



MOOG Industrial Controls Report CDS6500

INSTALLATION AND MAINTENANCE MANUAL FOR PROCESS VALVE ASSEMBLY

Revision B: 24 April, 2000
Location of Original: Dept. 366

Control Valve Models:

**80-063-X
80-063AX
80-080-X
80-107-X
80-108**

CAUTION

DISASSEMBLY, MAINTENANCE, OR REPAIR OTHER THAN IN ACCORDANCE WITH THE INSTRUCTIONS HEREIN OR OTHER SPECIFIC WRITTEN DIRECTIONS FROM MOOG INC., WILL INVALIDATE MOOG INC'S OBLIGATIONS UNDER THE WARRANTY. REFER TO THE MOOG INC., INDUSTRIAL CONTROLS DIVISION WARRANTY FOR COMPLETE PROVISIONS THEREOF.

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SECTION 1.0 - CONTROL VALVE ASSEMBLY INSTALLATION

1.1 HYDRAULIC SYSTEM CONTAMINATION CONTROL

The life of active hydraulic components (pumps, cartridge valves, hydraulic actuators and servovalves), is determined by the cleanliness of the hydraulic system fluid. The fluid should be maintained at a cleanliness level of ISO 4406 (SAE J1165) Solid Contaminant Code 16/14/11 or better. In no case should Solid Contaminant Code 18/16/13 be exceeded.

A continuously operating, side circulation filtration system is recommended as the most effective means for maintaining fluid cleanliness level. Shut down of the main hydraulic system is not required for filter element changeout. This design utilizes an auxiliary low volume, low pressure pump to continuously circulate oil from the sump through a low pressure 3 micron absolute ($\beta_3 \geq 75$) filter and back.

1.2 INSTALLING THE CONTROL VALVE ASSEMBLY

Note: Installation drawings are available from:
the supplier's document control center

or from Moog Inc., Industrial Controls Division; 8:00 am to 5:00 pm EST

Phone: (716) 655-3000; Fax: (716) 655-1803

or E-mail: application_support.icd @ moog.com

Ask for Customer Support and provide the Valve Assembly Model No. (80-XXX-X) from the large **MOOG** nameplate on the side of the Hydraulic Actuator.

- a. Clear the area surrounding the installation site.
- b. Flush the fuel or process fluid line of all dirt, welding chips, scale, or other foreign material prior to installing the valve.
- c. Whenever possible, install the actuator in an upright position with the rotary valve stem oriented horizontally. Vertical actuator installation permits easier valve maintenance.
- d. Provide adequate side and overhead clearance around the actuator to allow for disassembly of the actuator assembly from the valve assembly.
- e. Verify the valve flow direction, as shown by the arrow on the rotary valve, agrees with the intended flow direction in the pipeline.
- f. If the valve has separable flanges, the half rings must be installed on the valve body before bolting the valve into the line to ensure a secure connection.

<p style="text-align: center;">WARNING: FAILURE TO INSTALL HALF RINGS ON THE VALVE CORRECTLY CAN CAUSE SERIOUS PERSONAL INJURY.</p>
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- g. Flush the hydraulic supply and return lines of foreign material by inter-connecting the pressure and return lines around the servoactuator assembly. Circulate hydraulic fluid through the interconnected lines at full pump flow. Replace hydraulic system filter elements as indicated by their contamination alarms. Install hydraulic lines to the servoactuator only after the system runs for four to six hours, at full flow, without tripping a filter element contamination alarm.
- h. Connect hydraulic supply pressure to P port (on the filter assembly), return line to T port, and trip line to "Trip" port. Return pressure should not exceed 10% of system pressure.

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1.2 INSTALLING THE CONTROL VALVE ASSEMBLY (con't)

- i. Connect the instrument signal lines per the electrical schematic provided on the Control Valve Assembly Installation drawing. Close all unused electrical conduit ports with approved metal conduit plugs. Close electrical cavities with covers and seals provided. Where explosion-proof conduit sealing hubs are provided, seal the conduit hubs with the sealing compound supplied in order to comply with electrical code NFPA #70 and CSA C22.2, #30 hazardous area requirements. Follow the instructions supplied in the sealing compound package.

WARNING:
**FAILURE TO INSTALL CONDUIT PLUGS AND SEAL THE CONDUIT HUBS
ADJACENT TO THE ELECTRICAL ENCLOSURE CAN RESULT IN SERIOUS
PERSONAL INJURY AND EQUIPMENT DAMAGE.**

1.3 QUICK-CHECK

Prior to start-up, check the control valve assembly as follows:

- a. Verify that the rotary valve is installed with the flow arrow in the same direction as the intended flow in the line.
- b. Adjust the two valve packing nuts to finger-tight plus one-eighth (1/8) turn.

CAUTION:

**Do not over-tighten packing nuts. This can cause excessive packing wear
and high stem friction that may impede valve ball movement.**

- c. Verify that explosion-proof conduit seals, if applicable, have been installed within 2.0 inch (50 mm) of the valve assembly electrical enclosure.
- d. Verify that all unused conduit ports are plugged with threaded conduit plugs.
- e. Verify that the electrical cover of valve is in place, and the hold-down screws have been tightened until the spring washer is flat.
- f. With command signal at zero command, apply hydraulic pressure and check hydraulic connections for leaks.
- g. With process fluid blocked and hydraulic pressure applied, check for full stroke by applying and removing the command signal to the servovalve.
- h. Stroke the valve and observe the visual valve position indicator. Compare the position with the scale marks on the stroke indicator plate. The valve should change position in a smooth, controllable fashion.
- i. With hydraulic pressure supplied, apply an electrical command signal to open the valve. Remove the electrical command signal and observe the valve moving to the failure position.
- j. After the first process fluid temperature excursion has occurred, the packing bolting should be adjusted per the Fisher Service literature to ensure continued leak free seal of the packing.

New Application Support may be obtained at:

Phone: (716) 655-3000
or Fax: (716) 655-1803
or E-mail: application_support.icd @ moog.com

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SECTION 2.0 - CONTROL VALVE ASSEMBLY MAINTENANCE

- 2.1** Every six months or 4000 hours, check for proper operation of the control valve assembly by performing the preventative maintenance steps outlined below. These checks do not require removal of the valve from the process line. If a problem is suspected, repair the valve assembly prior to returning the unit to service.

WARNING:
KEEP HANDS, HAIR, CLOTHING, ETC. AWAY FROM ALL MOVING PARTS.
FAILURE TO DO SO CAN CAUSE SERIOUS INJURY.

- a.** Look for signs of leakage through the process valve packing and end flanges. Tighten the packing nuts (if required) in accordance with the enclosed Fisher maintenance bulletins.

CAUTION:
Do not over-tighten the process valve packing nuts.

- b.** Replace the hydraulic filter element.
- c.** Check for leakage at the hydraulic pressure and return ports and the actuator rod seal.
- d.** Examine the assembly for damage caused by corrosive fumes or process fluid drippings.
- e.** Clean and repaint areas of oxidation.
- f.** Verify that all accessories, brackets, hydraulic lines and bolting are securely fastened.
- g.** With hydraulics applied, remove the electrical command signal and observe the actuator for correct fail-safe action.
- h.** Stroke the valve and check for smooth, full-stroke operation. Unsteady motion could indicate a servovalve, actuator or process valve problem.

SECTION 3.0 - GENERAL DISASSEMBLY AND ASSEMBLY INSTRUCTIONS

3.1 GENERAL

This section contains general disassembly and assembly instructions that apply to the entire control valve assembly.

3.2 DISASSEMBLY

Most minor overhaul and repair procedures do not require complete disassembly of the control valve assembly. Perform only those disassembly procedures required for removal of suspect component(s).

- a. Disassembly should be performed in as clean an environment as possible.
- b. Remove hydraulic pressure to the unit.
- c. Disconnect all electrical signal sources to the unit after removing the hydraulic pressure.
- d. Disconnect all electrical power sources to the unit after removing the signal sources.

WARNING:
HYDRAULIC PRESSURE MUST BE REMOVED BEFORE ELECTRICAL SIGNAL AND POWER ARE TURNED OFF. FAILURE TO OBSERVE THIS SAFETY PROCEDURE MAY CAUSE PERSONAL INJURY OR DEATH DUE TO THE SUDDEN, UNEXPECTED AND RAPID MOTION OF HYDRAULICALLY POWERED EQUIPMENT.

- e. When disassembling threaded joints, thread locking compound can prevent free rotation of the fastener. Applying a slow, steady torque, just sufficient to turn the fastener, will result in satisfactory fastener removal. Using solvent or heat on the fastener is not recommended.
- f. Remove the process valve from the turbine if necessary.

3.3 SERVOACTUATOR/PROCESS VALVE DISMOUNTING/MOUNTING

Removal of the rotary valve from the process line is required to maintain the internal components of the rotary valve.

- a. Isolate the process valve from any process fluid under pressure.
- b. Isolate hydraulic supply pressure to the hydraulic actuator.
- c. Isolate command signals and electrical power to the unit.
- d. Remove the pointer assembly from the valve shaft.
- e. Observe and record the orientation of the flow arrow on the process valve with respect to filter assembly (or other landmark) on the actuator assembly.
- f. Remove four hex bolts (two bolts on 2 inch and smaller valves) which retain the process valve to the yoke.
- g. Carefully support and withdraw the process valve and shaft (straight out) of the yoke and transfer case assembly.
- h. Service the rotary valve per the attached Fisher service instruction.

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3.3 SERVOACTUATOR/PROCESS VALVE DISMOUNTING/MOUNTING (con't)

- i. Follow the above steps in reverse order to reassemble the valve to the actuator assembly observing applicable notes on the valve assembly figure.
- j. Verify the position transducer output agrees with values on the installation drawing at full open and full closed.
- k. Adjustment of the transducer output requires removal of the threaded transducer cover.
- l. Loosen (do not remove) two socket head screws retaining the position transducer.
- m. With the rotary valve full open or full closed, rotate (less than 10°) the position transducer to obtain the output shown on the installation drawing for your valve model.
- n. Torque the transducer hold down screws per note.
- o. Verify the transducer output at valve full open and full closed agrees with installation drawing.
- p. Reinstall transducer cover, tighten hand tight.

3.4 ROTATING ACTUATOR WITH RESPECT TO FLOW CENTERLINE

- a. The flow centerline of the process valve can be rotated in 180° increments from the factory installed orientation. If you wish to rotate the valve 90° from supplied orientation, consult factory for replacement mounting hardware.
- b. Follow steps 3.3a through 3.3h above.
- c. Install the valve in the desired orientation.
- d. Follow steps 3.3a through 3.3h in reverse order for re-assembly.
- e. Re-calibrate the position transducer per instructions in 3.3l through 3.3p.
- f. Loosen the setscrew on the visual indicator assembly and realign it with the appropriate indication on the indicator plate. Retighten setscrew in the pointer assembly.
- g. Reinstall valve assembly in process pipeline.

3.5 ASSEMBLY

- a. Perform all assembly work in a clean environment. Work on a clean, hard surface using only clean, lint free wipes and cloths.
- b. Exercise care to avoid cutting or nicking o-rings or mating surfaces when reassembling parts.
- c. Lubricate all o-rings with clean hydraulic fluid or petroleum jelly prior to installation.
- d. Mating surfaces of diametral o-rings, seals, and bearings must be lubricated with clean hydraulic fluid or petroleum jelly prior to assembly.
- e. Petroleum jelly may be used to hold face seal o-rings in place during assembly.

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3.5 ASSEMBLY *cont*

- f. Screw threads that require thread locking compound must be free of oil, grease and dirt. Apply only two to three drops of thread locking compound in a narrow band along the length of the male threaded part (across four to five threads).
- g. Screw threads that do **not** require installation with thread locking compound should be lubricated with petroleum jelly.
- h. Fasteners installed with spring washers are to be tightened until the spring washer is flat.
- i. Select torque wrenches that will be operating in the top 50% of their range at the specified torque.
- j. Tighten multiple fasteners in a cross pattern, in three steps to 30%, 60% and finally 100% of specified torque.
- k. Assembly of adjustable straight thread hydraulic fittings (**elbows and tees**):
 - 1. Back off the fitting locknut as far as possible to allow the back-up washer to contact the locknut thread. Push the back-up washer and o-ring into contact with the locknut thread.
 - 2. Lubricate the fitting o-ring and the locknut thread with clean hydraulic fluid or petroleum jelly.
 - 3. Turn the fitting into the straight thread port until the back-up washer contacts both the ported body and the locknut thread.
 - 4. Turn the fitting up to one turn counterclockwise to align the fitting with the mating tube or wireway.
 - 5. Holding the fitting with a wrench, tighten the locknut until the back-up washer fully contacts the ported body.
 - 6. Torque the locknut to the appropriate value shown in Table 3-1. Torque values for stainless steel fittings have positive tolerance only.
- l. Assembly of non-adjustable straight thread hydraulic fittings (**adaptors, connectors and plugs**):
 - 1. Lubricate the o-ring and thread on the fitting with clean hydraulic fluid or petroleum jelly.
 - 2. Turn the fitting or plug into the straight thread port until the fitting or plug contacts the ported body.
 - 3. Torque fittings and adaptors to values shown in Table 3-2.
 - 4. Torque hexagon socket (hollow hex) plugs to values shown in Table 3-3.
 - 5. Torque values for stainless steel fittings and plugs have positive tolerance only.

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3.5 ASSEMBLY *con't*
Table 3-1. Adjustable Fitting (Elbows and Tees) Torque

Fitting Size	SAE Port Thread Size	Locknut Torque Ft. lbs.
- 2	0.313-24	5.5 ± 0.5
- 3	0.375-24	11 ± 1
- 4	0.438-20	14 ± 1
- 5	0.500-20	22 ± 1
- 6	0.563-18	27 ± 2
- 8	0.750-16	42 ± 2
- 10	0.875-14	60 ± 2
- 12	1.062-12	80 ± 5
- 14	1.188-12	105 ± 6
- 16	1.313-12	115 ± 6
- 20	1.625-12	225 ± 12
- 24	1.875-12	250 ± 12
- 32	2.500-12	325 ± 15

Table 3-2. Non-Adjustable Fitting (Adaptors and Unions) Torque

Fitting Size	SAE Port Thread Size	Fitting Torque Ft. lbs.
- 2	0.313-24	7.5 ± 0.5
- 3	0.375-24	14 ± 1
- 4	0.438-20	18 ± 1
- 5	0.500-20	22 ± 1
- 6	0.563-18	27 ± 2
- 8	0.750-16	48 ± 2
- 10	0.875-14	90 ± 5
- 12	1.062-12	110 ± 5
- 14	1.188-12	145 ± 6
- 16	1.313-12	160 ± 6
- 20	1.625-12	225 ± 12
- 24	1.875-12	250 ± 12
- 32	2.500-12	325 ± 15

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3.5 ASSEMBLY *cont*
Table 3-3. Hexagon Socket Plug Torque

Fitting Size	SAE Port Thread size	Hollow Hex Plug Torque Ft. lbs.
- 2	0.313-24	3 ± 0.5
- 3	0.375-24	5 ± 0.5
- 4	0.438-20	11 ± 0.5
- 5	0.500-20	15 ± 0.5
- 6	0.563-18	18 ± 1
- 8	0.750-16	46 ± 2
- 10	0.875-14	75 ± 5
- 12	1.062-12	85 ± 5
- 14	1.188-12	130 ± 6
- 16	1.313-12	135 ± 6
- 20	1.625-12	225 ± 12
- 24	1.875-12	250 ± 12
- 32	2.500-12	325 ± 15

m. Assembly of explosion-proof pipe thread wireway fittings:

1. Mark the sixth male thread from the open end of the wireway fitting. Do not use lubricant or sealant on the threads.
2. Install the fitting and tighten until the threads in front of the mark are no longer visible. This assures five thread engagement required by the NFPA and CSA hazardous area electrical codes.

n. Assembly of explosion-proof SAE straight thread wireway fittings:

1. Lubricate the o-ring and thread on the fitting with petroleum jelly.
2. Install and torque adjustable straight thread style fittings (elbows and tees) per step k.
3. Install and torque non-adjustable straight thread style fittings (adaptors and connectors) per step l.

o. Assembly of explosion-proof SAE Flareless Wireway Fitting

Note: Examine the fitting for the "MOOG EP" mark. Flareless fittings not stamped "MOOG EP" are not acceptable for use in explosion-proof wireway service.

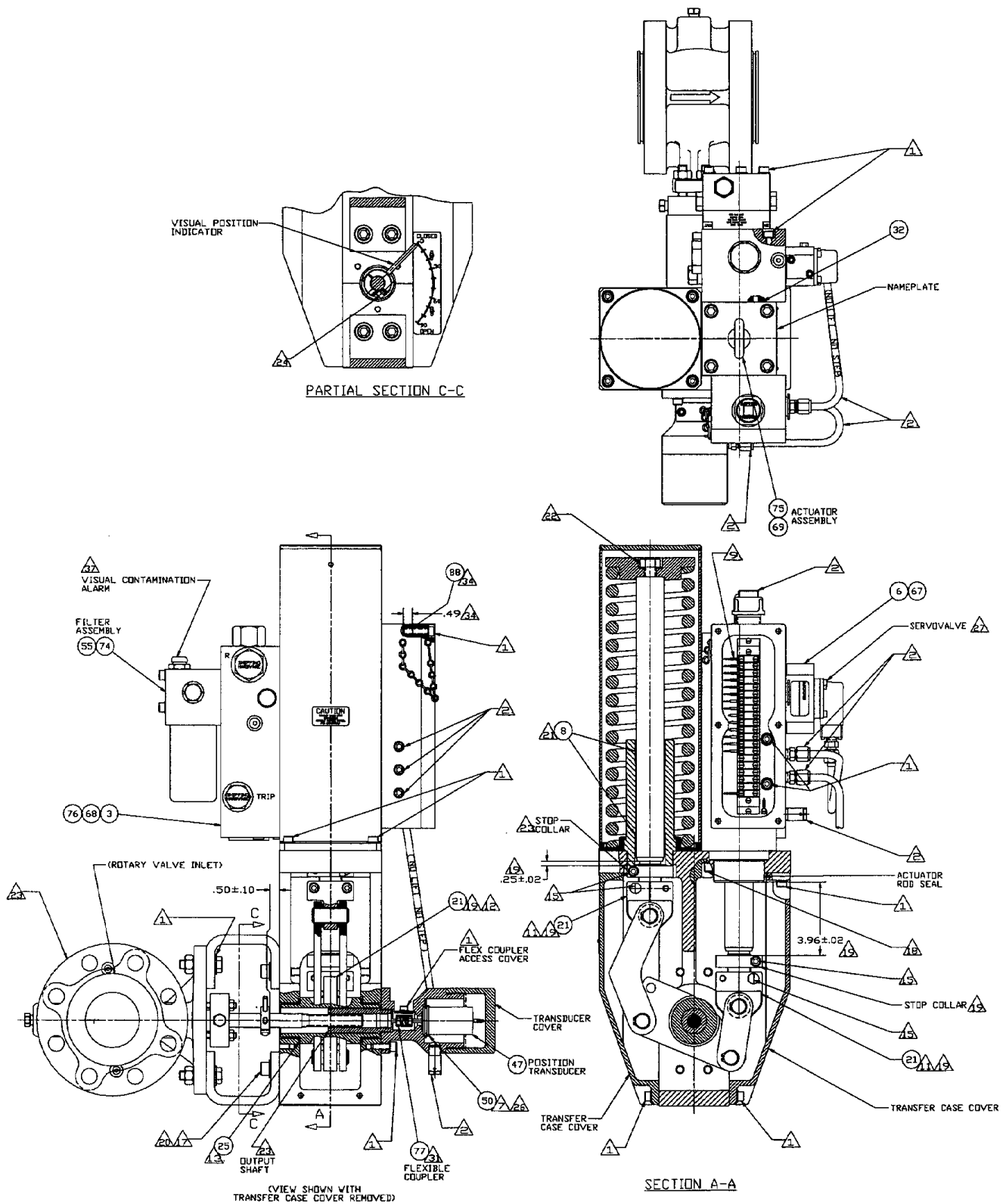
1. Lubricate threads on fitting with petroleum jelly.

CAUTION

A flareless fitting body used to pre-set a ferrule must only be connected to the ferrule it has pre-set.

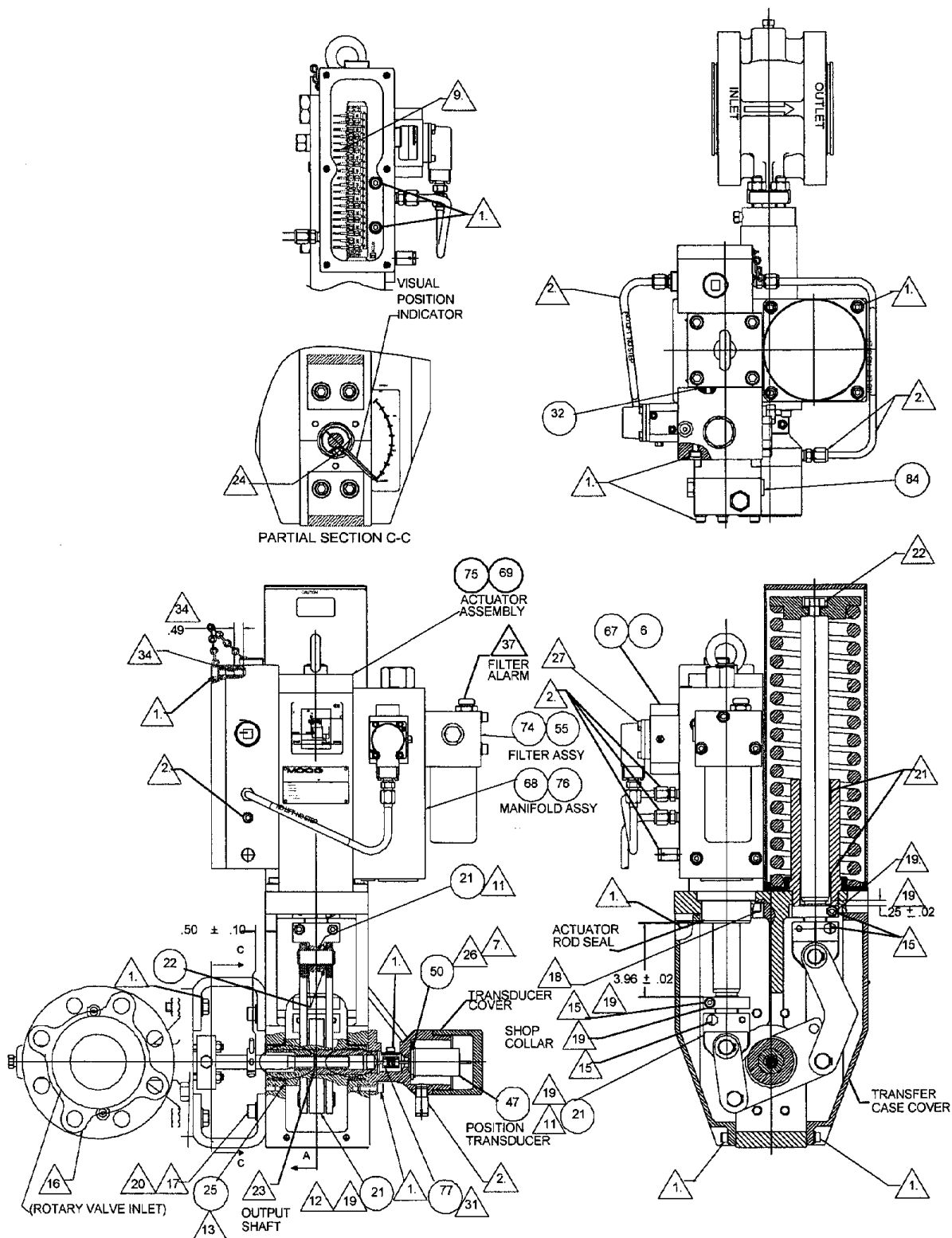
2. Insert the wireway into the fitting body and wrench the nut down easily until a sudden increase in torque is evident. From this point turn the nut an additional 1/6 turn (1 wrench flat) to spring the ferrule into place to seal against the wireway and the fitting body.
- p.** Follow disassembly steps in reverse order to reassemble the servoactuator assembly. See enclosed figures for bolt torque values and special instructions.
- q.** Verify the calibration of the position transducer per the installation drawing. If necessary, adjust transducer per section 3.4k to 3.4p.

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80-063-X VALVE ASSEMBLY (Sheet 1 of 3)

INSTALLATION AND MAINTENANCE MANUAL

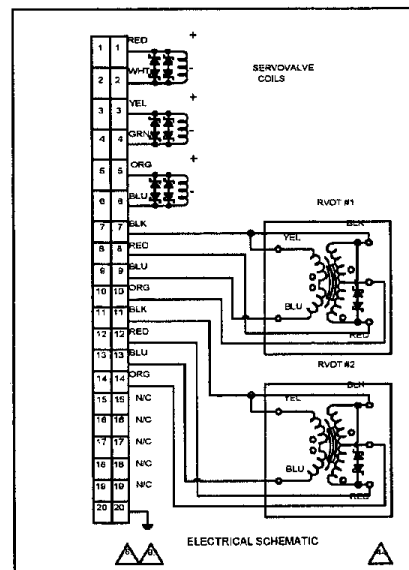
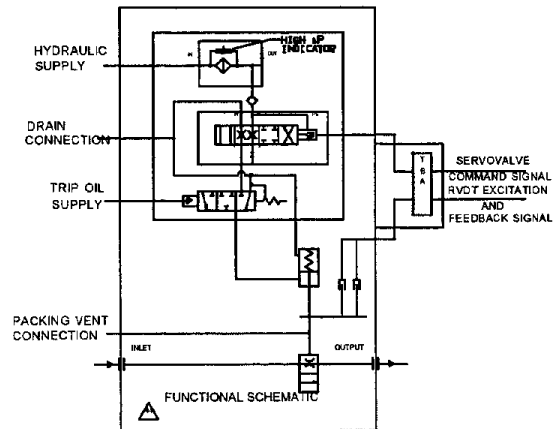


80-063AX AND 80-107-2 VALVE ASSEMBLY (Sheet 2 of 3)

INSTALLATION AND MAINTENANCE MANUAL

NOTES:

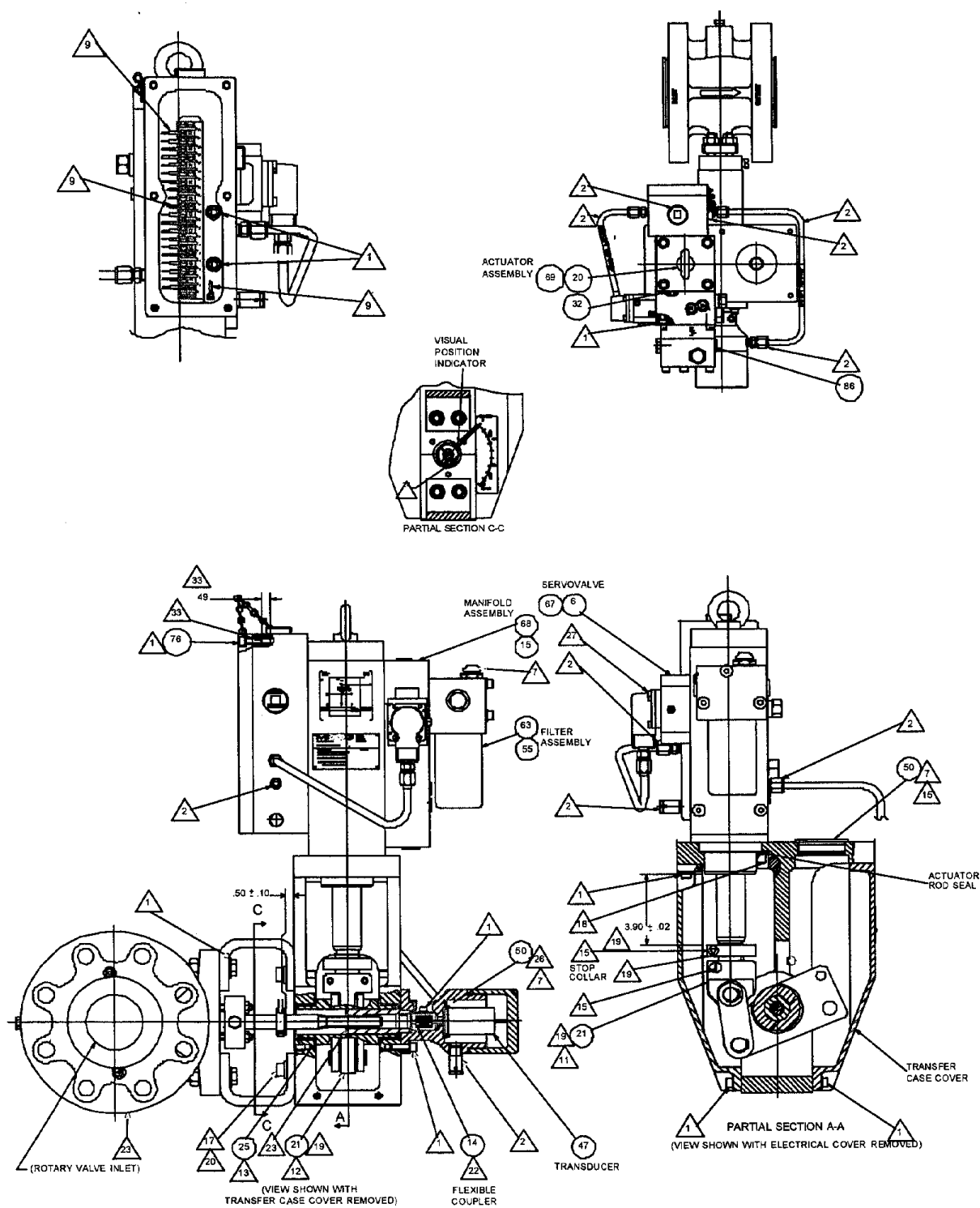
- 1 TORQUE FASTENERS UNTIL SPRING WASHER IS FLAT.
- 2 INSTALL WIREWAYS AND FITTINGS PER PARA. 3.5, M-O
- 6 POSITION LABEL (B/N 63) APPROXIMATELY WHERE SHOWN.
- 7 APPLY LOCKING COMPOUND TO THREADS PER PARA. 3.5 F.
- 8 TRIM LEAD LENGTHS TO 1.0 FOOT BEYOND TERMINAL STRIP. CONNECT MOOG WIRING TO OUTBOARD TERMINALS. COIL EXCESS WIRE IN HOUSING.
- 9 CRIMP TERMINALS TO WIRES PER MANUAL.
- 11 INSTALL BEARINGS (B/N 21) INTO CLEVIS WITH SPLIT FACING UP.
- 12 INSTALL BEARINGS (B/N 21) INTO LEVER WITH SPLIT FACING DOWN.
- 13 INSTALL BEARINGS (B/N 25) INTO TRANSFER CASE WITH SPLIT FACING DOWN.
- 15 TORQUE TO 25 ± 3 FT-LBS.
- 17 TORQUE TO 50 ± 5 FT-LBS.
- 18 TORQUE TO 90 ± 4 FT-LBS.
- 19 ASSEMBLE CENTERLINE PARTS BY COMPRESSING THE SPRING AND SETTING THE SPRING STOP TO THE DIMENSION SHOWN (.25). RELEASE SPRING AND INSTALL CLEVISES ONTO RODS TO WITHIN ONE (1) THREAD OF BOTTOMING. SET THE ACTUATOR STOP TO DIMENSION SHOWN (3.96) BY EXTENDING ACTUATOR ROD.
- 20 TWO (2) WASHERS REQUIRED, 4 PLACES.
- 21 PRESS TO FULL DEPTH.
- 22 TORQUE TO 100 ± 10 FT-LBS.
- 23 WITH THE ASSEMBLY IN ITS FAIL POSITION (SPRING STOP BOTTOMED), POSITION THE BALL VALVE USING HEX ON OUTPUT SHAFT UNTIL BALL IS APPROXIMATELY CENTERED IN ITS SEAT.
- 24 TORQUE TO $6 \pm .5$ FT-LBS.
- 26 TORQUE TO $2 \pm .2$ IN-LBS.
- 27 TORQUE TO $5 \pm .5$ IN-LBS.
- 31 TORQUE CLAMP SCREW IN FLEXIBLE COUPLER TO $5 \pm .5$ IN-LBS.
- 34 ASSEMBLE SNAP RING TO SHC SCREW AT DIMENSION SHOWN (.49) FROM END OF SCREW.
- 37 TORQUE TO 40 ± 5 FT-LBS.
- 44 SCHEMATICS ARE SHOWN WITH ELECTRICAL AND HYDRAULIC POWER OFF, ROTARY VALVE CLOSED.



