



MODEL C-BPV

BACK PRESSURE / RELIEF REGULATOR

SECTION I

I. DESCRIPTION AND SCOPE

Model C-BPV is a self-contained back pressure / relief regulator utilized in sanitary biotechnological process piping systems and is used to control upstream (inlet or P_1) pressure. Inlet and outlet sizes are 3/4", 1", 1-1/2", 2" and 3". This angle style regulator is only suitable for liquids and gases at temperatures less than 300°F (149°C). Refer to Technical Bulletin C-BPV-TB for specific design conditions.



CAUTION

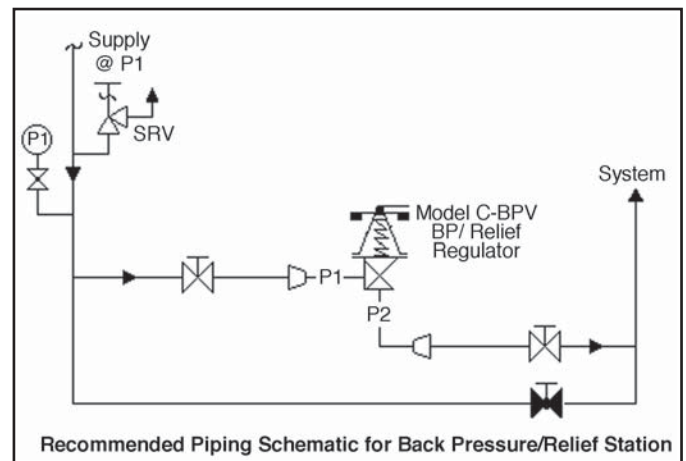
This is not a safety device and must not be substituted for a code approved pressure safety relief valve or a rupture disc.

SECTION II

II. INSTALLATION

A. General:

1. A diaphragm valve should be installed upstream of the regulator.
2. An inlet pressure gauge should be located approximately ten pipe diameters upstream and within sight.
3. All installations should include an upstream relief device if the inlet pressure could exceed the pressure rating of any equipment or the maximum inlet pressure rating of the unit.
4. Flow Direction: Install so flow enters through the side connection and exits the bottom connection.
5. Install with spring chamber (2) in the vertical up position to allow for proper draining.



Recommended Piping Schematic for Back Pressure/Relief Station



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.

SECTION III

III. PRINCIPLE OF OPERATION

A. General:

1. Movement occurs as pressure variations register on the diaphragm. The registering pressure is the inlet, P_1 or upstream pressure. The range spring opposes diaphragm movement.

As the inlet pressure drops, the range spring pushes the diaphragm down, closing the port; as inlet pressure increases, the diaphragm pushes up and the port opens.

2. A complete diaphragm failure may cause the regulator to fail close, and process fluid will discharge from the spring chamber vent hole.

SECTION IV

IV. START-UP

A. General:

1. Ensure that lock-open pin (10) and quick release pin (15) are in proper position. See Section VII.
2. Confirm 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.
3. When stating direction of rotation of the adjusting screw, the view is with respect to looking down towards the spring chamber or its normal location.

B. For systems utilizing an upstream block valve:

1. Start with the block valve closed. A bypass valve may be used to maintain inlet pressure in the upstream system without changing the following steps.
- 2a. **For range springs 2 - 75 psig** - Relax range spring (7) by turning adjustment nut (6) or handle (36) counter-clockwise (CCW) until rotation stops. Rotate adjustment nut (6) clockwise (CW) three (3) full revolutions to maintain spring (7) to diaphragm-plug assembly (14) contact. This reduces the inlet (upstream) pressure setpoint.
- 2b. **For range spring 60 - 125 psig** - Relax range spring (7) by turning handle (36) counter-clockwise (CCW) until rotation stops. Rotate handle (36) clockwise (CW) three (3) full revolutions to maintain spring (7) to diaphragm-plug assembly (14) contact. This reduces the inlet (upstream) pressure setpoint.
3. Slowly open the block valve until fully open.
4. Observing the inlet (upstream) pressure gauge, rotate the adjustment nut (6) or handle (36) clockwise (CW) slowly until the inlet pressure begins to rise. Rotate CW until the desired setpoint is reached.

