various methods of pressure loading a Model DAP main valve.

SECTION II

II. REFERENCES

Refer to Technical Bulletin DAP-TB for technical specifications for this regulator.

ABBREVIATIONS

CCW – Counter Clockwise
CW – Clockwise
ITA – Inner Trim Assembly

SECTION III

III. INSTALLATION

⚠ 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.*

1. Regulator may be rotated around pipe axis 360 degrees. For ease of maintenance, the recommended position is with the cover dome (25) upwards. <u>In liquid service it is recommended that the cover dome (25) be oriented downwards, and that a customer supplied and installed vent valve be provided at the external sensing connection to bleed-off trapped gas/air under the large piston (77)</u>.

2. Provide space below, above, and around regulator for removal of parts during maintenance.

3. Install block valves and pressure gauges to provide means for adjustment, operation, bypass, or removal of the regulator. A pipeline strainer is recommended before inlet to remove typical pipeline debris from entering regulator and damaging internal "soft goods", primarily the dynamic seal and seat.

⚠ 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.

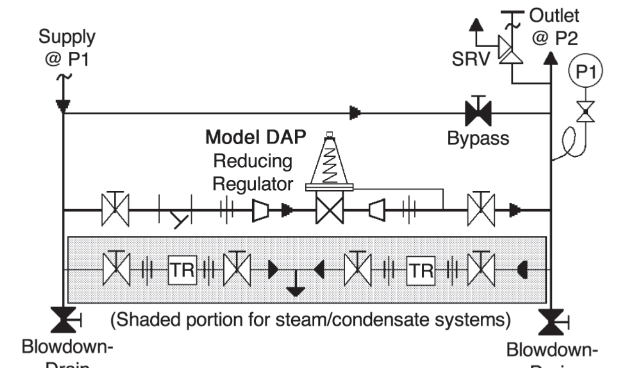
4. Downstream Sensing Installation Considerations – Internal or External Sensing:
   a. The regulator may be installed with internal or external sensing. Unless otherwise specified, the regulator is supplied by factory with internal sensing. The regulator may be converted in the field to external sensing.(See Section VII Maintenance, Part E – Converting Internal/External Sensing.
   b. Reference DAP-TB, Table DAG-11 for recommendations for applying external pressure sensing.
   c. For internal sensing, no external line is required. For external sensing, use an external control line. The line is connected from the 1/4" (DN8) NPT tap (Port 5 – See Fig. 1) on the side of the body diaphragm flange to a pressure tap downstream of the regulator. Use 1/4" or 3/8" outer diameter tubing or 3/8" (DN10) pipe having an inner diameter equivalent to schedule 40 pipe.

d. For condensable vapors (i.e. steam) slope the external sensing line downward 2 to 5 degrees to outlet piping to prevent water pockets, which allows the diaphragm chamber to always be self draining. The external sensing line may be sloped upward for liquids or gases.

5. <u>The loading fluid MUST be the same basic fluid as the fluid passing through the regulator body.</u>

> **⚠ CAUTION**
>
> **DO NOT HYDROSTATIC TEST THROUGH AN INSTALLED UNIT; ISOLATE REGULATOR FROM TEST. The pressure level on the nameplate is the recommended "upper operating limit". Higher pressures could cause internal damage. In addition, note on the nameplate that the <u>Inlet and Outlet pressure and temperature ratings are at different levels.</u>**

> **⚠ 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.**



Recommended Piping Schematic For Pressure Reducing Station

SECTION IV

IV. PRINCIPLE OF OPERATION

1. When a loading pressure – P_{Load} – is applied to the top side of the piston (77), the outlet controlled pressure – P2 – will balance at approximately 0.96–.98 of the loading pressure - P_L. (***NOTE:*** *Fluctuations in P1 – Inlet Pressure will cause a deviation in P2 – Outlet Pressure due to inverse sympathetic ratio effect.)* See Section VIII.

