



MODEL C-CS “CLEAN STEAM” PRESSURE REDUCING REGULATOR

SECTION I

I. DESCRIPTION AND SCOPE

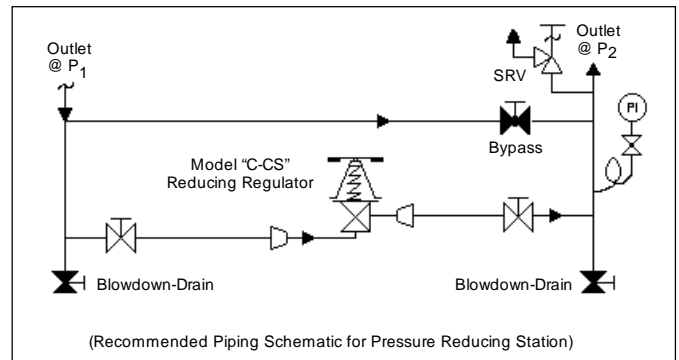
Model C-CS is a pressure regulator used to control downstream (outlet or P_2) pressure. Inlet and outlet sizes are 3/4", 1", 1-1/2", 2" and 3" with Tri-Clamp® fitting connections. This regulator is primarily designed for steam service at temperatures equal to or less than 366°F (185°C); this corresponds to 150 psig (10.3 Barg) saturated steam. However, the unit may also be used for clean gaseous or liquid applications.

SECTION II

II. INSTALLATION

A. General:

1. An inlet block valve should always be installed.
2. If service application is continuous such that shutdown is not readily accomplished, it is recommended that inlet and outlet block valves and a manual bypass valve be installed.
3. An outlet pressure gauge should be located approximately ten pipe diameters downstream and within sight.
4. All installations should include a downstream relief device if the inlet pressure could exceed the pressure rating of any downstream equipment.



5. Flow Direction: Install so the flow enters through the bottom connection and exits the side connection.
6. Install in a well drained pipe, properly trapped, with spring chamber (2) in the vertical position to allow for proper draining.
7. For insulated piping systems, recommendation is to not insulate the regulator.

SECTION III

III. PRINCIPLE OF OPERATION

A. General:

1. Movement occurs as pressure variations register on the diaphragm. The registering pressure is the outlet, P_2 or downstream pressure. The range spring opposes diaphragm movement. As the outlet pressure drops, the range spring pushes the diaphragm down, opening

the port; as outlet pressure increases, the diaphragm pushes up and the port closes.

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



CAUTION

The Model C-CS should never be used as a shut-off device.

SECTION IV

IV. START-UP

A. General:

1. CCW = Counter Clockwise, CW = Clockwise.
2. Inspect the unit's nameplate to confirm that the proper range spring is indicated to be within the regulator. Apply setpoint pressures that are only within the stated range
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. Relax range spring (7) by turning T-handle (6) counter-clockwise (CCW) until rotation stops. Rotate T-handle (6) clockwise (CW) three (3) full revolutions to maintain spring (7) to diaphragm contact. This reduces the outlet pressure setpoint.
5. If piping system includes 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.*
6. Crack open the outlet (downstream) block valve.
7. Slowly open the inlet (upstream) block valve observing the outlet (downstream) pressure gauge. Determine if the regulator is flowing; if not, rotate the regulator T-handle (6) CW (viewed from above) until flow begins. Determine if downstream equipment is operative.
8. Continue to slowly open the inlet (upstream) block valve until fully open.
9. Continue to slowly open the outlet (downstream) block valve, especially when the downstream piping system isn't pressurized. If the outlet pressure exceeds the desired pressure, close both the inlet block valve and bypass valve; go to Step 4, then return to Step 6.
10. When flow is established steady enough that the outlet (downstream) block valve is fully open, begin to slowly close the bypass valve, if installed.
11. Develop system flow to a level near its expected normal rate and reset the regulator setpoint by turning the T-handle (6) CW (viewed from above) to increase outlet pressure or CCW to reduce outlet pressure.
12. Reduce system flow to a minimum level and observe setpoint. Outlet pressure will rise from the setpoint of Step 11. 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. 10-30 psig (.69-2.07 Barg) range spring – at low flow the outlet pressure should not exceed 33 psig (2.28 Barg). If it does, consult factory.

SECTION V

V. SHUTDOWN

A. General:

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 block valve. Fully close the inlet block valve. When on bypass, the system pressure must be constantly observed and manually regulated.
2. If the regulator and system are to both be shutdown, slowly close the inlet block valve. Close the outlet valve only if regulator removal is required.