5. If the inlet (upstream) pressure exceeds the desired setpoint pressure, rotate the adjustment nut (6) or handle (36) CCW until the pressure decreases.
6. When flow is established steady enough that the block valve is fully open, begin to slowly close the bypass valve, if installed.
7. Develop system flow to a level near its expected normal rate and reset the regulator setpoint by turning the adjustment nut (6) or handle (36) CW to increase inlet pressure or CCW to reduce inlet pressure.
8. Reduce system flow to a minimum level and observe setpoint. Inlet pressure will rise from the setpoint of Step 6. (Ensure that this rise does not exceed the stated upper limit of the range spring by greater than 30%, i.e. 20-60 psig (1.38-4.14 Barg) range spring, at maximum flow the inlet pressure should not exceed 1.3 x 60 psig (4.14 Barg) or 78 psig (5.4 Barg). If it does, consult the factory.)
9. Increase flow to maximum level, if possible. Inlet (upstream) pressure should fall off. Re-adjust setpoint as necessary at the normal flow rate.

C. For systems not utilizing an upstream block valve:

1. Refer to instructions B. 2a and 2b previous.
2. Closely monitor inlet (upstream) pressure, via gauge, to ensure not over-pressurizing as system flow is established. Rotate adjustment nut (6) or handle (36) CW slowly until the inlet pressure begins to rise to desired setpoint. Slowly close the bypass valve, if installed.
3. If the inlet pressure exceeds the desired setpoint pressure, rotate the adjustment nut (6) or handle (36) CCW until the pressure decreases.
4. Follow instructions in "B", Steps 7 thru 9.

SECTION V

V. SHUTDOWN

1. On systems with a bypass valve, and where system pressure is to be maintained as the regulator is shutdown, 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.)



CAUTION

Do not walk away and leave a bypassed regulator unattended.

2. If the regulator and system are both to be shutdown, slowly close the inlet (upstream) block valve.

SECTION VI

VI. MAINTENANCE

⚠ 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.

A. General:

1. Unit's lock-open feature allows this regulator to be cleaned in-line; see Section VII.
2. Maintenance procedures hereinafter are based upon removal of regulator unit from the pipeline where installed.
3. Owner should refer to owner's procedures for removal, handling and disposal of non-reusable parts.
4. After dis-assembly, inspect, replace and clean parts in accordance to owner's specifications.

⚠ CAUTION

Owner's cleaning solution must be compatible with regulator's trim materials.

***NOTE:** For those fluids which could create a potential hazard to personnel working on this unit, owner must provide an OSHA approved MSDS (Material Safety Data Sheet), and a signed statement attesting to the fact that the unit has been flushed out, for a specific period of time, using an OSHA acceptable neutralizing agent. The name of the agent, manufacturer's name and total concentration level must also be included for both the service medium as well as the neutralizing agent. Returns WILL NOT BE ACCEPTED by Cashco, Inc. without an MSDS form attached to the outside of shipping carton.*

4. Refer to Figures 3 and 4 for item numbers ().

B. Trim Replacement:

1. Securely install the body (1) in a vise with the spring chamber (2) directed upwards. Ensure that the body (1) is not held in the vise by the edge of the end connection flange.

⚠ WARNING

SPRING UNDER COMPRESSION. Prior to removing the clamp (13), relieve spring compression by rotating the adjustment nut (6) or handle (36) CCW when viewed from above. Failure to do so may result in flying parts that could cause personal injury.

2. Ensure that the lever (16) is in standard horizontal position. Relax range spring (7) by turning adjustment nut (6) or handle (36) CCW until rotation stops.

- 3a. **For range springs 2 - 75 psig** - pull ring on pin (15) to remove pin, lever (16), nut (6) or handle (36) and collar (19).

- 3b. **For range spring 60 - 125 psig** - pull ring on pin (15) to remove pin, cam (16), slide base (24) assembly, bearing plate (29) and collar assembly (28).
 - a. Use a small round punch to tap and remove spring pin (32). Note the location of the eye nut (27). Count the number of revolutions (CCW) to remove eye nut (27) from top of guide post assembly (22). Record the count here.