2. Movement occurs as pressure variations register on the underneath side of the piston (77). The registering pressure is the outlet, P2, or downstream pressure. The loading pressure fluid opposes piston movement. As outlet pressure drops, the loading pressure pushes the piston down, opening the port; as outlet pressure increases, the piston pushes up and the port opening closes.

3. A complete piston dynamic seal failure will cause the regulator to fail closed. A loss of loading pressure while inlet pressure is imposed will cause valve to fail closed.

SECTION V

V. STARTUP

1 Start with the block valves closed.

2. Adjust the loading system pressure control device so that the main valve is trying to be controlled at 0 psig pressure.

3. If it is a "hot" piping system, and equipped with a bypass valve, slowly open the bypass valve to preheat the system piping and to allow slow expansion of the piping. Ensure proper steam trap operation if installed. Closely monitor outlet (downstream) pressure via gauge to ensure not over-pressurizing. ***NOTE:*** *If no bypass valve is installed, extra caution should be used in starting up a cold system; i.e., do everything slowly*.

> **⚠ CAUTION**
>
> **Do not walk away and leave a bypassed regulator unattended!**

4. Crack open the outlet (downstream) block valve to approximately 10% full open.

5. Slowly open the inlet (upstream) block valve to about 25% open. Adjust the loading system pressure control device setpoint pressure upwards until the regulator is flowing. Observe the outlet pressure gauge to ensure not overpressurizing.

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

7. 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 block valve and go to Step 2. Close bypass valve approximately 25%, and repeat procedure.

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

9. Develop system flow to a level near its expected normal rate, and reset the regulator set point by adjusting the loading system pressure control setpoint to the desired outlet pressure level.

10. Reduce system flow to a minimum level and observe pressure set point. The maximum rise in outlet pressure on decreasing flow should not exceed 10%. If it does, consult factory.

SECTION VI

VI. SHUTDOWN

1. Shutoff process loading pressure if other than main valve process fluid source.

2. Shutoff inlet block valve.

3. Allow sufficient time for the line pressure downstream of the inlet block valve to bleed down.

4. Shutoff the outlet block valve.

5. Relieve the trapped upstream and downstream pressure and loading pressure.

6. The regulator may now be removed from the pipeline or disassembled for inspection and preventative maintenance while in-line.

SECTION VII

VII. MAINTENANCE

A. General:

1. The regulator may be serviced without removing the regulator from pipeline. The regulator is designed with quick-change trim to simplify maintenance.

2. Record the nameplate information to requisition spare parts for the regulator. The information should include: size,Product Code, Serial Number, and internal or external sensing. ***(NOTE:** Never both types of sensing.)* If external sensing is used, be sure that the external sensing line is connected.

3. Refer to Section VIII for recommended spare parts. Only use original equipment parts supplied by Cashco for rebuilding or repairing regulators.

4. Owner should refer to owner's procedures for removal, handling, cleaning and disposal of nonreusable parts, i.e. gaskets, etc.
   ***NOTE:** Regulators originally supplied as "special clean" – Opt-56, maintenance must include a level of cleanliness equal to Cashco cleaning standard #S-1542.*

B. Main Regulator Disassembly:

⚠ WARNING

SYSTEM UNDER PRESSURE. Prior to performing any maintenance, isolate the regulator from the system and relieve all pressure. Failure to do so could result in personal injury.

1. Shut down the system in accordance with Section VI.

2. Disconnect the external sensing line, if installed.

3. Though it is possible to disassemble the regulator while installed in a pipeline, it is recommended that maintenance be done in a shop when possible. The description hereafter will assume shop disassembly. Remove regulator from pipeline.

4. Place the body in a vise with the cover dome (25) upwards.

5. Place matchmarks on body (23) and cover dome (25) flange.

6. Loosen body/cover dome flange bolts (11) and nuts (12) uniformly and remove bolting.

7. Remove the cover dome (25) by lifting vertically. Set cover dome aside.

8. Place a deep, offset, box end wrench over the piston lock nut (7). Place another box end wrench over the upper end of plug (20). Loosen lock nut by rotating CCW (viewed from above). Remove lock nut (7).