-	1	COUPLER, FLEXIBLE	77
-	1	RECOMMENDED SPARE PARTS, MANIFOLD AY	76
-	1	RECOMMENDED SPARE PARTS, ACTUATOR	75
-	3	FILTER ELEMENT (GE 315A2660P003)	74
1	-	KIT, SEAL, ACTUATOR	69
1	-	KIT, SEAL, MANIFOLD	68
4	-	O-RING (SERVO) (-12)	87
1	-	KIT, SEAL FILTER	55
-	1	COMPOUND, LOCKING (PURPLE)	50
-	1	TRANSDUCER, RVDT	47
4	-	O-RING (MANIFOLD)*	32
2	-	BEARING, ROD, FLANGED	25
-	4	WASHER, THRUST	22
-	4	BEARING, ROD (.75 ID X .75")	21
-	2	BEARING, ROD (1.50 ID X 1.25")	8
-	1	SERVOVALVE	6
1	-	KIT, SEAL, VALVE ASSEMBLY	
1	-	RECOMMENDED SPARE PARTS	
REV B		MODIFICATION OR DESCRIPTION	REVISION NO.

80-063-X AND 80-063AX VALVE ASSEMBLY (Sheet 3 of 3)

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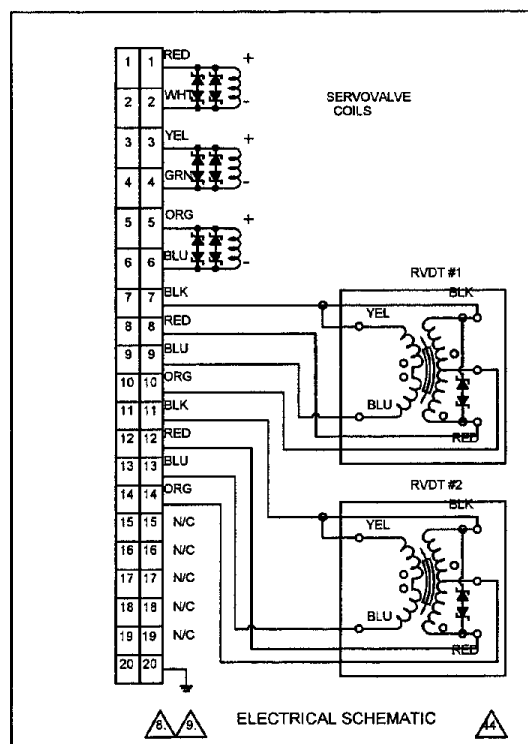
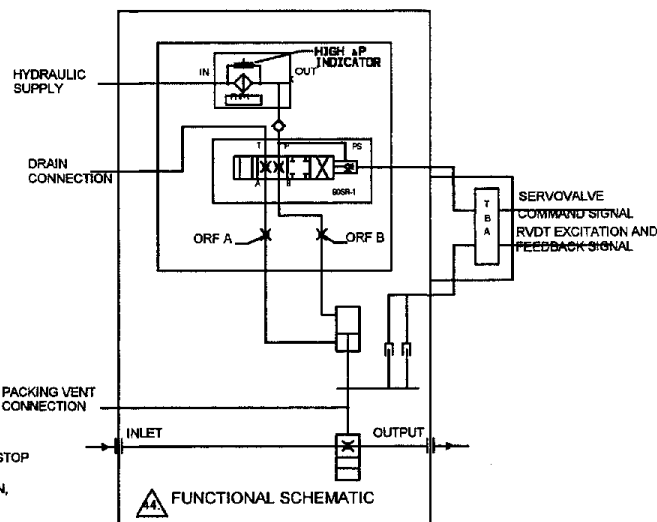
80-080-X VALVE ASSEMBLY (Sheet 1 of 2)

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NOTES:

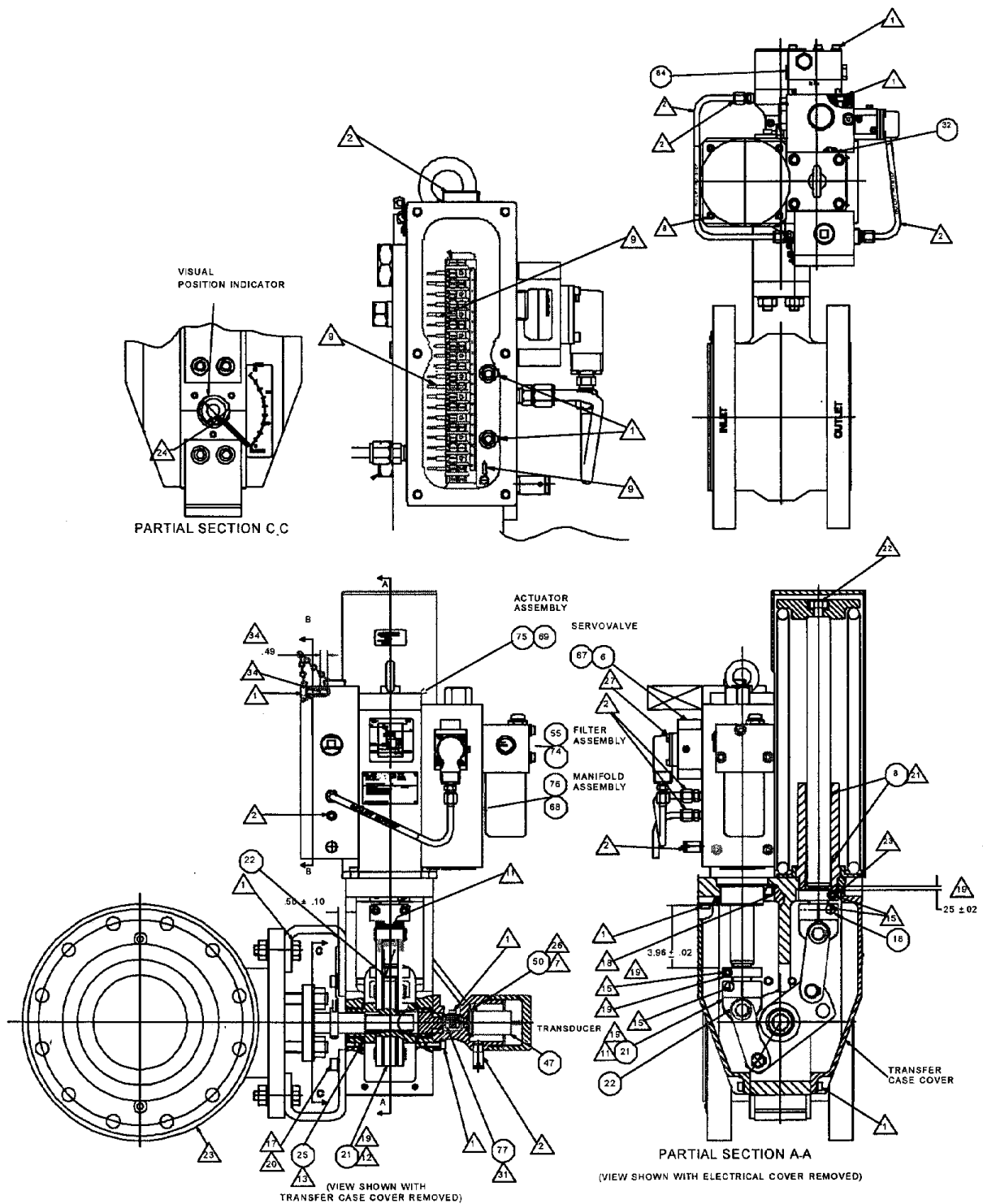
1. TORQUE FASTENER UNTIL SPRING WASHER IS FLAT.
2. INSTALL WIREWAYS AND FITTINGS PER PARA. 3.4, M.O.
7. APPLY LOCKING COMPOUND TO THREADS PER PARA. 3.5, F.
8. TRIM LEAD LENGTHS TO 1.0 FOOT BEYOND TERMINAL STRIP. CONNECT MOOG WIRING TO OUTBOARD TERMINALS. COIL EXCESS WIRE IN HOUSING.
9. CRIMP TERMINALS TO WIRES PER MANUAL.
11. INSTALL BEARINGS (B/N 21) INTO CLEVIS WITH SPLIT FACING UP.
12. INSTALL BEARINGS (B/N 21) INTO LEVER WITH SPLIT FACING DOWN.
13. INSTALL BEARINGS (B/N 25) INTO TRANSFER CASE WITH SPLIT FACING DOWN.
15. TORQUE TO 25 \pm 3 FT.-LBS.
17. TORQUE TO 50 \pm 5 FT.-LBS.
18. TORQUE TO 90 \pm 4 FT.-LBS.
19. ASSEMBLE CENTERLINE BY EXTENDING ACTUATOR AND SETTING ACTUATOR STOP TO DIMENSION SHOWN (3.98). INSTALL CLEVIS TO WITHIN ONE (1) THREAD OF BOTTOMING ON PISTON ROD. INSTALL LINKS AND PINS, AS SHOWN, IN LEVER AND CLEVIS.
20. TWO (2) WASHERS REQUIRED, 4 PLACES.
22. TORQUE CLAMP SCREW IN FLEXIBLE COUPLER (B/N 14) TO 5 \pm .5 IN.-LBS.
23. ALIGN VALVE WITH ACTUATOR FULLY EXTENDED. POSITION BALL VALVE USING HEX ON OUTPUT SHAFT UNTILL BALL IS APPROXIMATELY CENTERED IN ITS SEAT.
24. TORQUE TO 6 \pm .5 FT.-LBS.
26. TORQUE TO 2 \pm 2 IN.-LBS.
27. TORQUE TO 5 \pm .5 IN.-LBS.
33. ASSEMBLE SNAP RING TO SCREW TO DIMENSION SHOWN (.49), FROM END OF SCREW.
37. TORQUE TO 40 \pm 5 FT.-LBS.
44. SCHEMATICS ARE SHOWN WITH ELECTRICAL AND HYDRAULIC POWER OFF, ROTARY VALVE CLOSED.

1	-	O-RING	86
1	-	KIT, SEAL, ACTUATOR	69
1	-	KIT, SEAL, MANIFOLD	68
4	-	O-RING (SERVO) (-12)	67
-	3	FILTER ELEMENT (GE 315A2660P003)	63
1	-	KIT, SEAL, FILTER	55
-	1	COMPOUND LOCKING (PURPLE)	50
-	1	TRANSDUCER RVDI	47
4	-	O-RING (MANIFOLD)	32
-	2	BEARING, ROD, FLANGED	25
2	2	WASHER, THRUST	22
-	2	BEARING, ROD (.75 ID X .75")	21
-	1	RECOMMENDED SPARE PARTS, ACTUATOR	20
-	1	RECOMMENDED SPARE PARTS, MANIFOLD AY	15
-	1	COUPLER, FLEXIBLE	14
-	1	SERVOVALVE	6
1	-	KIT, SEAL, VALVE ASSEMBLY	
1	-	RECOMMENDED SPARE PARTS	
TOTL REQD		NOMENCLATURE OR DESCRIPTION	BALLOON NO.



80-080-X VALVE ASSEMBLY (Sheet 2 of 2)

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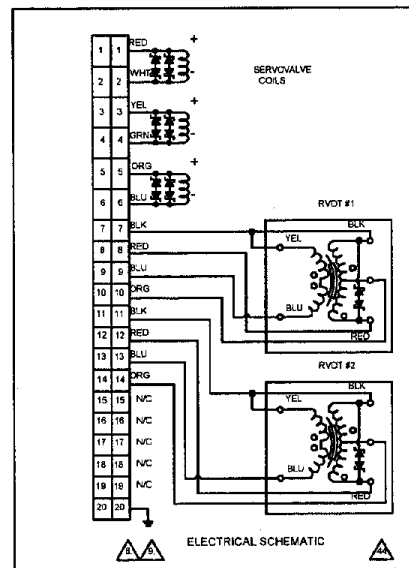
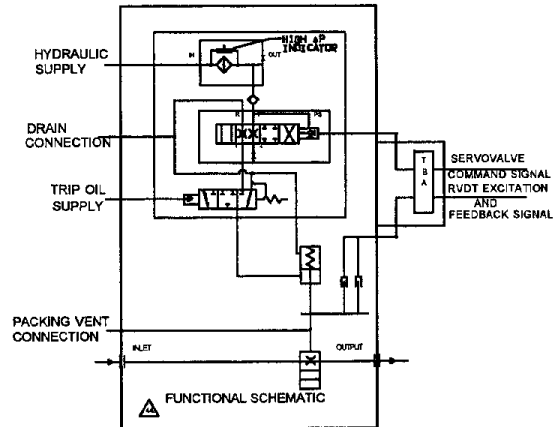


80-107 VALVE ASSEMBLY (Sheet 1 of 2)

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NOTES:

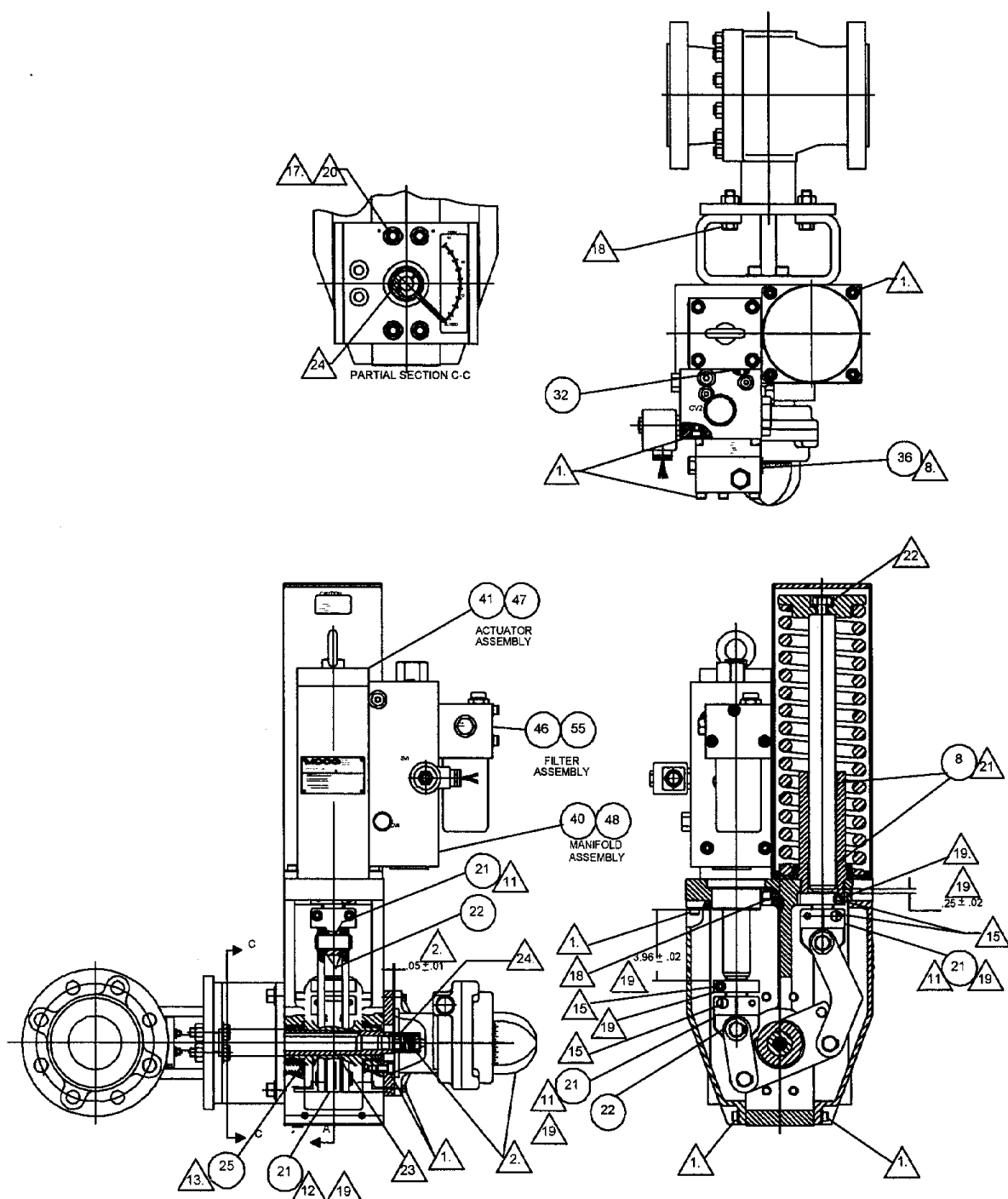
- 1 TORQUE FASTENERS UNTIL SPRING WASHER IS FLAT.
- 2 INSTALL WIREWAYS AND FITTINGS PER PARA. 3.5, M-Q.
- 6 POSITION LABEL (B/N 63) APPROXIMATELY WHERE SHOWN.
- 7 APPLY LOCKING COMPOUND TO THREADS PER PARA. 3.5 F.
- 8 TRIM LEAD LENGTHS TO 1.0 FOOT BEYOND TERMINAL STRIP. CONNECT MOOG WIRING TO OUTBOARD TERMINALS. COIL EXCESS WIRE IN HOUSING.
- 9 CRIMP TERMINALS TO WIRES PER MANUAL.
- 11 INSTALL BEARINGS (B/N 21) INTO CLEVIS WITH SPLIT FACING UP.
- 12 INSTALL BEARINGS (B/N 21) INTO LEVER WITH SPLIT FACING DOWN.
- 13 INSTALL BEARINGS (B/N 25) INTO TRANSFER CASE WITH SPLIT FACING DOWN.
- 15 TORQUE TO 25 ± 3 FT-LBS.
- 17 TORQUE TO 50 ± 5 FT-LBS.
- 18 TORQUE TO 90 ± 4 FT-LBS.
- 19 ASSEMBLE CENTERLINE PARTS BY COMPRESSING THE SPRING AND SETTING THE SPRING STOP TO THE DIMENSION SHOWN (.25). RELEASE SPRING AND INSTALL CLEAVES ONTO RODS TO WITHIN ONE (1) THREAD OF BOTTOMING. SET THE ACTUATOR STOP TO DIMENSION SHOWN (3.96) BY EXTENDING ACTUATOR ROD.
- 20 TWO (2) WASHERS REQUIRED, 4 PLACES.
- 21 PRESS TO FULL DEPTH.
- 22 TORQUE TO 100 ± 10 FT-LBS.
- 23 WITH THE ASSEMBLY IN ITS FAIL POSITION (SPRING STOP BOTTOMED), POSITION THE BALL VALVE USING HEX ON OUTPUT SHAFT UNTIL BALL IS APPROXIMATELY CENTERED IN ITS SEAT.
- 24 TORQUE TO $6 \pm .5$ FT-LBS.
- 26 TORQUE TO $2 \pm .2$ IN-LBS.
- 27 TORQUE TO $5 \pm .5$ IN-LBS.
- 31 TORQUE CLAMP SCREW IN FLEXIBLE COUPLER TO $5 \pm .5$ IN-LBS.
- 34 ASSEMBLE SNAP RING TO SHC SCREW AT DIMENSION SHOWN (.49) FROM END OF SCREW.
- 37 TORQUE TO 40 ± 5 FT-LBS.
- 44 SCHEMATICS ARE SHOWN WITH ELECTRICAL AND HYDRAULIC POWER OFF, ROTARY VALVE CLOSED.



-	1	COUPLER, FLEXIBLE	77
-	1	RECOMMENDED SPARE PARTS, MANIFOLD AY	76
-	1	RECOMMENDED SPARE PARTS, ACTUATOR	75
-	3	FILTER ELEMENT (GE 315A2680P003)	74
1	-	KIT, SEAL, ACTUATOR	69
1	-	KIT, SEAL, MANIFOLD	68
4	-	O-RING (SERVO) (-12)	67
1	-	KIT, SEAL FILTER	55
-	1	COMPOUND, LOCKING (PURPLE)	50
-	1	TRANSDUCER, RVDY	47
4	-	O-RING (MANIFOLD)	32
-	2	BEARING, ROD, FLANGED	25
-	4	WASHER, THRUST	22
-	4	BEARING, ROD (.75 ID X .75)	21
-	2	BEARING, ROD (1.50 ID X 1.25)	8
-	1	SERVOVALVE	6
1	-	KIT, SEAL, VALVE ASSEMBLY	
1	-	RECOMMENDED SPARE PARTS	
QTY	REQ'D	NOMENCLATURE OR DESCRIPTION	BALLOON NO.

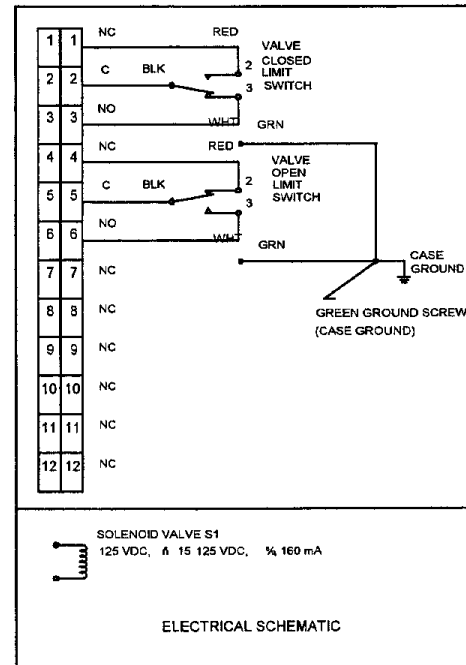
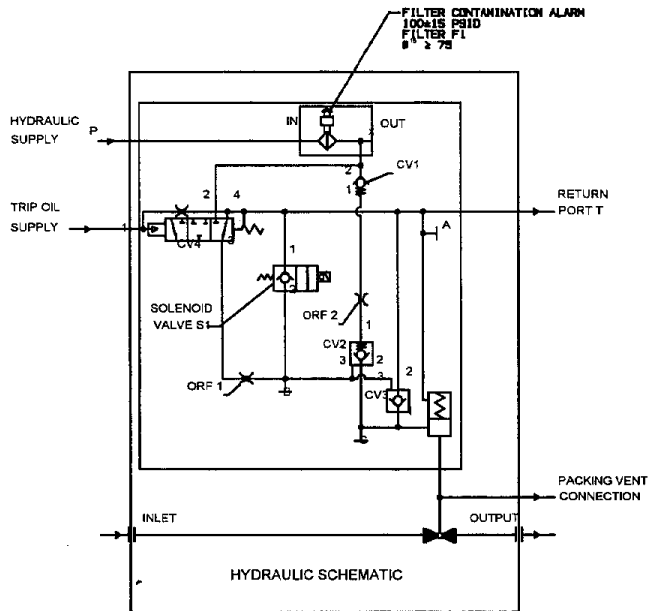
80-107 VALVE ASSEMBLY (Sheet 2 of 2)

INSTALLATION AND MAINTENANCE MANUAL



80-108 VALVE ASSEMBLY (Sheet 1 of 2)

INSTALLATION AND MAINTENANCE MANUAL



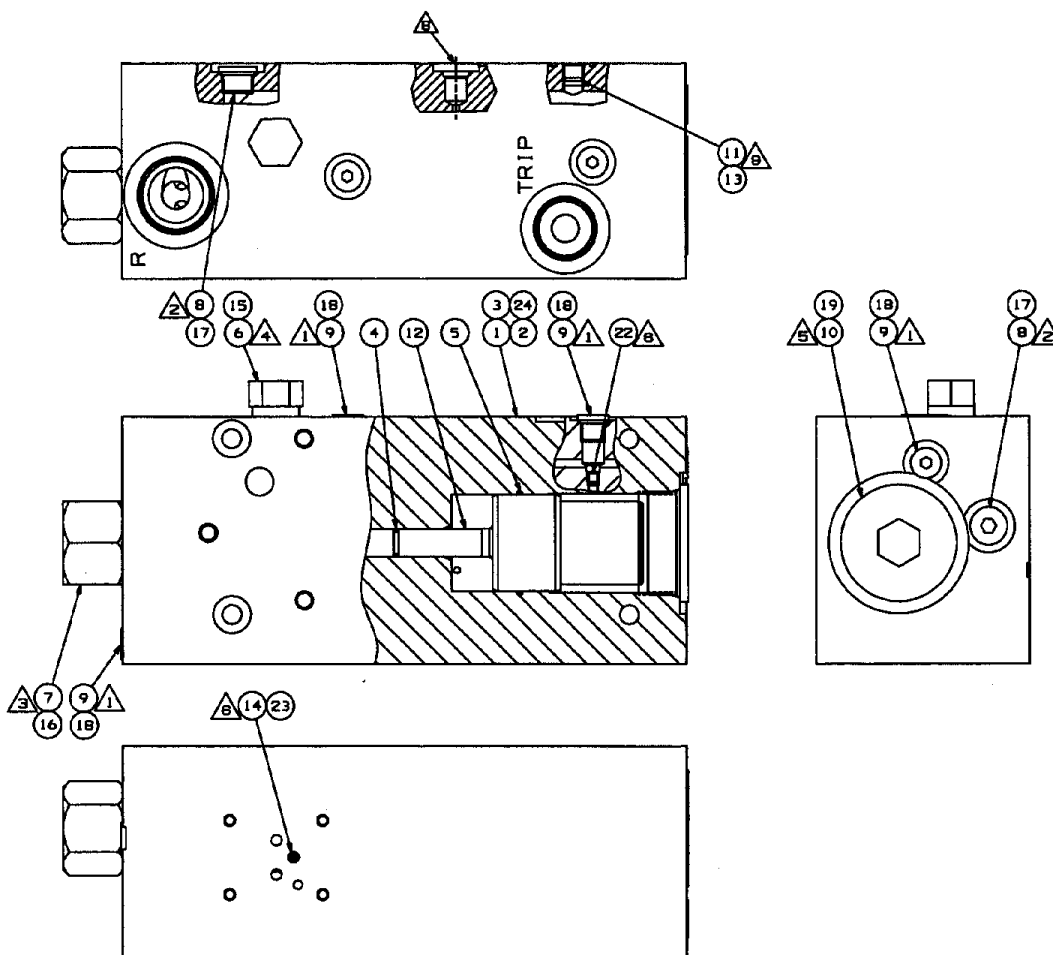
NOTES:

1. TORQUE FASTENER UNTIL SPRING WASHER IS FLAT.
2. INSTALL FLEX COUPLER ONTO SWITCH ASSEMBLY SHAFT TO DIMENSION SHOWN, 0.05" ABOVE MOUNTING FACE. TORQUE COUPLER SCREWS TO 11.
7. APPLY LOCKING COMPOUND TO THREADS PER PARA 3.5, F.
8. INSTALL HOLLOW HEX PLUG PER PARA 3.5, L.
11. INSTALL BEARINGS INTO CLEVIS WITH SPLIT FACING UP.
12. INSTALL BEARINGS INTO LEVER WITH SPLIT FACING DOWN.
13. INSTALL BEARINGS INTO TRANSFER CASE WITH SPLIT FACING DOWN.
15. TORQUE TO 25 ± 3 FT-LBS.
17. TORQUE TO 50 ± 5 FT-LBS.
18. TORQUE TO 90 ± 4 FT-LBS.
19. ASSEMBLE CENTERLINE PARTS BY COMpressing the spring and setting the spring stop to the dimension shown (25). RELEASE SPRING AND INSTALL CLEVIS ONTO RODS TO WITHIN ONE (1) THREAD OF BOTTOMING. SET THE ACTUATOR STOP TO DIMENSION SHOWN (3.96) BY EXTENDING ACTUATOR ROD.
20. TWO (2) WASHERS REQUIRED, 4 PLACES.
21. PRESS IN TO FULL DEPTH.
22. TORQUE TO 100 ± 10 FT-LBS.
23. BALL VALVE USING HEX ON OUTPUT SHAFT UNTIL BALL IS APPROXIMATELY CENTERED IN WITH THE ASSEMBLY IN ITS FAIL POSITION (SPRING STOP BOTTOMED), POSITION THE ITS SEAT.
24. TORQUE CLAMP SCREW IN FLEXIBLE COUPLER TO 11 ± 1 IN-LBS.