No. of Revolutions to remove eye nut.	
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4. Loosen clamp (13) and remove.
 - a. **For Opt. -80** 2-piece clamp design See Fig 1: Loosen and remove clamp nuts (13B), washers (13D), bolts (13C) and clamps (13A).
5. Lift spring chamber (2) up off body (1) and set aside. Remove bearing seal (23). Lift up to remove adjusting screw assembly (5), spring button (4) and spring (7) off guide post (22).
6. Grasp cap (5.1) of adjusting screw assembly with hand and lift up to separate and remove cap (5.1) and two u-cup seals (5.4). Do Not remove dowel pin (5.2).
7. Install two new u-cup seals (5.4) into the adjusting screw cap (5.1). Insert the first u-cup with the open side with the spring showing into the hole in the cap. Ensure that the u-cup is pressed all the way in. Look into the hole to confirm that the white seal material is showing and not the spring material. Then press second u-cup seal with white seal material side in first into the hole all the way in next to the first u-cup. (Spring side of u-cup should be visible).
8. Slide adjusting screw cap (5.1) with new u-cup seals (5.4) and adjusting screw (5.3) together, use the dowel pin (5.2) for alignment. **NOTE;** *Top end of pin (5.2) should be flush with top surface of adjusting screw cap (5.1).* Place new seal (23) on adjusting screw cap (5.1). Set parts aside.
9. Grasp the guide post (22) and lift upwards to remove diaphragm (14) and plug (18) sub-assembly.

10A. **For Sizes 3/4"-1-1/2" w/lower spring ranges:**

Clamp the plug (18) at the flats on the plug in a smooth jawed vice.

- a. Place a wrench at the flats on the adapter (20) and rotate CCW to remove adapter (20), and guide post (22) from the plug (18).
- b. Remove pressure plate (3), diaphragm (14) and diaphragm spacer (38). **NOTE:** *Correct orientation of spacer (38) has the side with the I.D. radius towards the clamping surface of the plug.*
- c. Install diaphragm spacer (38) on plug (18). Place new diaphragm (14) with convolution side facing up, onto plug (18) and fit it around the diaphragm spacer (38).
- d. Lay pressure plate (3) on top of diaphragm (14).
- e. Apply Loctite 242 or equivalent to the threads of the adapter (20) and thread adapter (and guide post (22)) through parts and into plug (18) and tighten to 60 in-lbs of torque.
- f. Replace plug/guide post assembly of parts back into body (1). Align tab on diaphragm with the tab slot cut in the body flange lip.
- g. Place spring (7) over guide post (22) and fit it around adapter (20).
- h. Return spring button (4) with adjusting screw assembly (5) and bearing (23) down over guide post (22) onto spring (7). Align one tab (ear) on spring button (4) directly above tab slot in the body flange lip.
- i. Align the two ribs inside the spring chamber (2) with the tabs on the spring button (4) and place the spring chamber (2) over assembled parts directly on body (1).
- j. Position the Tri-Clamp (13) around the mating flanges of the body (1) and the spring chamber (2) with the threaded fastener aligned with the tab slot cut in the body flange lip. Clamp should be tightened to approximately 4 to 6 ft-lbs. (Apply same torque for Opt.-80) - See Figure 1.
- k. Place load collar (19) and adjustment nut (6) or handle (36) over guide post (22).
- l. Place lever (16) over guide post (22) and insert quick release pin (15) through holes in lever and post.
- m. See Section IV for start up and adjustment of set point and Section VII for Cleaning.

10B. **For Sizes 1-1/2"-3" w/lower spring range:**

Clamp the lower end of the plug (18) in a smooth jawed vice, around the outside edges of the winged design.