CAUTION

DO NOT DEAD-END FLOW DOWNSTREAM of the Model C-CS as internals may be damaged.

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. Maintenance procedures hereinafter are based upon removal of the regulator unit from the pipeline where installed.
2. Refer to Figure 2 for basic regulator item number reference ().

B. Diaphragm – 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 T-handle (6) CCW when viewed from above. Failure to do so may result in flying parts that could cause personal injury.

2. Relax range spring (7) by turning T-handle (6) CCW (viewed from above) until rotation stops. Count and record the number of revolutions in the box below:

Number of revolutions required to relax range spring: _____

3. Pull hitch pin (21) and lift up on T-handle (6) to remove.
4. Loosen and remove clamp nuts (13B), washers (13D), bolts (13C) and clamps (13A).
5. Place matchmarks between body (1) and spring chamber (2) to assist in final orientation when reassembled. Lift spring chamber (2) off of body (1).
6. Lift up the adjusting screw (5) assembly to

remove spring button (4) and spring (7) and lay aside. **NOTE: Do Not rotate or remove spring button (4) from adjusting screw (5).**

7. Using an adjustable wrench, secure the pressure plate (3) at the "flats" near the base. Grasp the lower portion of the plug (14) by the "flats", which protrudes from the body (1) inlet, with soft-jawed pliers or soft-jawed vice and proceed to turn CCW (viewed from above) for disassembly. **NOTE: Maintain firm grasp of plug (14). After disengagement, plug (14) could fall out of body (1) and damage seating surface area.**

8a. For Model C-CS :

Remove diaphragm (17), O-ring (16), diaphragm gasket (15), and plug (14).

8b. For Model C-CS with Opt.-11:

Remove diaphragm (17), diaphragm gasket (15), O-ring (18), seal (19), pusher plate (20), O-ring (16), and plug (14).

9. Inspect plug (14) and seating surface of body (1) for excessive wear. Replace all worn parts.
10. Clean gasket (15) and O-ring (16) retaining surfaces.
11. Remove body (1) from vise and thoroughly clean along with replacement wetted parts (14, 15, 16, 17, 18, 19, 20) in accordance with Owner's cleaning procedures. Reposition body (1) back into vise.
12. Place new diaphragm gasket (15) on body (1) flange.
13. Insert threaded end of plug (14) through the bottom connection of body (1) and install O-ring (16). **NOTE: For Opt.-11, reposition pusher plate (20) on threaded end of plug (14) and install O-ring (18) and seal (19). Refer to Figure 3.**
14. Place diaphragm (17) over threaded end of plug (14). **NOTE: The word 'TOP' is etched on one side of the diaphragm and should be visible when looking down on the diaphragm.**
15. Reassemble pressure plate (3) to plug (14). Using tools per 7. above, grasp the parts and rotate pressure plate (3) CW until wrench tight (metal-to-metal contact). Torque not to exceed 100 in. lbs. for 3/4", 1" and 1-1/2" sizes or 270 in. lbs. for 2" and 3" sizes.
16. Center/align this assembly on the diaphragm (17) flange surface in the body (1).

17. Position spring (7) on to hub of pressure plate (3). Place adjusting screw (5) assembly – with spring button (4) – over post end of the pressure plate (3) and into spring (7) cavity. **NOTE:** Apply a small amount of Emhart Bastic White Food Grade “Never-Seez” or equivalent to threads of adjusting screw (5) and the shoulder of the adjusting screw (5) where they make contact with the spring chamber (2). Do Not rotate adjusting screw (5) or spring button (4).
18. Align slot guides inside spring chamber (2) with spring button (4) “ears” and position on to body (1). Align with match marks.
19. Place T-handle (6) on post end of adjusting screw (5) and insert hitch pin (21) into hole through post end of adjusting screw (5).
20. Reposition clamps (13A) around body (1) and spring chamber (2) flanges. Insert clamp bolts (13C), washers (13D) and tighten clamp nuts

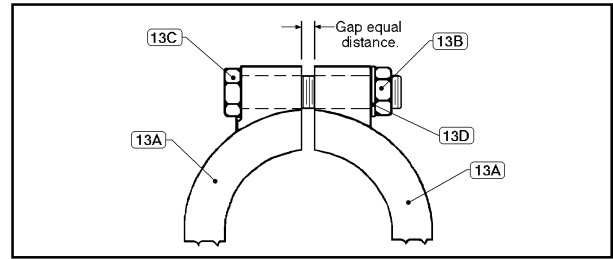


Figure 1: Clamp Arrangement.