1	-	KIT, SEAL, FILTER	55
-	1	COUPLER, FLEXIBLE	49
-	1	RECOMMENDED SPARE PARTS, MANIFOLD AY	48
-	1	RECOMMENDED SPARE PARTS, ACTUATOR	47
-	3	FILTER ELEMENT	46
1	-	KIT, SEAL, ACTUATOR	41
1	-	KIT, SEAL, MANIFOLD	40
1	-	O-RING	38
4	-	O-RING (MANIFOLD)	32
-	2	BEARING, ROD, FLANGED	25
-	4	WASHER, THRUST	22
-	4	BEARING, ROD (.75 ID X .75")	21
-	2	BEARING, ROD (1.50 ID X 1.25")	8
1	-	KIT, SEAL, VALVE ASSEMBLY	
1	-	RECOMMENDED SPARE PARTS	
1	-	RECOMMENDED SPARE PARTS	

80-108 VALVE ASSEMBLY (Sheet 2 of 2)

INSTALLATION AND MAINTENANCE MANUAL



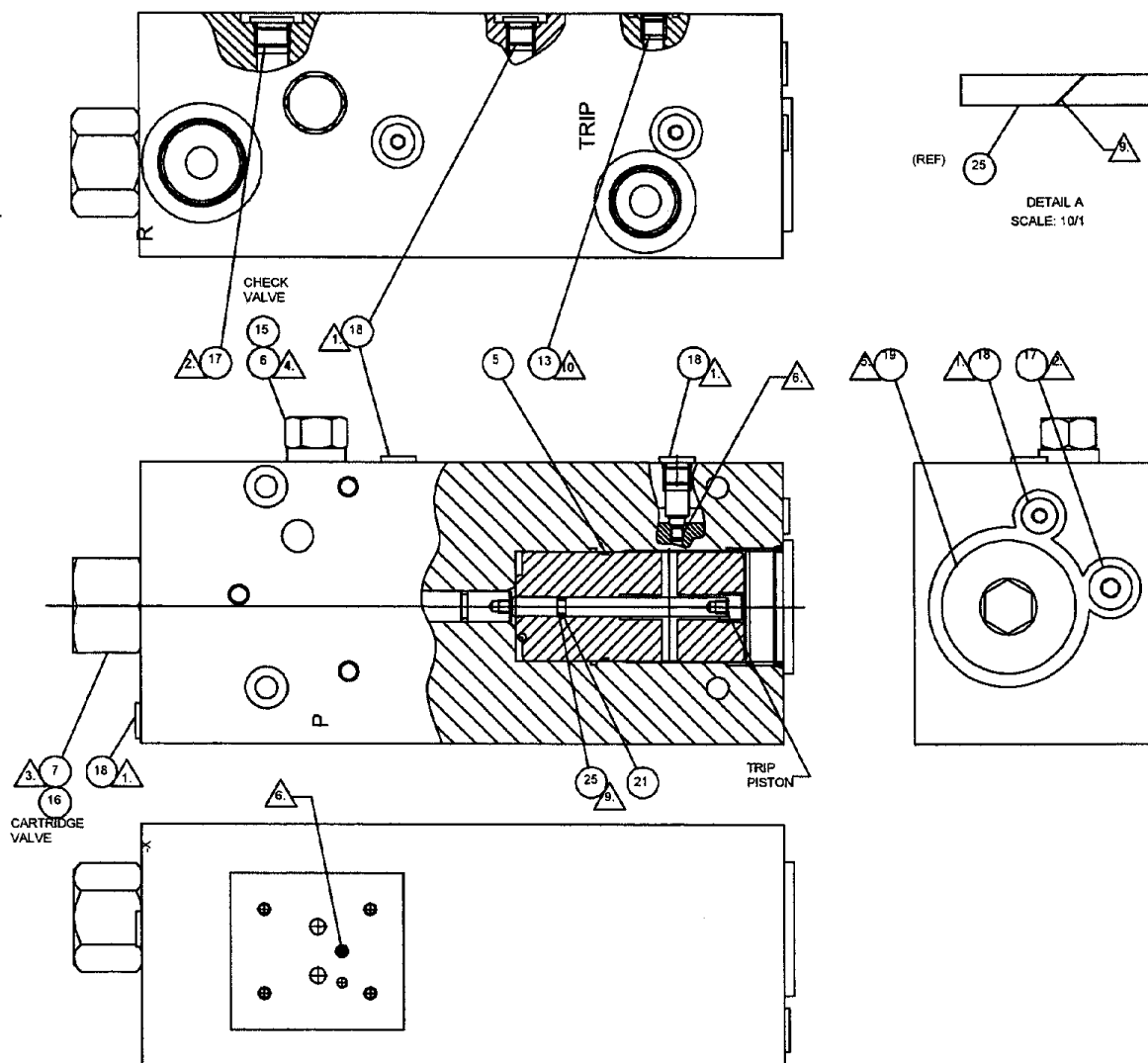
NOTES:

- 1 TORQUE TO 11±.5 FT-LBS PER CDP6033.
- 2 TORQUE TO 18±1 FT-LBS PER CDP6033.
- 3 TORQUE TO 80-90 FT-LBS.
- 4 TORQUE TO 30-35 FT-LBS.
- 5 TORQUE TO 100±10 FT-LBS PER CDP6033.
- 6 TORQUE TO 40±4 IN-LBS.
- 8 DO NOT INSTALL PLUG IN THIS PORT. MANIFOLD PORT IS USED IN DIFFERENT ASSEMBLY.
- 9 TORQUE TO 9±1 FT-LBS.

1	-	O - RING (1 1/2 PLUG)	19
4	-	O - RING (1/4 PLUG)	18
2	-	O - RING (3/8 PLUG)	17
1	-	KIT, SEAL, 3 - WAY CARTRIDGE VALVE	16
1	-	KIT, SEAL, CHECK VALVE	15
-	1	CARTRIDGE VALVE, 3 - WAY, EXTERNAL PILOT	7
-	1	CARTRIDGE, CHECK VALVE (CXCD - XAV)	6
1	-	O - RING	5
1	-	O - RING	4
KIT, SEAL, MANIFOLD			
RECOMMENDED SPARE PARTS, MANIFOLD			
QTY	REQD	NOMENCLATURE OR DESCRIPTION	BALLOON NO.

LOW PRESSURE TRIP OIL MANIFOLD ASSEMBLY (Sheet 1 of 1)

INSTALLATION AND MAINTENANCE MANUAL



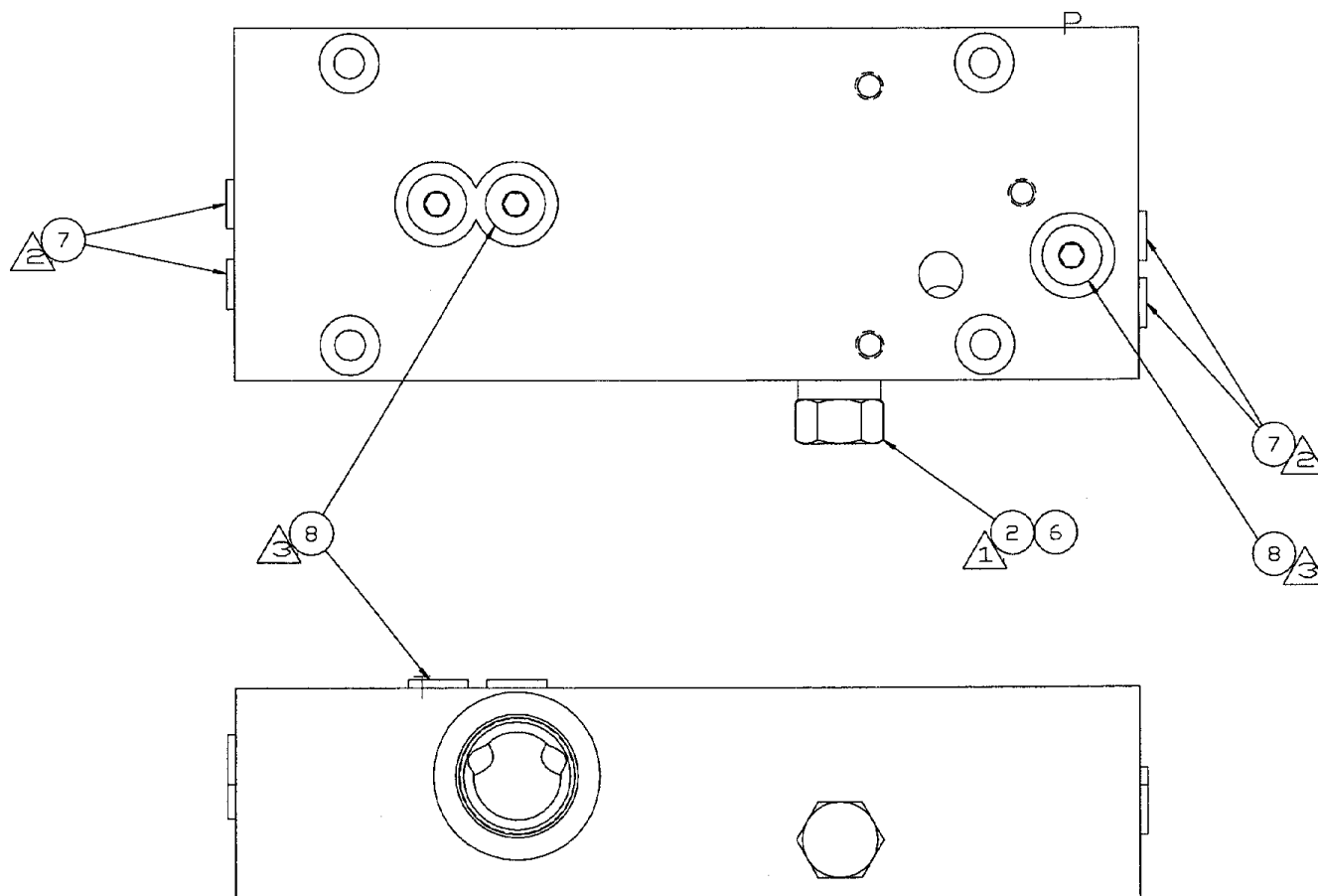
NOTES:

1. TORQUE TO 11 \pm .5 FT.-LBS PER MANUAL.
 2. TORQUE TO 18 \pm 1 FT.-LBS PER MANUAL.
 3. TORQUE TO 80-90 FT.-LBS.
 4. TORQUE TO 30-35 FT.-LBS.
 5. TORQUE TO 100 \pm 10 FT.-LBS PER MANUAL.
 6. TORQUE TO 20 \pm 2 IN.-LBS.
 9. PRIOR TO INSTALLING BACK-UP RING CUT PER DETAIL A.
 10. TORQUE TO 9 \pm 1 FT.-LBS.

1	-	RING, BACK-UP(MS- 8)	25
1	-	O-RING (MS- 8)	21
1	-	O-RING (1 1/2 PLUG)	19
5	-	O-RING (1/4 PLUG)	18
2	-	O-RING (3/8 PLUG)	17
1	-	KIT, SEAL, 3- WAY CARTRIDGE VALVE	16
1	-	KIT, SEAL, CHECK VALVE	15
-	1	CARTRIDGE VALVE, 3- WAY, EXTERNAL PILOT	7
-	1	CARTRIDGE, CHECK VALVE (CXCD- XAV)	6
1	-	O- RING (MS-30)	5
1	-	O- RING (MS-12)	4
		1	KIT, SEAL, MANIFOLD
			RECOMMENDED SPARE PARTS, MANIFOLD
QTY.	REQ'D	NOMENCLATURE OR DESCRIPTION	BALLOON NO.

HIGH PRESSURE TRIP OIL MANIFOLD ASSEMBLY (Sheet 1 of 1)

INSTALLATION AND MAINTENANCE MANUAL



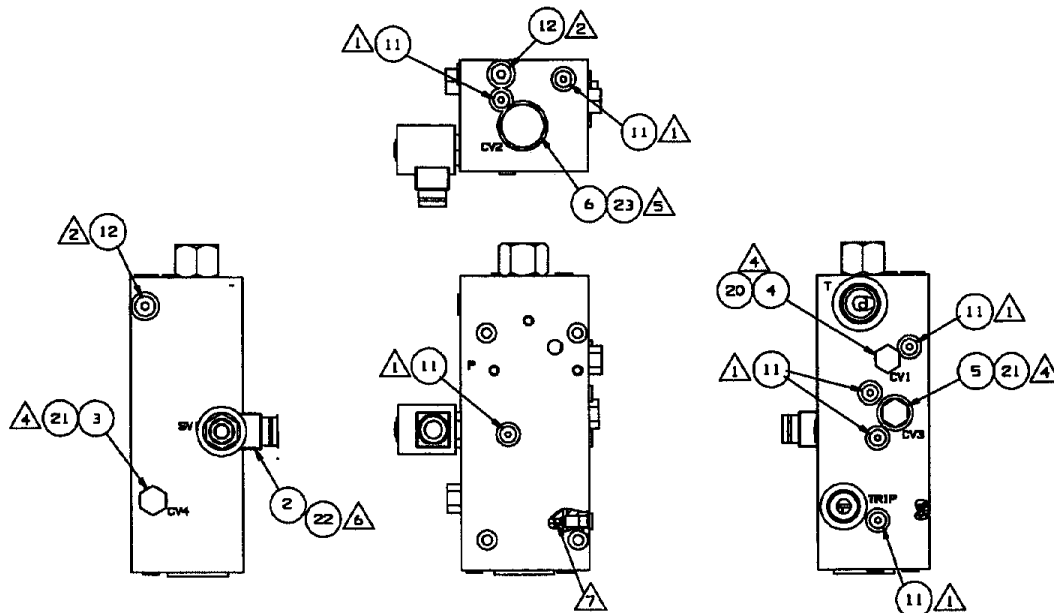
NOTES:

1. TORQUE TO 30-35 FT-LBS.
2. TORQUE TO 11±5 FT-LBS. PER MANUAL.
3. TORQUE TO 18±1 FT-LBS. PER MANUAL.

3	-	O-RING (3/8 TUBE)	8
4	-	O-RING (1/4 TUBE)	7
1	-	KIT, SEAL, CHECK VLV	6
-	1	CARTRIDGE, CHECK VLV (CXCD-XAV)	2
		1 KIT, SEAL, MANIFOLD	
		RECOMMENDED SPARE PARTS, MANIFOLD	
QTY. REQ'D	NOMENCLATURE OR DESCRIPTION		BALLOON NO.

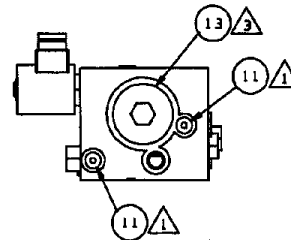
80-080-X MANIFOLD ASSEMBLY (Sheet 1 of 1)

INSTALLATION AND MAINTENANCE MANUAL

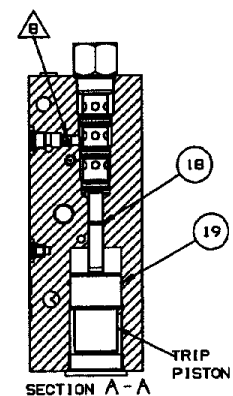
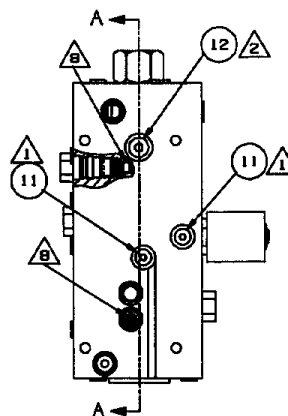


NOTES:

- 1 TORQUE TO 11 ± 0.5 FT.-LBS.
- 2 TORQUE TO 18 ± 1 FT.-LBS.
- 3 TORQUE TO 250 ± 12 FT.-LBS.
- 4 TORQUE TO 30 TO 35 FT.-LBS.
- 5 TORQUE TO 80 TO 90 FT.-LBS.
- 6 TORQUE TO 23 ± 2 FT.-LBS.
COVER NUT TORQUE TO 5 ± 5 FT.-LBS.
- 7 TORQUE TO 20 ± 2 IN.-LBS.
- 8 TORQUE TO 9 FT.-LBS.

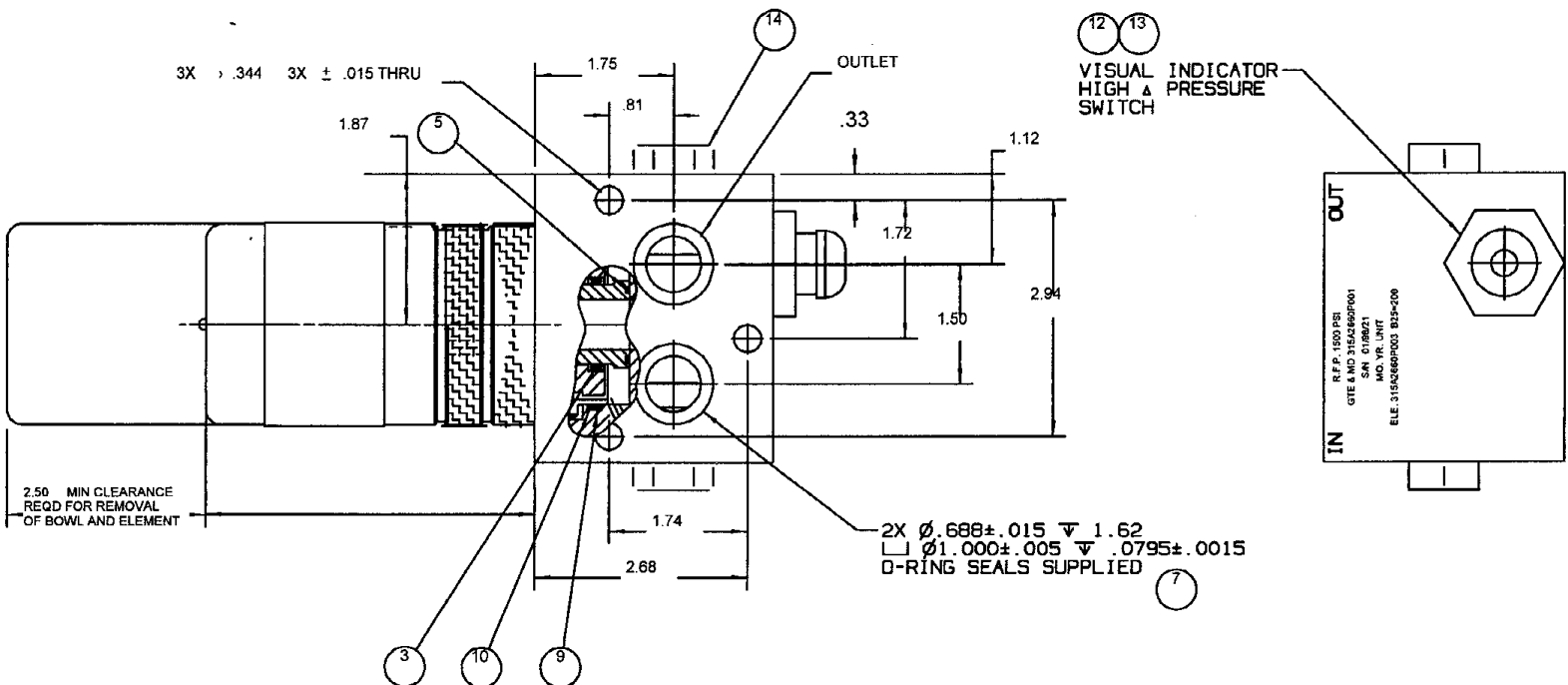


1	-	-	KIT, SEAL, CARTRIDGE VALVE	23
1	-	-	KIT, SEAL, POPPET VALVE	22
2	-	-	KIT, SEAL, CHECK VALVE	21
1	-	-	KIT, SEAL, CHECK VALVE	20
	-	1	O-RING	19
	-	1	O-RING	18
	-	-	O-RING (1-1/2 PLUG)	13
3	-	-	O-RING (3/8 PLUG)	12
11	-	-	O-RING (1/4 PLUG)	11
-	1	1	CARTRIDGE VALVE	6
-	1	1	VALVE, CHECK, PILOT TO OPEN	5
-	1	1	VALVE, CHECK	4
-	1	1	VALVE, CHECK, PILOT TO CLOSE	3
-	1	1	POPET VALVE, NORMALLY OPEN	2
X	1	AR	KIT, SEAL, MANIFOLD	
X		AR	RECOMMENDED SPARE PARTS, MANIFOLD	
			MANIFOLD ASSEMBLY, SOLENOID ABORT	
	REF		NUMERICAL OR DESCRIPTION	QUANTITY



80-108 MANIFOLD ASSEMBLY LOW PRESSURE TRIP, SOLENOID ABORT

INSTALLATION AND MAINTENANCE MANUAL



2	O-RING (UNIVERSAL SIZE - 908)	14
1	O-RING (UNIVERSAL SIZE - 14)	13
1	O-RING (UNIVERSAL SIZE - 908)	12
1	BACK-UP RING (MS28774-136)	10
1	O-RING (UNIVERSAL SIZE - 136)	9
2	O-RING (UNIVERSAL SIZE - 117)	7
1	O-RING (UNIVERSAL SIZE - 19)	5
1	O-RING (UNIVERSAL SIZE - 120)	3
	KIT, SEAL FILTER	
QTY REQD	NOMENCLATURE OR DESCRIPTION	BALLOON NO.

FILTER ASSEMBLY

4.0 TROUBLESHOOTING THE HARDWARE

The causes of the malfunctions described below are easily determined using a small, variable, voltage supply (0 to 1.6 Vdc at 40 mA) and a multimeter. A dual trace oscilloscope may be useful for detecting the source of oscillation related problems. An installation drawing, and the figures in this manual will help locate components discussed in the diagnosis. To accurately diagnose a problem, the steps within a section, must be performed in the order shown. It is suggested the tests be performed and the results recorded prior to calling for factory assistance. The corrective action needs to be completed only if the previous step failed.

WARNING:
HYDRAULIC AND ELECTRICAL POWER MUST BE OFF WHEN CONNECTING / DISCONNECTING WIRES. FAILURE TO OBSERVE THIS SAFETY PROCEDURE MAY CAUSE PERSONAL INJURY OR DEATH DUE TO THE SUDDEN, UNEXPECTED AND RAPID MOTION OF HYDRAULICALLY POWERED EQUIPMENT.

4.1 All Moog valves in the system open when hydraulic system pressure is applied - No electrical command to valves

- a. Check the hydraulic system pressure line is connected to the 'P' pressure port (filter inlet port) on the control valve assemblies and the return (tank) line is attached to the 'T' return port.
- b. Corrective action: Re-connect hydraulic lines to appropriate valve ports and replace affected filter elements.

CAUTION:

When a return port has been exposed to system pressure, the filter element on the valve assembly MUST be replaced.

Reverse flow through the filter destroys the element in a way which may not be visually detectable. Also, the failed element is incapable of activating the contamination alarm. Eventually, hydraulic contamination of the assembly will result.

4.2 Sluggish valve operation - otherwise have full control

- a. Check the system pressure and return pressure are within limits specified on the installation drawing.
- b. Corrective action: Correct or adjust system and/or return pressure.
- c. Check for over-tightened rotary valve packing.
- d. Corrective action: Readjust packing per Fisher instructions.
- e. Check visual filter contamination alarm for 'red' (tripped) indicator. Also, may have periodic or continuous electrical contamination alarm.
- f. Corrective action: Replace the hydraulic filter element and reset the visual alarm by pushing the poppet in. The electrical alarm has an automatic reset.

INSTALLATION AND MAINTENANCE MANUAL

4.3 Partial stroke - valve won't open all the way

- a. Turbine and process flow must be off.
- b. Open electrical enclosure on valve assembly.
- c. Check for correct supply power and frequency (per installation drawing) at position transducer input terminals.
- d. Corrective action: Repair or replace customer supplied transducer power supply.
- e. Remove customer leadwires to the servovalve. With hydraulics up, apply a variable 0 to 1.6 Vdc signal to the servovalve terminals. Check the transducer output signal agrees with the values on the installation drawing. Reattach servovalve wires to proper terminals.
- f. Corrective action: Replace position transducer.
- g. Pass all of the above tests.
- h. Corrective action: Adjust or repair customer supplied servoamplifier.
- i. Replace electrical housing cover and tighten screws until spring washers are flat.

4.4 Oscillation - slow, continuous back / forth motion about the operating point

- a. Turbine, process flow and hydraulics must be off.
- b. Open electrical enclosure on valve assembly.
- c. Check that the supply power and frequency to the position transducer is steady.
- d. Corrective actions: 1) Transducer power leadwires must not be located near high voltage, AC, power cables which might induce unwanted ripple voltage on the transducer supply lines.
2) Replace or repair the customer supplied transducer power supply.
- e. Remove the customer transducer output leadwire at the valve assembly. Check the transducer output voltage to common is steady.
- f. Corrective action: Replace the transducer.
- g. Check the transducer output voltage to common at the control room is steady.
- h. Corrective action: Leadwires must not be located near high voltage, AC, power cables which might induce unwanted ripple voltage on the transducer feedback lines.
- i. Check the servovalve command signal at the valve assembly is steady.
- j. Corrective action: 1) Replace, repair or adjust the customer supplied servoamplifier. Failures here have been in a customer supplied filter network in the customer's electronics.
2) Leadwires must not be located near high voltage, AC, power cables which might induce unwanted ripple voltage on the position command line
- k. Reconnect any loosened leadwires. Replace electrical housing cover and tighten screws until spring washers are flat.

4.5 Random, 'jumpy' motion - valve in any position

- a. Command valve to a steady position.
- b. Verify leadwires are securely attached to terminals in control room.
- c. Corrective action: Repair wire attachments as necessary.
- d. Open electrical enclosure on valve assembly. Verify leadwires are securely attached to terminal strip in the valve assembly.
- e. Corrective action: Repair wire attachments as necessary. Replace electrical housing cover and tighten screws until spring washers are flat.
- f. Are two-way radios used in the area?
- g. Corrective action: Shield control leadwires from strong radio signals or remove radios from the area.

4.6 Process valve hard over - full open or closed, no control

- a. Open electrical enclosure on valve assembly.
- b. Remove customer leadwires to the servovalve. With hydraulics up, apply a variable 0 to 1.6 Vdc signal to the servovalve terminals. Verify valve motion follows command signal.
- c. Corrective action: 1) Adjust globe valve packing per Fisher instructions.
2) Replace servovalve.
- d. Replace electrical housing cover and tighten screws until spring washers are flat.

4.7 Filter contamination alarm switch

The contamination alarm switch is a differential pressure device. i.e., It senses the difference in upstream and downstream pressure at the filter element when hydraulic flow occurs. The switch will actuate only when the filter is contaminated and the differential pressure due to flow exceeds the preset value of the device. There is no way to periodically test the alarm switch without removing it from the assembly and placing it in a special test fixture designed to simulate the differential pressure which occurs when the filter gets dirty.

4.8 Continuous electrical filter alarm signal, hydraulics on or off

- a. Turbine, process flow and hydraulics must be off.
- b. Open electrical enclosure on valve assembly. Remove customer leadwires to the filter alarm.
- c. Check normally closed (0 ohms) and normally open (∞ ohms) terminals of the filter alarm using a multimeter as an ohmmeter.
- d. Corrective action: Replace the filter alarm.
- e. Check insulation resistance between NO (red) and NC (white) alarm leadwires, resistance should be infinite (∞).
- f. Corrective action: Replace the filter alarm.

INSTALLATION AND MAINTENANCE MANUAL

4.8 Continuous electrical filter alarm signal, hydraulics on or off *con't*

- g.** Check insulation resistance between individual alarm leadwires and surrounding wireway. Resistance should be infinite (∞).
- h.** Corrective action: Replace the filter alarm.
- i.** Pass all of the above tests.
- j.** Corrective action: Check out and repair both wiring to the control room and the control room electronics.
- k.** Replace electrical housing cover and tighten screws until spring washers are flat.

