



Red Valve Company, Inc.®

SERIES 5400 CONTROL VALVE

WITH BEVEL GEAR ACTUATOR

Installation, Operation, and Maintenance Manual



The Red Valve Series 5400 Control Pinch Valve is a bi-directional valve designed for tough slurry applications. The elastomer sleeve closes on centerline, creating a smooth venturi which reduces wear. The flexing action of the sleeve breaks up any sediment or build-up in the valve, which makes the Series 5400 a reliable, low maintenance control valve.

A variety of elastomers are available to suit your specific needs. Along with the standard Red Valve sleeve, we offer Cone, Variable Orifice, Reduced Port, and Double Wall sleeves for special applications.

- Simple design
- No packing to maintain, ever
- Cost effective
- No cavities or dead spots to bind valve operation
- Low maintenance

IMPORTANT

Please take a moment to **review this manual. Before performing any maintenance on the valve be sure the pipeline has been de-pressurized.** The improper installation or use of this product may result in personal injury, product failure, or reduced product life. Red Valve Co., Inc. can accept NO liability resulting from the improper use or installation of this product. If you have any questions or problems, please call the customer service department at (412) 279-0044. We appreciate your comments. And thank you for choosing Red Valve.

GENERAL DESCRIPTION

The Red Valve Series 5400 Control Pinch Valve consists of the following major components, plus optional accessories. (See Fig. A)

A. Body - The body acts as a housing and support for the other valve components. It is not the primary pressure containing component.

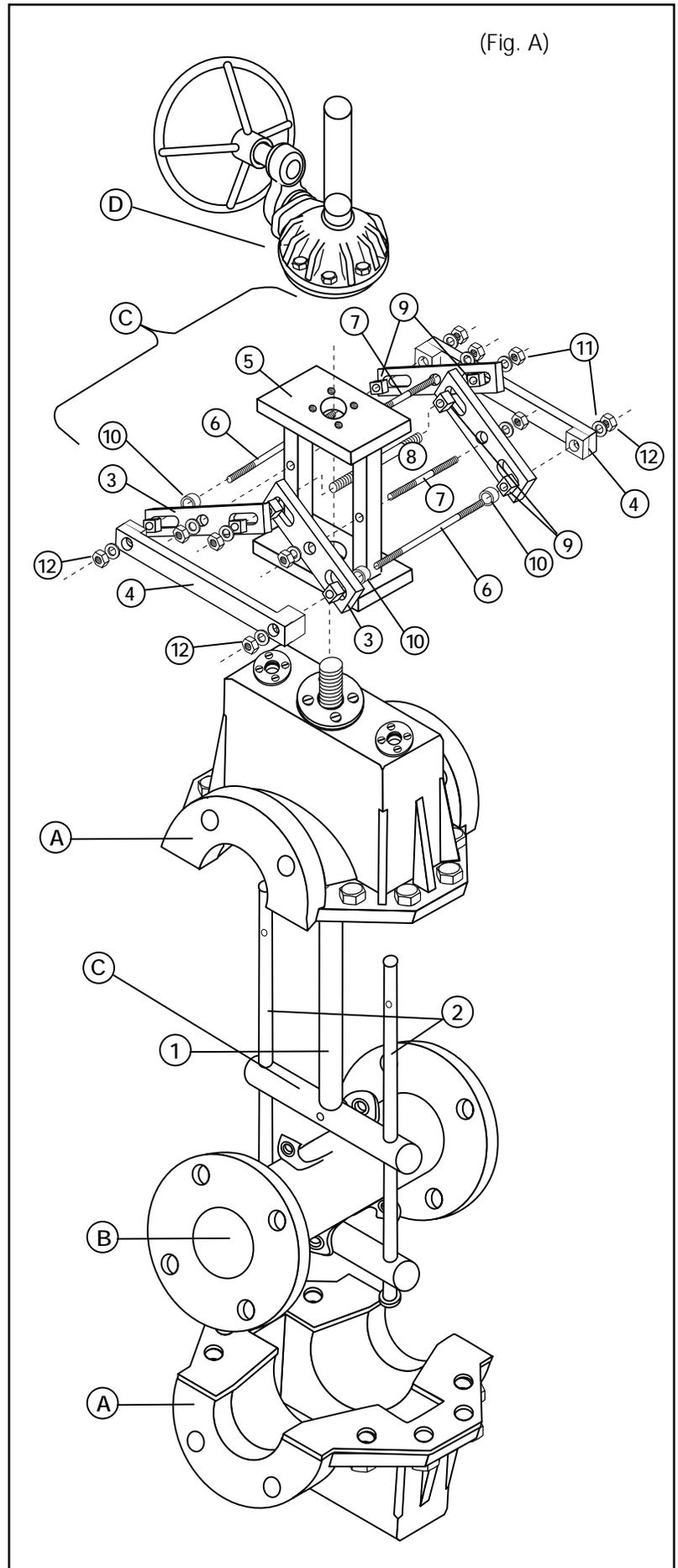
B. Sleeve - The sleeve is the primary pressure containing component and is the only component in contact with the process fluid. The sleeve is attached to the upper and lower pinch bars by tabs built into the sleeve.

