



MODEL C-CS

“CLEAN STEAM”

PRESSURE REDUCING REGULATOR

SECTION I

I. DESCRIPTION AND SCOPE

Model C-CS is a pressure reducing regulator used to control downstream (outlet or P_2) pressure. Inlet and outlet sizes are 3/4" (DN20), 1" (DN25), 1-1/2" (DN40), 2" (DN50) and 3" (DN80) 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.



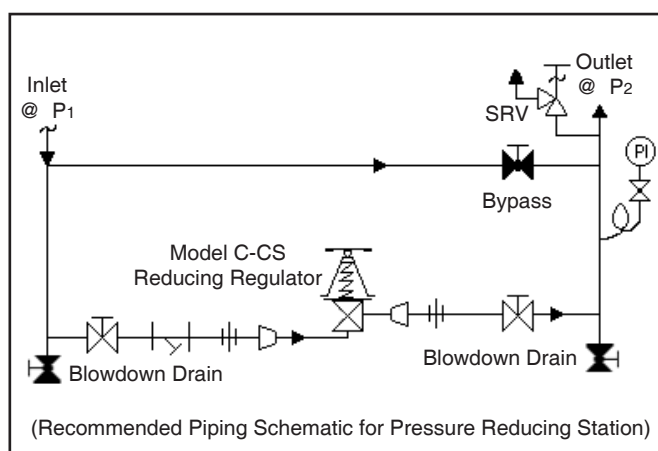
CAUTION

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

SECTION II

II. INSTALLATION

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.



(Recommended Piping Schematic for Pressure Reducing Station)

7. For insulated piping systems, the regulator should not be insulated.



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

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



CAUTION

Do not apply spring load or operate regulator with hitch pin (21) removed from top of guide post (27). Premature diaphragm failure will result.

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.

SECTION IV

IV. START-UP

NOTE 1: The regulator set point must be set under normal flowing conditions.

1. CCW = Counter Clockwise, CW = Clockwise.
2. Inspect the unit's nameplate to confirm that the proper range spring is installed in 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 while performing the following steps.
4. Relax compression of 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(17) 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. To prevent overpressurization, closely monitor outlet (downstream) pressure with a gauge. **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 (see NOTE 1). If no flow, rotate the regulator T-handle (6) CW (viewed from above) until flow begins. Determine if downstream equipment is in operation.
8. Continue to slowly open the inlet (upstream) block valve until fully open.
9. Continue to slowly open the outlet (downstream) block valve. When flow is established steady enough that the outlet (downstream) block valve is fully open, begin to slowly close the bypass valve, if installed, until fully closed.
10. 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.
11. Reduce system flow to a minimum level and observe setpoint. Outlet pressure will 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 30%; i.e. 10-30 psig (.69-2.1 Barg) range spring – at low flow the outlet pressure should not exceed 39 psig (2.7 Barg). 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 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 overpressurizing regulator may damage internals.

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 regulator in a soft-jawed vise with the spring chamber (2) directed upwards. Ensure that the body (1) is not held in the vise by the Tri-clamp® fitting connections. The regulator may be held in the vise with flats on the plug (14). If this method is used, ensure that the plug (14) is in contact with the seating area of the body (1) and the face of the inlet flange of the body (1) is resting on the vise.



WARNING

SPRING UNDER COMPRESSION. Relieve all spring (7) compression prior to removing clamp (13). Failure to do so may result in flying parts that could result in 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: _____



CAUTION

Do not apply spring load or operate regulator with hitch pin (21) removed from top of guide post (27). Premature diaphragm failure will result.