4.9 Globe valve troubleshooting.

See Fisher documentation attached to this manual.

SECTION 5.0 - FACTORY PARTS AND SERVICE

5.1 FACTORY PARTS - RECOMMENDED SPARE AND REPLACEMENT

Factory parts are available from Moog, Industrial Controls Division. Recommended spares are those items which the user may wish to stock in order to expeditiously support a repair. Moog ICD's stock is subject to prior sale. Suggested spare parts for the servoactuator assembly are shown on the enclosed figures. These parts may be ordered from:

Moog Inc.
Industrial Controls Division
East Aurora, NY 14052
phone: (716) 655-3000
fax: (716) 655-1803

Identify the part(s) by the assembly model number, service manual balloon number and description. Specify the model number (80-XXX-X) and serial number of your assembly from the large **MOOG** nameplate attached to the hydraulic actuator of the assembly.

Process valve parts must be ordered from:

Fisher - Rosemount
Northeast Controls Inc.
3 Badertscher Drive
Clifton Park, NY 12065
phone: (518) 664-6610
fax: (518) 664-8500

Specify serial number information from the Fisher nameplate located on the rotary valve bonnet flange or body.

5.2 FACTORY SERVICE

Moog, Industrial Controls Division twenty-four (24) hour, on-site, factory service is available for products described in this manual. This service can be contacted at:

Moog Inc.,
Industrial Controls Division
phone: 1-800-624-8585 or (716) 655-3000
or fax: (716) 687-4928
or E-mail: field_service.icd @ moog.com

Moog, Industrial Controls Division factory direct service is available by returning the assembly to:

Moog Inc.
Industrial Controls Division
300 Jamison Road
East Aurora, NY 14052
phone: (716) 655-3000
fax: (716) 687-4928
E-mail: field_service.icd @ moog.com

INSTALLATION AND MAINTENANCE MANUAL

SECTION 6.0 - WARRANTY

(a) Moog, Inc., Industrial Controls Division warrants that each item of its manufacture is free from defects in material and workmanship at the date of shipment. This warranty shall not apply to any part or parts supplied to but not manufactured by Moog ICD. As to such parts, Moog ICD agrees to purchase the same from a reputable supplier and to assign to its customer whatever rights Moog ICD may have under warranties of such suppliers.

(b) Unless otherwise specified, Moog ICD's obligation under this warranty is limited to replacing or repairing any item which, within twenty-four months from date of shipment, is proven by Moog ICD inspection to have been defective at the time of shipment. As a condition of this warranty, purchaser shall notify Moog ICD in writing of any claimed defect immediately upon discovery and shall return the item to Moog ICD for inspection. Unless specifically approved in writing, Moog ICD shall not provide uncompensated field service repairs or alterations unless Moog ICD has previously agreed in writing to such allowance. Moog ICD shall not be responsible for any work done or repairs made by others and disassembly by anyone other than authorized Moog ICD personnel may void the terms of this warranty.

(c) Unless Moog ICD is specifically requested to provide installation assistance under the terms of this quotation, proper installation and checkout shall be the sole responsibility of the customer.

(d) Moog Inc., Industrial Controls Division shall not be liable for improper use, installation, operation or maintenance of items manufactured by Moog ICD, nor for any damage resulting from improper use, installation, operation or maintenance. In addition, Moog ICD shall not be responsible for any damages for loss of production or profits, damage to product or economy of operation, or any other consequential or incidental damages occasioned by defects in or failure of any goods supplied by Moog ICD, or by defects in or failure of any product in which a component manufactured by Moog ICD is incorporated.

(e) Moog ICD shall not be responsible for the performance of any product which incorporates component parts manufactured by Moog ICD unless such performance is expressly designated as Moog ICD's responsibility under the terms of the written agreement between Moog ICD and the customer.

(f) The Warranties contained herein are exclusive and are given in lieu of all other warranties, express, implied or statutory, including the implied warranty of merchantability or fitness for a particular purpose.

Design V150, V200, and V300 Rotary Control Valves Sizes 1 Through 12-Inch

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Introduction

Scope of Manual

This instruction manual provides installation, operation, maintenance, and parts information for the Design V150 (1- through 12-inch sizes), V200 (1- through 10-inch sizes), and V300 (1- through 12-inch sizes) rotary control valves (see figure 1). For larger valves (14-, 16-, and 20-inch size), refer to a separate instruction manual. For information on ENVIRO-SEAL® packing, see the Fisher Controls



DESIGN V150 AND V300 VALVE

Figure 1. Design V150, V200, and V300 Valves with Type 1052 Actuator

instruction manual titled *ENVIRO-SEAL Packing System for V-Line and edisc® Rotary Valves*. Refer to separate manuals for information concerning the actuator, positioner, and accessories.

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Designs V150, V200, & V300

Table 1. Specifications

<p>Valve Sizes and End Connection Styles</p> <p>Design V150 (& DIN): 1, 1-1/2, 2, 3 (PN 10-16), 4 (PN 10-16), 6 (PN 10-16), 8 (PN 10 & 16), 10 (PN 10 & 16), and 12-inch (PN 16) sizes with Class 150 raised-face flanges. See table 2.</p> <p>Design V200: 1, 1-1/2, 2, 3, 4, 6, 8, and 10-inch flangeless valves that mate with ANSI Class 150, 300, or 600 (for size 1 through 8 inches) raised-face flanges.</p> <p>Design V300 (& DIN): 1 (PN 10-40), 1-1/2 (PN 10-40), 2 (PN 10-40), 3 (25-40), 4 (25-40), 6, 8, 10, and 12-inch valves with Class 300 raised-face flanges. See table 4.</p> <p>Maximum Inlet Pressures⁽¹⁾</p> <p>Consistent with the pressure-temperature ratings in tables 2 (Design V150), 3 (Design V200) or 4 (Design V300), but do not exceed the material temperature capabilities or the pressure drop limitations shown in the bulletin⁽²⁾. For CW2M (Hastelloy), and CG8M (317 stainless steel) valves, the pressure-temperature tables are shown in the bulletin.</p> <p>Maximum Shutoff Pressure/Temperature Ratings⁽¹⁾</p> <p>Composition (Fisher TCM Plus™ and Fisher TCM Ultra™), Flat Metal, and HD (Heavy Duty) Metal Ball Seals: Refer to the bulletin⁽²⁾. For information on pressure classes, contact your Fisher Controls sales office or sales representative.</p> <p>Shutoff Classification</p> <p>Composition Ball Seal (Forward Flow): Class VI per ANSI/FCI 70-2-1991 and per IEC 534-4, Amendment 1 (1986)</p> <p>Flat Metal Ball Seal (Forward Flow): 0.01% of valve capacity at full travel; Class IV per ANSI/FCI 70-2-1991 and per IEC 534-4, Amendment 1 (1986)</p> <p>HD (Heavy Duty) Metal Ball Seal (Bidirectional Flow): 0.01% of valve capacity at full travel; Class IV per ANSI/FCI 70-2-1991 and per IEC 534-4, Amendment 1 (1986)</p> <p>Flow Ring Construction (Bidirectional Flow): 5% of valve capacity at full travel</p> <p>Standard Construction Materials</p> <p>See table 5</p> <p>Material Temperature Capabilities⁽¹⁾</p> <p>Composition Seals: -50 to 450°F (-46 to 232°C)</p> <p>HD Metal Seals: -50 to 550°F (-46 to 288°C)</p> <p>Ceramic Micro-Notch™ Ball: -50 to 250°F (-46 to 121°C)</p>	<p>Flat Metal Seals or Flow Ring with PTFE Packing: -50 to 450°F (-46 to 232°C)</p> <p>Flat Metal Seals or Flow Ring with Graphite Ribbon Packing: -325 to 800°F (-198 to 427°C)</p> <p>PEEK/PTFE Bearings: -50 to 500°F (-46 to 260°C)</p> <p>Flow Characteristic</p> <p>Approximately equal percentage</p> <p>Standard Flow Direction</p> <p>Forward (into the convex face of the V-notch ball)</p> <p>Actuator Mounting</p> <p>■ Right-hand or ■ left-hand as viewed from upstream end of valve</p> <p>Maximum Ball Rotation</p> <p>90 degrees</p> <p>Valve/Actuator Action</p> <p>With diaphragm or piston rotary actuator, field-reversible between: push-down-to-close (extending actuator rod closes valve) and push-down-to-open (extending actuator rod opens valve. See actuator manual for details)</p> <p>Face-to-Face Dimensions</p> <p>Design V200: Consistent with ISA S75.04 (standard), ASME B16.10-short (optional for Class 150 only), and IEC 534-3-2 (IEC 534-3-2 face-to-face dimensions are equivalent to S75.04 face-to-face dimensions) Optional 6- or 8-inch valve construction with S75.04 face-to-face dimensions for use with ANSI Class 600 applications</p> <p>Design V150 and V300: Consistent with ISA S75.04 and IEC 534-3-2 (IEC 534-3-2 face-to-face dimensions are equivalent to S75.04 face-to-face dimensions). The Design V150 valves are also available in B16.10 (short) face-to-face dimensions.</p> <p>Drive Shaft Diameters and Valve Assembly Weights</p> <p>Refer to the appropriate valve bulletin: For Design V150 see Bulletin: 51.3:V150, Bulletin 51.3:V200, or Bulletin: 51.3:V300 for your valve</p> <p>Options</p> <p>■ A pipe plug, at the end of the follower shaft, is available for all sizes. ■ Micro-Notch VTC ceramic trim, ■ Optional 6- or 8-inch ANSI Class 600 valves are available. (See figure 4), ■ 254SMO (Avesta) body and trim materials are available</p>
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1. The pressure/temperature limits in this manual, and any applicable code or standard limitation, should not be exceeded.
2. Refer to the appropriate Bulletin 51.3:V150, 51.3:V200 or 51.3:V300 for additional information.

Designs V150, V200, & V300

Table 2. Design V150 Valve Sizes, End Connection Styles, and Ratings

VALVE SIZE, INCHES (DN)	VALVE BODY MATERIAL	FLANGE COMPATIBILITY	RATING	FACE-TO-FACE DIMENSION
1, 1-1/2, 2, 3, 4, 6, 8, and 10 (DN 25 through DN250)	WCC steel (standard) and CF3M ⁽¹⁾ [316L stainless steel (SST)]	ANSI Class 150 raised-face flange	ASME/ANSI B16.34-1988 Class 150	ISA S75.04 (standard) and IEC 534-3-2 (1984) or ASME B16.10 Short (Optional)
		DIN PN10 and PN16	DIN PN10 and PN16	
	CG8M (317 SST)	ANSI Class 150 raised-face	See tables in Bulletin 51.3:V150 for maximum inlet pressure and temperature	
	DIN 1.0619 steel or DIN 1.4581 (SST)	DIN PN10 and PN16	DIN PN10 and PN16	
12 (DN300)	WCC steel (standard) and CF3M ⁽¹⁾ (316L SST)	ANSI Class 150 raised-face	ASME/ANSI B16.34-1988 Class 150	
		DIN PN16	DIN PN16	
	CG8M (317 SST)	ANSI Class 150 raised-face	See tables in Bulletin 51.3:V150 for maximum inlet pressure and temperature	
	DIN 1.0619 steel or DIN 1.4581 (SST)	DIN PN16	DIN PN16	
1, 1-1/2, 2, 3, 4, 6, 8, and 10 (DN25 through DN250)	CW2M (Hastelloy C)	ANSI Class 150 raised-face	See tables in Bulletin 51.3:V150 for maximum inlet pressure and temperature	
	CW2M	DIN PN10 and PN16	DIN PN10 and PN16	
12 (DN300)	CW2M	ANSI Class 150 raised-face	See tables in Bulletin 51.3:V150 for maximum inlet pressure and temperature	
	CW2M	DIN PN16	DIN PN16	

1. CF3M is available in all areas as a special order and is the standard material offering from Fisher Controls in Europe.

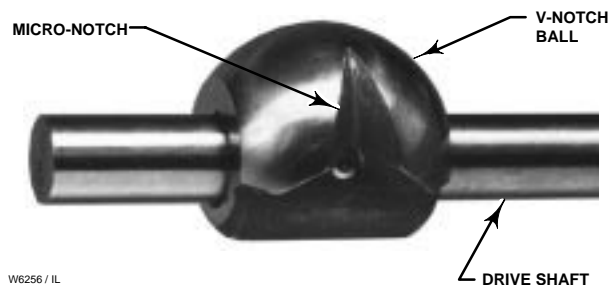


Figure 2. Typical Metal Micro-Notch™ Ball and Drive Shaft

For the 2-inch Design V150 valve, this manual covers only valves with serial numbers 12551183 and higher. See the note in the Parts List for further information.

Only personnel qualified through training or experience should install, operate, and maintain Designs V150, V200, and V300 valves. If you have any questions about these instructions, contact your Fisher Controls sales office or sales representative before proceeding.

Description

The Designs V150, V200, and V300 Vee-Ball® valves (figure 1) with a V-notch ball are used in throttling or on-off service. The Design V200 is a flangeless construction for installation between ANSI Class 150, 300, and 600 flanges. The Design V150 and V300 valves are raised-face flanged constructions, and are available in ANSI Class 150, for Design V150 valves, or ANSI Class 300, for Design V300 valves. The Design V150 and V300 valves have integral ANSI or DIN flanges (see tables 2, 3, and 4). The splined valve shaft of all these valves connect to a variety of rotary-shaft actuators.

For very precise control of low flow rates (C_v of 8.4 or less), the Micro-Notch construction (see figure 2) is available on 1-inch valves. There are three Micro-Notch ball materials available: chrome-plated CG8M (317 stainless steel), solid alloy 6, and solid VTC ceramic. A VTC ceramic HD seal is standard with the VTC ceramic ball valve construction (see figure 22). For the CG8M and alloy 6 constructions, pressure and temperature capabilities are the same as for standard constructions. For the ceramic construction, the maximum temperature is 250°F (121°C).

Designs V150, V200, & V300

Table 3. Design V200 Valve Sizes, End Connection Styles, and Ratings

VALVE SIZE, INCHES	VALVE BODY MATERIAL	FLANGE COMPATIBILITY	RATING	FACE-TO-FACE DIMENSION
1, 1-1/2 & 2	WCC steel or CF3M ⁽¹⁾ (316L stainless steel)	ANSI Class 150/300/600 ⁽²⁾ raised-face	ASME/ANSI B16.34-1988 Class 600	ANSI Class 150/300/600— ISA S75.04 (standard) and IEC 534-3-2 ⁽³⁾ , or ANSI Class 150--ASME B16.10 Short (Optional)
	CG8M (317 stainless steel)	ANSI Class 150/300/600 raised-face	See tables in Bulletin 51.3:V200 for maximum inlet pressure and temperature	
	DIN 1.0619 steel or DIN 1.4581 stainless steel	DIN PN 10-100 ⁽²⁾	ASME/ANSI B16.34-1988 Class 600	
3 and 4	WCC steel	ANSI Class 150 raised-face	ASME/ANSI B16.34-1988 Class 150	ISA S75.04 (standard) and IEC 534-3-2 ⁽³⁾ or ASME B16.10 Short (Optional)
		ANSI Class 300/600 ⁽⁴⁾ raised-face	ASME/ANSI B16.34-1988 Class 600 ⁽⁴⁾	ISA S75.04 (standard) or IEC 534-3-2 ⁽³⁾
	CG8M (317 stainless steel)	ANSI Class 150 raised-face	See tables in Bulletin 51.3:V200 for maximum inlet pressure and temperature	ISA S75.04 (standard) and IEC 534-3-2 ⁽³⁾ or ASME B16.10 Short (Optional)
		ANSI Class 300/600 ⁽⁵⁾ raised-face	See tables in Bulletin 51.3:V200 for maximum inlet pressure and temperature	ISA S75.04 (standard) or IEC 534-3-2 ⁽³⁾
6 and 8	WCC steel	ANSI Class 150/300/600 ⁽⁶⁾ raised-face	ASME/ANSI B16.34-1988 Class 300 ⁽⁷⁾	ANSI Class 150/300/600— ISA S75.04 (standard) and IEC 534-3-2 ⁽³⁾ , or ANSI Class 150— B16.10 Short (Optional)
	CG8M (317 stainless steel)	ANSI Class 150/300/600 ⁽⁶⁾ raised-face	See tables in Bulletin 51.3:V200 for maximum inlet pressure and temperature	
10	WCC steel	ANSI Class 150 raised-face	ASME/ANSI B16.34-1988 Class 150	ISA S75.04 (standard) and IEC 534-3-2 ⁽³⁾ or ASME B16.10 Short (Optional)
	CG8M (317 stainless steel)	ANSI Class 150 raised-face	See tables in Bulletin 51.3:V200 for maximum inlet pressure and temperature	
1, 1-1/2 & 2	CW2M	ANSI Class 150/300/600 ⁽²⁾ raised-face	See tables in Bulletin 51.3:V200 for maximum inlet pressure and temperature	ISA S75.04 (standard) or IEC 534-3-2 ⁽³⁾
	CW2M (Hastelloy C)	DIN PN 10-50	ASME/ANSI B16.34-1988	
3, 4, and 6	CW2M (Hastelloy C)	ANSI Class 150 raised-face	See tables in Bulletin 51.3:V200 for maximum inlet pressure and temperature	ISA S75.04 (standard) or IEC 534-3-2 ⁽³⁾

1. CF3M is available in all areas as a special order and is the standard material offering from Fisher Controls in Europe.
 2. The valve body will mate with either ANSI Class 150, 300, or 600 flanges. Pressure ratings of the valve body is ANSI Class 600. Do not exceed the rating for the mating flanges.
 This ANSI 1-, 1-1/2, and 2-inch valve body will fit between DN25, DN40, and DN50 flanges.
 3. IEC 534-3-2 face-to-face dimensions are equivalent to S75.04 face-to-face dimensions.
 4. This valve body will mate with either ANSI Class 300 or 600 flanges. Pressure ratings of the valve body is ANSI Class 600. Do not exceed the rating of the mating flanges.
 5. This valve body will mate with either ANSI Class 300 or 600 flanges. Pressure ratings are shown in bulletin. Do not exceed the rating of the mating flanges.
 6. This valve body will mate with either ANSI Class 150 or 300 flanges. Pressure ratings are shown in bulletin. Do not exceed the rating of the mating flanges.
 7. This valve body will mate with either ANSI Class 150 or 300 flanges. Pressure ratings of the valve body is ANSI Class 300. Do not exceed the rating of the mating flanges.

Table 4. Design V300 Valve Sizes, End Connection Styles, and Ratings

VALVE SIZE, INCHES (DN) ⁽¹⁾	VALVE BODY MATERIAL	FLANGE COMPATIBILITY	RATING
1, 1-1/2, 2, 3, and 4 (DN25 through DN100)	WCC Steel (standard,) and CF3M ⁽²⁾ (316L stainless steel)	ANSI Class 300 raised-face	ASME/ANSI B16.34 Class 300
		DIN PN 25 and 40	DIN PN 25 and 40
	CG8M (317 stainless steel)	ANSI Class 300 raised-face	See tables in Bulletin 51.3:V300 for maximum inlet pressure and temperature
6, 8, 10, and 12	DIN 1.0619 steel or DIN 1.4581 stainless steel	DIN PN 25 and 40	DIN PN 25 and 40
	WCC (standard) Steel and CF3M ⁽²⁾ (316L stainless steel)	ANSI Class 300 raised-face	ASME/ANSI B16.34 Class 300
	CG8M (317 stainless steel)	ANSI Class 300 raised-face	See tables in Bulletin 51.3:V300 for maximum inlet pressure and temperature
1, 1-1/2, 2, 3, 4, and 6	CW2M (Hastelloy C)	ANSI Class 300 raised-face	See tables in Bulletin 51.3:V300 for maximum inlet pressure and temperature
1, 1-1/2, 2, 3 and 4 (DN25 through DN100)	CW2M (Hastelloy C)	DIN PN 25 and 40	

1. DN50, DN80, and DN100 are the only sizes offered in Design V300 in Europe.
 2. CF3M is available in all areas as a special order and is the standard material offered from Fisher Controls in Europe.

Designs V150, V200, & V300

Table 5. Standard Construction Materials

PART		MATERIAL
Valve Body & Seal Protector Ring or Flow Ring		WCC steel (NACE), CG8M (317 stainless steel, NACE), CF3M ⁽¹⁾ (316L stainless steel), CW2M (Hastelloy C) (CW2M valve available with composition seal only), or CK3MCuN (Avista)
Backup Ring (1, 1-1/2 and 2-inch only)		CG8M (NACE), CF3M ⁽¹⁾ (NACE) or CW2M
V-Notch Ball		Chromium-plated CG8M (NACE), CG8M (NACE), chromium-plated CF3M, CF3M, and CW2M
Seal	Composition	Fisher TCM Plus and Fisher TCM Ultra
	Flat Metal Seal, Shims, and Spring Seal	S31600 (316 stainless steel) or S30200 (302 stainless steel) for 12-inch valves only
	HD (Heavy-Duty) Metal	CF10SMnN ⁽²⁾ (Nitronic 60), CD7MCuN ⁽³⁾ (alloy 255 duplex stainless steel) or R30006 (Alloy 6, NACE)
HD Seal Wave Spring		N07750 (Inconel X750, NACE)
HD Seal Radial Seal		PTFE with N10276 (Hastelloy C276, NACE) spring
Bearings		PEEK/Carbon-filled liner ⁽⁴⁾ (NACE), S44004 (440C stainless steel), R30006 (alloy 6, NACE), silver-plated R30006, carbon-filled PTFE with N10276 (Hastelloy C) sleeve, or glass-filled PTFE with N10276 sleeve
Thrust Washers		S17400 (17-7PH stainless steel), Alloy 6B (NACE), or N10276 (Hastelloy C)
Seal Retainer Gasket		Laminated graphite
Packing		PTFE V-ring with one carbon-filled PTFE ring ⁽⁵⁾ , PTFE V-ring, or graphite ribbon. Packing is available with or without live loading.
Shafts		S20910 (Nitronic 50, NACE), S17400 (17-4PH stainless steel), or N10276 (Hastelloy C276)
Groove Pin		S31600 (NACE) or N10276
Taper Key		R30006 ⁽⁶⁾ , S20910, or N10276
Taper Pin (1, 1-1/2, and 2-inch only)		S20910 (NACE) or N10276
Pipe Plug (Optional)		S31600 (NACE) N10276, or S31603 (316L stainless steel, NACE)
Seal Retainer Screws and Washers		Stainless steel
Packing Follower and Packing Box Ring		CF8M (316 stainless steel, NACE), N10276, or N10276 with separate S31600 packing box flange (NACE)
Actuator Mounting Bolts and Nuts		Grade 5 steel or strain-hardened B8M stainless steel
Spacer and Bushing		S31700 (NACE), N10276, or S31603
Packing Follower Bolting and Optional Line Bolting		SA-193-B7, SA-193-B7M, or strain-hardened SA-193-B8M

1. CF3M is available in all areas as a special order and is the standard material offered for Fisher Controls in Europe.
 2. Recommended for lubricated and non-lubricated service and where corrosion properties similar to 304 stainless steel are acceptable.
 3. Recommended for lubricated service and where corrosion properties equal to or better than 317 stainless steel are required.
 4. PEEK is poly-ether-ether-ketone.
 5. The carbon-filled PTFE ring is used for grounding.
 6. Standard material offered in North America.

Installation

The installation section is divided into two sections. The first section is for Design V150 and V300 flanged valves, and the second section is for V200 flangeless valves. Key numbers in this procedure are shown in figures 19 through 22, unless otherwise indicated.

Some types of ceramic trim, including VTC (very tough ceramic) verity, can create a spark under certain conditions. If an edge of a ceramic part is struck against a second ceramic part with enough force, it can produce a spark.



WARNING

Personal injury or equipment damage caused by sudden release of pressure may result if the valve assembly is installed where service conditions could exceed either the valve body rating or the mating pipe flange joint rating. To avoid such injury or damage, provide a relief valve for overpressure protection as required by government or accepted industry codes and good engineering practices.

Designs V150, V200, & V300

WARNING

Avoid personal injury and property damage from ignition of process fluid caused by sparks from ceramic trim. Do not use ceramic trim where the process fluid is unstable or if it is an explosive mixture (such as ether and air).

CAUTION

When ordered, the valve configuration and construction materials were selected to meet particular pressure, temperature, pressure drop, and controlled fluid conditions. Because some valve/trim material combinations are limited in their pressure drop and temperature ranges, do not apply any other conditions to the valve without first contacting your Fisher Controls sales office or sales representative.

Note

The valve drive shaft is not necessarily grounded when installed in a pipeline. Personal injury or property damage could result—if the process fluid or the atmosphere around the valve is flammable—from an explosion caused by a discharge of static electricity from the valve components. If the valve is installed in a hazardous area, electrically bond the drive shaft to the valve body.

For hazardous applications, attach the optional bonding strap assembly (key 131, figure 3) to the valve drive shaft (key 6) with the clamp (key 130, figure 3) and connect the other end of the bonding strap assembly to the body with the cap screw (key 23).

Key numbers are shown in figures 19 through 22 unless otherwise noted.

1. If the valve is to be stored before installation, protect the flange mating surfaces and keep the body cavity dry and free of foreign material.
2. Install a three-valve bypass around the control valve assembly if continuous operation will be necessary during inspection and maintenance of the valve.
3. The valve is normally shipped as part of a control valve assembly, with an actuator mounted on the

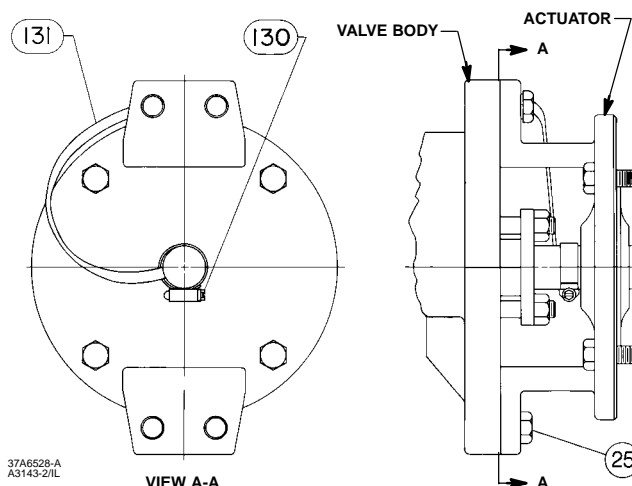


Figure 3. Optional Shaft-to-Body Bonding Strap Assembly

valve. If the valve and actuator have been purchased separately or if the actuator has been removed, mount the actuator according to the actuator mounting section and the appropriate actuator instruction manual.

4. Adjust actuator travel before installing the valve because it is not possible to determine the closed position (necessary for actuator adjustment) with the valve installed in the pipeline.
5. Standard flow direction is with the seal protector ring (key 3) facing upstream.
6. Install the valve in a horizontal pipeline with the drive shaft horizontal and the V-notch ball closing in the downward direction (see figure 1).

Note

Do not allow the valve to be installed in the pipeline with the drive shaft in the vertical position because of excessive wear to component valve parts.

Key numbers are shown in figures 19 through 22 unless otherwise noted.

7. The actuator can be right- or left-hand mounted with the shaft in a horizontal orientation as shown in figure 1. If necessary, refer to the appropriate actuator instruction manual for actuator installation and adjustment procedures.
8. Be certain the valve and adjacent pipelines are free of any foreign material that could damage the valve sealing surfaces.
9. Be sure the pipeline flanges are in line with each other.

Designs V150, V200, & V300

Table 6. Flange Stud Lengths Required for Seal Protector Ring End of Design V150 and V300 Valves

VALVE SIZE, INCHES	DESIGN V150				DESIGN V300					
	ISA S75.04 Face-to-Face		ASME B16.10 Short Face-to-Face		Class 300		PN25		PN40	
	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm
1	3.00	76	4.00	102	3.5	89	3.25	83	3.25	83
1-1/2	3.25	83	5.25	133	4.00	102	3.75	95	3.75	95
2	3.62	92	5.88	149	4.38	111	4.25	108	4.25	108
3	4.00	102	5.50	140	5.12	130	4.56	116	4.56	116
4	4.38	111	5.88	149	5.38	137	4.88	124	4.88	124
6	4.62	117	6.25	159	5.88	149	5.62	143	5.62	143
8	5.00	127	7.00	178	6.44	164	5.69	145	6.25	159
10	5.38	137	6.75	171	7.25	184	6.12	155	6.88	175
12	5.62	143	6.38	162	7.75	197	6.31	160	7.19	183

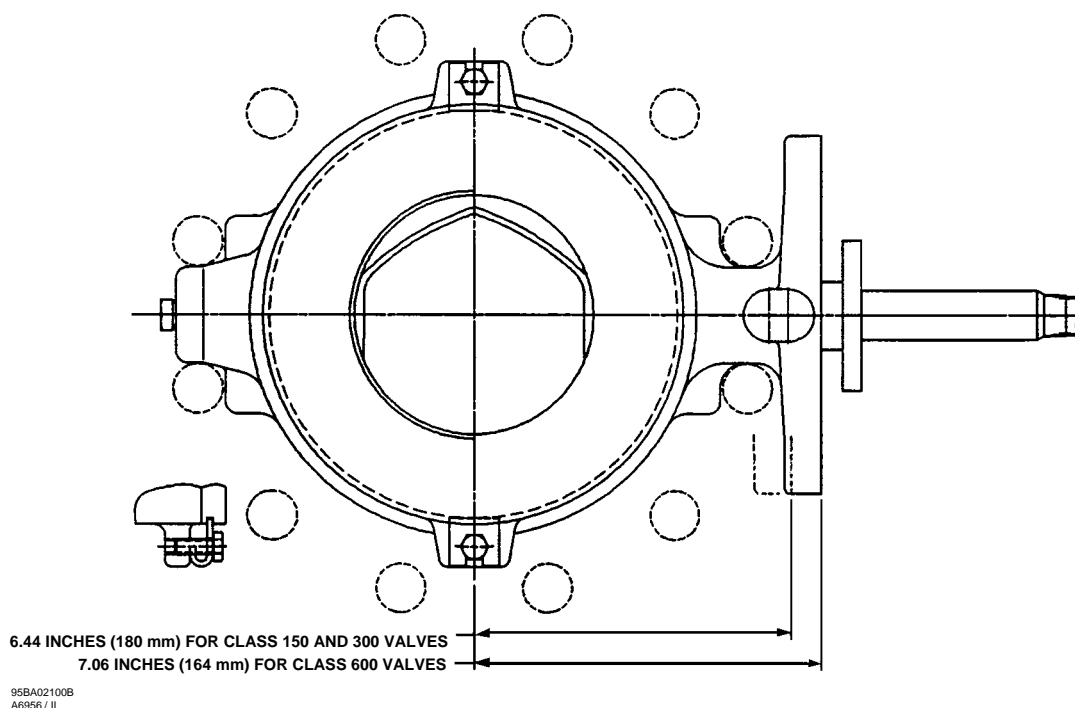


Figure 4. Design V200, Size 6-Inch, ANSI Class 600 Valve Detail

Installing Design V150 and V300 Valves

Key numbers are shown in figures 19 through 22 unless otherwise noted.