- a. Remove set screw (37) from guide post assembly (22).
- b. Rotate guide post (22) CCW and remove from plug (18).
- c. Turn adapter (20) CCW and remove pressure plate (3), diaphragm (14) and diaphragm spacer (38). **NOTE:** *Correct orientation of spacer (38) has the side with the I.D. radius towards the clamping surface of the plug.*
- d. Reinstall diaphragm spacer (38) on plug (18). Place new diaphragm (14) with convolution side facing up, onto plug (18) and fit it around the diaphragm spacer (38).
- e. Lay pressure plate (3) on top of diaphragm (14).
- f. Apply Loctite 242 or equivalent to the threads on the plug (18) and secure adapter (20) to plug (18). Tighten to 60 in-lbs of torque.
- g. Secure guide post (22) to threaded end of plug (18) hand tight. Adjust final rotation to ensure that the set screw (37) will lock firmly against one of the surface flats on the plug (18).
- h. Apply Loctite 242 or equivalent to threads of set screw (37) and thread tight into guide post.
- i. Replace plug/guide post assembly of parts back into body (1). Align tab on diaphragm with the tab slot cut in the body flange lip.
- j. Place spring (7) over guide post (22) and around adapter (20).
- k. Return spring button (4) with adjusting screw assembly (5) and bearing (23) down over guide post (22) onto spring (7). Align one tab (ear) on spring button (4) directly above tab slot in the body flange lip.
- l. Align the two ribs inside the spring chamber (2) with the tabs on the spring button (4) and place the spring chamber (2) over assembled parts directly on body (1).
- m. Position the Tri-Clamp (13) around the mating flanges of the body (1) and the spring chamber (2). Align the threaded fastener with the tab slot cut in the body flange lip. The clamp should be tightened to approximately 4 to 6 ft-lbs. (Apply same torque for Opt.-80) - See Figure 1.
- n. Place load collar (19) and adjustment nut (6) or handle (36) over guide post (22).
- o. Position lever (16) over guide post (22) and insert quick release pin (15) through holes in lever and post.
- p. See Section IV for start up and adjustment of set point and Section VII for Cleaning.

10C. **For Sizes 3/4" - 1-1/2 w/65-125 psig range**

spring:

Clamp the plug (18) at the flats on the plug in a smooth jawed vice.

- a. Remove set screw (26).
- b. Rotate guide post (22) assembly CCW and remove from adapter (31).
- c. Place a wrench on the flats of the adapter (31) and rotate CCW to remove from plug (18).
- d. Remove pressure plate (3), diaphragm (14) and diaphragm spacer (38). **NOTE:** *Correct orientation of spacer (38) has the side with the I.D. radius towards the clamping surface of the plug.*
- e. Reinstall diaphragm spacer (38) on plug (18). Place new diaphragm (14) with convolution side facing up, onto plug (18) and fit it around the diaphragm spacer (38).
- f. Lay pressure plate (3) on top of diaphragm (14).
- g. Apply Loctite 242 or equivalent to the long threaded end on the adapter (31) and secure adapter (31) to plug (18). Tighten to 60 in-lbs of torque.
- h. Secure guide post assembly (22) to threaded end of adapter (31) hand tight. Adjust final rotation to ensure that the set screw (26) will lock firmly against one of the surface flats on the adapter (31).
- i. Apply Loctite 242 or equivalent to threads of set screw (26) and thread tight into guide post.
- j. Replace plug/guide post assembly of parts back into body (1). Align tab on diaphragm with the tab slot cut in the body flange lip.
- k. Place spring (7) over guide post (22).
- l. Return spring button(4) with adjusting screw assembly (5) and bearing (23) down over guide post (22) onto spring (7). Align one tab (ear) on spring button (4) directly above tab slot in the body flange lip.
- m. Align the two ribs inside the spring chamber (2) with the tabs on the spring button (4) and place the spring chamber (2) over assembled parts directly on body (1).
- n. Position the clamp (13) halves around the mating flanges of the body (1) and the spring chamber (2). Insert clamp bolts (13C), washers (13D) and tighten clamp nuts (13B) in alternating pattern. The clamp should be tightened to approximately 4 to 6 ft-lbs. **(NOTE: Gap between clamp (13A) halves should be equal in size. - See Figure 1.**
- o. Replace eye nut (27) on guide post (22). Ref to Section VI B. 3b previous to recall

the number of revolutions recorded for removal.

- p. Insert spring pin (32) through eye nut (27) and guide post (22).
- q. Place collar (28), bearing plate (29) and base slide assembly (24) over guide post (22).
- r. Position cam (16) over guide post (22) and insert quick release pin (15) through holes in cam and post.
- s. See Section IV for start up and adjustment of set point and Section VII for Cleaning.