3. Remove socket head set screw (30) CCW from top end of guide post (27).

4. Pull hitch pin (21) and lift up on T-handle (6) to remove.
5. Loosen and remove clamp nuts (13B), washers (13D), bolts (13C) and clamps (13A). See Figure 1.
6. Place matchmarks between body (1) and spring chamber (2) to assist in final orientation when reassembled. Lift spring chamber (2) vertically up and off of body (1) and above guide post (27) to remove. Note alignment of spring button (4) ears with slot guides inside spring chamber (2).
7. Remove bearing (26). Lift up and remove adjusting screw cap (25.7) and dowel pin (25.8) assembly. **NOTE:** *May need to tap lightly on O.D. of adjusting screw (25.6) to free Dowel pin (25.8) from adjusting screw (25.6).* **NOTE:** *The two guide seals (25.9) may/ may not remove along with this assembly (25.7,25.8). Remove guide seals (25.9) and replace with new seals later.*
8. Remove the adjusting screw (25.6) and spring button (4) as an assembly. **NOTE:** *Do not rotate or remove spring button (4) from adjusting screw (25.6).* Remove spring (7) and lay aside.
9. Secure the pressure plate assembly (27,28 and 29) 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.* Remove plug (14).
10. Remove pressure plate assembly (27,28 and 29) and lay aside. **NOTE:** *The travel of the guide post (27) has been factory set. Do not loosen or adjust the hex nut (29) on pressure plate assembly (27,28,29).*
- 11a. **For Model C-CS :**
Remove diaphragm (17), O-ring (16), and diaphragm gasket (15).
- 11b. **For Model C-CS with Opt.-11:**
Remove diaphragm (17), diaphragm gaskets (15), O-ring (18), seal (19), pusher plate (20), and O-ring (16).
12. Inspect plug (14) and seating surface of body (1) for excessive wear. Replace all worn parts.

13. Clean gasket (15) and O-ring (16) retaining surfaces of body (1) and spring chamber (2).
14. Remove body (1) from vice 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.
15. Place new diaphragm gasket (15) on body (1) flange.
16. 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.
17. 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.
18. Place a small amount of medium strength threadlocker equal to "Blue 242 Loctite" on threaded end of plug (14). Reassemble pressure plate assembly (27,28 and 29) to plug (14). Follow instructions per Step 9., grasp the parts and rotate pressure plate assembly (27,28,29) CW until wrench tight (metal-to-metal contact). Torque not to exceed the following values.

Body Size in (DN)	Torque in-lbs (N-m)
3/4"-1 1/2" (20-40)	100 (11)
2" - 3" (50-80)	270 (31)

19. Center/align pressure plate assembly (27,28,29) on the diaphragm (17) flange surface in the body (1).
20. Position spring (7) on to hub of pressure plate (28). Place adjusting screw (25.6) - with spring button (4) - over end of guide post (27) and into spring (7) cavity. **NOTE:** Apply a small amount of Emhart Bostik White Food Grade "Never-Seez" or equivalent to threads of adjusting screw (25.6) **Do Not rotate adjusting screw (25.6) or spring button (4).**
21. Install new guide seals (25.9) in adjusting screw cap (25.7). **NOTE:** There are two sizes

of u-cup seals - install the seal with the bigger diameter spring first, open face into the cap recess. Install the second u-cap seal, open face exposed to face of adjusting screw (25.6). Slide adjusting screw cap (25.7) over end of guide post (27). Align dowel pin (25.8) with hole in adjusting screw (25.6) and press together by hand.

22. Install new bearing (26) on top of upper guide assembly (25).
23. Align slot guides inside spring chamber (2) with spring button (4) "ears" and position on to body (1). Align with match marks of step 6. previous.
24. Place T-handle (6) over end of guide post (27) coming to rest on adjusting screw cap (25.7). Insert hitch pin (21) into hole through end of guide post (27). Thread set screw (30) into top of guide post (27) and tighten securely.
25. Reposition clamps (13A) around body (1) and spring chamber (2) flanges. Insert clamp bolts (13C), washers (13D) and tighten clamp nuts (13B) in alternating pattern. **NOTE:** Gap between clamp (13A) halves should be equal in size. Gap and torque requirements are as follows:

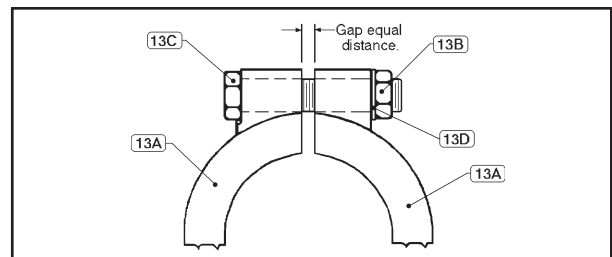


Figure 1: Clamp Arrangement.