1. Install the Design V150 and V300 valve using studs (keys 32 and 33, not shown) and nuts to connect the valve flanges to the pipeline flanges. The seal protector ring (key 3) end of the valve requires longer line flange studs (key 32) than standard. Do not attempt to use standard-length line flange studs for the seal protector ring end of the valve.
2. See tables in the parts list for keys 32 and 33 for the required studs part numbers and table 6 for length of studs for the seal protector ring end of Design V150 and V300 valves. Lubricate the studs with Never-Seez Nickel Special or equivalent lubricant.

3. Insert flat-sheet line flange gaskets (or spiral-wound gaskets with compression-controlling center rings) that are compatible with the flowing media.

4. Be sure the pipeline flanges are in line with each other.

Installing Design V200 Valves

Stud length dimensions are shown in Figure 5 for the seal protector ring end of the valve. For Design V200, ANSI Class 600, the dimension from the center line of the valve bore to the mounting flange face is larger than a Class 150 or 300 valve. Refer to figure 4 for the Class 600 face-to-face dimension for size 6-inch valves only.

Designs V150, V200, & V300

DESIGN V200 VALVE SIZE, INCHES	DIMENSION						
	A		B	M			
	Standard ISA S75.04 ⁽¹⁾	ASME B16.10 Short (Optional)		Standard Class 150 S75.04 ⁽¹⁾	Class 150 ASME B16.10 Short (Optional)	Class 300	Class 600
Inches							
1	4.00	5.00	2.29	6.94	7.94	7.94	7.94
1-1/2	4.50	6.50	2.50	7.44	9.44	8.81	8.81
2	4.88	7.00	2.25	8.31	10.56	9.31	9.31
3	6.50	8.00	3.44	10.00	11.25	11.00	11.25
4	7.62	9.00	3.62	11.25	12.62	12.00	13.50
6	9.00	10.50	4.69	13.50	15.00	14.25	16.25
8	9.56	11.50	4.69	13.50	15.50	15.25	16.75
10	11.69	13.00	5.94	16.50	17.75	---	---
Millimeters							
1	102	127	58	176	202	202	202
1-1/2	114	165	64	189	240	224	224
2	124	178	57	211	268	237	237
3	165	203	87	254	286	279	286
4	194	229	92	286	321	305	343
6	229	267	119	343	381	362	423
8	243	292	119	343	394	387	426
10	297	330	151	419	451	---	---
1. IEC 534-3-2 face-to-face dimensions are equivalent to S75.04 face-to-face dimensions.							

1. IEC 534-3-2 face-to-face dimensions are equivalent to S75.04 face-to-face dimensions.

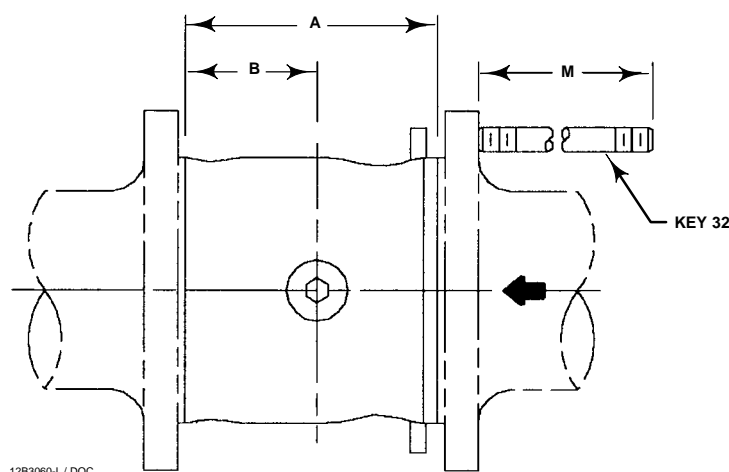


Figure 5. Design V200 Dimensions and Required Clearances for Installation

1. Install the Design V200 valve using long studs (key 32, figure 5) to connect the two pipeline flanges. Refer to figure 5 for the size of studs required. Lubricate the studs with Never-Seez Pure Nickel Special or equivalent lubricant.
2. Install two studs in the flanges before you place the valve in the line. Place the two studs so they will contact the line-centering notches at the bottom of the valve body.
3. Insert flat-sheet line flange gaskets (or spiral-wound gaskets with compression-controlling center rings) that are compatible with the process fluid.
4. Place the valve on the two studs. Install all remaining studs. Measure carefully to be sure the valve is

centered on the pipeline flanges, and tighten the flange stud nuts. Tighten the nuts in a criss-cross sequence to be sure the flange gaskets are properly loaded.

5. Connect pressure lines to the actuator as indicated in the actuator instruction manual. When an auxiliary manual actuator is used with a power actuator, install a bypass valve on the power actuator (if one is not supplied) for use during manual operation.

WARNING

Personal injury could result from packing leakage. Valve packing was tightened before shipment; however the

packing might require some readjustment to meet specific service conditions.

If the valve has ENVIRO-SEAL live-loaded packing installed, this initial re-adjustment will probably not be required. See the Fisher Controls instruction manual titled *ENVIRO-SEAL Packing System for V-Line and edisc® Rotary Valves* for packing instructions.

Maintenance

Valve parts are subject to normal wear and must be inspected and replaced as necessary. The frequency of inspection and replacement depends upon the severity of service conditions. Because of the care Fisher Controls takes in meeting all manufacturing requirements (heat treating, dimensional tolerances, etc.), use only replacement parts manufactured or furnished by Fisher Controls.

Key numbers in this procedure are shown in figures 19 through 22 unless otherwise noted.



WARNING

The V-notch ball closes with a shearing, cutting motion, which could result in personal injury. To avoid injury, keep hands, tools, and other objects away from the V-notch ball while stroking the valve.

Avoid personal injury from sudden release of process pressure. Before performing any maintenance operations:

- Disconnect any operating lines providing air pressure, electric power, or a control signal to the actuator. Be sure the actuator cannot suddenly open or close the valve.
- Use bypass valves or completely shut off the process to isolate the valve from process pressure. Relieve process pressure from both sides of the valve. Drain the process media from both sides of the valve.
- Vent the power actuator loading pressure and relieve any actuator spring precompression.
- Use lock-out procedures to be sure that the above measures stay in effect while you work on the equipment.

Packing Maintenance

Key numbers in this procedure are shown in figures 19 through 22 unless otherwise noted. A detail view of the packing is also shown in figure 7.

If the valve is equipped with the ENVIRO-SEAL Packing System, refer to the separate *ENVIRO-SEAL Packing System for V-Line and edisc Rotary Valves* instruction manual (see figure 8).

Note

For the ENVIRO-SEAL Packing System, refer to the Parts List section for: retrofit kits, parts kits, and individual parts (see figure 7). Refer to the separate *ENVIRO-SEAL Packing System for V-Line and edisc Rotary Valves* instruction manual for maintenance instructions.

If the packing is relatively new and tight on the drive shaft (key 6), and if tightening the packing follower nuts does not stop leakage, it is possible that the drive shaft is worn or nicked so that a seal cannot be made. If the leakage comes from the outside diameter of the packing, it is possible that the leakage is caused by nicks or scratches on the packing box wall. Inspect the drive shaft and packing box wall for nicks or scratches while performing the following procedure.

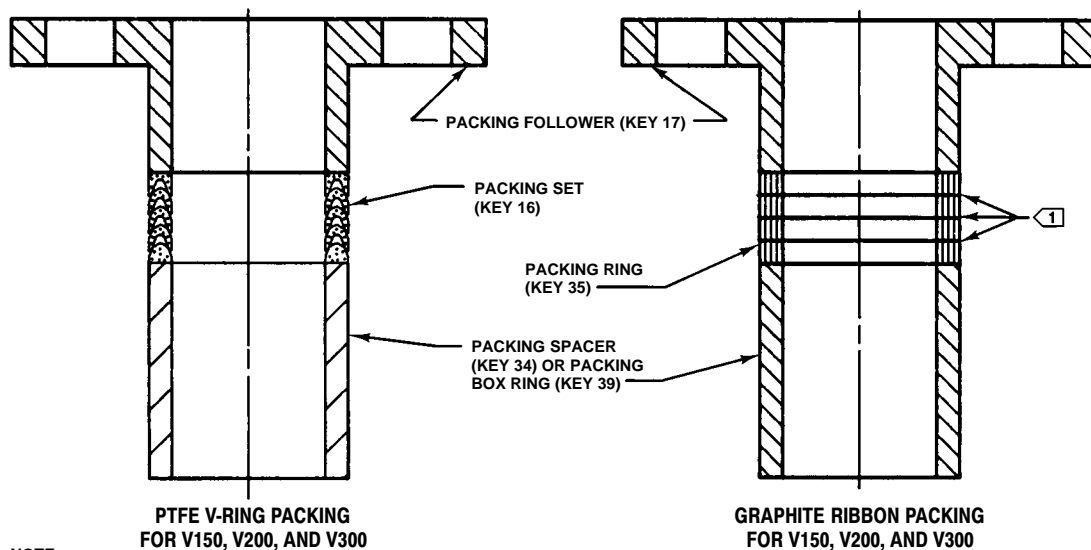
Replacing Packing

When using this Replacing Packing procedure, it is recommended that the actuator **not** be removed from the valve while the valve is still in the pipeline or between flanges. Valve/actuator adjustments must be made with the valve out of the pipeline. Refer to the *Determining Closed Position* section of this manual.

Disassembly

1. Isolate the control valve from the line pressure, release pressure from both sides of the valve body, and drain the process media from both sides of the valve. If using a power actuator, shut off all pressure lines to the power actuator, release pressure from the actuator, and disconnect the pressure lines from the actuator. Use lock-out procedures to be sure that the above measures stay in effect while you are work on the equipment.
2. Remove line bolting, remove the control valve from the pipeline, and place the valve/actuator assembly on a flat surface with the seal protector ring facing up.
3. Remove the actuator cover. Note the orientation of the actuator with respect to the body and the lever orientation with respect to the valve drive shaft (see figure 8).

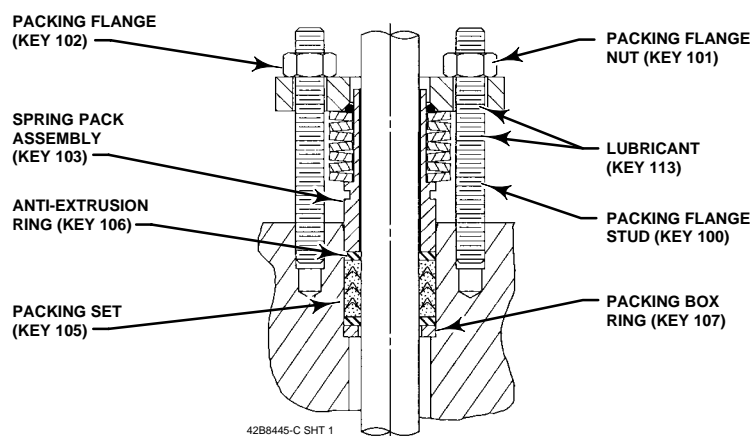
Designs V150, V200, & V300



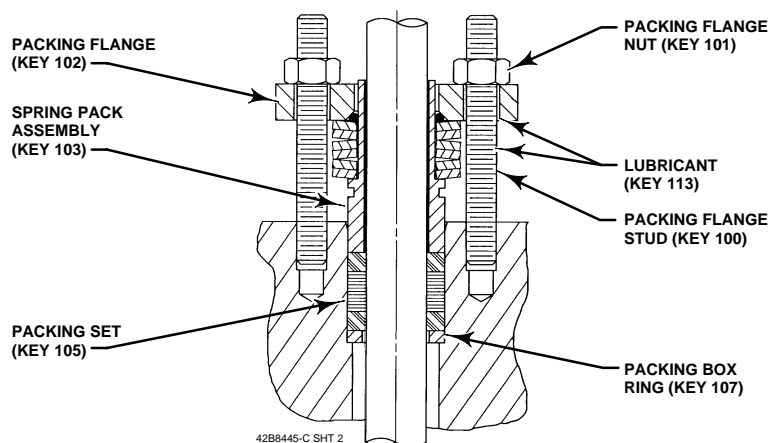
NOTE:
 1 INCLUDES ZINC WASHERS (KEY 36) FOR GRAPHITE RIBBON PACKING ONLY.

11B5695-A
 10B6817-A
 B2332-1 / IL

STANDARD PACKING



ENVIRO-SEAL™ PTFE PACKING SYSTEM



B2412-1 / IL

ENVIRO-SEAL™ GRAPHITE PACKING SYSTEM

Figure 6. Packing Arrangements



WARNING

When the actuator is removed from the valve, the V-notch ball/shaft assembly may suddenly rotate, resulting in personal injury. To avoid injury, carefully rotate the V-notch ball to the stable position after the actuator is removed.



CAUTION

When removing the actuator from the valve, do not use a hammer or similar tool to drive the lever or actuator off the valve shaft. Driving the lever or actuator off the valve shaft could damage the V-notch ball, seal, and valve.

If necessary, use a wheel puller to remove the lever or actuator from the valve shaft. It is okay to tap the wheel puller screw lightly to loosen lever or actuator, but hitting the screw with excessive force could damage the V-notch ball, seal, and valve.

4. Remove the lever (do not loosen the actuator turn-buckle adjustment), remove the actuator mounting screws and nuts (keys 23 and 24), and remove the actuator. (If necessary, refer to the actuator instruction manual for assistance.)

5. If necessary, remove the bonding strap assembly before attempting to remove the packing (see figure 3).

6. Remove the packing follower nuts and packing follower (keys 17 and 20). For alloy packing constructions, there is a packing follower (key 17) and a separate packing flange (key 40) that must be removed.

If the valve is equipped with the ENVIRO-SEAL packing system, refer to the *ENVIRO-SEAL Packing System for V-Line and edisc® Rotary Valves* instruction manual for disassembly.

7. Remove the packing parts (see figure 6, keys 16, 17, 35, and 39 depending on construction) using a formed wire hook with a sharp end. Pierce the rings with the sharp end of the hook in order to remove them. Do not scratch the drive shaft or packing box wall; scratching these surfaces could cause leakage. Clean all accessible metal parts and surfaces to remove particles that would prevent the packing from sealing.

Assembly

If the valve is equipped with the ENVIRO-SEAL packing system, refer to the *ENVIRO-SEAL Packing System for V-Line and edisc® Rotary Valves* instruction manual for assembly.

1. For 8-, 10-, and 12-inch, install the packing spacer (key 34, figure 19, 20, or 22) if it has been removed.

2. To help ensure correct centering of the V-notch ball (key 2) on the seal (key 11), make sure the ball is closed while you install or tighten new packing. Before installing the packing, close the ball. Insert a screw driver, pry bar, or similar tool between the lower ear of the ball and the valve body. Use the pry to move the ball tightly against the thrust washer and bearing on the actuator side of the valve (see figure 8). Keep the ball in that position until you have completed packing installation.

3. Install the new packing parts using the parts sequence shown in figure 6. Install the packing follower (key 17). For alloy constructions, there is a packing follower (key 17) and a separate packing flange (key 40) that must be replaced.

4. Secure the packing follower with the packing follower nuts (key 20). Tighten the nuts far enough to stop leakage under operating conditions.

Handle the seal protector ring, seal, and other parts carefully to prevent damage. A new gasket (key 15) is required whenever the seal protector ring (key 3) is removed.

Flow ring construction does not use a seal, shims, or spring seal. Use this procedure to remove the seal protector ring from flow ring constructions, but disregard any instructions calling for the seal, shims, or spring seal.

Note

If the valve is equipped with a bonding strap assembly (figure 3), re-install the assembly.

5. Reconnect the actuator and lever in accordance with the orientations that were noted in step 3 of the disassembly procedures. If necessary, use figure 7 to identify the correct index marks.

6. Refer to the appropriate actuator instruction manual to complete actuator assembly and adjustment.

7. When the control valve is in operation, check the packing follower for leakage and retighten the packing follower nuts (key 20) as necessary.

Designs V150, V200, & V300

ACTUATOR		VALVE OPEN	ACTUATOR POSITION			
MOUNTING	STYLE		1	2	3	4
RIGHT-HAND ⁽¹⁾	STYLE A (PDTC) ⁽²⁾					
	STYLE B (PDTO) ⁽²⁾					
LEFT-HAND ⁽¹⁾	STYLE C (PDTC) ⁽²⁾					
	STYLE D (PDTO) ⁽²⁾					

1. Right-hand mounting controls with v notch no. 1; Left-hand mounting controls with v notch no. 2
 2. PDTC-push down to close; PDTO-push down to open
 3. Arrow on lever indicates direction of actuator thrust to close valve

Figure 7. Index Marks for Actuator Lever Orientation

Replacing the Ball Seal

Disassembly

Perform this procedure if the control valve is not shutting off properly or if seal inspection is necessary. The actuator/valve assembly must be removed from the pipeline; however, the actuator may remain mounted on the valve during ball seal replacement procedure. Ball Seal Assembly details (with key numbers) are also shown in figures 9 and 10. Upon inspection, if it is found that the V-notch ball, shaft, or bearings need to be replaced, use this procedure to remove the ball seal. Then, proceed to the V-notch Ball and Bearing Maintenance procedures to replace the V-notch ball, bearings, and shafts. After other procedures are complete, return to this procedure and begin with the assembly of the ball seal steps.

Key numbers are shown in figures 19 through 22, unless otherwise indicated.

1. Isolate the control valve from process pressure and release pressure from both sides of the valve body, and drain the process media from both sides of the valve. If using a power actuator, also shut off all pressure lines to the power actuator, release all pressure from the actuator and disconnect the pressure lines from the actuator. Use lock-out procedures to be sure that the above measures stay in effect while you are working on the equipment.

2. Remove line bolting, remove the control valve from the pipeline, and place the valve on a flat surface with the seal protector ring facing up. Carefully rotate the V-notch ball to the open position.

3. Remove protector ring screws and washers (keys 21 and 22). Carefully remove the seal protector ring and gasket (keys 3 and 15). (For flow ring constructions, go to step 4.)

a. **For valves with composition (TCM Plus or TCM Ultra) seals**, remove the seal (key 11) from the valve body. For 1-, 1-1/2, and 2-inch valves, also remove the backup ring (key 42, figure 10) from the valve body.

Designs V150, V200, & V300

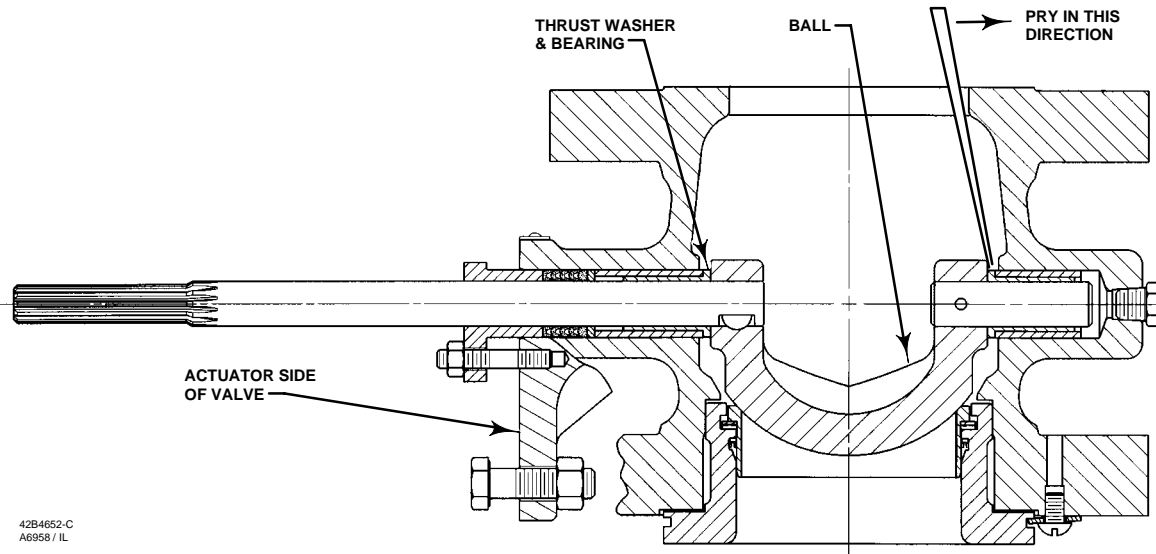


Figure 8. Typical V-Line Valve Showing Pry Bar

b. **For a flat metal seal**, remove the spring seal, seal, and shims (keys 13, 11, and 12). (Note: It may be necessary to re-use some of the original shims when reassembling the flat metal seal.)

c. **For an HD metal seal**, once the protector ring has been removed from the valve, push the metal seal (key 11) out of the seal protector ring (key 3). Remove the wave spring and radial seal (keys 13 and 37).

- It might be necessary to remove the HD metal seal by carefully tapping it with a soft punch and hammer. Take care not to damage the seal protector ring.

- **3- through 12-inch valves**, where the seal is difficult to push out, it is recommended that a seal removal plate be used to press the HD metal seal out of the seal protector ring. Refer to figure 9 for dimensions of the seal removal plate. (a seal removal plate is not required for 1-, 1-1/2, or 2-inch valves.)

- It might be necessary to remove the HD metal seal by carefully tapping it with a soft punch and hammer. Take care not to damage the seal protector ring.

- **10- and 12-inch valves:** Remove the retaining ring (key 41) in the seal protector ring. This retaining ring is an octagonal-shaped support wire. To remove the retaining ring, find one of the free ends of the ring. Use a screwdriver or similar tool to pry inward and upward until the ring is removed.

4. Inspect the gasket and sealing surfaces on the valve body (key 1 or 1A), the seal protector ring (key 3), V-notch ball (key 2), and the retaining ring (key 41 for 10- and 12-inch valves only). Be sure the sealing surfaces are not damaged.

5. If replacement of the V-notch ball, shafts (keys 6 or 9), or bearings (key 10) is needed, proceed to the Bearing and V-notch Ball Maintenance procedure. If only the seal is to be replaced, proceed to the Assembly steps below.

Assembly

Refer to figures 9 and 10 for key number locations during seal installation. Valve key number locations are shown in figures 19 through 22.

1. Thoroughly clean all parts that are to be re-used and obtain replacement parts. Be sure that all sealing surfaces are in good condition without scratches or wear. If the valve has been installed between line flanges and the flange studs and nuts have been tightened, always replace the gasket (key 15) with a new gasket.

2. To help ensure correct centering of the V-notch ball (key 2) on the seal (key 11), make sure the ball is closed while you install the seal or flow ring and seal protector ring. Insert a screw driver, pry bar, or similar tool between the lower ear of the or ball and the valve body (see figure 8).

3. Use the pry to move the ball tightly against the thrust washer and bearing on the actuator side of the valve. Keep the ball in that position until you have completed seal or flow ring installation.

Designs V150, V200, & V300



WARNING

The V-notch ball closes with a shearing, cutting motion, which could result in personal injury. To avoid injury or property damage, keep hands, tools, and other objects away from the V-notch ball while stroking the valve.

4. Carefully close the V-notch ball. Make sure it cannot rotate during assembly.

5. For valves with composition ball seals:

a. **1-, 1-1/2, and 2-inch valves:** Install the backup ring (key 14). Install the composition seal (key 11) into the valve body. Refer to figure 12.

- Install the gasket (key 15) on the valve body.

- Install the seal protector ring (key 3) into the valve body. (Go to step 9, page 16.)

b. **3- through 12-inch valves:** Install the composition seal (key 11) into the valve body.

- Install the gasket (key 15) on the valve body.

- Install the seal protector ring (key 3) into the valve body. (Go to step 9, page 16)

6. For valves with flat metal seals:

a. Install 12 shims in the valve and install the flat metal seal on top of the shims (see figure 11).

b. Install the spring seal (key 13) on the flat metal seal (key 11) with the convex side of the spring seal facing the V-notch ball.

c. Install the seal protector ring, and install the protector ring screws and washers (keys 21 and 22). Tighten the screws.

d. Add or remove shims under the ball seal as necessary to obtain zero ball seal deflection as accurately as possible.

Note

Zero ball seal deflection for a flat metal seal is the point at which the addition of one 0.005-inch (0.13 millimeter) thick shim causes contact between the V-notch ball and ball seal to be broken. Hold the parts tightly together when determining zero deflection, or improper zero deflection might result.

e. After zero deflection is reached, remove the seal protector ring, spring seal, seal and 4 shims. Final assembly of control valve should not exceed a maximum of 9 shims for zero deflection. If more than 9 shims are required, contact your Fisher Controls sales office or sales representative.

f. Install the gasket (key 15) on the valve body.

g. Install the seal protector ring (key 3) into the valve body.

h. When the above steps are complete, go to step 9 in this procedure.

7. For valves with HD metal seals:

a. **For 1-, and 1-1/2 inch valves:** There are old style and new style protector rings (key 3) installed in Design V200 valves (see figure 12 for dimensions, also see parts list table for *Key 3. Steel and Stainless Steel Seal Protector Ring*).

(Note: In the parts list, the table for key 3 part numbers are divided between the older style and newer style seal protector ring.) Both rings serve the same function, but are of different dimensions. Refer to figure 12 for ring dimensions.

b. **For 1-, 1-1/2, and 2-inch valves:**

- Install the wave spring (key 13) onto the ball seal.

- Lubricate and install the radial seal (key 37) onto the ball seal (key 11). Make sure the open side of the radial seal faces away from the V-notch ball.

Designs V150, V200, & V300

VALVE SIZE, INCHES	DIMENSION A	
	Minimum-Maximum, Inches	Minimum-Maximum, mm
3	2.990-3.000	75.9-76.2
4	3.740-3.750	95.0-95.3
6	4.990-5.000	126.7-127.0
8	6.240-6.250	158.5-158.8
10	8.365-8.375	212.5-212.7
12	10.365-10.375	263.3-263.5

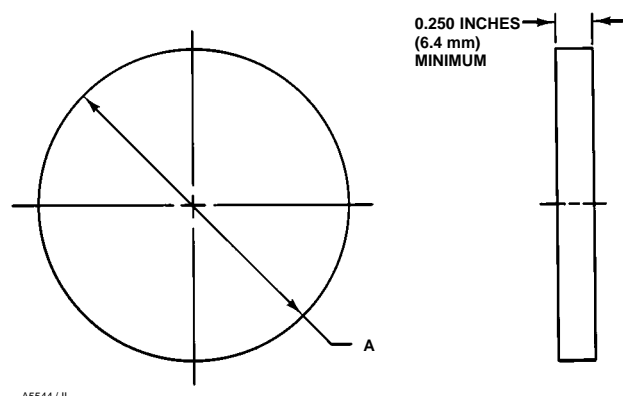


Figure 11. HD Seal Removal Plate Dimensions

- Push the ball seal assembly into the seal protector ring (key 3).

- Go to step 9 in this procedure.

c. For 3- through 8-inch valves,

- Lubricate and install the radial seal (key 37) into the appropriate groove in the seal protector ring making sure the open side of the radial seal faces away from the ball.

- Install the wave spring (key 13) into the seal protector ring (key 3).

- Install the HD metal seal (key 11) into the seal protector ring (key 3), past the radial seal. While pushing it past the radial seal, make sure the HD metal seal is level. Go to step 9 in this procedure.

d. For 10- and 12-inch valves:

- Lubricate and install the radial seal (key 37) into the appropriate groove in the seal protector ring making sure the open side of the radial seal faces away from the ball.

- Install the wave spring (key 13) into the seal protector ring (key 3).

- To install the retaining ring (key 41), find one of the free ends of the ring. Insert the free end into the groove in the seal protector ring. Work around the

ring, pressing it into the groove until the ring is completely in its groove.

- Install the HD metal seal (key 11) into the seal protector ring (key 3), past the radial seal. While pushing it past the radial seal, make sure the HD metal seal is level.