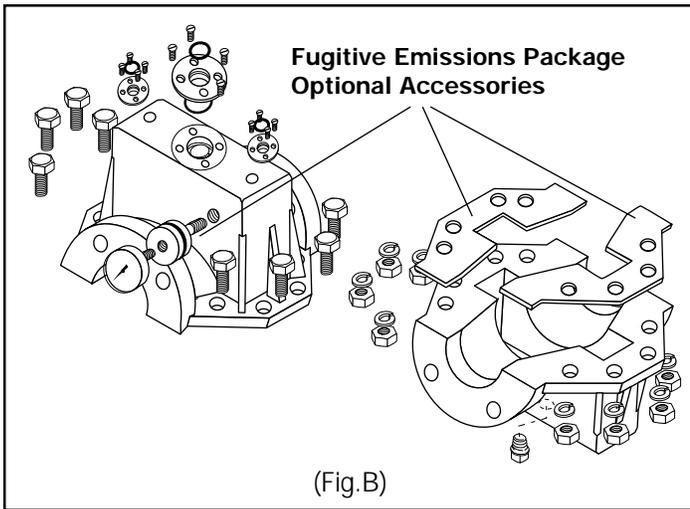
C. Mechanism - The mechanism consists of a set of linkages that act in a scissor-like motion to operate the upper and lower pinch bars simultaneously. The scissor mechanism is made up of the following parts:

1. **Stem** - Connected directly to the upper pinch bar.
2. **Side Rods** - Connected to the lower pinch bar.
3. **Scissor Plates** - Four pivoting plates that connect the Stem and Side Rods.
4. **Spreader Bars** - One bar on left, one on right, connected to both Side Rods
5. **Mounting Frame** - Steel frame that provides the pivot points for the scissor mechanism and mounting point for the actuator.
6. **Side Rod Pins** - One pin for each side rod, threaded on each end.
7. **Pivot Pins** - Two pins, similar to the side pins but slightly shorter, threaded on both ends.
8. **Stem Pin** - One pin, slightly shorter than the Side Rod Pins, threaded on both ends.
9. **Brass Bearing Blocks** - Square brass blocks with a hole in the center.
10. **Spacers** - Round spacers, 2 thin, 2 thick, with hole in center, not threaded.
11. **Threaded Washers** - Flat washer with threaded center hole.
12. **Nuts** - To secure Pins.

NOTE: On valves using a bevel gear or an electric motor actuator, the upper portion of the Stem (1) is threaded. On valves using cylinder actuators the stem is connected to the actuator piston rod.

D. Actuator - The actuator is the component that raises and lowers the stem, thereby opening and closing the valve. The actuator can be pneumatic, hydraulic, electric, or a manually operated bevel gear. Information on the actuator appears on page 5 of this IOM, along with the actuator manufacturer's IOM if applicable.





E. ACCESSORIES

Positioner - For modulating applications using a pneumatic cylinder, the valve is supplied with a positioner that accepts the standard ISA input signals of 4~20 mA or 3~15 psi.

Filter/Regulator - The filter/regulator provides clean air at a constant pressure to the positioner and/or actuator.

Limit Switches - Limit switches are supplied where specified to indicate that the valve is open or closed.

Solenoid Valves - Solenoid valves are supplied for on/off applications to control the valve from a remote location.

Handwheel Override - A handwheel override is supplied when is necessary to open or close the valve if the control system signal or plant air supply is lost. They are also provided on most electric actuators.

Pressure Gauge - To provide a visual indication of a sleeve failure, a pressure gauge and diaphragm seal are tapped into the valve body. (Fig. B)

MISCELLANEOUS

STORAGE

If your Series 5400 Control Pinch Valve is to be stored for a period of time prior to installation, the following guidelines will help preserve the valve and assure trouble-free installation.

1. Store the valve and spare sleeves in a cool, clean, dry location.
2. Avoid exposure to light, electric motors, dirt or chemicals. resilient sleeves are subject to rapid deterioration when exposed to ozone and certain chemicals.