10D. **For Sizes 1-1/2"-3" w/65-125 psig range**

spring:

Clamp the lower end of the plug (18) in a smooth jawed vice, around the outside edges of the winged design.

- a. Remove set screw (26).
- b. Rotate guide post (22) CCW and remove from locknut (25).
- c. Place a wrench at the flats on the locknut (25) and rotate CCW to remove nut from plug (18).
- d. Remove pressure plate (3), diaphragm (14) and diaphragm spacer (38). **NOTE:** *Correct orientation of spacer (38) has the side with the I.D. radius towards the clamping surface of the plug.*
- e. Reinstall diaphragm spacer (38) on plug (18). Place new diaphragm (14) with convolution side facing up, onto plug (18) and fit it around the diaphragm spacer (38).
- f. Lay pressure plate (3) on top of diaphragm (14).
- g. Thread locknut (25) to plug (18) and tighten to 60 in-lbs of torque.
- h. Secure guide post assembly (22) to threaded locknut (25) by hand. Adjust final rotation to ensure that the set screw (26) will lock firmly against one of the surface flats on the plug (18).
- i. Apply Loctite 242 or equivalent to threads of set screw (26) and thread tight into guide post.
- j. Replace plug/guide post assembly of parts back into body (1). Align tab on diaphragm with the tab slot cut in the body flange lip.
- k. Place spring (7) over guide post (22).
- l. Install spring button(4) with adjusting screw assembly (5) and bearing (23) down over guide post (22) onto spring (7). Align one tab (ear) on spring button (4) directly above tab slot in the body flange lip.
- m. Align the two ribs inside the spring chamber (2) with the tabs on the spring button (4) and place the spring chamber (2) over assembled parts directly on body (1).

- n. Position the clamp (13) halves around the mating flanges of the body (1) and the spring chamber (2). Insert clamp bolts (13C), washers (13D) and tighten clamp nuts (13B) in alternating pattern. The clamp should be tightened to approximately 4 to 6 ft-lbs. (**NOTE:** Gap between clamp (13A) halves should be equal in size.

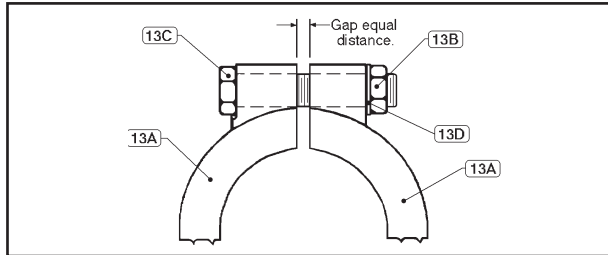


Figure 1: Clamp Arrangement.

- o. Replace eye nut (27) on guide post (22). Ref to Section VI B. 3b previous to recall the number of revolutions recorded for removal.
- p. Insert spring pin (32) through eye nut (27) and guide post (22).
- q. Place collar (28), bearing plate (29) and base slide assembly (24) over guide post (22).
- r. Position cam (16) over guide post (22) and insert quick release pin (15) through holes in cam and post.
- s. See Section IV for start up and adjustment of set point and Section VII for Cleaning.

SECTION VII

VII.CLEANING PROCEDURE

A. Pre-Sanitation:

1. Owner should refer to owner's operating procedures for system shutdown to include relieving all system pressure.
2. Refer to Fig. 3 and 4 for item number reference ().
3. Lift lever (16) to vertical position. **NOTE:** Do not change range spring (7) setting by rotating adjustment nut (6) or handle (36).
4. Remove the lock-open pin (10) from the pin retainer hole in the spring chamber (2) and insert it into drilled passage through the adjusting screw (5). (See Figure 2.)

B. Sanitation:

1. Flush, drain and sanitize system in accordance to owner's specifications.

CAUTION

Owner's cleaning solution must be compatible with regulator's trim materials.

NOTE: CIP is limited to 50 psig (3.45 Barg) maximum cleaning solution pressure at 300°F (149°C). SIP is recommended to 20 psig (1.38 Barg) saturated steam pressure; can withstand 30 psig (2.07 Barg), but may reduce elastomer life expectancy.