9. Lift piston (77) vertically up to remove. Set piston aside on a flat work area.

10. Remove lower, dynamic, u-cup balancing, side seal (27). Inspect for wear, leakage, damage, etc.; discard when inspection is completed. ***NOTE:** Seal may be found around the piston (77) when it is withdrawn, or it may be nested within the cage (19).*

11. Remove three cage bolts (18) that secure cage (19) in the body (23).

12. Remove plug (20), cage (19), lower retainer ring (109), seat ring (21), and stem seal o-ring (14) from body by pulling stem upwards and out of body (23) cavity.

13. Remove the plug (20), lower retainer ring (109), and stem seal (14) from the cage (19). Inspect for unusual signs of wear or leakage. Discard stem seal (14). Replace plug (20) or lower retainer ring (109), if badly worn.

14. Remove seat ring (21) from lower end of cage (19). Inspect for unusual signs of wear. Discard following inspection.

15. Inspect piston (77). Remove the upper retainer screws (110) securing the upper retainer ring (108) to piston. Remove upper retainer ring.

16. Remove upper dynamic actuator seal (78). Inspect for wear, leakage, damage, etc.; discard when inspection is completed.

17. Remove o-ring cage seal (15). Inspect for signs of leakage. Discard cage seal (15).

18. Remove o-ring body/cover dome seal (65). Inspect for signs of leakage. Discard following inspection.

19. If supplied with "internal" sensing, remove internal sensing drilled plug (32) using 5/32" (4mm) Allen wrench.

20. If installed, remove lower piston spring (22) from body (23) cavity.

21. Remove body (23) from vise. Solvent clean all removed metal parts to be used at reassembly.

C. Inspection of Parts:

1. After inspection, discard the old “soft goods” parts (i.e. o-rings, seals, gaskets, etc.). These parts <u>MUST</u> be replaced with factory supplied new parts.

2. Inspect the metal parts that will be reused. The parts should be free of surface contaminants, burrs, oxides, and scale. Rework and clean the parts as necessary. Surface conditions that affect the regulator performance are stated below; replace parts that can not be reworked or cleaned.

3. QC Requirements:
   a. <u>Regulator plug (20)</u>;
      1. 16 rms finish on its seating surface for tight shutoff.
      2. No major defects on bottom guide spindle.
   b. <u>Cage (19)</u>;
      1. 16 rms finish on cylinder bore. No “ledges” formed due to wear from moving dynamic balancing side seal (27).
   c. <u>Cover Dome (25)</u>;
      1. 16 rms finish on cover dome cylinder bore. No “ledges” formed due to wear from moving upper dynamic actuator seal (78).
   d. <u>Lower guide bushing (24) (non-replaceable)</u>:
      1. 16 rms finish in bore.
      2. Max 0.015 inch (0.38 mm) clearance between plug (20) spindle and lower guide bushing (24).
   e. <u>Internal sensing drilled plug (33)</u>;
      1. Ensure that bore is minimum 0.125 inch (3.20 mm). Drill out as required.

4. Staging Material for Reassembly.
   a. Inspect and clean parts, as necessary, from the spare parts kit. (See Article VII.A.4. comments concerning cleaning for oxygen service.)

   b. Lay out all the regulator parts and check against the bill of material.

D. Main Regulator Reassembly:

1. Place body (23) in a vise.

2. If equipped with "internal" sensing, reinstall internal sensing drilled plug (32), use compatible thread sealant.

3. Insert the lower piston spring (22) into the body (23), if supplied.

4. Fit o-ring cage seal (15) into body groove.

5. Place o-ring stem seal (14) over threaded end of plug (20) down to proper position.

6. Lower plug (20) into body (23) cavity, inserting the plug spindle into the lower guide bushing (24), ensuring that the lower piston spring (22), if installed, is properly positioned in the bottom of the body and around the plug.

7. Place the seat ring (21) properly oriented onto

the lower ledge of the cage (19).