3. Grease stem liberally and store valve in the full-open position. Do not stack other items on top of the valve.
4. Store the installation Operation and Maintenance Manual with the valve so it will be readily available for installation.

Reduced Port or Cone Sleeves - When replacing either of these sleeve types, the pinching bars must be spaced at their original factory setting. Due to the reduced port size, the line size no longer represents the stroke length of the valve.

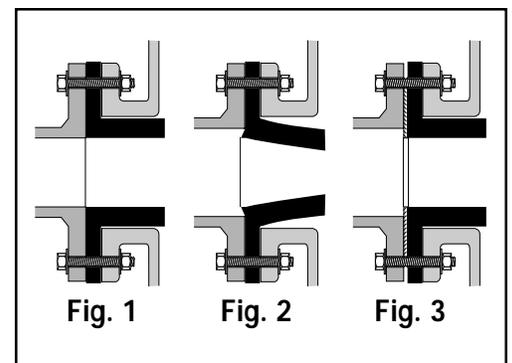
Returns - All returns must have standard Red Valve Company return goods tags. Sleeves to be inspected by the Red Valve Company must have the tag firmly attached to the sleeve via the bolt holes, and must list the company, order number, address, valve serial number your telephone number, operating temperature, pressure, closing frequency, fluid media, and total days in service.

NOTE: If the product being returned has been in contact with a hazardous chemical or material, an MSDS (Material Data Safety Sheet) must be provided with the return paperwork; otherwise the return will not be processed. Any product that has been in contact with a hazardous substance **MUST** be cleaned prior to being returned to Red Valve, or the return will not be processed.

Double Wall Sleeves have triple the life expectancy in severely abrasive installations. The extra thickness requires the next larger flange size on the valve body to be used in order to maintain a matching port diameter. (Fig 1). It is recommended that a reducing flange be purchased, or an oversized flange be installed on the pipe. This is easily done by using blind flanges and boring the I.D. to suit the existing pipe. For example, on a double wall sleeve with a 6" flange and a 4" bore, the mating flange would be a 6" blind flange bored out to slip over the 4" pipe (approx. 4-1/2" dia.).

If it is not possible to match the pipe and sleeve I.D. as described above, the flanges will mate, but the sleeve I.D. will protrude into the pipeline.

(Fig.2) To prevent bulging and premature breaking of the Double Wall Sleeve, a steel washer must be installed as shown (Fig3). The washer should be 1/8" thick and serrated on the side facing the sleeve. The washer O.D. can be just short of the bolt holes, or it can equal the flange O.D. and bolt holes can be drilled through the washer.



INSTALLATION

1. Red Valves have flanges that mate with standard 125# ANSI flanges which are also equivalent to 150# flange dimensions. Due to clearances, the valves have tapped holes, not through bolts. **WARNING:** Do not use bolts that are too long. They will bottom out and may crack the valve body. Stud bolts are recommended, and be sure to tighten bolts in a istari pattern, not sequentially around the flange.
2. The flanges mating to the Series 5400 should be serrated, approximately 1/16" x 90°. Rubber will creep along smooth glass, PVC, or Teflon flanges, eventually causing a flange leak. Flange I.D. should match sleeve I.D. and should be free of sharp edges which could cut into the sleeve. Weld-neck or socket flanges are recommended. Slip-on or screw-on flanges have a larger I.D. and can cut into the rubber. If slip-on or screw-on must be used, grind off all sharp I.D. edges.
3. Do not use sharp tools such as screwdrivers or crowbars on the rubber for installation. This can damage the face flange and cause possible leakage.
4. The valve should be completely open before installing the valve in the pipeline or tightening flange bolts. Valves with Fail-Closed spring-return cylinders are shipped with the lower portion pressurized to keep the valve open during shipment, storage, and installation. See the supplementary sheet on installing valves with fail-closed cylinders for more information. For valves with stem seals and body gaskets, remove the drain plug in the bottom of the casting before operating valve.
5. Tighten all flange bolts to values listed in the table on the back page. You will not overtorque the flange rubber.
6. Pneumatic and hydraulic actuators are sized based upon the line pressure and operating pressure at the installation site. Changing the location of the valve may result in insufficient pressure to fully close the valve, or if the valve has a fail close spring, it may not fully open. Be sure to refer to the positioner manufacturer's IOM for proper air line connections. Connecting plant air to the instrument air port can result in severe damage.
7. For pneumatic valves, a pressure reducing valve and integral gauge should be placed on the air supply line and also on the instrument air supply line. This will prevent accidental damage to the unit from overpressures or surges.
8. Electrically operated valves are sized based upon the line pressure and electrical supply available at the installation site. Only qualified personnel should handle the electrical connections. Be sure to refer to the actuator manufacturer's IOM for proper safety precautions. Reversing positive-negative connections, or connecting the wrong phase power supply can lead to severe damage.