- The HD metal seal uses a retaining ring (key 41) for 10- and 12-inch sizes only. This retaining ring is an octagonal-shaped support wire. Go to step 9 in this procedure.

8. Install a replacement gasket (key 15) on the valve body (key 1 or 1A). Install the HD metal ball seal/seal protector ring assembly into the valve body (key 1 or 1A).

9. Install washers (or clips), and screws that clamp the seal protector ring to the valve body [keys 3, 21, and 22; the Design V200 valve uses clips (key 22) in place of washers].

10. If necessary, refer to the packing maintenance procedures to install the packing. Install the actuator using the Actuator Mounting procedures in this section. If necessary, refer to the valve/actuator adjustment steps in the Actuator Mounting procedures in this manual, or to the appropriate actuator instruction manual.

HD Metal Seal Lubrication

To assist with break-in of the HD metal seals, it is recommended that the V-notch ball and seal be lubricated with Dow Corning 321 dry film lubricant or equivalent moly disulfide.

Bearing and V-Notch Ball Maintenance

Procedures for disassembly and assembly of the bearings and V-notch ball can **not** be accomplished until the ball seal and valve packing are removed from the valve.

1. Refer to the Replacing Packing procedures to remove the actuator, and to remove the packing flange and packing follower from the valve. When the packing disassembly steps are complete, return to this section.

2. Refer to the Replacing the Ball Seal procedures to remove the ball seal from the valve.

Designs V150, V200, & V300

Disassembly



WARNING

When the actuator is removed from the valve, the V-notch ball/shaft assembly may suddenly rotate, resulting in personal injury. To avoid injury, carefully rotate the V-notch ball to the open position. Make sure the ball will not rotate.

Key numbers in this procedure are shown in figures 19 through 22, unless otherwise indicated. In the following procedure, unless otherwise noted.

1. A taper key (key 4, figure 18) is used in 3- through 12-inch valves.

2. **Metal Micro-Notch ball constructions:** A taper pin (key 4, figure 16) is used in the 1-, 1-1/2, and 2-inch size valves. And, a taper pin (figure 14) is used in the 1-inch valve size.

3. **Ceramic Micro Notch ball constructions:** A screw (key 4, figure 15) is used to attach the ball to the drive shaft.

a. The parts are held together with a screw and with a Loctite product. Remove the screw (key 4) and separate the drive shaft from the ball. In some cases, a small amount of heat can be applied to help loosen the adhesive. However, excessive heat may damage other valve component parts.

b. Once the shafts have been removed from the valve body, the V-notch ball may fall. To avoid personal injury or damage to the sealing surfaces, provide support for the V-notch ball to prevent it from falling as the shaft(s) are being removed.

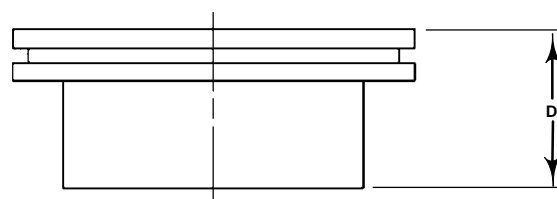
4. Carefully rotate the V-notch ball to the open position after the actuator is disconnected. Make sure the ball will not rotate (see warning above). Provide support for the V-notch ball during the following disassembly.

5. Unscrew the pipe plug (key 25). (With newer valve constructions, the pipe plug is optional and may not be available.)

6. Locate the small end of the taper pin (key 4, see figure 14 or 16) or taper key (key 4, see figure 18). Using a pin punch on the smaller end of the taper pin or key, drive it out of the V-notch ball (key 2) and drive shaft (key 6). Note: driving the taper pin or taper key in the wrong direction will tighten it.

For tack welded taper keys, driving the taper key out of the ball ear will shear the tack welding.

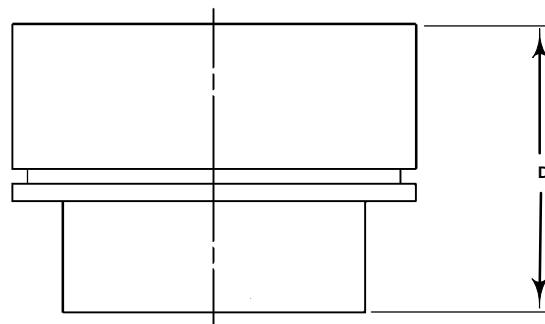
Valve Size, Inches	Construction	TCM Seal "D"	HD Seal "D"	Flow Ring "D"
Inches				
1	Old	1.30	0.99	1.06
	New	1.76	1.48	1.56
1-1/2	Old	1.29	1.08	1.15
	New	1.75	1.54	1.61
mm				
1	Old	58.4	25.1	26.9
	New	44.7	37.6	39.6
1-1/2	Old	32.8	27.4	29.2
	New	44.5	39.1	40.9



A6959 / IL

ISA S75.04 FACE-TO-FACE VALVE

Valve Size, Inches	Construction	TCM Seal "D"	HD Seal "D"	Flow Ring "D"
Inches				
1	Old	2.30	1.99	2.06
	New	2.76	2.48	2.56
1-1/2	Old	3.29	3.08	3.15
	New	3.75	3.54	3.61
mm				
1	Old	58.4	50.5	52.3
	New	70.1	63.0	65.0
1-1/2	Old	83.6	78.2	80.0
	New	95.3	89.9	91.7



A6960 / IL

ANSI B16.10 (SHORT) FACE-TO-FACE VALVE

Figure 12. 1 and 1-1/2 Inch Seal Protector Ring Measurements for Design V200 Valves

Designs V150, V200, & V300

Table 7. Continuous Threaded Rod

Valve Size, Inches	Threaded Rod Thread Size	Thread Depth in Follower Shaft
1	1/4-20	0.5
1-1/2	1/4-20	0.5
2	1/4-20	0.5
3	1/4-20	0.5
4	1/4-20	0.5
6	1/4-20	0.5
8	5/16-18	0.62
10	5/16-18	0.62
12	5/16-18	0.94

7. Working from the small end of the groove pin (key 7), use a pin punch to drive the groove pin out of the V-notch ball ear and follower shaft.

8. Pull the drive shaft (key 6) out of the actuator side of the valve body. For 3-inch and larger valves with metal bearings, remove the thrust washer (key 38). For 1-, 1-1/2, and 2-inch valves, remove the thrust washer (key 38) from valves with composition or metal bearings.

9. Make sure the sealing surface of the V-notch ball is not damaged while removing the follower shaft.

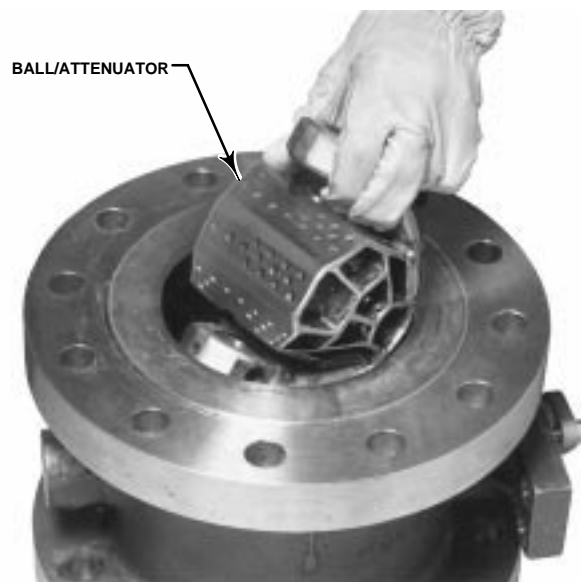
a. If a pipe plug (key 25) is installed, use a punch to drive the follower shaft (key 7) into the center of the V-notch ball.

b. If a pipe plug is not installed, use a piece of continuous threaded rod as a removal rod when moving the follower shaft (key 7) into the center of the V-notch ball. Refer to the table 7 shown below for a description of the size threaded rod needed. The length of the rod should allow easy working room from the valve body.

10. Removing the V-notch ball (key 2):

a. **For V-notch ball without attenuator**, carefully remove the follower shaft and V-notch ball from the valve body, and for valves with metal bearings, remove the thrust washer (key 38). Also, 1-, 1-1/2, and 2-inch valves will require removing the thrust washer (key 38) when both shafts are removed.

b. **For V-notch ball with attenuator (sizes 4-through 12-inch valves)**, carefully remove the follower shaft and V-notch ball from the valve body. For 4-inch valves, remove the V-notch ball/attenuator through the inlet of the valve. For 6-, 8-, 10-, and 12-inch valves, remove the V-notch ball/attenuator through the outlet of the valve. The 6-, 8-, 10-, or 12-inch V-notch ball/attenuator will not come straight out of the valve body.



WB134 / IL

Figure 13. Ball/Attenuator Installation and Removal Method

c. Taking hold of the follower shaft ear on the ball/attenuator, you must position the scalloped edge of the attenuator against the valve bore opening and then pivot, or roll, the V-notch ball/attenuator out of the valve body (see figure 13). For valves with metal bearings, remove the thrust washer (key 38).

11. Remove the packing box spacer (key 34) for 8-, 10-, and 12-inch valves.

12. Removing the bearings (key 10):

a. **For composition bearings**, remove the bearings by hand. If the bearings are tight in the body, then pull or drive them out with a slight pressure. Allow the bushings (key 5 or 8) to remain in the valve body.

b. **For metal bearings**, use a press and ram to remove the drive shaft bearings out of the valve body. Refer to figure 17 ram dimensions. The bushings (key 5 or 8) will normally remain in the valve body.

- To remove the follower shaft bearings, use a blind-hole bearing puller similar to CG2545AB, which is made by Snap-On Tools. If you do not have such a tool, you can machine the bearing out.

Note

For proper shutoff performance, the ball and seal require the bearing (key 10) to be positioned correctly. If you removed the bearings (key 10), be sure to locate the new bearings as shown in figure 17.

13. Thoroughly clean surfaces of all parts that are to be re-used or obtain replacement parts.

Designs V150, V200, & V300

Assembly

1. Inspect all sealing surfaces to ensure they are in good condition and without scratches or wear.
2. Installing bearings (key 10):
 - a. **For composition bearings**, install the bearings by hand. The bearing flanged end should touch the bushing (key 5 or 8).
 - b. **For metal bearings:**
 - Use a press and ram to install the bearings (key 10). Refer to figure 17.
 - Press the bearings in until each bearing is flush with the bushing (key 5 or 8). The acceptable tolerance for bearing location is: flush with the bushing to 0.060 inches (1.52 mm) inside the bushing. That is, the bearings should not protrude into the flow cavity of the valve, and they should not be more than 0.060 inches (1.52 mm) inside the bushing.
 - Take care not to change the position of the bushings (key 5 or 8) when pressing in new bearings (key 10), otherwise the V-notch ball will not center in the valve body and seal.
3. Installing the V-notch ball (key 2):



WARNING

The V-notch ball might be damaged if it is allowed to fall into the valve body. To avoid personal injury or damage to the sealing surfaces, support the V-notch ball to prevent it from falling into or out of the valve body cavity.

Note

For ease of assembly, the follower shaft (key 9) should be inserted into the V-notch ball before installing the V-notch ball in the following applications:

- 3-inch valve without ball/attenuator
 - 4- through 12-inch valves with ball/attenuator.
- a. **For V-notch ball without attenuator**, carefully install the V-notch ball into the valve body cavity.
 - b. **For V-notch ball with attenuator (sizes 4 through 12-inch valves)**, carefully install the V-notch ball into the valve body cavity. For 4-inch valves, install the V-notch ball/attenuator through

the inlet of the valve. For 6-, 8-, 10-, and 12-inch valves, install the V-notch ball/attenuator through the outlet of the valve. The 6-, 8-, 10-, or 12-inch V-notch ball/attenuator will not install straight into the valve body. Taking hold of the follower shaft ear on the ball/attenuator, you must position the scalloped edge of the attenuator against the valve bore opening and then pivot, or roll, the V-notch ball/attenuator into the valve body (see figure 13).

After you have installed the V-notch ball (key 2) into the valve body assembly, firmly support the V-notch ball while installing the shafts.

4. Installing the follower shaft (key 9):

- **For 4-inch and larger valves without attenuator:** Hold the washer (key 38, for metal bearings) in place. Insert the follower shaft (key 9) through the V-notch ball, and into the valve body bearing (key 10). Align the hole in the follower shaft with the holes in the V-notch ball. Insert the small end of the groove pin (key 7) into the hole in the V-notch ball and into the follower shaft. The pin will hold the parts in place while the drive shaft (key 6) is being installed.

- **For 4- through 12-inch valves with ball/attenuator:** The follower shaft (key 9) should already have been inserted into the V-notch ball/attenuator before the ball was put into the valve body. Hold the washer (key 38, for metal bearings) in place. Insert the follower shaft (key 9) into the valve body bearing (key 10). Align the hole in the follower shaft with the holes in the V-notch ball. Insert the small end of the groove pin (key 7) into the hole in the V-notch ball and into the follower shaft. The pin will hold the parts in place while the drive shaft (key 6) is being installed.

- **For 1- through 3-inch valves:** The follower shaft (key 9) should already have been inserted into the V-notch ball before the ball was put into the valve body. Hold the washer (key 38, for metal bearings) in place. Insert the follower shaft (key 9) into the valve body bearing (key 10). Align the hole in the follower shaft with the holes in the V-notch ball. Insert the small end of the groove pin (key 7) into the hole in the V-notch ball and into the follower shaft. The pin will hold the parts in place while the drive shaft (key 6) is being installed.

Installing the Drive Shaft for Valves with Taper Pins

Note

- **Make sure the drive shaft is free of oil or grease, otherwise the taper pin will not seat properly.**
- **Make sure to inspect the V-notch ball and shaft carefully. The small end of the ta-**

Designs V150, V200, & V300

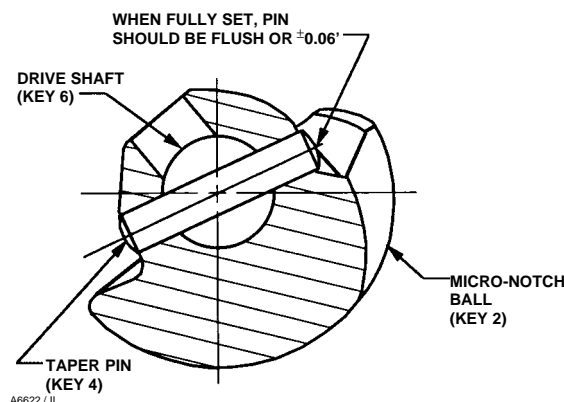


Figure 14. Taper Pin Installation for Design V150, V200, and V300 Size 1-Inch Valves with Micro-Notch Ball Construction

per pin must be inserted into the larger hole side of the ball ear (or ball, for Micro-Notch constructions), and into the large hole side of the drive shaft (see figure 14 or 16).

1. Hold the thrust washer (key 38) in place, insert the drive shaft into the valve body bearing (key 10), and into the V-notch ball ear (or ball, for Micro-Notch constructions). Align the hole in the drive shaft with the holes in the V-notch ball.
2. Insert the taper pin into the V-notch ball and drive shaft as shown in figure 14 and 16.

Note

The taper pin will not fit correctly if inserted in the wrong direction through the ball ear (or ball, for Micro-Notch constructions) or through the drive shaft. Make sure the drive shaft and ball ear (or ball, for Micro-Notch constructions) are in the correct orientation for installing the pin.

Installing VTC Ceramic V-Notch Ball Valves

The valves with 1-inch ceramic micro-notch balls use a screw with a threaded valve shaft to connect the ball to the shaft. A Locktite compound is used to lock the screw in the valve shaft (keys 4 and 6, figure 15).



WARNING

Avoid personal injury and property damage from ignition of process fluid caused by sparks from ceramic trim.

Do not use ceramic trim where the process fluid is unstable or if it is an explosive mixture (such as ether and air).

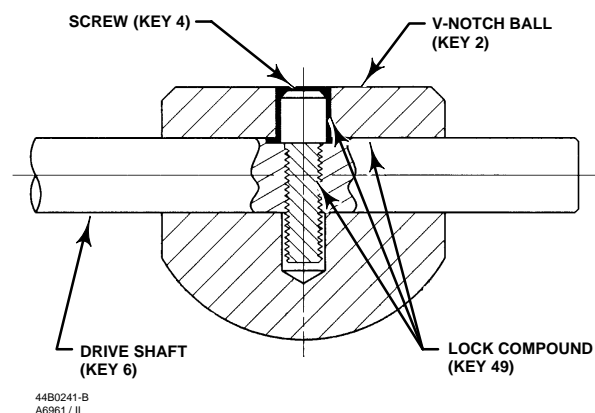


Figure 15. Screw Installation for Design V200, Size 1-Inch Valves with VTC Ceramic Micro-Notch Ball Construction

Within the valve body:

1. The threaded hole in the shaft, the screw and screw clearance hole in the ball must be free of oil or grease before applying an activator.
2. Apply Loctite Depend Activator 7387 to threaded hole, screw and ball clearance hole. Assemble the ball on to the shaft while aligning threaded shaft hole within the ball clearance hole.
3. The flat, on the shaft, must be oriented such that the head of the cap screw seats on the flat.
4. Apply 5 drops of Loctite Depend 330 into the hole in the ball.
5. Thread screw into the shaft tightening it to 81 in. lbs torque. Remove excess adhesive, Allow four hours to cure fully before continuing with assembly.

Installing Taper Pins in 1-, 1-1/2, and 2-inch Valves

Note

For 1-, 1-1/2, and 2-inch valves, the taper pins (figure 16) do not require welding.

Using a flat-end punch, drive the taper pin into the ball ear (or ball, for Micro-Notch constructions) and drive shaft until solid heavy contact is felt. Make sure the taper pin spans the width of the ball.

Using a flat end punch, drive the groove pin (key 7) into the ball and follower shaft until it is flat with the ball surface.

Designs V150, V200, & V300

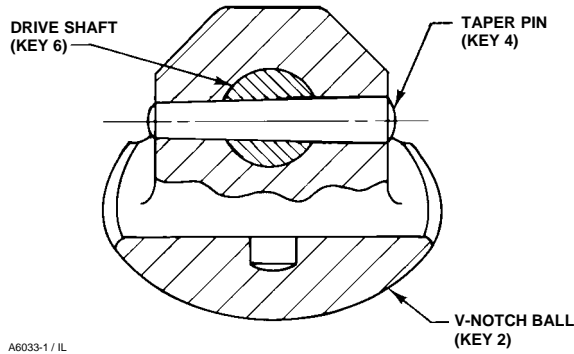


Figure 16. Taper Pin Installation for Design V150, V200, and V300 Sizes 1, 1-1/2, & 2-Inch Valves.

Installing the Taper Key in 3- through 12-Inch Valves

Current standard construction materials for all 3-through 12-inch valves require the taper key (key 4, figure 18) to be tack welded in place using the following procedure. Use standard welding preparations when preparing parts for reassembly.

Note

Make sure the drive shaft (key 6) is free of oil or grease, otherwise the taper key will not seat properly.

1. Install the drive shaft (key 6) into the valve body through the ball and into the lower bearing.
2. Insert the taper key (key 4) into V-notch ball and drive shaft (keys 2 and 6) as shown in figure 18. The taper key inserts, with the flat side of the key, facing the drive shaft (key 6).
3. Using a flat end punch, drive the groove pin (key 7) into the ball ear and follower shaft until it is flat with the ball ear surface.
4. Using a flat end punch, drive the taper key (key 4) into the ball ear and drive shaft (key 6) until solid, heavy contact is obtained between the key and shaft.
5. Measure the position of the taper key head.
6. Drive the taper key in further using the minimum distance shown in table 8.
7. Inspect the ball/shaft taper key connection to verify that the taper key spans the entire shaft flat width. If not, the taper key must be driven in further until this condition is satisfied. However, do not exceed the maximum depths shown in table 9.

Table 8. Taper Key Minimum Depth

VALVE SIZE, INCHES	MINIMUM DEPTH TO DRIVE TAPER KEY AFTER INITIAL SOLID CONTACT, INCHES (MM)
3, 4, 6	0.188 (4.8)
8, 10, 12	0.219 (5.6)

Table 9. Taper Key Maximum Depth

VALVE SIZE, INCHES	MAXIMUM DEPTH TO DRIVE TAPER KEY AFTER INITIAL SOLID CONTACT, INCHES (MM)
3, 4	0.281 (7.1)
6	0.312 (7.9)
8, 10	0.375 (9.5)
12	0.406 (10.3)

Note

When welding standard valves that have a CG8M (317 SST) or CF3M (316L SST) ball, use 309 or 309L filler rod material.

Alloy valve taper keys are normally not welded.

8. When the above conditions are met, tack weld the taper key (key 4) to the ball ear on the head end of the key (see figure 18). Use a:

- 1/8-inch diameter weld on 3- through 6-inch valves,
- 3/16-inch diameter weld on an 8- through 10-inch valves, and
- 1/4-inch diameter weld on 12-inch valves.

For all constructions: Refer to Ball Seal, Packing Maintenance, and other procedures as necessary to complete the assembly of the valve.

Actuator Mounting

Use the appropriate actuator instruction manual and figure 8 of this manual when mounting the actuator or changing actuator styles and positions.

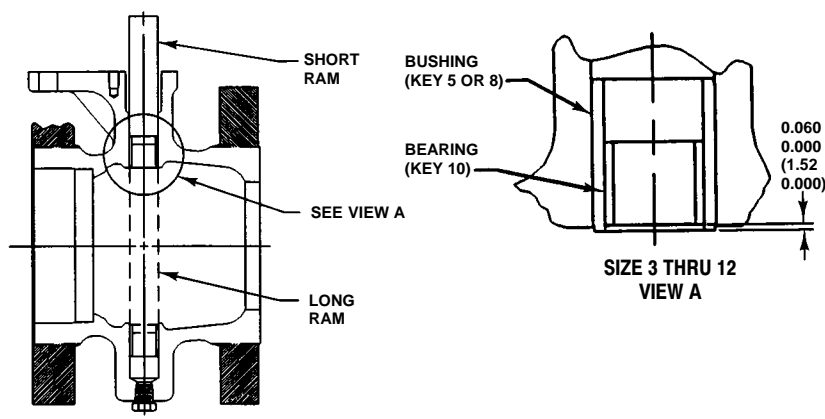
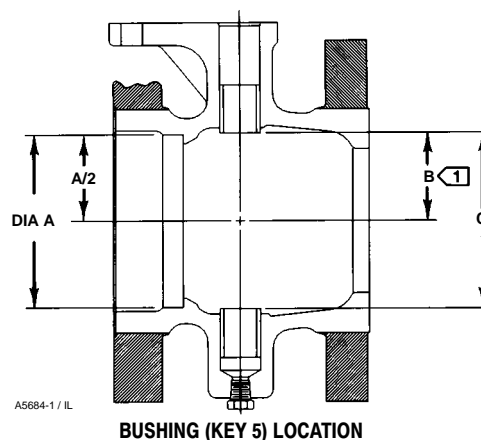
To help ensure correct centering of the V-notch ball (key 2) on the seal (key 11), be sure the ball is closed when mounting the actuator. Do not use a hammer or other tool to drive the actuator lever onto the valve shaft. Clean the valve shaft and actuator lever splines to be sure the actuator lever will slide on easily. If the lever does not slide on easily, carefully wedge the ball solidly against the actuator-side thrust washer using a screw driver or similar tool inserted between the lower ear of the ball and the valve body. Keep the wedge in place while installing the lever, but again, do not drive on the lever. Remove the wedge after you have clamped the actuator lever on the valve shaft and connected the lever to the actuator piston rod or diaphragm rod.

Designs V150, V200, & V300

VALVE SIZE, INCHES	BEARING RAM DIMENSIONS								BUSHING RAM DIMENSIONS					
	Ram Lengths				Ram Diameters				Ram Diameters					
	L		M		D		d		D		Long Ram d		Short Ram d	
	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm
3 & 4	7.930 MIN ⁽¹⁾	201.42 MIN	3.750 MIN	95.25 MIN	0.900 0.890	22.86 22.61	0.750 0.740	19.05 18.80	1.110 1.100	28.19 27.94	0.750 0.740	19.05 18.80	0.900 0.890	22.86 22.61
6	9.750 MIN	247.65 MIN	3.750 MIN	95.25 MIN	1.150 1.140	29.21 28.96	1.000 0.990	25.40 25.15	1.360 1.350	34.54 34.29	1.000 0.990	25.40 25.15	1.150 1.140	29.21 28.96
8	13.310 MIN	338.75 MIN	5.500 MIN	139.70 MIN	1.400 1.390	35.56 35.31	1.250 1.240	31.75 31.50	1.610 1.600	40.89 40.64	1.250 1.240	31.75 31.50	1.400 1.390	35.56 35.31
10	15.620 MIN	396.75 MIN	5.500 MIN	139.70 MIN	1.400 1.390	35.56 35.31	1.250 1.240	31.75 31.50	1.610 1.600	40.89 40.64	1.250 1.240	31.75 31.50	1.400 1.390	35.56 35.31
12	18.750 MIN	476.25 MIN	6.000 MIN	152.40 MIN	1.650 1.640	41.91 41.66	1.500 1.490	38.10 37.85	1.985 1.975	50.42 50.17	1.500 1.490	38.10 37.85	1.650 1.640	41.91 41.66

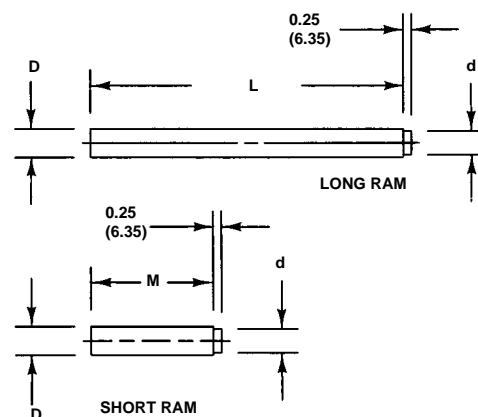
1. MIN = Minimum.

VALVE SIZE, INCHES	DIMENSION			
	B	C	B	C
	Inches		Millimeters	
3	1.960 1.970	3.952 3.962	48.26 50.04	100.38 100.63
4	2.366 2.376	4.764 4.774	60.10 60.35	121.01 121.26
6	3.291 3.301	6.614 6.624	83.59 83.85	168.00 168.25
8	4.181 4.191	8.394 8.404	106.20 106.45	213.21 213.46
10	5.328 5.338	10.688 10.698	135.33 135.59	271.48 271.73
12	6.680 6.690	13.392 13.402	169.67 169.93	340.16 340.41



NOTES:
 1. DIMENSION B IS THE DISTANCE BETWEEN THE
 GUIDE BUSHING AND THE CENTER OF DIAMETER A.

BEARING RAM



INCHES
(mm)

Figure 17. Metal Bearing Ram and Bushing Location

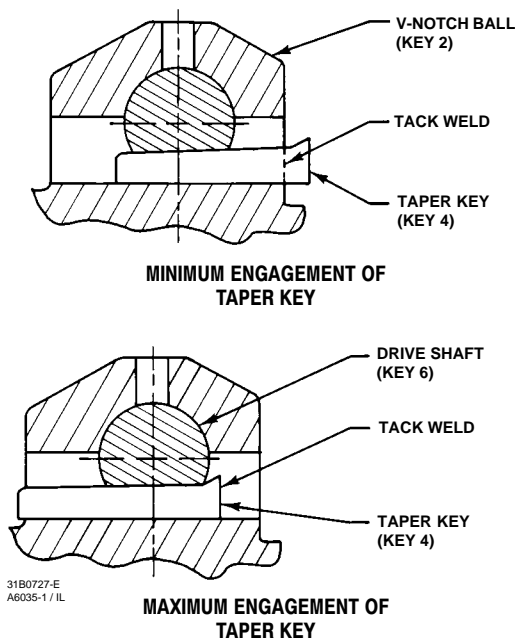


Figure 18. Taper Key Installation

Determining Mounting Position

The actuator can be either right or left-hand mounted.

Note

Right-hand mounting—Actuator is on the right side of the valve when viewed from valve inlet.

Left-hand mounting—Actuator is on the left side of the valve when viewed from valve inlet.

The preferred location of the V-notch ball is in the top of the body when the valve is open. To convert from right to left hand-mounting, turn the valve to position the actuator mounting pad on the left and rotate the V-notch ball to the top of the valve.

The number one V-notch controls flow on right-hand mounting. Turn the valve 180 degrees, and rotate the V-notch ball to the top of the valve to obtain left-hand mounting. The number two V-notch controls flow for this construction.

Determining Closed Position

1. The valve must be removed from the line to check the position of the V-notch ball.



WARNING

The V-notch ball closes with a shearing, cutting motion. To avoid personal injury, keep hands, tools, and other objects away from the V-notch ball while stroking the valve.

2. Rotate the V-notch ball to the closed position.
3. Follow one of the procedure below:

c. On Valves Without Rotary Attenuator Installed

- When viewed from the body outlet, the ball is in the proper position when both Vnotches of the ball are centered between the machined diameter of the ledge that supports the seal.

- **The micro-notch ball closed position** is approximately 5 degrees closed from the first point of flow. This establishes the zero degree position for the ball.

d. On Valves With Rotary Attenuator Installed

- Remove the seal protector ring (key 3, figures 9 and 10) and the seal. When viewed from the body outlet, the ball, on sizes up to 6 inches, is in the proper position when the V-notch of the ball is centered between the machined diameter of the ledge that supports the seal.

- The ball is in the proper position when the V-notch ball is centered on the machined diameter of the ledge that supports the seal.