8. Carefully insert the cage (19) and seat ring (21) into the body (23) cavity, around the plug (20).

9. Properly align all three cage bolt (18) holes as there is only one circumferential location possible for this alignment. If a lower piston spring (22) is used, apply downward force to the top of the cage (19) until the plug (20) is lowered sufficiently to engage the cage bolts into the body (23). Engage threads of all the cage bolts into the body, then rotate the cage bolts CW in one-half revolution increments to pull the plug (20) down evenly, taking care NOT TO "COCK" THE PLUG (20) IN THE BODY. Torque the cage bolts to 13-15 ft-lbs (17.5-20 N-m).

10. Insert lower retainer ring (109) over the threaded end of the plug (20) and down around the stem seal (14).

11. Place piston (77) into a vise, use the jaws to secure that portion of the piston's underneath side that does not insert into the cage (19); i.e., the larger diameter "hub".

12. Stretch a new properly oriented upper dynamic actuator seal (78) onto the piston (77) groove. ***NOTE:*** *The open-end of the u-cup seal should be upwards such that the loading pressure fluid "fills" the cup portion of the seal (78).*

13. Position upper retainer ring (108) onto piston (77). Engage threads of all retainer screws (110) and tighten each securely in an alternating crossing-pattern.

14. Remove piston (77) from vise.

15. Stretch properly oriented lower dynamic balancing side seal (27) over the lower end of the piston (77). (*NOTE: The open-end of the u-cup seal (27) should be downwards such that the P1 inlet pressure fluid "fills" the cup portion of the seal.*

16. Position piston (77) with the dynamic side seal (27) over the threaded end of the plug (20) and slide down to the upper edge of the cage (19). Try to "tilt" the piston (77), as much as possible, to one side while placing a downwards force to engage the lip of the dynamic side seal (27) into the cage (19); using a thumb, press the outer edge of the dynamic side seal inwards to aid the insertion, move circumferentially around the seal until it slides downwards into the cage fully.

17. Engage threads of lock nut (7) on threaded end of plug (20). Hand-tighten as far as possible.

18. Place a deep offset box end wrench onto the lock nut (7). Place a torque wrench on the protruding end of the stem. Tighten the lock nut (7) to the following torque levels:

Body Size **in (mm)**	**Torque Value** **Ft-lbs (N-m)**
1/2" - 1" (DN15 - 25)	60 - 70 (81 - 95)
1 1/2" - 2" (DN40 - 50)	120 - 130 (163 - 176)

19. Units with V-TFE & CTFE seat ring (21): Due to the relative "hardness" of the V-TFE & CTFE material, to obtain the best possible shutoff it is necessary to "coin" the V-TFE & CTFE with a permanent indentation.
    a. Close-off the outlet connection.
    b. The level of seat leakage can be quantified at the internal sensing drilled plug (32) for units equipped with internal sensing. For units with external sensing, it will be necessary to remove the internal sensing plug (33).
    c. Place 50 psig (3.5 Barg) of gas pressure to the valve's inlet.
    d. Using a soft-headed mallet (rubber, leather), sharply rap the top end of the plug (20). (Note: Gas will escape as the plug (20) opens at the seat ring (21). Allow sufficient time for leakage pressure on outlet to bleed-off.) The hammer rap should be strong enough to "bounce" the plug (20) into the seat ring (21), leaving the "coined" indentation.
    e. Repeat d. a minimum of 2 times until the best possible seat leakage is obtained.
    f. After "coining" completed, remove gas pressure source, remove outlet closure, and reinstall plug (33) if removed.

20. Place new o-ring flange seal (65) into groove of body (23) flange.

21. Position cover dome (25) matchmarks correctly, then bring cover dome (25) down to large piston (77). Tilt the cover dome (25) approximately 20° from vertical and press down on the cover dome (25) while using thumb to press the actuator seal (108) into the cover dome (25). When seal (108) is fully inserted,

align matchmarks from body (23) to cover dome (25).