OPERATION

1. All units are bench tested before shipping. Calibration and stroke adjustment may change during shipment. An operational test is recommended before installing the unit into the line.
2. If flanges leak during initial operation, the holes in the sleeve may be out of line. Open the valve fully, loosen all flange bolts, stroke the valve half-closed, re-open, and re-tighten the flange bolts a second time.
3. For both on-off and modulating valves, be certain that the sleeve is not slightly cracked open in the fully closed position. Operating the valve in the cracked position can shorten sleeve life, since flow velocities are very high under these conditions. If the valve does not close completely, it should be adjusted.

For electrically operated valves, the stroke limits and/or torque limits can be increased to gain additional stroke. Check the manufacturer's operating instructions. For all valves, the lower pinch bar can be raised slightly to shorten the stroke.

- A. With the valve open, remove both Side Rod Pins (6).
- B. Close the valve to clear the Scissor Plates (3).
- C. Turn each Side Rod clockwise 1-1/2 revolutions.
- D. Both bars must be turned the same number of times.
- E. Open the valve and reinstall Side Rod Pins (6).

MAINTENANCE

Valves should be inspected, actuated, and lubricated every 90 days. If the valve is operated under severe environmental conditions, (eg. high vibration, abrasive dust, frequent washdown, etc.) the frequency of inspection, actuation, and lubrication should be increased as appropriate. Visually examine the operating mechanism for damage, loose parts or signs of excessive wear. **WARNING:** Make sure there is no pressure in the line before adjusting, tightening, or replacing any parts. Tighten any close parts. Replace any parts that are damaged or exhibit excessive wear. Lubricate the operating mechanism, side rods, and stem in the fully closed position using a high quality Lithium based grease (Mobil Mobilith AW 1 or equivalent). Lubrication is required at every pivot point on the operating mechanism, the side rods, and stem. This includes pins, scissor plates, and the brass bearing blocks. Open the valve and lubricate the operating mechanism, stem, and side rods in the fully open position. Cycle the valve to the full closed position and back to the full open position to distribute the grease throughout the mechanism.

BEVEL GEAR ACTUATOR (Fig. C)

1. DESCRIPTION

For manually operated valves using a bevel gear actuator, the bevel gear is bolted to an actuator mounting frame, or yoke. The mounting frame is bolted to the top half of the valve body. The threaded stem passes through the frame and the bevel gear unit. The threaded portion of the stem is actuated by a bronze drive nut inside of the bevel gear. The handwheel or chainwheel is connected directly to the bevel gear input shaft. In large line sizes or high pressure applications, a spur gear unit may be attached to the input shaft, and the handwheel or chainwheel attached to the spur gear.

2. INSTALLATION

The threaded stem rises through the opening in the top of the bevel gear. This area must be kept clear of obstructions. Be sure to open the valve fully before installing the valve ensure there is sufficient clearance above the bevel gear for the piston rod to rise.

3. OPERATION

The valve is closed by turning the handwheel clockwise, and opened by turning the handwheel counterclockwise.

CAUTION: Due to the torque amplifying effect of the bevel gear, it is possible to overtorque the pinch mechanism, causing damage to the valve.