C. Post-Sanitation:

1. Prior to system start-up, remove the lock-open pin (10) from the adjusting screw (5) and insert it into the pin retainer hole. Lower lever (16) to horizontal position. Unit is again operative at the setpoint established prior to cleaning.

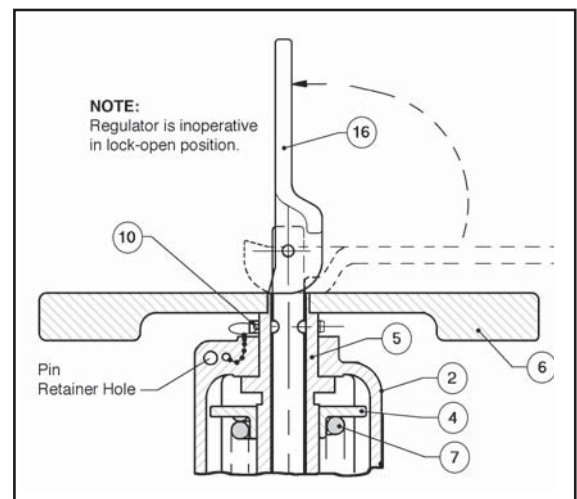


Figure 2: Spring Chamber in Lock-Open Position.

SECTION VIII

VIII. 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 (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).

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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.

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 Bill of Materials 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. Local Sales Representative will provide quotation for appropriate Kit Number, Price and Availability.