22. Insert bolting (11, 12) and hand-tighten. Final tighten by torque wrench in an alternating cross-pattern to the following torque levels:

Body Size in (mm)	Torque Ft-lbs (N-m)
Non-PED All Sizes	35-40 (47-54)
PED All Sizes	25-30 (34-41)

E. <u>Converting Internal/External Sensing</u>:

1. Disassemble the regulator and remove the piston (77) according to Steps 1-10 in Part B – Main Regulator Disassembly.

2. To convert from internal to external sensing, remove the drilled pipe plug (32) and install a solid pipe plug. Reverse this step for converting from external to internal sensing.

3. Reassemble the regulator according to Part D – Main Regulator Reassembly.

F. <u>Pressure Testing</u>:

1. Model DAP has two different pressure ratings – one for inlet, the other for outlet/cover dome. If full inlet pressure hydrostatic test is required, then it is necessary to fabricate a "plug" to seal the "inlet zone" from "outlet zone" of valve for this high pressure test.

2. If an outlet pressure rating hydrostatic pressure test is performed, pressure <u>must</u> be applied to all three of cover dome (25), inlet and outlet of body at the same level.
DO NOT HYDROSTATICALLY TEST WITHOUT COVER DOME PRESSURIZED. NOT ADHERING MAY DO PHYSICAL INTERNALS DAMAGE THAT COULD RENDER THE UNIT INOPERABLE.

3. <u>Inboard Leakage Test</u>.

   a. Release all loading pressure in cover dome.
   b. Pressurize inlet to 50 psig (0.35 Barg) with air, GN_2.
   c. Tube outlet to a beaker of water to observe number of escaping gas bubbles.

   Inboard leakage path may be via plug/seat or dynamic side seal or both.

4. <u>Pressure Containment Test</u>.

   a. Pressurize inlet to 200 psig (14 Barg); outlet and cover dome to 150 psig (10.5 Barg) with air or GN_2.
   b. Soap solution test all external leak points; plugged connections, cover and flange and bolting.

5. Excessive leakage will require disassembly, examination of sealing elements, correction of problem, reassembly and retesting.

SECTION VIII

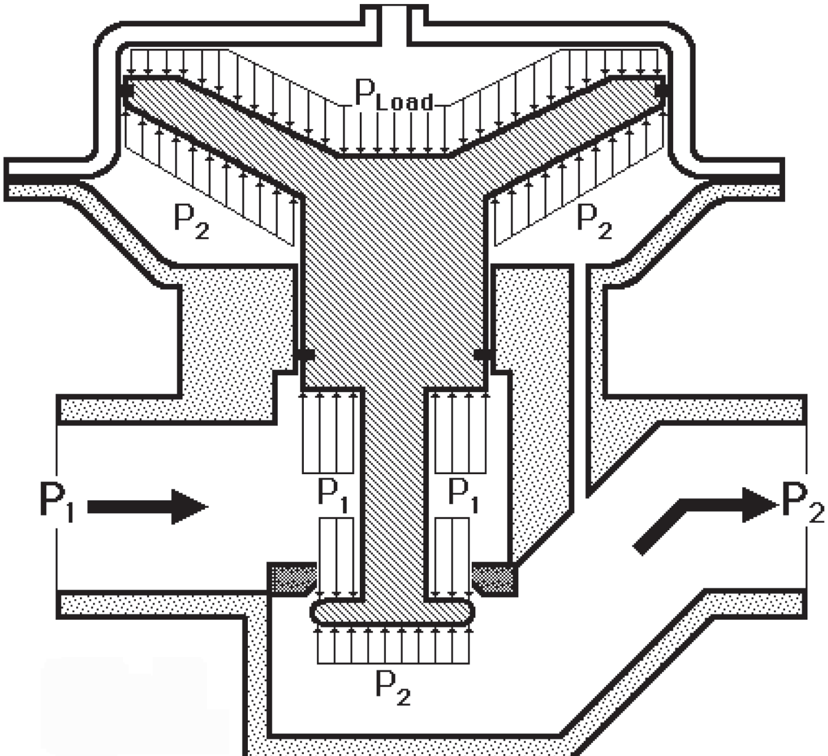
VIII. PRESSURE LOADING

1. Loading pressure can be supplied using various schemes. Please reference LOADING SYSTEMS on web-site for the schematics of these various schemes, including:
   - pressure unloading using BPV
   - pressure loading using PRV
   - pressure loading using pilot
   - pressure loading using I/P transducer