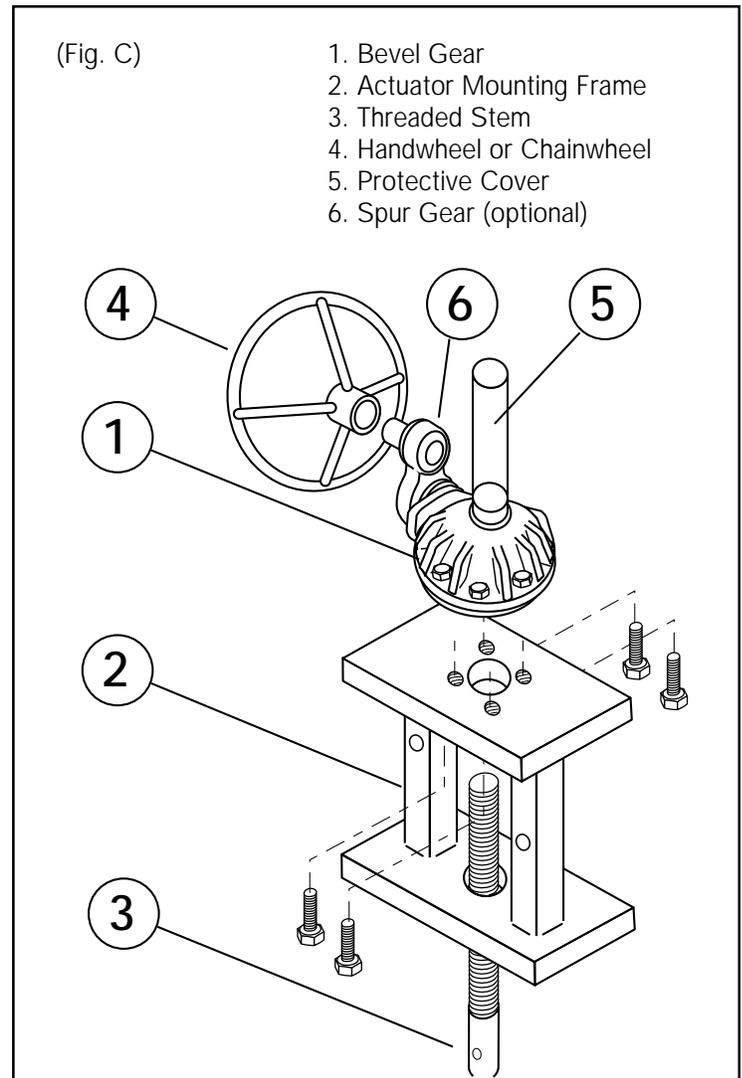
4. MAINTENANCE

Red Valve Company recommends lubricating the stem where it is attached to the bevel gear internals every 90 days. The protective cover should be removed and the valve stem greased liberally with Mobil Mobilith AW 1 or equivalent grease. Be sure to replace the stem cover securely, or debris could get inside the bevel gear housing and prevent operation.

The rest of the Dynatorque manual actuator does not require periodic maintenance. They are lifetime lubricated with all components designed to have a life equal to or exceeding the wear life of the gearing. If, for any reason, lubrication replacement is necessary, Dynatorque recommends replacement with Amoco Amdex No#1 EP or Exxon Nebula EP1.

5. REMOVAL

To remove the bevel gear unit from the valve, begin by removing the handwheel or chainwheel by removing the through bolt that attaches it to the input shaft. Remove all of the bolts that connect the bevel gear to the mounting frame. Turn the entire bevel gear counterclockwise. This will "unscrew" the unit up the piston rod until it can be removed. Remove the set screw or through bolt that attaches the handwheel to the input shaft.



REPLACING SLEEVE

1. To remove and replace the sleeve, the entire valve must be removed from the line. Be sure that the valve is in the full open position before removing the electrical supply or air supply. On fail-closed spring-loaded actuators, air must be trapped in the lower portion of the cylinder with the ball valve provided. See the supplementary sheet on installing valves with fail-closed cylinders for more information.

NOTE: The valve may need to be partially closed during this procedure. Actuators must have manual overrides, or access to the required air or electrical supply. If neither is available, the actuator must be removed. See the supplementary sheet for your type of actuator for more information.

2. Remove all body bolts, so that the valve body may be separated. Lift the top half, with actuator and scissor mechanism, straight up to expose the sleeve.

3. Remove the screws that hold the lower tabs to the pinch bar, and the sleeve should move freely enough to allow access to the upper tabs one at a time. The actuator may need to be stroked closed to push the upper pinch bar farther out of the top body half.

4. The old sleeve is removed by bending one flange and sliding the sleeve through the mechanism.

5. The new sleeve is installed by bending one flange, sliding the sleeve through the mechanism, and attaching the tabs to the pinch bars. The top half can be lowered and re-attached to the bottom half. If provided, be sure that the rubber gasket is in place between the body halves and does not interfere with any bolt holes. Do not trim the gasket for length, it is necessary that the body gaskets extend beyond the serrated body casting flange.