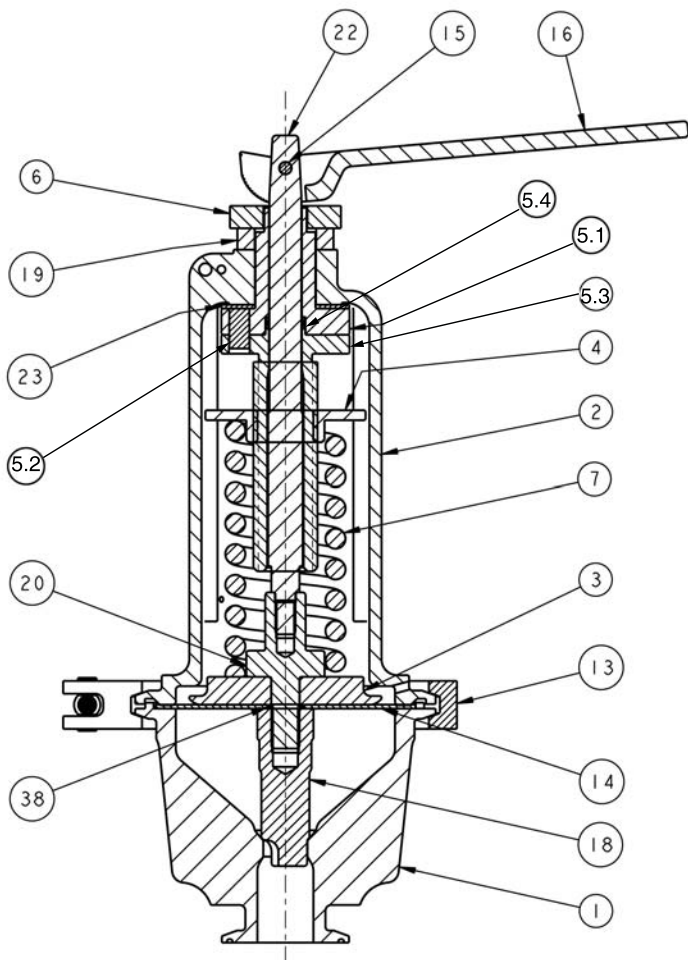


CAUTION

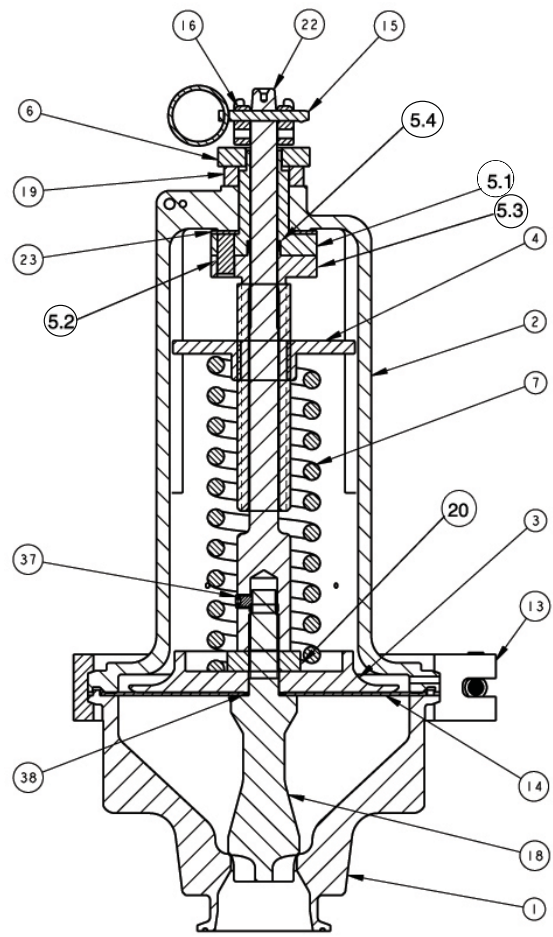
Do not attempt to alter the original construction of any unit without assistance and approval from the factory. All purposed changes will require a new name plate with appropriate ratings and new product code to accomodate the recommended part(s) changes.

NOTES

NOTES



Model C-BPV
3/4" - 1-1/2" Reduced Port
Forged body with lower range spring shown above.

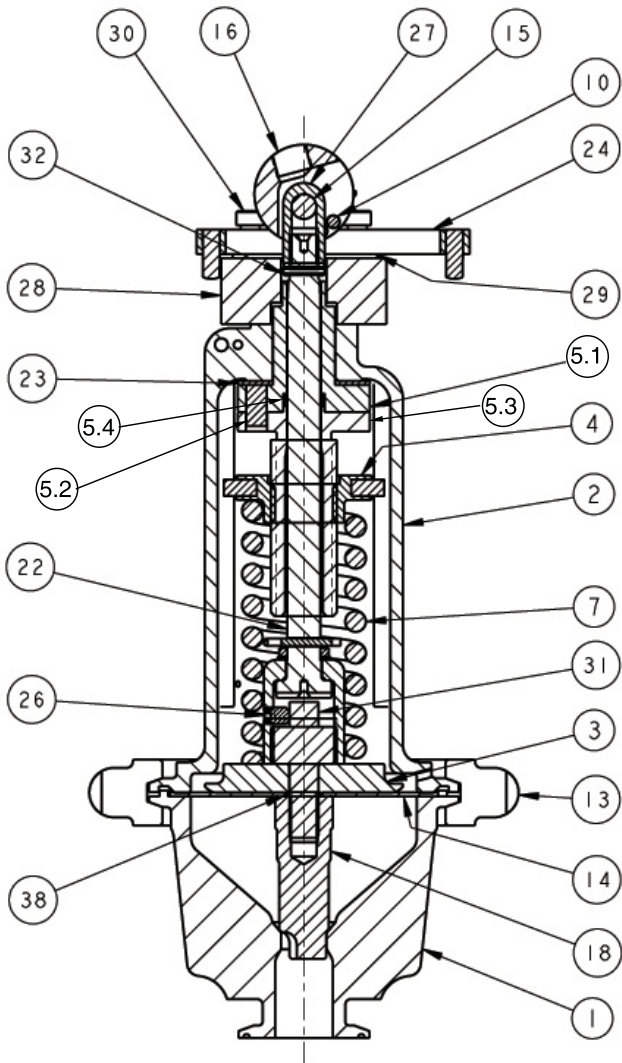


Model C-BPV
1-1/2" - 3" Full Port
Forged body with lower range spring shown above.

Figure 3:

NOTE: This product is to be installed with the spring chamber in the vertical position.