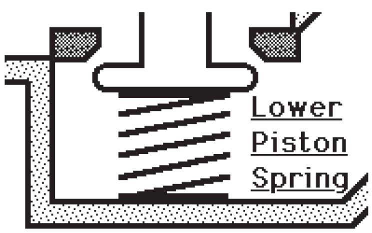
2. A Model DAP exhibits a deviation in outlet controlled pressure when the inlet pressure varies; this “effect” is identified as ISR – Inverse Sympathetic Ratio. Its relative pressure effect can be calculated from following equation.

LOADING PRESSURE FOR MODEL DAP —

APPLIED PRESSURES



ISR FACTOR	
BODY SIZE	ISR - %
1/2"-1" (DN15-25)	3.0
1-1/2" (DN40)	4.0
2" (DN50)	2.0



LOWER PISTON SPRING			
Model	Lower Piston Spring Range psig (Barg)	$\Delta P_{Piston\ Spr}$ psig (Barg)	LVPS psig (Barg)
DAP	2-5 (.14-.35)	3 (0.21)	2 (0.14)
	4-10 (.28-.69)	6 (0.42)	4 (0.28)

P_{Load} = ISR Effect + Lower Piston Spring Compression Effect + Lower Piston Spring Spring Preload

$$P_{Load} = P_2 + \left[ISR \times (P_1 - P_2) \right] + \left[\frac{C_V Req'd}{C_V Max} \times \Delta P_{Piston\ Spr.} \right] + LVPS$$

REVISION: 2-20-02

SECTION IX

IX. TROUBLE SHOOTING GUIDE

When trouble shooting this regulator there are many possibilities as to what may be causing problems. Many times, the regulator itself is not defective, but one or more of the accessories may be. Sometimes the process may be causing difficulties.

The key to efficient trouble shooting is information and communication. The customer should try to be as precise as possible in their explanation of the problem, as well as their understanding of the application and operating conditions.

It is imperative the following information be provided by the customer:

- Fluid (with fluid properties)
- Range of flow rate
- Range of inlet pressure
- Range of outlet pressure
- Range of fluid temperature
- Range of ambient temperature

Pressure readings should be taken at every location that pressure plays a role - i.e., regulator inlet (as close as possible to inlet port), regulator outlet (as close as possible to outlet port), etc.

Following are some of the more common complaints along with possible causes and remedies.

1. Erratic regulation, instability or hunting.

Possible Causes	Remedies
A. Sticking of internal parts.	A. Remove internals, clean, and if necessary, replace.
B. Load changes are too quick for system.	B. Convert to external sensing (if necessary) and an orifice or needle valve in external sensing line.
C. Oversized regulator.	C. Check actual flow conditions; resize regulator for minimum and maximum flow; if necessary, replace with smaller regulator.
D. Too much variation in Inlet Pressure – P1.	D. Consider use of a pilot for closer Outlet Pressure – P2.

2. Erratic regulation, instability or hunting (liquid service).

Possible Causes	Remedies
A. Air trapped under large piston.	A. Install valve on external sensing port and bleed off air.(Install regulator upside down to help prevent reoccurrence.)

3. Downstream pressure will not reach desired setting.

Possible Causes	Remedies
A. Supply pressure is down (confirm on pressure gauge).	A. Increase supply pressure.
B. Undersized regulator.	B. Check actual flow conditions; resize regulator for minimum and maximum flow; if necessary, replace with larger regulator.
C. Pressure loading system pressure restricted.	C1. Clean restriction or bleed orfices. C2. Clean filter(s). C3. Clean loading pressure control device.
D. Faulty loading pressure control device.	D. Replace/repair loading pressure control device.