(13B) in alternating pattern. **NOTE:** Gap between clamp (13A) halves should be equal in size. Gap and torque requirements are as follows:

Gap	Torque
Equal Distance	225-250 in-lbs (25-28 N-M)

21. Reapply compression to the range spring (7) by rotating T-handle (6) CW (viewed from above) as per the number of revolutions recorded in VI.B.2.
22. Return to Section II for Installation and Section IV for Start-up.

SECTION VII

VII. PARTS ORDERING INFORMATION

Selection of parts is minimal due to the regulator’s basic construction. Refer to the three methods below to obtain parts ordering information/numbers.

METHOD A – USE OF PRODUCT CODE.

- Step 1. If available, obtain the 18 character product code number from:
 - a. The Bill of Materials sheet.
 - b. The metal tag attached to the regulator.

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NOTE: Some regulators may not have the product code located on the metal tag.

- Step 2. Identify which parts are desired from the Bill of Materials sheet or Table 1, Parts Kit Numbers. Kit "A" contains diaphragm, gasket and O-ring. Kit "B" contains trim replacement parts plus diaphragm, gasket and O-ring.

- Step 3. Contact your local Cashco, Inc., Sales Representative and specify the product code number and the part numbers required.

METHOD B – NO PRODUCT CODE AVAILABLE – DISASSEMBLED REGULATOR.

- Step 1. Determine all available information from regulator’s metal tag.
 - a. Serial number.
 - b. Regulator “Type” or “Model” number.
 - c. Size.
 - d. Trim.
 - e. Spring range.

NOTE: Refer to Table 2 for correct spring selection.

- Step 2. Contact your local Cashco, Inc., Sales Representative for proper identification numbers.

METHOD C – NO PRODUCT CODE AVAILABLE – ASSEMBLED REGULATOR IN SERVICE.

- Step 1. Determine all available information from metal tag using Step 1, Method B.
- Step 2. Contact your local Cashco, Inc., Sales Representative with the above information.

Step 3. Sales Representative will contact the factory to determine the original internal construction. Factory will relay information to the Sales Representative.

Step 4. Await the Sales Representative's return contact with the proper part numbers.