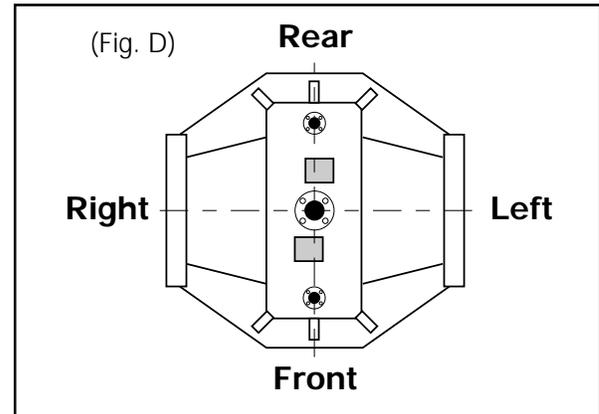
6. The lower pinch bar may also be removed to make sleeve replacement easier. Remove the balance bars and side rod pins before lifting the top half of the body. Remove the screws that attach the tabs to the lower pinch bar, and slide the side rods down and out of the body. After replacing the sleeve and attaching the tabs to the upper pinch bar, lower the top half of the body, carefully guiding the side rods through the brass guides.

MECHANISM ASSEMBLY

If the scissor mechanism is removed for any reason, it is important that it is re-assembled in the correct order. (See Fig.E)

1. Place Mounting Frame (5) onto the top of the valve body. If pattern of small holes in the bottom plate does not line up with holes on the top of the valve, Mounting

Frame (5) must be turned over. Secure with bolts. The “legs” of the Mounting Frame (5) are offset. Orient yourself at the front of the valve. (Fig.D)



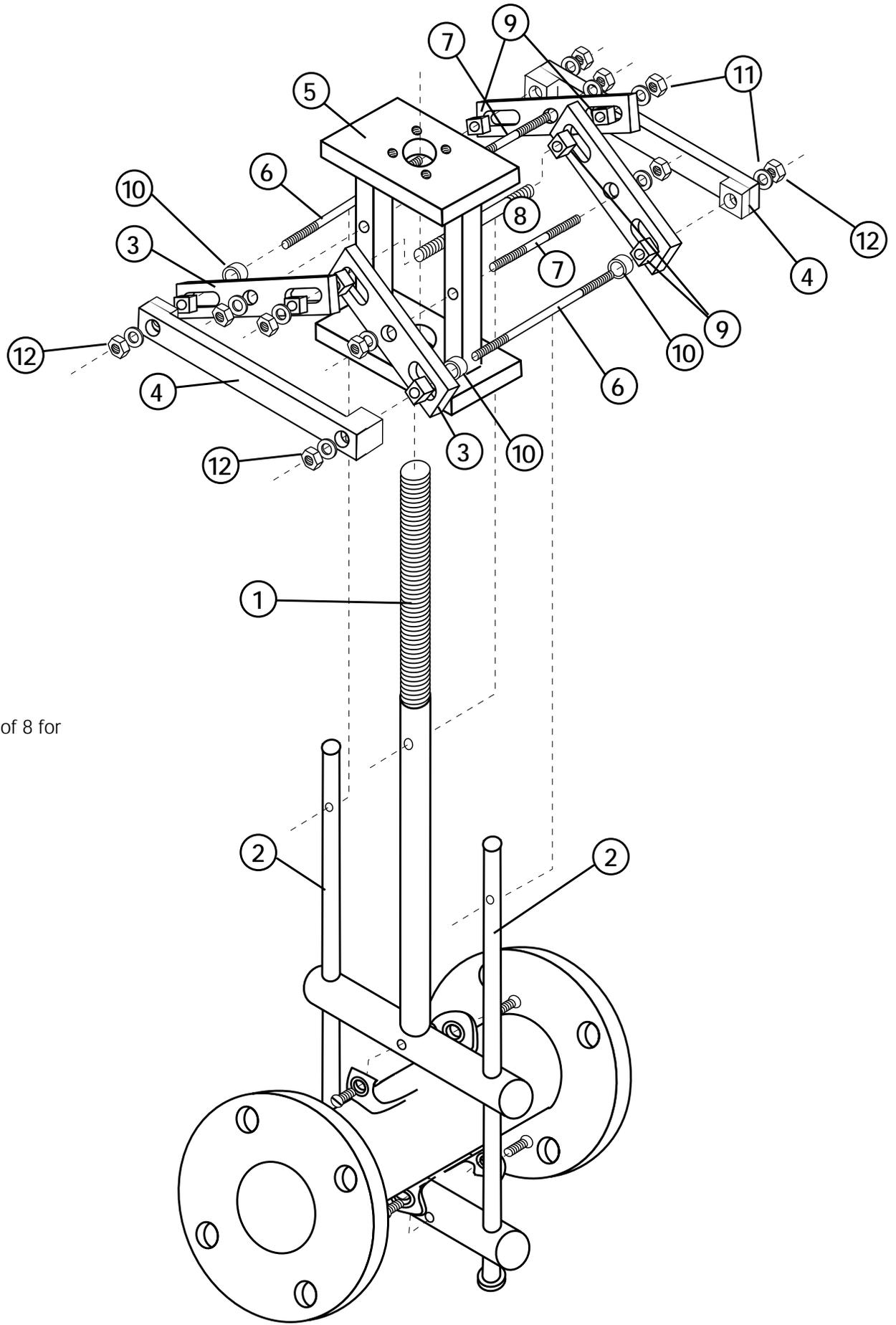
2. Slide one Pivot Pin (7) into each leg of the Mounting Frame (5). Slide one Side Rod Pin(6) into each Side Rod(2). On the FRONT Side Rod Pin (6), slide the thick Spacer (10) onto the LEFT side of the Side Rod Pin (6), and the thin Spacer (10) onto the RIGHT side. On the REAR Side Rod Pin (6), the thin Spacer (10) goes onto the LEFT side, the thick Spacer (10) goes onto the RIGHT side.