4. Leakage at diaphragm flange.

Possible Causes	Remedies
A. Body bolts not torqued properly.	A. Torque to proper value (see Section VII, paragraph D-21).
B. Pressures at outlet may be too high for regulator design.	B. Consult factory.

5. Leakage across seat.

Possible Causes	Remedies
A. Contamination (debris) in regulator.	A1. Remove internals, clean, and if necessary, replace sealing and seating elements. * Consider filter/ strainer. A2. "Coin" seat if V-TFE or CTFE seat material.
B. Oversized regulator; valve plug operates directly next to seat.	B. Check actual flow conditions; resize regulator for minimum and maximum flow; if necessary, replace with smaller regulator.
* Excess seat leakage may be diagnosed when a failure of the dynamic balancing side seal or dynamic actuator seal has occurred. Inspect <u>all three</u> potential internal leak paths.	

6. Dynamic Seal Leakage.

Possible Causes	Remedies
A. Contamination (debris) in regulator.	A. Remove internals, clean, and if necessary, replace sealing and seating elements. * Consider filter/ strainer.
B. Seal failure.	B. Replace both dynamic seals.
C. Seal leakage.	C. Seal installed upside down. Remove and reverse up-down. (Confirm with drawings).

7. Downstream Pressure too High.

Possible Causes	Remedies
A. Seat leakage.	A. Replace seat.
B. Dynamic balancing side seal is failing.	B. Replace both dynamic seals.
C. Dynamic actuator seal is failing.	C. Replace both dynamic seals.

SECTION X

X. 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, Inc., 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, Inc., 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.