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

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

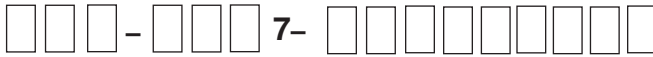
SECTION VII

VII. PARTS ORDERING INFORMATION

Selection of parts is minimal due to the regulator's basic design. 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:
- The Bill of Materials sheet.
 - The metal tag attached to the regulator.



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, gaskets, seals, and O-rings. Kit "B" contains trim replacement parts plus diaphragms, gaskets, seals, and O-rings.
- 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.

- Serial number.
- Regulator "Type" or "Model" number.
- Size.
- Trim.
- Spring range.

- 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.

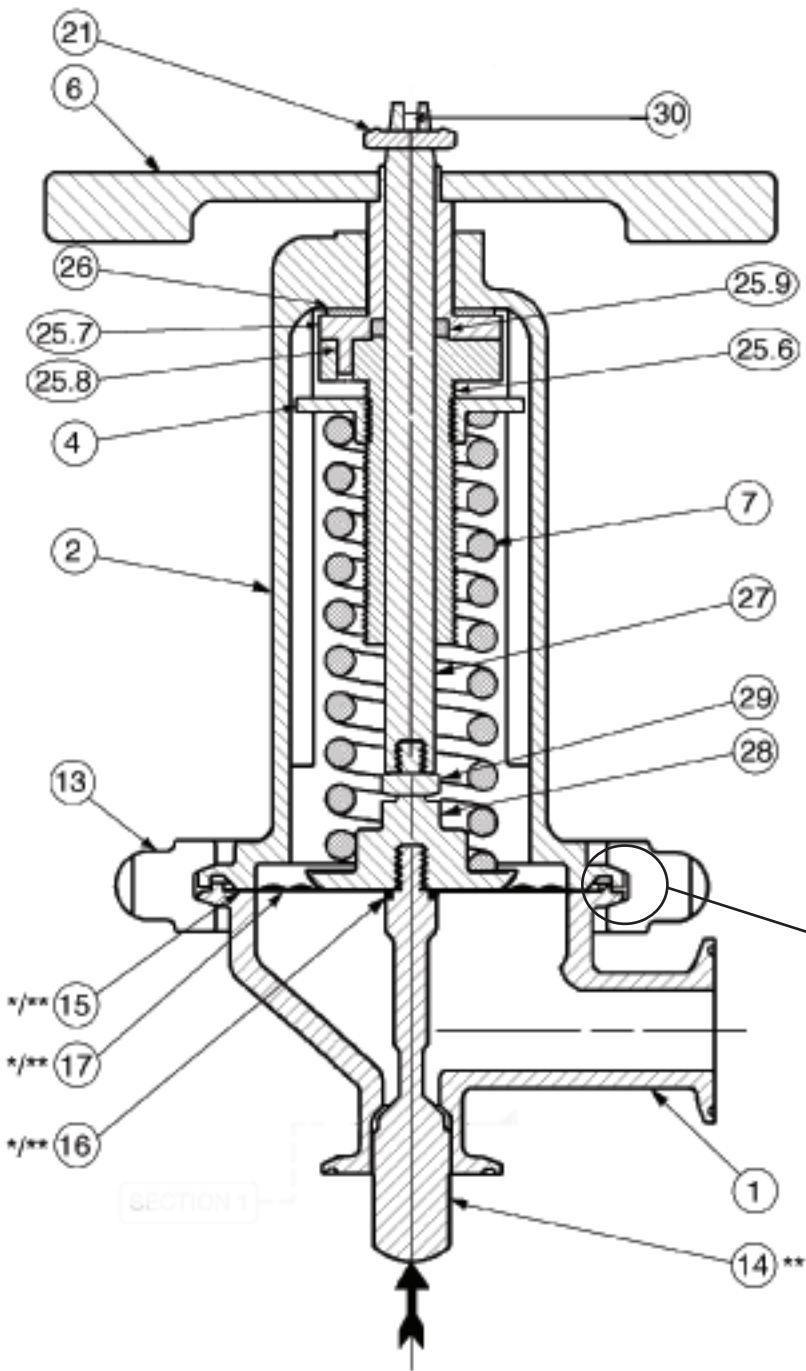
**TABLE 1
MODEL C-CS
PARTS KIT NUMBERS (SHADED)**

Following Kit Codes are specific to those C-CS Regulators that have an "F" for the Rev. Level in the last position of the Product Code. For those Product Codes having a different Rev. Level ("A" thru "E") contact your local Cashco Inc. Sales Representative and they will help determine the appropriate kit code or recommended spare parts numbers.