4. Adjust the actuator linkage as described in the appropriate actuator instruction manual until the condition described in step 3 exists. A line is stamped on the actuator end of the drive shaft (see *Figure 8. Index Marks for Actuator Lever Orientation*) to indicate the V-notch ball position.

Parts Ordering

A serial number is assigned to each valve and stamped on the nameplate. Always refer to the valve serial number when corresponding with your Fisher Controls sales office or sales representative regarding spare parts or technical information. When ordering replacement parts, also specify the complete 11-character part number from the parts kits or parts list information.

Designs V150, V200, & V300

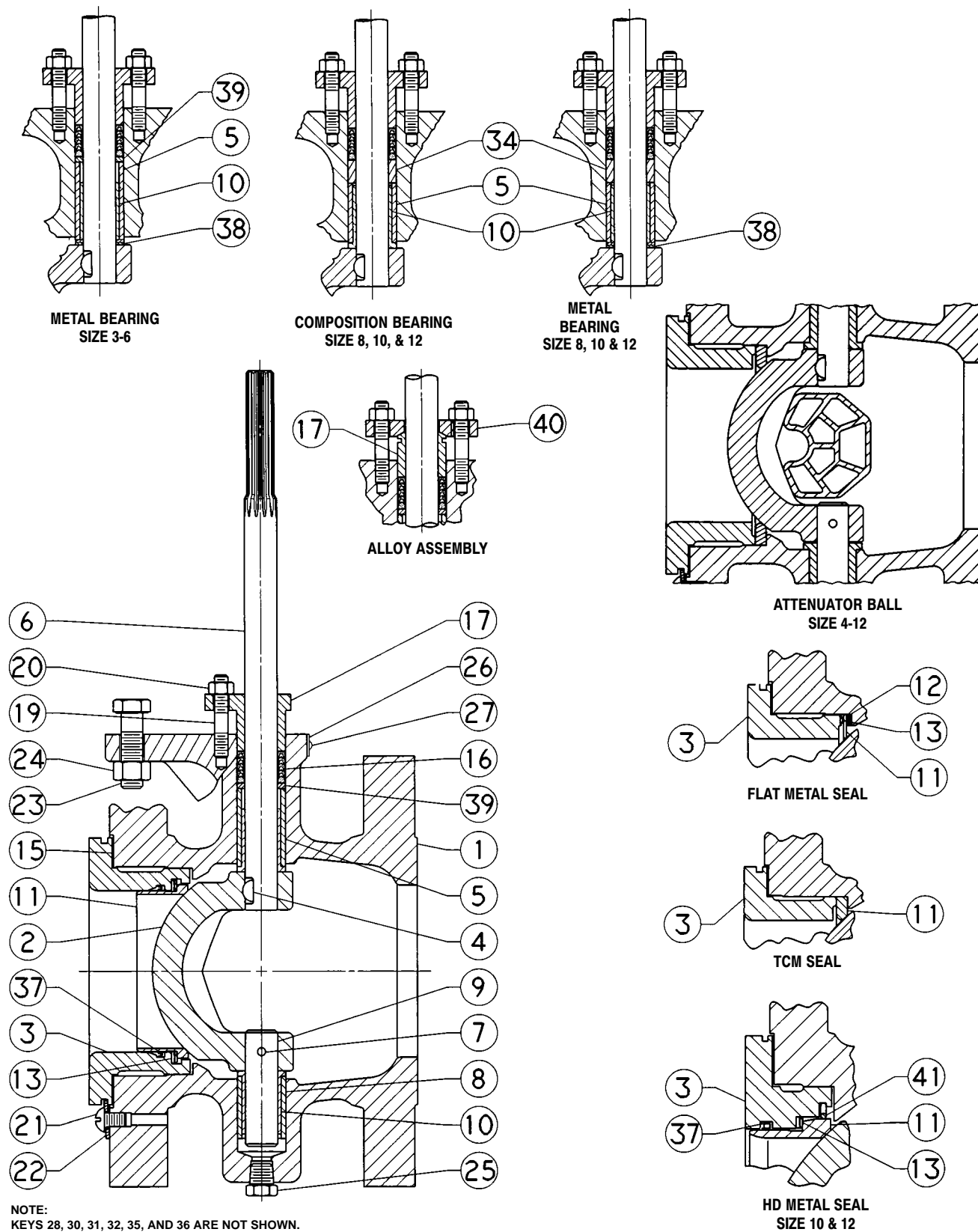
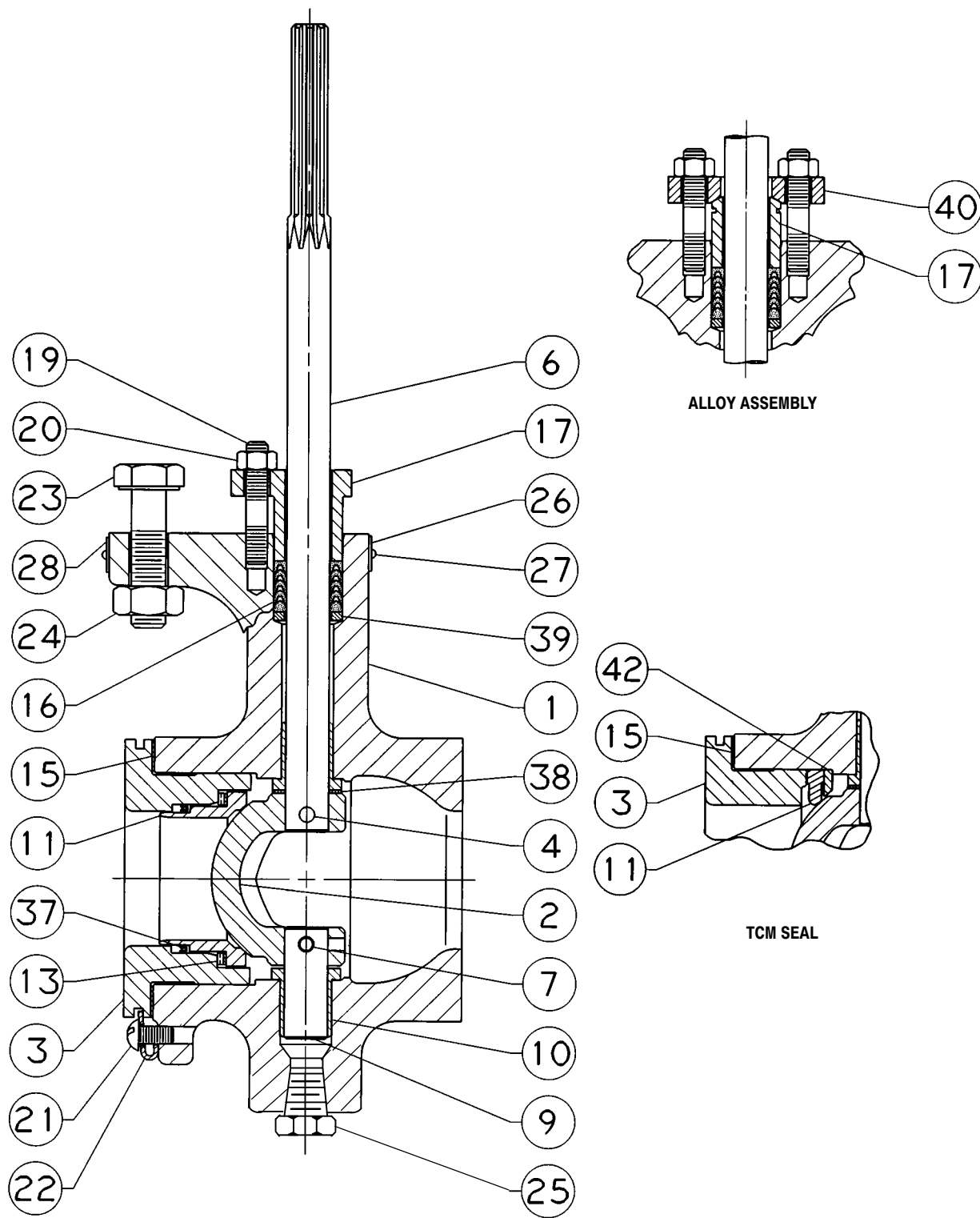


Figure 19. Designs V150 and V300 Valve Assembly (3-12 Inch Sizes)

Designs V150, V200, & V300



NOTE
KEY 30, 31, 32, 35, AND 36 ARE NOT SHOWN.
42B2228-A / DOC

Figure 21. Design V150 Size 1, 1-1/2, and 2-Inch Valve
(Details are Typical for Design V200 and V300 Valves Except Design V200 Does Not Have Line Flanges)

Designs V150, V200, & V300

Parts Kits

Retrofit Kits for HD Metal Seal

Retrofit kits include parts to convert existing valves to the HD (heavy-duty) metal ball seal construction. The seal protector ring has a standard S75.04 or IEC 534-3-2 face-to-face dimension.

HD Metal Ball Seal Retrofit Kits for ISA S75.04 Face-to-Face Valves

VALVE SIZE, INCHES		RETROFIT KIT NUMBER FOR HD METAL BALL SEAL	
For WCC Steel Seal Protector Ring		CF10SMnN (Nitronic 60) Seal Material	DC7MCuN (Alloy 255 Duplex SST) Seal Material
2 ⁽¹⁾		RV150X0R012	RV150XCR012
2 ⁽²⁾		RV150X0R152	RV150XCR152
3		RV150X0R022	RV150XCR022
4		RV150X0R032	RV150XCR032
6		RV150X0R042	RV150XCR042
8		RV150X0R052	RV150XCR052
10		RV150X0R062	RV150XCR062
12 ⁽³⁾		RV150X0R072	RV150XCR072
For CG8M (317 SST) Seal Protector Ring		CF10SMnN Seal Material	DC7MCuN Seal Material
2 ⁽¹⁾		RV150X0R082	RV150XCR082
2 ⁽²⁾		RV150X0R162	RV150XCR162
3		RV150X0R092	RV150XCR092
4		RV150X0R102	RV150XCR102
6		RV150X0R112	RV150XCR112
8		RV150X0R122	RV150XCR122
10		RV150X0R132	RV150XCR132
12 ⁽³⁾		RV150X0R142	RV150XCR142
Parts Included in Kit		Quantity in Kit	
Key No.	Description		
3	Seal Protector Ring	1	1
11	Ball seal	1	1
13	Wave spring	1	1
15	Gasket	1	1
21	Retainer screw	2 or 4 ⁽⁴⁾	2 or 4 ⁽⁴⁾
22	Retainer washer	2 or 4 ⁽⁴⁾	2 or 4 ⁽⁴⁾
37	Radial seal	1	1
41 ⁽⁵⁾	Retaining ring	1	1
1. V150's only for serial numbers below 12551183. 2. V150's for serial numbers 12551183 and above. All V200's and V300's. 3. Design V200 is not available in 12-inch sizes. 4. A quantity of 2 is supplied for 1- through 8-inch valves, and a quantity of 4 is supplied for 10- and 12-inch valve kits. 5. Retaining rings (key 41) are supplied for sizes 10- and 12-inch valve kits.			

Designs V150, V200, & V300

Repair Kits

Seal repair kits include recommended spare parts for Fisher TCM Plus™, S31600 stainless steel, CF10SMuN, or CD7MCuN ball seal constructions. The following table indicates the repair kit part number and the quantity of parts included in the kit.

Design V150, V200, and V300 Repair Kits

VALVE SIZE, INCHES		KIT PART NUMBER			
		Ball Seal Material			
		TCM Plus	---	Alloy 6	CD7MCuN (Alloy 255 Duplex SST)
1 1-1/2		RV150X00CA2 RV150X00CB2	--- ---	RV150XHDA2 RV150XHDB2	RV150XHDC2 RV150XHDCB2
VALVE SIZE, INCHES		Ball Seal Material			
		TCM Plus	S31600 (316 SST)	CF10SMnN (Nitronic 60)	CD7MCuN (Alloy 255 Duplex SST)
2 ⁽¹⁾ 2 ⁽²⁾ 3 4 6 8 10 12		RV150X00C12 RV150X00C82 RV150X00C22 RV150X00C32 RV150X00C42 RV150X00C52 RV150X00C62 RV150X00C72	RV150X00M12 --- RV150X00M22 RV150X00M32 RV150X00M42 RV150X00M52 RV150X00M62 RV150X00M72	RV150X0HD12 RV150X0H082 RV150X0HD22 RV150X0HD32 RV150X0HD42 RV150X0HD52 RV150X0HD62 RV150X0HD72	RV150XHDC12 RV150XHDC82 RV150XHDC22 RV150XHDC32 RV150XHDC42 RV150XHDC52 RV150XHDC62 RV150XHDC72
Parts Included in Kit		Quantity in Kit			
Key No.	Description				
11	Ball seal	1	1	1	1
12	Shim seal ⁽³⁾	---	4	---	---
13	Spring seal	---	1	---	---
13	Wave spring	---	---	1	1
15	Gasket	1	1	1	1
37	Radial seal	---	---	1	1
21	Retainer screw	2 or 4 ⁽⁴⁾	2 or 4 ⁽⁴⁾	2 or 4 ⁽⁴⁾	2 or 4 ⁽⁴⁾
22	Retainer washer	2 or 4 ⁽⁴⁾	2 or 4 ⁽⁴⁾	2 or 4 ⁽⁴⁾	2 or 4 ⁽⁴⁾

1. V150's only for serial numbers below 12551183.

2. V150's for serial numbers 12551183 and above. All V200's and V300's.

3. Fewer shim seals are furnished in the parts kits than are used in the original construction of the valve. Most original shim seals can be reused.

4. A quantity of 2 is supplied for 2- through 8-inch valves, and a quantity of 4 is supplied for 10- and 12-inch valves.

Retrofit Kits for ENVIRO-SEAL® Packing

Retrofit kits include parts to convert existing V150, V200 and V300 valves with shallow (single packing depth) packing box to the ENVIRO-SEAL packing box construction. Retrofit kits include single PTFE packing. See following table.

ENVIRO-SEAL Packing Retrofit Kits

SHAFT DIAMETER ⁽¹⁾		PART NUMBER	
Inches	mm	Single PTFE	Graphite
1/2	12.7	RRTYXRT0012	RRTYXRT0312
5/8	15.9	RRTYXRT0022	RRTYXRT0322
3/4	19.1	RRTYXRT0032	RRTYXRT0332
1	25.4	RRTYXRT0052	RRTYXRT0352
1-1/4	31.8	RRTYXRT0062	RRTYXRT0362
1-1/2	38.1	RRTYXRT0072	RRTYXRT0372
Parts Included in Kit			
Key	Description	Quantity	
100	Packing stud	2	2
101	Packing nut	2	2
102	Packing flange	1	1
103	Spring pack assembly	1	1
105	Packing set	1	1
106	Anti-extrusion washer	2	---
107	Packing box ring ⁽²⁾	1	1
---	Tag	1	1
---	Tie Cable	1	1

1. Diameter through the packing box.
2. Not required for all sizes of Design V150 and V200 or for V300 with 1-1/4 or 1-1/2 inch diameter shafts.

Designs V150, V200, & V300

Repair Kits for ENVIRO-SEAL® Packing

Repair kits include valves parts for shallow (single packing depth) for ENVIRO-SEAL packing box construction. Repair kits include single PTFE or graphite packing. See following table.

ENVIRO-SEAL Packing Repair Kits

SHAFT DIAMETER ⁽¹⁾		PART NUMBER	
Inches	mm	PTFE	Graphite
1/2	12.7	RRTYX000012	13B8816X012
5/8	15.9	RRTYX000022	13B8816X032
3/4	19.1	RRTYX000032	13B8816X052
1	25.4	RRTYX000052	13B8816X092
1-1/4	31.8	RRTYX000062	13B8816X112
1-1/2	38.1	RRTYX000072	13B8816X142
Parts Included in Kit			
Key	Description	Quantity	
105	Packing set	1	1
106	Anti-extrusion washer	2	-- (2)
1. Diameter through the packing box. 2. Included in key 105.			

Note

The 2-inch Design V150 valve was redesigned to allow sharing of trim parts with the 2-inch Design V200 and V300 valves. There are no common parts between the older and newer 2-inch Design V150 valves. This instruction manual covers only the newer 2-inch valve.

The newer design has a valve shaft diameter 5/8-inch (15.9 mm) at the packing box. Always reference the serial number of your valve when corresponding with your Fisher Controls sales office or sales representative.

For the older design replacement parts, use only the instruction manual that was originally furnished with the valve, or contact your Fisher Controls sales office or sales representative. The older design valve will have serial numbers below 12551183. Also, the older design has a valve shaft diameter of 1/2 inch (12.7 mm) at the packing box.

Parts List

Key	Description	Part Number
1	Body w/o bushing or pipe plug	
1A	If you need a valve body w/body-bushing assembly as a replacement part, order by valve size, serial number, and desired valve body material. Contact your Fisher Controls sales office or sales representative for assistance.	
2	V-Notch Ball	
	CG8M (317 stainless steel [SST])	
	1-, 1-1/2, and 2-inch valves, see table for key 48	
	3-inch	31B0727X022
	4-inch	31B0667X022
	6-inch	41B0731X022

Key	Description	Part Number
2	V-Notch Ball (cont'd)	
	8-inch	41B0737X022
	10-inch	41B0715X022
	12-inch	41B4677X022
	Chrome-plated CG8M	
	1-, 1-1/2, and 2-inch valves, see table for key 48	
	3-inch	31B0727X012
	4-inch	31B0667X012
	6-inch	41B0731X012
	8-inch	41B0737X012
	10-inch	41B0715X012
	12-inch	41B4677X012
	CF3M (316L SST for European Mfg.)	
	1-, 1-1/2, and 2-inch valves, see table for key 48	
	3-inch	31B0727X072
	4-inch	31B0667X082
	6-inch	41B0731X072
	8-inch	41B0737X062
	10-inch	41B0715X062
	12-inch	41B4677X092
2	V-Notch Ball (Continued)	
	Chrome-plated CF3M (for European Mfg.)	
	Design V150 and V300	
	1-, 1-1/2, and 2-inch valves, see table for key 48	
	3-inch	31B0727X032
	4-inch	31B0667X032
	6-inch	41B0731X032
	8-inch	41B0737X032
	10-inch	41B0715X032
	12-inch	41B4677X032
	CW2M (Hastelloy C)	
	1-, 1-1/2, and 2-inch valves, see table for key 48	
	3-inch	31B0727X062
	4-inch	31B0667X042
	6-inch	41B0731X042
	Alloy 6 V-notch ball w/CG8M chrome pl	
	1-, 1-1/2, and 2-inch valves, see table for key 48	
	3-inch	31B0727X042
	4-inch	31B0667X062
	6-inch	41B0731X052
	8-inch	41B0737X052
	10-inch	41B0715X042
	12-inch	41B4677X072
2	V-Notch Ball with attenuator	
	CG8M ball, CG8M attenuator	
	4-inch valve	
	Right-hand mounted	32B8732X012
	6-inch valve	
	Right-hand mounted	42B8713X012
	Left-hand mounted	42B8734X012
	8-inch valve	
	Right-hand mounted	42B8718X012
	Left-hand mounted	42B8735X012
	10-inch valve	
	Right-hand mounted	42B8722X012
	Left-hand mounted	42B8736X012
	12-inch valve	
	Right-hand mounted	42B8727X012
	Left-hand mounted	42B8737X012

Designs V150, V200, & V300

Key	Description	Part Number	Key	Description	Part Number
3	Seal Protector Ring See figure 12 for dimensional information about older and newer style 1- and 1-1/2 inch seal protector rings. Also, for 2-inch older and newer style seal protector rings, see the note provided on page 39 in this parts list section.	See following tables	9	Follower Shaft (cont'd) S20910 1-inch 1-1/2 inch and 2-inch 3 and 4-inch 6-inch 8 and 10-inch 12-inch	13B0336X012 13B6678X012 11B0728X012 11B0733X012 11B0717X012 11B4679X012
4*	Taper Key R30006 cobalt alloy 6 casting 3 and 4-inch 6-inch 8 and 10-inch 12-inch N10276 (Hastelloy C) 3 and 4-inch 6-inch	12B9530X012 12B9531X012 12B9532X012 12B9533X012 11B0674X032 11B0695X032		N10276 1-inch 1-1/2 inch and 2-inch 3 and 4-inch 6-inch	13B0336X022 13B6678X022 11B0728X022 11B0733X022
5	Bushing Included in Key 1, Valve Body Assembly; not field replaceable	- - -	10*	Bearing (2 req'd) Composition 1-inch 1-1/2 inch 2-inch	14B3351X012 14B3352X012 14B3353X012
6	Drive Shaft S17400 (17-4PH stainless steel) 1-, 1-1/2, and 2-inch valves, see table for key 48 3 and 4-inch 6-inch, Class 150/300 6-inch, Class 600 8 and 10-inch 12-inch S20910 1-, 1-1/2, and 2-inch valves, see table for key 48 3 and 4-inch 6-inch, Class 150/300 6-inch, Class 600 8 and 10-inch 12-inch N10276 1-, 1-1/2, and 2-inch valves, see table for key 48 3 and 4-inch 6-inch, Class 150/300	21B0668X032 31B0732X032 37B0528X012 31B0716X032 31B4678X032 21B0668X012 31B0732X012 37B0528X022 31B0716X012 31B4678X012 21B0668X022 31B0732X022	10*	Bearing (2 req'd)(cont'd) 3- and 4-inch 6-inch 8 and 10-inch 12-inch S44004 (440C stainless steel) 1-inch 1-1/2 inch 2-inch 3- and 4-inch 6-inch 8 and 10-inch 12-inch Alloy 6B 1-inch 1-1/2 inch 2-inch 3- and 4-inch 6-inch 8 and 10-inch 12-inch Silver-plated alloy 6B 1-inch 1-1/2 inch 2-inch 3- and 4-inch 6-inch 8 and 10-inch 12-inch Carbon-filled PTFE with N10276 sleeve 1-inch 1-1/2 inch 2-inch 3- and 4-inch 6-inch Glass-filled PTFE with N10276 sleeve 1-inch 1-1/2 inch 2-inch 3- and 4-inch 6-inch	14B3354X012 14B3355X012 14B3356X012 14B3357X012 23B0342X022 23B6819X012 23B6682X022 14A5698X012 14A4618X012 14A5699X012 14A6549X012 23B0342X012 23B6819X022 23B6682X012 14A6546X012 14A6547X012 14A6548X012 14A6550X012 23B0343X012 23B6820X012 23B6683X012 14A6537X012 14A2498X012 14A6538X012 14A6539X012 13B0349X012 13B6822X012 13B6685X012 12B5944X012 12B5945X012 13B0349X042 13B6822X042 13B6685X022 12B5944X042 12B5945X042
7*	Groove Pin S31600 (316 stainless steel) 1-inch 1-1/2 inch and 2-inch 3- and 4-inch 6-inch 8-inch 10- and 12-inch N10276 1-inch 1-1/2 inch and 2-inch 3- and 4-inch 6-inch	13B0345X012 11B0705X012 18A6135X012 18A6138X012 11B0738X012 11B8596X012 13B0345X022 11B0705X022 18A6135X022 18A6138X032			
9	Follower Shaft S17400 1-inch 1-1/2 inch and 2-inch 3 and 4-inch 6-inch 8 and 10-inch 12-inch	13B0336X032 13B6678X032 11B0728X032 11B0733X032 11B0717X032 11B4679X032			

Designs V150, V200, & V300

Key	Description	Part Number	Key	Description	Part Number
11*	Composition Seal		12*	Shim Seal, S31600 (12 req'd)	
	Fisher TCM Plus™			Use w/flat metal seal only	
	1-inch	13B0339X052		3-inch	11B4689X012
	1-1/2 inch	13B6815X062		4-inch	11B5706X012
	2-inch	13B6686X062		6-inch	11B5710X012
	3-inch	13A2565X102		8-inch	11B5714X012
	4-inch	13A2585X102		10-inch	11B5718X012
	6-inch	13A2619X102		12-inch	11B5721X012
	8-inch	13A2645X072			
	10-inch	13A2662X052	13*	Spring Seal, S31600	
	12-inch	13A2677X062		Use w/flat metal seal only	
				3-inch	21B4687X012
	Fisher TCM Ultra™			4-inch	21B5705X012
	1-inch	13B0339X062		6-inch	21B5707X012
	1-1/2 inch	13B6815X072		8-inch	21B5713X012
	2-inch	13B6686X072		10-inch	21B5716X012
	3-inch	13A2565X112		12-inch	21B5720X012
	4-inch	13A2585X112	13*	Wave Spring, N07750 Inconel (NACE ⁽¹⁾)	
11*	Composition Seal (cont'd)			HD Metal Seal	
	6-inch	13A2619X112		1-inch	23B0347X012
	8-inch	13A2645X082		1-1/2 inch	23B6825X012
	10-inch	13A2662X062		2-inch	23B6689X012
	12-inch	13A2677X072		3-inch	24B4760X012
				4-inch	24B4761X012
11*	Flat Metal Seal			6-inch	24B4762X012
	S31600			8-inch	24B4763X012
	3-inch	11B4688X012		10-inch	22B4509X012
	4-inch	11B5704X012		12-inch	22B4514X012
	6-inch	11B5708X012			
	8-inch	11B5712X012	14	Backup Ring (composition seal only)	
	10-inch	11B5717X012		CG8M	
				1-inch	13B0338X012
	S30200			1-1/2 inch	13B6814X012
	12-inch	11B5722X012		2-inch	13B6677X012
				CW2M	
11*	HD (Heavy-Duty) Metal Ball Seal			1-inch	13B0338X032
	CF10SMnN (Nitronic 60) stainless steel)			1-1/2 inch	13B6814X032
	2-inch	33B6676X012		2-inch	13B6677X032
	3-inch	34B4766X012			
	4-inch	34B4767X012		CF3M, European Mfg.	
	6-inch	34B4768X012		1-inch	13B0338X022
	8-inch	34B4769X012		1-1/2 inch	13B6814X022
	10-inch	34B3365X012		2-inch	13B6677X022
	12-inch	34B3366X012			
	CD7MCuN (alloy 255 duplex stainless steel)		15*	Gasket,	
	1-inch	33B0341X022		Graphite laminate (Standard)	
	1-1/2 inch	33B6817X022		1-inch	13B0344X032
	2-inch	33B6676X022		1-1/2 inch	13B6823X042
	3-inch	34B4766X022		2-inch	13B6687X052
	4-inch	34B4767X022		3-inch	11B0660X042
	6-inch	34B4768X022		4-inch	11B0672X052
	8-inch	34B4769X022		6-inch	11B0681X032
	10-inch	34B3365X022		8-inch	11B0693X032
	12-inch	34B3366X022		10-inch	11B0720X022
				12-inch	11B4682X022
	R30006 cobalt alloy 6 casting				
	1-inch	33B0341X012		Graphite for Oxy Service	
	1-1/2 inch	33B6817X032		1-inch	13B0344X022
	2-inch	33B6676X032		1-1/2 inch	13B6823X022
	3-inch	34B4766X032		2-inch	13B6687X022
	4-inch	34B4767X032		3-inch	11B0660X052
	6-inch	34B4768X032		4-inch	11B0672X062
	8-inch	34B4769X032		6-inch	11B0681X042
				8-inch	11B0693X042
	S31700 (317 SST) w/alloy 6 overlay			10-inch	11B0720X032
	10-inch	34B3365X032		12-inch	11B4682X032
	12-inch	34B3366X032			