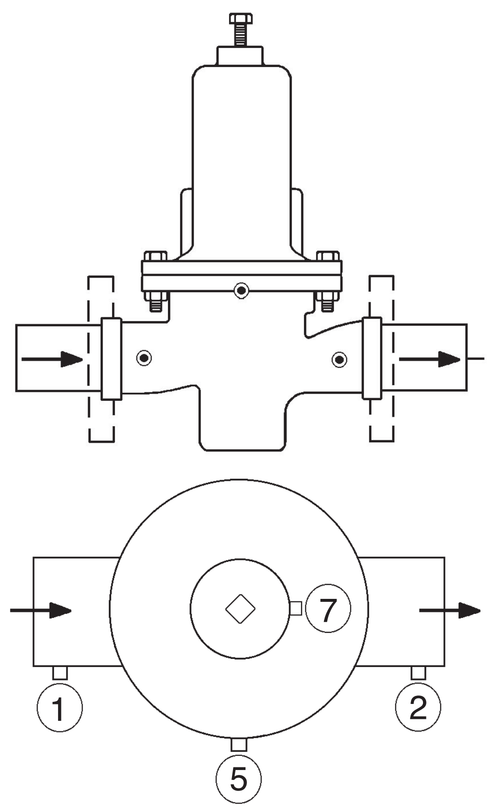
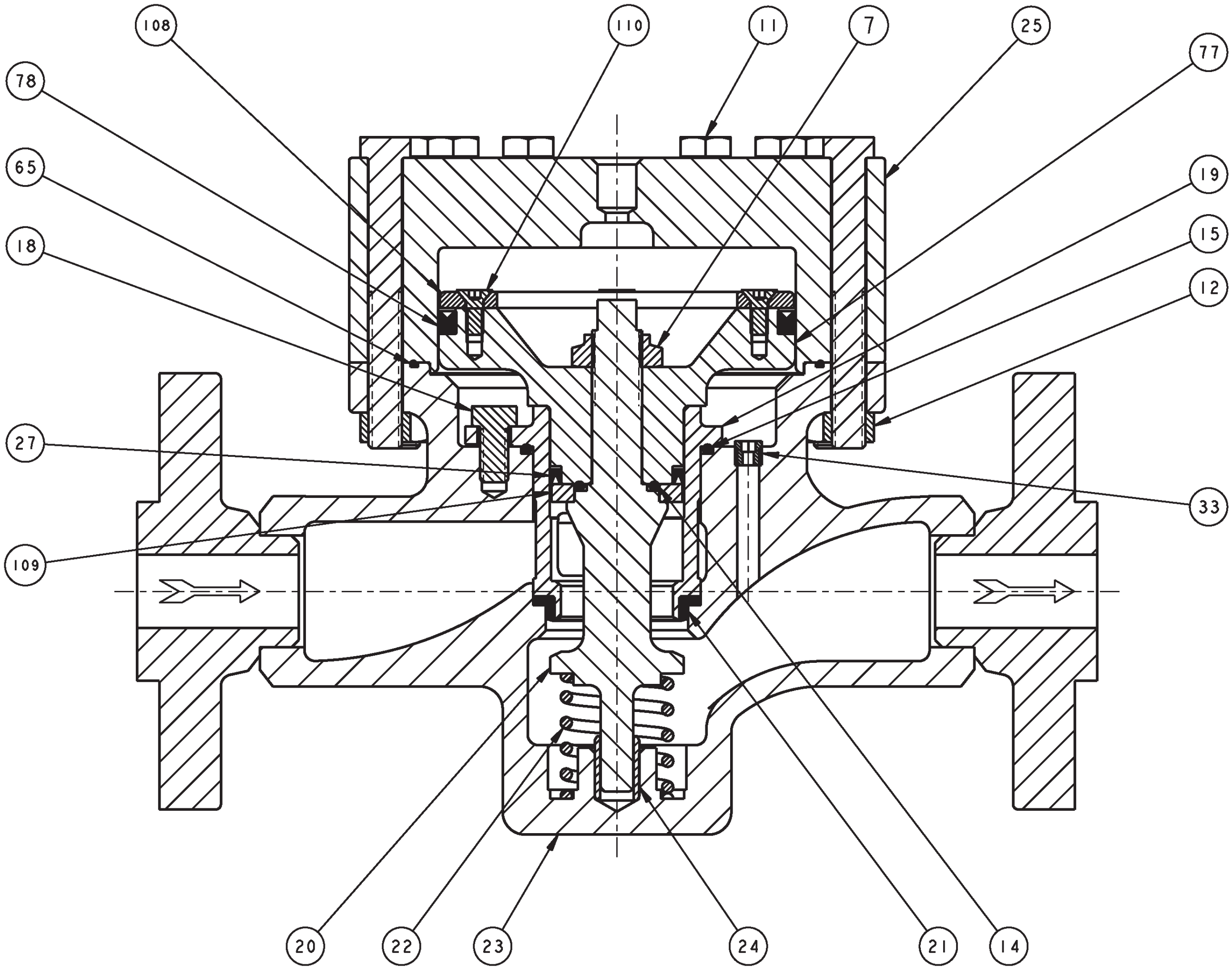


Figure 1: Location of Auxiliary Ports



Item No.	Description	Item No.	Description
7	Lock Nut	27 ‡‡	Lower Dynamic U-cup Balancing Side Seal
11	Body/Cover Dome Bolts	33	Internal Sensing - Drilled Plug (External is solid)
12	Body/Cover Dome Nuts	65 ‡‡	O-ring Body/Cover Dome Seal
14 ‡‡	O-ring Stem Seal	77	Piston
15 ‡‡	O-ring Cage Seal	78 ‡‡	Upper Dynamic Actuator Seal
18 ‡‡	Cage Bolts	108	Upper Retainer Ring
19	Cage	109	Lower Retainer Ring
20	Regulator Plug	110	Upper Retainer Screw
21 ‡‡	Seat Ring		
22	Lower Piston Spring (if supplied)		
23	Body		
24	Lower Guide Bushing		
25	Cover Dome		

‡‡ Recommended Repair Parts

ATEX 2014/34/EU: Explosive Atmospheres and Cashco Inc. Products

Cashco, Inc. 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. 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
	FL800/FL200
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, Inc.
P.O. Box 6
Ellsworth, KS 67439-0006
PH (785) 472-4461
Fax. # (785) 472-3539
www.cashco.com
email: sales@cashco.com
Printed in U.S.A. DAP-IOM

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