3. The first Scissor Plate (3) is placed at the FRONT, on the RIGHT side. Slide hole in the center of the plate over the Pivot Pin (7). The Side Rod Pin (6) should protrude through one of the slots. One Brass Guide (9) is slid onto the Side Rod Pin (6) and into the slot. Another Brass Guide (9) is placed into the upper slot for later use. The second Scissor Plate (3) is installed in the same manner on the REAR RIGHT Side. Repeat the procedure for the LEFT side Scissor Plate (3), beginning with the REAR plate first, and then the FRONT plate. Secure the Scissor Plates (3) with a NUT(12) on each end of the Pivot Pins (7).

4. Insert the Stem Pin (8). Place a Brass Guide (9) into the RIGHT outer plate, slide the Stem Pin (8) through both Brass Bearing Blocks (9) on the RIGHT side. Raise the Stem (1) until the Stem Pin (8) aligns with the hole in the Stem (1). The Center Pin (1) can then be slid through the Brass Guide (9) in the inner plate on the LEFT side, and a Brass Guide (9) can be added to the outer plate. Secure the Stem Pin (8) with a Threaded Spacer (11) on each side.

5. Notice that each Spreader Bar (4) has a spacer block at each end, one thick, and one thin. Slide the Spreader Bar (4) onto the Side Rod Pins (6) and secure with a Nut (12).One the RIGHT Side, The thick spacer goes towards the FRONT, and the thin spacer goes towards the REAR. Repeat the procedure for the LEFT side, placing the thick spacer to the REAR and the thin spacer to the FRONT. Once all parts have been assembled, secure all three rods by adding a second Nut (12) and tighten. Secure with a fastening compound such as Lock-Tite.

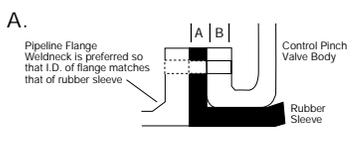
(Fig. E)



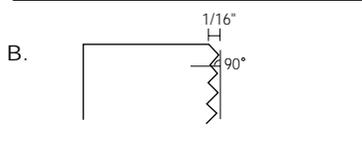
See Page 2 of 8 for parts list.

SERIES 5400 FLANGE BOLTING SPECIFICATIONS

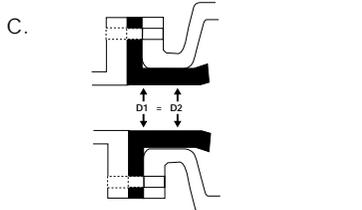
VALVE SIZE	NO. OF BOLTS	BOLT CIRCLE DIAMETER	THREAD SIZE	A	B	BOLT TORQUE (ft. lbs)
1"	4	3-1/8"	1/2" - 13 NC	1/2"	3/4"	20
1-1/2"	4	3-7/8"	1/2" - 13 NC	1/2"	5/8"	25
2"	4	4-3/4"	5/8" - 11 NC	1/2"	3/4"	40
2-1/2"	4	5-1/2"	5/8" - 11 NC	1/2"	3/4"	50
3"	4	6"	5/8" - 11 NC	1/2"	3/4"	55
4"	8	7-1/2"	5/8" - 11 NC	3/8"	7/8"	40
5"	8	8-1/2"	3/4" - 10 NC	3/8"	-"	50
6"	8	9-1/2"	3/4" - 10 NC	5/8"	7/8"	60
8"	8	11-3/4"	3/4" - 10 NC	1"	1"	70
10"	12	14-1/4"	7/8" - 9 NC	1/2"	1"	70
12"	12	17"	7/8" - 9 NC	5/8"	1-1/4"	75
14"	12	18-3/4"	1" - 8 NC	1"	1-3/8"	100
16"	16	21-1/4"	1" - 8 NC	1"	1-7/16"	70
18"	16	22-3/4"	1-1/8" - 7 NC	1-1/2"	1-5/8"	55
20"	20	25"	1-1/8" - 7 NC	1-1/2"	1-3/4"	50
24"	20	29-1/2"	1-1/4" - 7 NC	1-1/2"	2"	70