*Recommended spare parts

1. As detailed in National Association of Corrosion Engineers (NACE) standard MR0175.

Designs V150, V200, & V300

Key	Description	Part Number	Key	Description	Part Number
16*	Packing Set, PTFE and carbon-filled PTFE V-ring		21	Seal Protector Screw, 18-8 stainless steel	
	1-inch	12A9016X0022		Designs V150 and V300	
	1-1/2 inch and 2-inch	1R5795X0012		1-, 1-1/2, 2-, 3-inch (2 req'd)	1A8991X0032
	3 and 4-inch	12A8995X0022		4-inch (2 req'd)	1R1938X0012
	6-inch	12A8832X0022		6- and 8-inch (2 req'd)	11B0682X022
	8 and 10-inch	12A8951X0022		10- and 12-inch (4 req'd)	11B0682X022
	12-inch	12A8935X0022			
17	Packing Follower w/integral flange			Design V200	
	CF8M (316 stainless steel)			1-, 1-1/2, 2-inch	1A8991X0032
	1-inch w/B8M Class 2	16A6078X0012		3- and 4-inch (2 req'd)	1A3816K0012
	1-1/2 inch	16A6079X0012		6-, 8-, and 10-inch (2 req'd)	1A3816K0012
	2-inch	16A6079X0012	22	Seal Protector Clip, 18-8 stainless steel (2 req'd)	
	3 and 4-inch	26A6080X0012		Design V200	
	6-inch	26A6077X0012		1-, 1-1/2, 2-, 3-, and 4-inch	24B3040X012
	8 and 10-inch	26A6081X0012		6-, 8-, and 10-inch	22B4975X012
	12-inch	26A6088X0012	22	Seal Protector Washer, 18-8 stainless steel	
17	Packing Follower w/o integral flange			Designs V150 and V300	
	N10276			1-, 1-1/2, 2-, and 3-inch (2 req'd)	1A8518X0012
	1-inch	12A9021X0032		4-inch (2 req'd)	11B4671X012
	1-1/2 inch	12A8906X0032		6- and 8-inch (2 req'd)	1A3756X0012
	2-inch	12A8906X0032		10- and 12-inch (4 req'd)	1A3756X0012
	3 and 4-inch	12A8982X0032	23	Actuator Mounting Screw	
	6-inch	12A8821X0042		PI steel	
19	Packing Follower Stud (2 req'd)			1- and 1-1/2, and 2-inch (2 req'd)	1A344424052
	SA-193-B7			3-, 4-, and 6-inch (4 req'd)	1A344424052
	1-, 1-1/2, 2-, 3- and 4-inch	1E944131032		8-, 10-, and 12-inch (4 req'd)	1R443624052
	6-inch	12A8835X0012		S31600 stainless steel	
	8 and 10-inch	12A8950X0012		1-, 1-1/2, and 2-inch (2 req'd)	12A8950X0022
	12-inch	12A8926X0012		1- through 6-inch (4 req'd)	12A8950X0022
				8- 10- and 12-inch (4 req'd)	1R378135222
	SA-193-B8M (B8M Class 2)(strain hardened)		24	Actuator Mounting Nut	
	1-, 1-1/2, 2-, 3- and 4-inch	1E944135222		PI steel	
	6-inch	12A8835X0022		1-, 1-1/2- and 2-inch (2 req'd)	1A377224112
	8 and 10-inch	12A8950X0022		3-, 4-, and 6-inch (4 req'd)	1A377234112
	12-inch	12A8926X0022		8-, 10-, and 12-inch (4 req'd)	1A343324112
	N010276			316 stainless steel	
	1-, 1-1/2, 2-, 3- and 4-inch	1E944140152		1-, 1-1/2, and 2-inch (2 req'd)	1A377235252
	6-inch	12A8835X0072		3-, 4-, and 6-inch (4 req'd)	1A377235252
	For NACE MR-01-75 ⁽¹⁾ , SA-193-B7M			8-, 10-, and 12-inch (4 req'd)	1A343335252
	1-, 1-1/2, 2-, 3 and 4-inch	1E9441X00A2	25	Pipe Plug (Optional) Standard valve body is without a pipe plug.	
	6-inch	12A8835X0032		Compatible valve body material:	
	8 and 10-inch	12A8950X0032		WCC, CF3M, CG8M, & WCC (NACE)	1A767535072
	12-inch	12A8926X0032		CW2M	1A767540152
				R5055	1A7675X0032
20	Packing Follower Nut (2 req'd)		26	Identification Nameplate, stainless steel	15A0460X012
	SA-194-2H		27	Drive Screw, 18-8 SST (2 req'd for	
	1-, 1-1/2, 3- and 4-inch	1E944024112		forward flow; 4 req'd for reverse flow)	1A368228982
	6-inch	1A375324112	28	Flow Arrow, 18-8 SST (reverse flow only—	
	8- through 12-inch	1A341224112		not shown)	1V105938982
	SA-194-8M		30	Nameplate, 18-8 SST (not shown)	
	1-, 1-1/2, 2-, 3- and 4-inch	1E944035252		For valve bodies furnished without	
	6-inch	1A375335252		actuator	- - -
	8- through 12-inch	1A341235252	31	Nameplate Wire, steel (not shown)	
	N10276			For valve bodies furnished without	
	1-, 1-1/2, 2-, 3- and 4-inch	1E944040152		actuator	1D884799012
	6-inch	1A3753X0062	32	Line Flange Stud (not shown)	See following tables
	NACE MR-01-75, SA-194-2H		33	Line Flange Stud (not shown)	
	1-, 1-1/2, 2-, 3- and 4-inch	1E9440X0012		Design V300 valve only	See following table
	6-inch	1A3753X0012			
	8- through 12-inch	1A3412X0012			

*Recommended spare parts

Designs V150, V200, & V300

Key	Description	Part Number	Key	Description	Part Number
34	Spacer, S31700 8- and 10-inch 12-inch	11B0719X012 11B4681X012	39*	Packing Box Ring (cont'd) N10276 1-inch 1-1/2 and 2-inch 3- and 4-inch 6-inch	16A6082X092 16A6083X082 16A6084X072 16A6085X092
35*	Packing Ring, graphite ribbon (4 req'd) 1-inch 1-1/2 and 2-inch 3- and 4-inch 6-inch 8- and 10-inch 12-inch	12A9134X012 12A9135X012 12A9136X012 12A9137X012 12A9138X012 12A9139X012	40	Packing Flange Use with CW2M (Hastelloy) trim CF8M (316 stainless steel) 1-inch 1-1/2 and 2-inch 3- and 4-inch 6-inch N10276 1-inch	11B9430X012 12B9440X012 12B5417X012 12B5419X012 31B9432X022
36*	Packing Washer, zinc 1-inch (3 req'd) 1-1/2 and 2-inch	14A8362X012 14A9771X012	40	Packing Flange (cont'd) 1-1/2 inch and 2-inch 3- and 4-inch 6-inch	31B9442X022 12A8983X042 12A8822X042
36*	Packing Washer, zinc (cont'd) 3- and 4-inch (3 req'd) 6-inch (3 req'd) 8- and 10-inch (3 req'd) 12-inch (3 req'd)	14A8363X012 14A8365X012 14A8366X012 14A8367X012	41	Retaining Ring, N07750 (alloy 750) 10-inch 12-inch	22B6526X012 22B6527X012
37*	Radial Seal, N10276/PTFE/CG Use w/HD Metal Ball Seal 1-inch 1-1/2 inch 2-inch 3-inch 4-inch 6-inch 8-inch 10-inch 12-inch	13B0346X012 13B6824X012 13B6688X012 12B3779X012 12B3783X012 12B3787X012 12B4380X012 12B4510X012 12B4515X012	48	Ball-Shaft Assembly 1- through 2-inch	See following table
38	Thrust Washer (1 req'd) 1-inch w/composition, Alloy 6B, S4404, and Alloy 6B w/silver pl, or w/PTFE/carbon filled and PTFE/glass filled bearing 1-1/2 and 2-inch w/composition, Alloy 6B, S4404, and Alloy 6B w/silver pl, or w/PTFE/carbon filled and PTFE/glass filled bearing	13A2518X062 13A2518X052 13B6746X022 13B6746X032	130	Clamp, stainless steel Use for alternate electrical bonding 1- through 6-inch 8- through 12-inch	16A8717X012 16A8714X012
	Thrust Washer (4 req'd) 17-7PH stainless steel (for 440C bearings) 3- and 4-inch 6-inch 8- and 10-inch 12-inch	13A2570X012 12B5437X012 12B4573X012 12B5943X012	131	Bonding Strap Assembly Use for alternate electrical bonding 1- through 6-inch 8-inch 10- and 12-inch	17A6532X012 17A6532X022 17A6532X032
	R30006 (alloy 6B) 3- and 4-inch 6-inch 8- and 10-inch 12-inch	13A2570X122 12B5437X022 12B4573X022 12B5943X022	100-113	See ENVIRO-SEAL parts below.	
	N10276 3- and 4-inch 6-inch	13A2570X042 12B5437X032	100	Packing Flange Stud (2 req'd) 1-, 1-1/2, 2-, 3-, 4-inch Steel Stainless Steel 6-inch Steel Stainless Steel 8- and 10-inch Steel Stainless Steel 12-inch Steel Stainless Steel	11B3814X102 11B3814X012 16A1061X082 16A1061X022 1P568231032 1P568235222 1P568231032 1P568235222
39*	Packing Box Ring 316 stainless steel 1-inch 1-1/2 and 2-inch 3- and 4-inch 6-inch	16A6082X012 16A6083X012 16A6084X012 16A6085X012	101	Packing Flange Nut (2 req'd) 1-, 1-1/2, and 2-inch Steel Stainless steel	1E944024112 1E944035252

ENVIRO-SEAL® Packing System (figure 6)

Designs V150, V200, & V300

Key	Description	Part Number	Key	Description	Part Number
101	Packing Flange Nut (2 req'd) (cont'd)		107*	Packing Box Ring	
	3-, 4-, and 6-inch			W/single and double PTFE packing	
	Steel	1A944024112		1-inch	16A6082X012
	Stainless Steel	1E944035252		1-1/2 and 2-inch	16A6083X012
	8-, 10-, and 12-inch			3- and 4-inch	16A6084X012
	Steel	1A341224112		6-inch	16A6085X012
	Stainless Steel	1A341235252			
102	Packing Flange		108*	Packing Ring (2 req'd)	
	1-, 1-1/2, and 2-inch	32B7777X012		W/double PTFE packing	
	3- and 4-inch	32B7778X012		1-inch	1H7844X0012
	6-inch	32B7779X012		1-1/2 and 2-inch	1R5794X0012
	8- and 10-inch	32B7780X012		3- and 4-inch	12A8992X022
	12-inch	32B7781X012		6-inch	12A8831X022
				8- and 10-inch	12A8953X022
103	Spring Pack Assembly		109*	Anti-Extrusion Ring (2 req'd)	
	W/single and double PTFE packing			W/double PTFE packing	
	1-, 1-1/2, and 2-inch	12B8319X032		1-inch (adapter rings)	12B7473X012
	3- and 4-inch	12B8320X012		and (anti-extrusion rings)	12B7054X012
	6-inch	12B8320X032		1-1/2 and 2-inch (adapter rings)	12B7410X012
	8- and 10-inch	12B8321X012		and (anti-extrusion rings)	12B7406X012
	12-inch	12B8321X032		3- and 4-inch PTFE packing	12B7422X012
105*	Packing Set			6-inch PTFE packing	12B7446X012
	W/single PTFE packing			8- and 10-inch PTFE packing	12B7458X012
	1-inch	12B7053X012	110	Lantern Ring, 1-1/2, and 2-inch	
	1-1/2 and 2-inch	12B7402X012		W/double PTFE packing	
	3-inch	12B7414X012		1-, 1-1/2, and 2-inch inch	12B7061X012
	4-inch	12B7414X012		3- and 4-inch	12B7423X012
	6-inch	12B7438X012		6-inch	22B7447X012
	8- and 10-inch	12B7450X012		8- and 10-inch	22B7459X012
	12-inch	12B7462X012			
106*	Anti-Extrusion Ring (2 req'd)		111	Tag	23B6562X012
	W/single and double PTFE packing		112	Tie Cable	18A9401X012
	1-inch	12B7054X012	113	Lubricant, Never-Seez Nickel Special	
	1-1/2 and 2-inch	12B7406X012		or Equivalent (not furnished with packing	
	3- and 4-inch	12B7418X012		system)	
	6-inch	12B7442X012			
	8- and 10-inch	12B7454X012			
	12-inch w/single PTFE packing only	12B7466X012			

Designs V150, V200, & V300

Key 3. Steel and Stainless Steel Seal Protector Ring for Composition, Flat Ball Seal, and for Flow Ring Constructions

VALVE SIZE, INCHES (MATERIAL) ⁽¹⁾			USE WITH TCM AND TCM III SEAL			USE WITH FLAT METAL BALL SEAL OR FLOW RING		
			Standard ISA S75.04 Face-to-Face	ASME B16.10- Short Face-to-Face (Optional) ⁽²⁾	DIN PN10 & PN16 ISA S75.04 Face-to-Face	Standard ISA S75.04 Face-to-Face	ASME B16.10- Short Face-to-Face (Optional) ⁽²⁾	DIN PN10 & PN16 ISA S75.04 Face-to-Face
1	Newer Design ⁽³⁾	WCC (Steel) CG8M CF3M ⁽⁴⁾	34B1720X012 34B1720X022 34B1720X052	34B1724X012 34B1724X022 34B1724X032	--- --- ---	34B1722X012 34B1722X022 34B1722X032	34B1726X012 34B1726X022 34B1726X032	--- --- ---
	Older Design ⁽³⁾	WCC (Steel) CG8M CF3M ⁽⁴⁾	33B6602X012 33B6602X022 33B6602X032	33B6607X012 33B6607X022 33B6607X032	--- --- ---	33B6604X012 33B6604X022 33B6604X042	33B6609X012 33B6609X022 33B6609X032	--- --- ---
1-1/2	Newer Design ⁽³⁾	WCC (Steel) CG8M CF3M ⁽⁴⁾	34B1563X012 34B1563X022 34B1563X052	34B1567X012 34B1567X022 34B1567X032	--- --- ---	34B1565X012 34B1565X022 34B1565X032	34B1569X012 34B1569X022 34B1569X032	--- --- ---
	Older Design ⁽³⁾	WCC (Steel) CG8M CF3M ⁽⁴⁾	33B6806X012 33B6806X022 33B6806X062	33B6811X012 33B6811X022 33B6811X032	--- --- ---	33B6808X012 33B6808X022 33B6808X042	33B6813X012 33B6813X022 33B6813X032	--- --- ---
2 ⁽⁵⁾		WCC (Steel) CG8M CF3M ⁽⁴⁾	33B0992X012 33B0992X022 33B0992X062	33B6672X012 33B6672X022 33B6672X032	--- --- ---	33B0994X012 33B0994X022 33B0994X032	33B6674X012 33B6674X022 33B6674X032	--- --- ---
3		WCC (Steel) CG8M CF3M ⁽⁴⁾	21B0658X012 21B0658X022 21B0658X042	31B0699X012 31B0699X022 31B0699X032	21B5701X012 21B5701X022 21B5701X032	30B6825X012 30B6825X022 30B6825X032	31B5736X012 31B5736X022 31B5736X032	31B5743X012 31B5743X022 31B5743X032
4		WCC (Steel) CG8M CF3M ⁽⁴⁾	21B0665X012 21B0665X022 21B0665X262	31B0701X012 31B0701X022 31B0701X032	21B0665X012 21B0665X022 32B3790X032	31B5703X012 31B5703X022 31B5703X032	31B5737X012 31B5737X022 31B5737X032	31B5703X012 31B5703X022 31B5703X032
4 PN10-16		WCC (Steel) CF3M ⁽⁴⁾	21B0665X242 21B0665X262	--- ---	--- ---	31B5703X162 31B5703X182	--- ---	--- ---
6		WCC (Steel) CG8M CF3M ⁽⁴⁾	21B0678X012 21B0678X022 21B0678X032	31B0707X012 31B0707X022 31B0707X032	21B5726X012 21B5726X022 21B5726X032	31B5709X012 31B5709X022 31B5709X032	31B5738X012 31B5738X022 31B5738X032	31B5744X012 31B5744X022 31B5744X032
8		WCC (Steel) CG8M CF3M ⁽⁴⁾	31B0686X012 31B0686X022 31B0686X032	31B0709X012 31B0709X022 31B0709X032	31B5728X012 31B5728X022 31B5728X032	31B5711X012 31B5711X022 31B5711X032	31B5739X012 31B5739X022 31B5739X032	31B5745X012 31B5745X022 31B5745X032
10		WCC (Steel) CG8M CF3M ⁽⁴⁾	31B0713X012 31B0713X022 31B0713X032	31B0724X012 31B0724X022 31B0724X032	31B5731X012 31B5731X022 31B5731X032	31B5715X012 31B5715X022 31B5715X032	31B5740X012 31B5740X022 31B5740X032	31B5746X012 31B5746X022 31B5746X032
12 ⁽⁷⁾		WCC (Steel) CG8M CF3M ⁽⁴⁾	31B4675X012 31B4675X022 31B4675X032	31B4686X012 31B4686X022 31B4686X032	31B5734X012 ⁽⁶⁾ 31B5734X022 ⁽⁶⁾ 31B5734X032 ⁽⁶⁾	31B5719X012 31B5719X022 31B5719X032	31B5741X012 31B5741X022 31B5741X032	31B5747X012 ⁽⁶⁾ 31B5747X022 ⁽⁶⁾ 31B5747X032 ⁽⁶⁾

1. For CW2M (Hastelloy C) material, see Key 3 in the parts list.
 2. ASME B16.10 short is available only on Class 150 valves.
 3. For a definition of older and newer designs for the 1- and 1-1/2 inch valves, see the note on page 15, Replacing Ball Seal Section, Assembly procedures.
 4. CF3M is available in all areas and is the standard material offering from Fisher Controls in Europe.
 5. For a definition of older and newer designs for the 2- inch valves, see the note below. Newer style part numbers are shown in this table.
 6. Use for DIN PN16 applications only.
 7. Design V150 and V300 valves only.

Note

The older and newer designs of the 1- and 1-1/2 inch seal protector ring are functionally the same, but are different lengths and not interchangeable. All part number in this manual are for the newer design 1- and 1-1/2 inch sizes of Design V150 and V300 valves. Also, see figure 12 for dimensions.

Designs V150, V200, & V300

Key 3. Alloy 6 Tip and CW2M Seal Protector Ring for Composition and Flow Ring Constructions

VALVE SIZE, INCHES	USE WITH COMPOSITION SEAL—ISA S75.04 FACE-TO-FACE ONLY	USE WITH FLOW RING CONSTRUCTION—ISA S75.04 FACE-TO-FACE ONLY
	CW2M	Alloy 6 Tip/CG8M
1 Older Design ⁽¹⁾ 1 Newer Design ⁽¹⁾	33B6602X032 34B1720X032	--- ---
1-1/2 Older Design ⁽¹⁾ 1-1/2 Newer Design ⁽¹⁾	33B6806X032 34B1563X032	--- ---
2 ⁽²⁾	33B0992X012	---
3	21B0658X082	32B7289X012
4	21B0665X092	32B1475X012
6	21B0678X072	32B7890X012
8	---	32B7891X012
10	---	32B4721X012
12	---	32B7892X012

1. For a definition of older and newer designs for the 1- and 1-1/2 inch valves, see the note and table on page 37.
2. For a definition of older and newer designs for the 2- inch valves, see the note on page 30.

Key 3. Seal Protector Ring for HD Metal Ball Seal

VALVE SIZE, INCHES (MATERIAL)			USE WITH HD (HEAVY- DUTY) METAL SEAL	
			Standard ISA S75.04 Face-to-Face	ASME B16.10-Short Face-to-Face (Optional) ⁽¹⁾
1 ⁽²⁾	Newer Design ⁽²⁾	WCC Steel CG8M (317 SST) CF3M (316L SST) ⁽³⁾	34B1721X012 34B1721X022 34B1721X032	34B1725X012 34B1725X022 34B1725X032
	Older Design ⁽²⁾	WCC CG8M CF3M ⁽³⁾	33B6603X012 33B6603X022 33B6603X032	33B6608X012 33B6608X022 33B6608X032
1-1/2 ⁽²⁾	Newer Design ⁽²⁾	WCC CG8M CF3M ⁽³⁾	34B1564X012 34B1564X022 34B1564X032	34B1568X012 34B1568X022 34B1568X032
	Older Design ⁽²⁾	WCC CG8M CF3M ⁽³⁾	33B6807X012 33B6807X022 33B6807X032	33B6812X012 33B6812X022 33B6812X032
2 ⁽⁴⁾		WCC CG8M CF3M ⁽³⁾	33B0993X012 33B0993X022 33B0993X032	33B6673X012 33B6673X022 33B6673X032
3		WCC CG8M CF3M ⁽³⁾	32B3776X012 32B3776X022 32B3776X032	32B3789X012 32B3789X022 32B3789X032
4		WCC CG8M CF3M ⁽³⁾	32B3780X012 32B3780X022 32B3780X032	32B3790X012 32B3790X022 32B3790X032
4 PN10–16		WCC CF3M ⁽³⁾	32B3780X132 32B3780X152	--- ---
6		WCC CG8M CF3M ⁽³⁾	32B3784X012 ⁽⁶⁾ 32B3784X022 ⁽⁶⁾ 32B3784X032	32B3791X012 32B3791X022 32B3791X032
8		WCC CG8M CF3M ⁽³⁾	32B4378X012 ⁽⁶⁾ 32B4378X022 ⁽⁶⁾ 32B4378X032	32B4382X012 32B4382X022 32B4382X032
10		WCC CG8M CF3M ⁽³⁾	32B4507X012 32B4507X022 32B4507X032	32B4508X012 32B4508X022 32B4508X032
12 ⁽⁵⁾		WCC CG8M CF3M ⁽³⁾	32B4512X012 32B4512X022 32B4512X032	32B4513X012 32B4513X022 32B4513X032

1. ASME B16.10 short is available only on Class 150 valves.
2. For a definition of older and newer designs for the 1- and 1-1/2 inch valves, see the note on this page.
3. CF3M is available in all areas and is the standard material offering from Fisher Controls in Europe.
4. For a definition of older and newer designs for the 2- inch valves, see the note on page 30.
5. Designs V150 and V300 only.
6. For Design V200 valves ANSI Class 150, 300, and 600.

Designs V150, V200, & V300

Keys 32 and 33 Design V150 Line Flange Studs (Not Shown)

KEY NUMBER	VALVE SIZE, INCHES	ANSI Class	NUMBER REQ'D	SA-193-B7	SA-193-B7M	SA-193-B8M CLASS 2 (Strain Hardened)
Standard ISA S75.04 Face-to-Face						
Key 32 Seal Protector End of Valve	1	150	4	1A420731012	1A4207X0012	1A420735222
	1-1/2	300	4	1H397131012	1H3971X0012	1H397135222
	2		4	1A354431012	1A3544X00A2	1A354435222
	3	150	8	17A0822X012	17A0822X022	17A0822X032
	4	300	12	1B542131012	1B5421X0012	1B5421X0022
	6	150	8	1P572231012	1P5722X0042	1P572235222
		300	12	1U172631012	1U1726X0032	1U172635222
		600	12	1P4979X0012	- - -	1P4979X0042
	8	150	8	1P572231012	1P5722X0042	1P722352222
		300	12	1R440331012	1R4403X0042	1R440335222
		600	12	13A25531012	- - -	13A2553X042
	8	150	8	1L119431012	1L1194X0082	1L119435222
Key 32 Seal Protector End of Valve	10	300	12	1A377131012	1A3771X0012	1A3771X00A2
	12	600	12	1B542331012	1B5423X0022	1B5423X0032
Option						
Optional ASME B16.10-Short Face-to-Face						
Key 32 Seal Protector End of Valve	1		4	1H3972X0012	1H3972X0042	1H3972X0052
	1-1/2		4	1H989231012	1H9892X0022	1H9892X00A2
	2		4	1N956731012	1N9567X0022	1N956735222
	3		4	1J2246X0012	1J2246X0032	1J2246X0022
	4		8	1N956731012	1N9567X0022	1N956735222
	6		8	11A7569X032	11A7569X022	11A7569X042
	8		8	11A7570X062	11A7570X012	11A7570X022
	10		12	11B0740X012	11B0740X022	11B0740X032
	12		12	1A519531012	1A5195X0012	1A5195X0022
All Design V150 Valves						
Key 33 Opposite End of Valve	1		4	11A4596X012	11A4596X042	11A4596X052
	1-1/2		4	1A420731012	1A4207X0012	1A420735222
	2		4	1J698131012	1J6981X0022	1J6981X0012
	3		4	1A354431012	1A3544X00A2	1A354435222
	4		8	1A354431012	1A3544X00A2	1A354435222
	6		8	1B542231012	1B5422X0022	1B5422X0032
	8		8	1A354331012	1A3543X00A2	1A3543X0062
	10		12	1A376231012	1A3762X0022	1A3762X0012
	12		12	1A376231012	1A3762X0022	1A3762X0012

Designs V150, V200, & V300

Key 32 Design V200 Line Flange Studs (Not Shown)

VALVE SIZE, INCHES, AND ANSI CLASS	ISA S75.04 FACE-TO-FACE (STANDARD)			ASME B16.10-SHORT FACE-TO-FACE (OPTIONAL)		
	SA-193-B7	SA-193-B7M	SA-193-B8M (Strain Hardened)	SA-193-B7	SA-193-B7M	SA-193-B8M (Strain Hardened)
1—150 (4 req'd) 1—300 & 600 (4 req'd)	1U440431012 1U994831012	1U4404X0032 1U9948X0032	1U440435222 1U994835222	1U9597X0012 ---	1U9597X0042 ---	1V9597X0052 ---
1-1/2—150 (4 req'd) 1-1/2—300 & 600 (4 req'd)	1U421631012 1U994931012	1U4216X0032 1U9949X0032	1U421635222 1U994935222	13B8189X012 ---	13B8189X022 ---	13B8189X032 ---
2—150 (4 req'd) 2—300 (4 req'd) 2—600 (4 req'd)	1U995031012 1L480131012 1U995131012	1U9950X0032 1L4801X0012 1U9951X0032	1U995035222 1L480135222 1U995135222	1V9315X0012 ---	1V9315X0042 ---	1V9315X0052 ---
3—150 (4 req'd) 3—300 (8 req'd) 3—600 (8 req'd)	1P589631012 1U485931012 1P577831012	1P5896X0032 1U4859X0022 1P5778X0062	1P589635222 1U485935222 1P577835222	13A2630X012 ---	13A2630X032 ---	13A2630X022 ---
4—150 (8 req'd) 4—300 (8 req'd) 4—600 (8 req'd)	13A2630X012 1L484131012 13A2631X012	13A2630X032 1L4841X0012 13A2631X022	13A2630X022 1L484135222 13A2631X042	17A3076X012 ---	17A3076X032 ---	17A3076X042 ---
6—150 (8 req'd) 6—300 (12 req'd)	1P572231012 1U172631012	1P5722X0042 1U1726X0032	1P572235222 1U172635222	1U5287X0012 ---	1U5287X0032 ---	1U5287X0022 ---
8—150 (8 req'd) 8—300 (12 req'd)	1P572231012 1R440331012	1P5722X0042 1R4403X0042	1P572235222 1R440335222	15A4797X012 ---	15A4797X022 ---	15A4797X032 ---
10—150 (12 req'd)	1U164631012	1U1646X0032	1U164635222	1R8854X0022	1R8854X0042	1R8854X0052

Keys 32 and 33 Design V300 Line Flange Studs (Not Shown)

VALVE SIZE, INCHES (REQ'D)	KEY 32 (SEAL PROTECTOR END OF VALVE)			KEY 33 (OPPOSITE END OF VALVE)		
	SA-193-B7	SA-193-B7M	SA-193-B8M Class 2 (Strain Hardened)	SA-193-B7	SA-193-B7M	SA-193-B8M Class 2 (Strain Hardened)
1 (4) 1-1/2 (4) 2 (8)	1A354431012 1B542231012 1A487531012	1A3544X00A2 1B5422X0022 1A4875X0032	1A354435222 1B5422X0032 ---	1L515131012 1V2217X0012 1A354431012	1L5151X0022 1V2217X0032 1A354431332	1L5151X0052 1V2217X0022 ---
3 (8) 4 (8) 6 (12)	1L119431012 1A572831012 1C6098X0062	1L1194X0042 1A5728X0012 1C6098X0022	1L119435222 1A5728X0022 1C6098X0032	1A308831012 1A354331012 1A572831012	1A3088X0012 1A3543X00A2 1A5728X0012	1A3088X0022 1A3543X0062 1A5728X0022
8 (12) 10 (16) 12 (16)	1A4520X0012 1N816531012 1L9521X0012	1A4520X0042 1N8165X0012 1L9521X0062	1A4520X0052 1N8165X0022 1L9521X0042	1B542331012 1B231831012 1A500931012	1B5423X0022 1B2318X0042 1A5009X0122	1B5423X0032 1B2318X0012 1A5009X0022

Key 48. Ball/Shaft Assembly for 1-, 1-1/2, and 2-Inch Valves

Ball Material Shaft Material	CG8M CRPL ⁽¹⁾ S20910	CG8M CRPL S17400	CG8M S20910	CG8M S17400	CW2M N10276
1-Inch	23B7072X012	23B7072X022	23B7072X032	23B7072X042	23B7072X052
1-1/2 Inch	33B7014X012	33B7014X022	33B7014X032	33B7014X042	33B7014X052
2-Inch	33B7014X112	33B7014X122	33B7014X132	33B7014X142	33B7014X152
Ball Material Shaft Material (Cont.)	R50550 R56400	CF3M ⁽²⁾ CRPL S20910	CF3M CRPL S17400	CF3M S20910	CF3M S17400
1-Inch	23B7072X062	23B7072X072	23B7072X082	23B7072X092	23B7072X102
1-1/2 Inch	33B7014X062	33B7014X072	33B7014X082	33B7014X092	33B7014X102
2-Inch	33B7014X162	33B7014X172	33B7014X182	33B7014X192	33B7014X202
Ball Material Shaft Material (Cont.)	CG8M ⁽³⁾ S20910 (1/2-Inch Splined)		CG8M ⁽³⁾ S17400 (1/2-Inch Splined)		CG8M ⁽³⁾ S20910 (1/2-Inch Splined)
1-Inch	23B7072X112		23B7072X122		---
1-1/2 Inch	33B7015X252		33B7015X262		33B7014X262
2-Inch	33B7015X212		33B7015X222		33B7014X222

1. Chrome-plated ball (CRPL).
2. CF3M is the standard material offered from Fisher Controls in Europe only.
3. Alloy 6 V-notch ball with CG8M chrome plate.

Designs V150, V200, & V300

Key 48. Ball/Shaft Assembly for 1-Inch Valves with Micro-Notch Vee Ball⁽¹⁾

Mounting Ball Material Shaft Material	Left-Hand CG8M CRPL⁽²⁾ S20910	Left-Hand CG8M CRPL S17400	Right-Hand CG8M CRPL S20910	Right-Hand CG8M CRPL S17400
1-inch	33B9734X012	33B9734X022	33B9735X012	33B9735X022
Mounting Ball Material Shaft Material	Left-Hand CF3M CRPL S20910	Left-Hand CF3M CRPL S17400	Right-Hand CF3M CRPL S20910	Right-Hand CF3M CRPL S17400
1-inch	33B9734X032	33B9734X042	33B9735X032	33B9735X042
1. For alloy 6 and VTC ceramic Micro-Notch ball materials, consult factory. 2. Chrome-plated ball (CRPL).				

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