Desig. Number	Size					
	inches -- Port	(DN)	Standard Construction		Opt. - 11	
			KIT A	KIT B	KIT A	KIT B
S1L	3/4"	(20)	CS6-ASLK-00F	CS5-BSLK-00F	CS6-ASLK-01F	CS5-BSLK-01F
	1" -- Full	(25)		CSF-BSLK-00F		CSF-BSLK-01F
	1" -- Reduced	(25)		CS6-BSLK-00F *		CS6-BSLK-01F *
	1-1/2" -- Reduced	(40)		CS8-BSLK-00F		CS8-BSLK-01F
	1-1/2" Full	(40)	CS9-ASLK-00F	CSG-BSLK-00F	CS9-ASLK-01F	CSG-BSLK-01F
	2"	(50)		CS9-BSLK-00F		CS9-BSLK-01F
	3"	(80)		CSB-BSLK-00F		CSB-BSLK-01F
S36L	3/4"	(20)	CS5-A6LK-00F	CS5-B6LK-00F	CS5-A6LK-01F	CS5-B6LK-01F
	1" -- Full	(25)	CSF-A6LK-00F	CSF-B6LK-00F	CSF-A6LK-01F	CSF-B6LK-01F
	1-1/2" -- Reduced	(40)	CS8-A6LK-00F	CS8-B6LK-00F	CS8-A6LK-01F	CS8-B6LK-01F
	1-1/2" Full	(40)	CSG-A6LK-00F	CSG-B6LK-00F	CSG-A6LK-01F	CSG-B6LK-01F
	2"	(50)	CS9-A6LK-00F	CS9-B6LK-00F	CS9-A6LK-01F	CS9-B6LK-01F
	3"	(80)	CSB-A6LK-00F	CSB-B6LK-00F	CSB-A6LK-01F	CSB-B6LK-01F

* Investment cast body with reduced port only.

NOTE: If it becomes necessary to up-grade or modify your regulator(s) -- A NEW CASHCO, INC. NAMEPLATE MUST BE ATTACHED TO THE REGULATOR. Contact your local Cashco, Inc. Sales Representative with the Serial Number off the existing nameplate and the new service "application" conditions. They will contact the factory to review unit's original internal construction and determine a new product code and pressure / temperature limits. Your Sales Representative's will contact you with the proper kit / part numbers.



Item No.	Description	Repair Parts	
		Kit A	Kit B
1	Body		
2	Spring Chamber		
4	Spring Button		
6	Handle		
7	Range Spring		
11	Nameplate		
12	Drive Screw		
13	Clamp (2 Req'd) ¹		
14	Plug		**
15	Gasket (Diaphragm)	*	**
16	O-ring (Plug)	*	**
17	Diaphragm	*	**
18	O-ring	*	**
19	Seal	*	**
20	Pusher Plate		
21	Hitch Pin		
25	Upper Guide Assembly		
25.6	Adjusting Screw		
25.7	Adjusting Screw Cap		
25.8	Dowel Pin		
25.9	Guide Seals (2 Req'd)	*	**
26	Bearing		
27	Guide Post		
28	Pressure Plate		
29	Nut Hex Jam		
30	Set Screw		

¹ Refer to Figure 1 for Clamp and related item numbers.

Figure 2: Model C-CS

NOTE: Investment Cast body shown. Forged body has different cutaway view. Item number callouts are the same for both body variations.

Cashco, Inc.
P.O. Box 6.
Ellsworth, KS 67439-0006
PH (785) 472-4461
Fax. (785) 472-3539
www.cashco.com
E-mail: sales@cashco.com
exportsales@cashco.com
Printed in U.S.A. IOM-C-CS