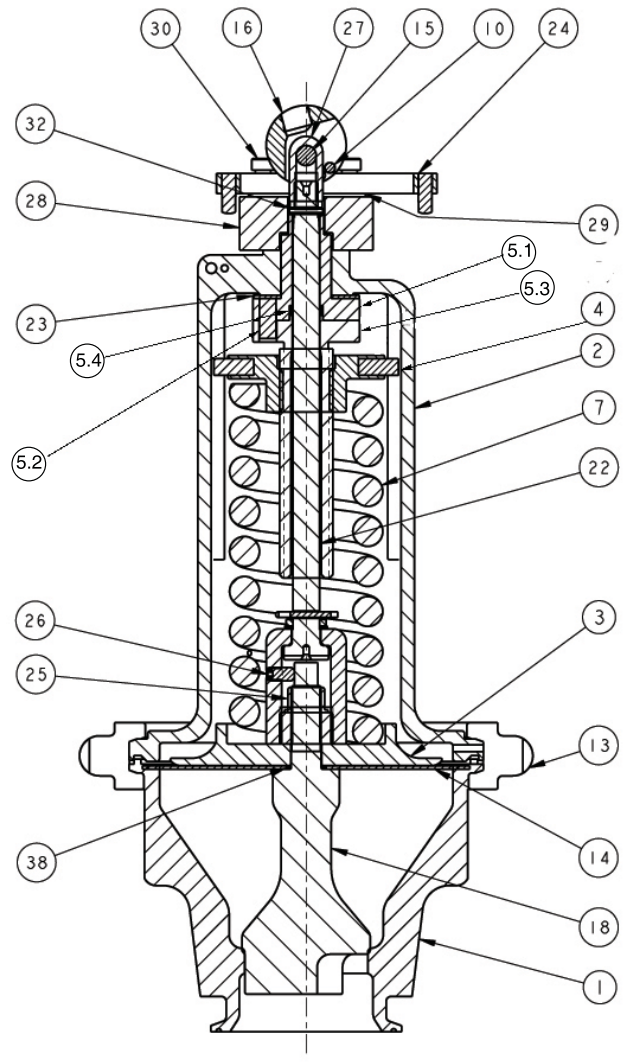
Item No.	Description	Item No.	Description	Not Shown:	Item No.	Description
1	Body	15	Pin (Quick Release)	8	Connector	
2	Spring Chamber	16	Lever / Cam	9	Ball Chain	
3	Pressure Plate	18	Plug	10	Quick Release Pin (Lock Open)	
4	Spring Button	19	Load Collar	11	Name Plate	
5	Adjusting Screw	20	Adapter	12	Drive Screw	
5.1	Adjusting Screw Cap	22	Guide Post	17	3A Symbol Plate	
5.2	Pin	22.1	Guide Post	36	Handle	
5.3	Adjusting Screw	22.2	Cotter Pin			
5.4	U-Cup Seal	22.3	Shim			
6	Adjustment Nut	22.4	Cap			
7	Spring	22.5	Curved Disc Spring			
13	Clamp	23	Bearing (Seal Soft)			
14	Diaphragm	37	Set Screw			
		38	Spacer			



Model C-BPV

3/4" - 1-1/2" Reduced Port

Forged body with upper range spring (60-125) shown above.



Model C-BPV

1-1/2" - 3" Full Port

Forged body with upper range spring (60-125) shown above.

Figure 4:

NOTE: This product is to be installed with the spring chamber in the vertical position.

Item No.	Description	Item No.	Description	Not Shown:	Item No.	Description
1	Body	22	Guide Post	6	Adjustment Nut	
2	Spring Chamber	22.1	Guide Post	8	Connector	
3	Pressure Plate	22.2	Cotter Pin	9	Ball Chain	
4	Spring Button	22.3	Shim	11	Name Plate	
5	Adjusting Screw	22.4	Cap	12	Drive Screw	
5.1	Adjusting Screw Cap	22.5	Curved Disc Spring	17	3A Symbol Plate	
5.2	Pin	23	Bearing (Seal Soft)	19	Load Collar	
5.3	Adjusting Screw	24	Base (Slide)	20	Adapter	
5.4	U-Cup Seal	25	Locknut	31	Adapter	
7	Spring	26	Set Screw	33	Diaphragm Cover	
10	Quick Release Pin (Lock Open)	27	Eye End (Nut)	36	Handles	
13	Clamp	28	Collar			
14	Diaphragm	29	Bearing Plate			
15	Pin (Quick Release)	30	Shoulder Screw			
16	Lever / Cam	32	Spring Pin			
18	Plug	38	Spacer			

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