**TABLE 1
MODEL C-CS
PARTS KIT NUMBERS**
(Kit Nos. Shaded)

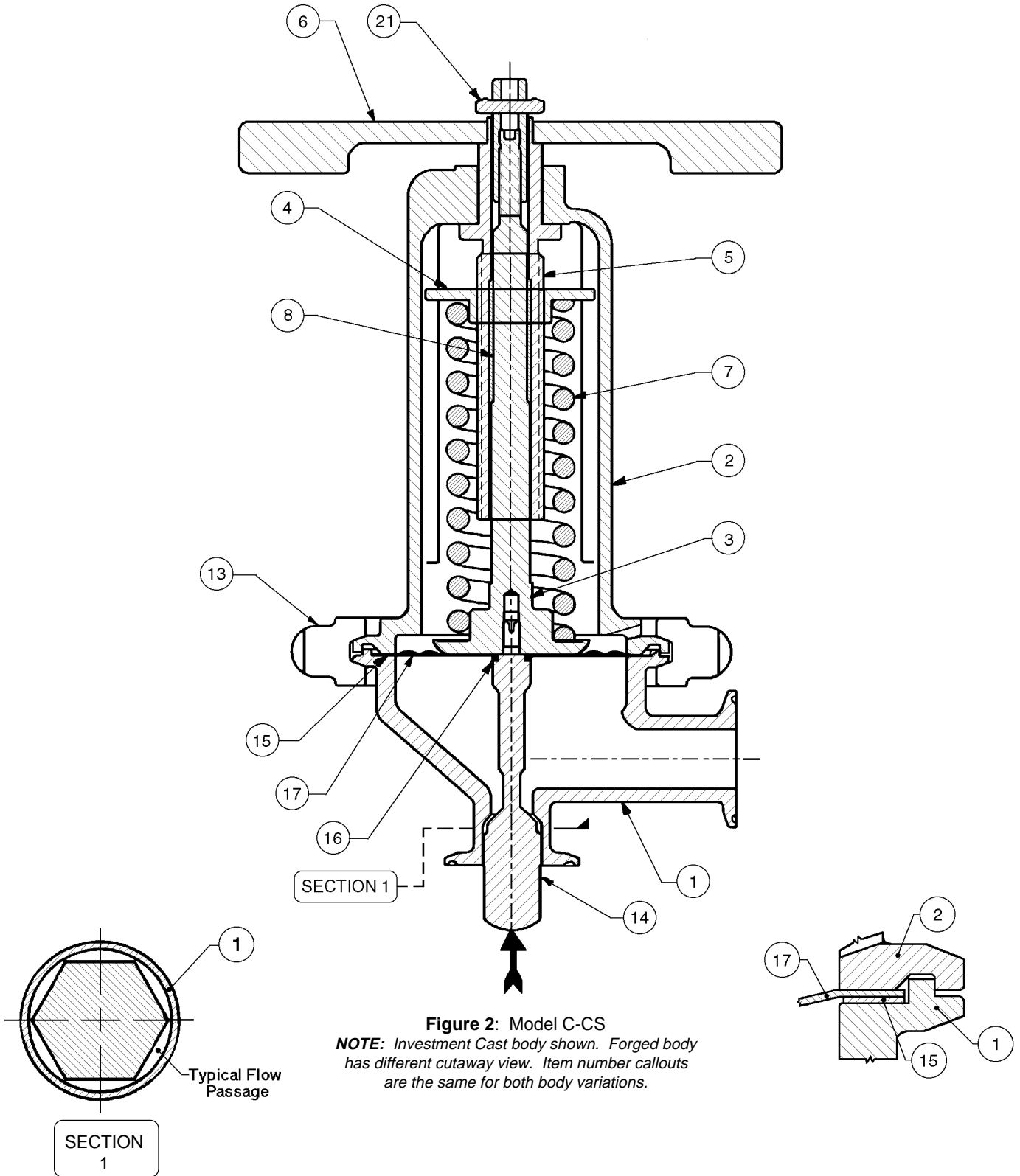
Design Number	Size	Kit Abbreviation			
		Standard		Opt.-11	
		KIT A	KIT B	KIT A	KIT B
S1L	3/4"	CS6-ASLK-D	CS5-BSLK-D	CS6-A11K-D	CS5-B11K-D
	1" Full		CSF-BSLK-D		CSF-B11K-D
	1" Reduced		CS6-BSLK-D *		CS6-B11K-D *
	1-1/2" Reduced		CS8-BSLK-D		CS8-B11K-D
	1-1/2" Full	CS9-ASLK-D	CSG-BSLK-D	CS9-A11K-D	CSG-B11K-D
	2"	CS9-BSLK-D	CS9-B11K-D		
	3"	CSB-BSLK-D	CSB-B11K-D		

* Investment cast body with reduced port only.

**TABLE 2
MODEL C-CS
*COLOR-CODED SPRING CHART**

Stainless Steel Range Spring			
Size	Range Spring psig	Standard Constuction	Option-20
		Part Number/Color	
3/4", 1" and 1-1/2"	10-30	830-78-5-09230-00 (Green)	830-78-5-00107-00 (Red)
	10-75	830-78-5-09235-00 (Lt. Blue)	830-78-5-00109-00 (Blue)
2" and 3"	10-30	830-K4-5-09270-00 (Green)	830-78-5-06215-00 (Dk Green)
	10-75	830-K4-5-09275-00 (Lt. Blue)	830-78-5-06298-00 (White)

***NOTE:** If it becomes necessary to change a regulator's range spring and install a new spring for a different pressure range, A NEW CASHCO, INC. NAMEPLATE MUST BE AFFIXED TO THE REGULATOR. Contact your local Cashco, Inc. Sales Representative and specify the new pressure range and the serial number off the existing nameplate. They will contact the factory who will review unit's original internal construction and determine new operating pressure limits. Await the Sales Representative's return contact with the proper part numbers.



Item No.	Description
1	Body
2	Spring Chamber
3	Pressure Plate
4	Spring Button
5	Adjusting Screw
6	Handle
7	Spring
8	Guide Bushing
11	Nameplate
13A	Clamp (2 Req'd)
14	Plug
15	Gasket (Diaphragm)
16	O-ring (Plug)
17	Diaphragm
18	O-ring
19	Seal
20	Pusher Plate
21	Hitch Pin
22	Gasket
23	Closing Cap
24	Bushing

Not Shown:

Item No.	Description
12	Drive Screw
13B	Clamp Nuts (2 Req'd) ¹
13C	Clamp Bolts (2 Req'd) ¹
13D	Clamp Washers (2 Req'd) ¹

¹ Refer to Figure 1 for blow-up of clamp and related item numbers.