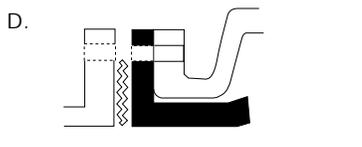
A. Standard pinch valves are built to schedule 40 pipe I.D. and to ANSI Class 125/150# flange and bolt circle specifications. It is recommended that the mating flanges are flat and full faced.



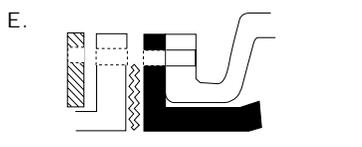
B. It is recommended that the mating flange be serrated to "grip" the rubber flange. The serrations should be cut 1/16" deep, with a 90 angle tool point. the pitch should be 8 (eight) cuts per inch.



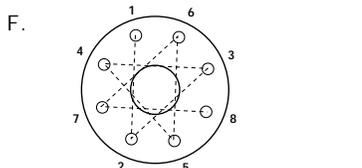
C. Mating flange ID must match the pinch valve sleeve ID.



D. When installing a pinch valve to a rubber, PVC, or any "slick" mating flange, we recommend that you install a metal serrated gasket between the two flanges to assist in the seal.



E. When bolting a pinch valve to a PVC or synthetic mating flange, use a split back-up retaining ring, since the mating flange will yield prior to generating enough force on the flange faces for a proper seal.



F. Torque all the flange bolts in a star pattern, first to 50% of tabulated valves, then retorqued to 100% of tabulated valves. If greater torque is required, continue retorquing in increments of 50% of tabulated valves. Use of high quality anti-seize compound on all bolt threads is recommended.

Variables such as the surface finish on bolt threads, type of anti-seize compound used, and surface finish of the mating flanges all have an effect on the minimum torque required to obtain a leak-tight flange seal.

RED VALVE WARRANTY

WARRANTIES - REMEDIES - DISCLAIMERS - LIMITATION OF LIABILITY
 Unless otherwise agreed to in writing signed by Red Valve, all Products supplied by Red Valve will be described in the specifications set forth on the face hereof.

THE WARRANTIES SET FORTH IN THIS PROVISION ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES WHETHER STATUTORY, EXPRESS OR IMPLIED (INCLUDING ALL WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE AND ALL WARRANTIES ARISING FROM COURSE OF DEALING OR USAGE OR TRADE).

Red Valve Products are guaranteed for a period of one year from date of shipment, against defective workmanship and material only, when properly installed, operated and serviced in accordance with Red Valve's recommendations. Replacement for items of Red Valve's manufacture will be made free of charge if proved to be defective within such year; but not claim for transportation, labor or consequential damages shall be allowed. We shall have the option of requiring the return of the defective product to our factory, with transportation charges prepaid, to establish the claim and our liability shall be limited to the repair or replacement of the defective product, F.O.B. our factory. Red Valve will not assume costs incurred to remove or install defective products nor shall we incur backcharges or liquidated damages as a result of warranty work. Red Valve does not guarantee resistance to corrosion erosion, abrasion or other sources of failure, nor does Red Valve guarantee a minimum length of service, or that the product shall be fit for any particular service. Failure of purchaser to give prompt written notice of any alleged defect under this guarantee forthwith upon its discovery, or use, and possession thereof after an attempt has been made and completed to remedy defects therein, or failure to return product or part for replacement as herein provided, or failure to install and operate said products and parts according to instructions furnished by Red Valve, or failure to pay entire contract price when due, shall be a waiver by purchaser of all rights under these representations. All orders accepted shall be deemed accepted subject to this warranty which shall be exclusive of any other or previous warranty, and shall be the only effective guarantee or warranty binding on Red Valve, anything on the contrary contained in purchaser's order, or represented by any agent or employee of Red Valve in writing or otherwise, notwithstanding implied warranties. RED VALVE MAKES NO WARRANTY THAT THE PRODUCTS, AUXILIARIES AND PARTS ARE MERCHANTABILITY OR FIT FOR ANY PARTICULAR PURPOSE.