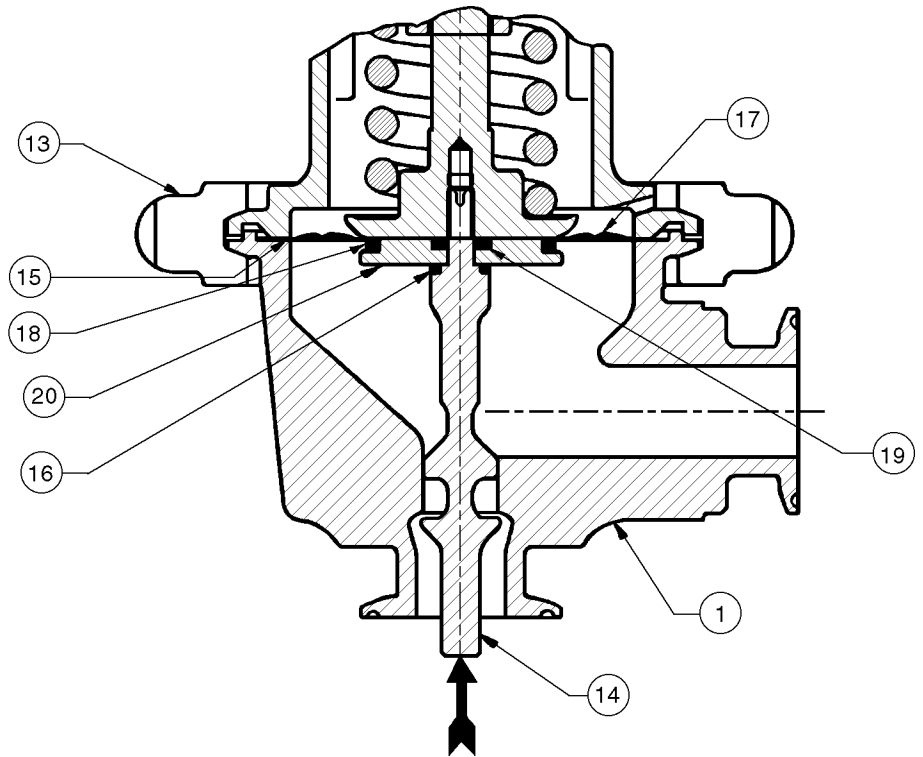


Figure 3: Option-11, Diaphragm Restraint (Forged Body Shown)

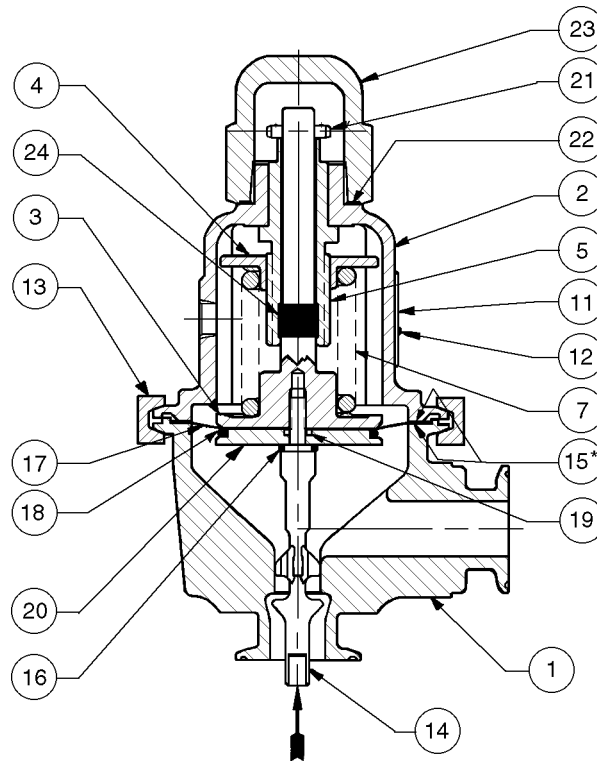


Figure 4: Option-20, Pressure Loaded Spring Chamber (Forged Body Shown)

* Requires two diaphragm gaskets placed above and below the diaphragm

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