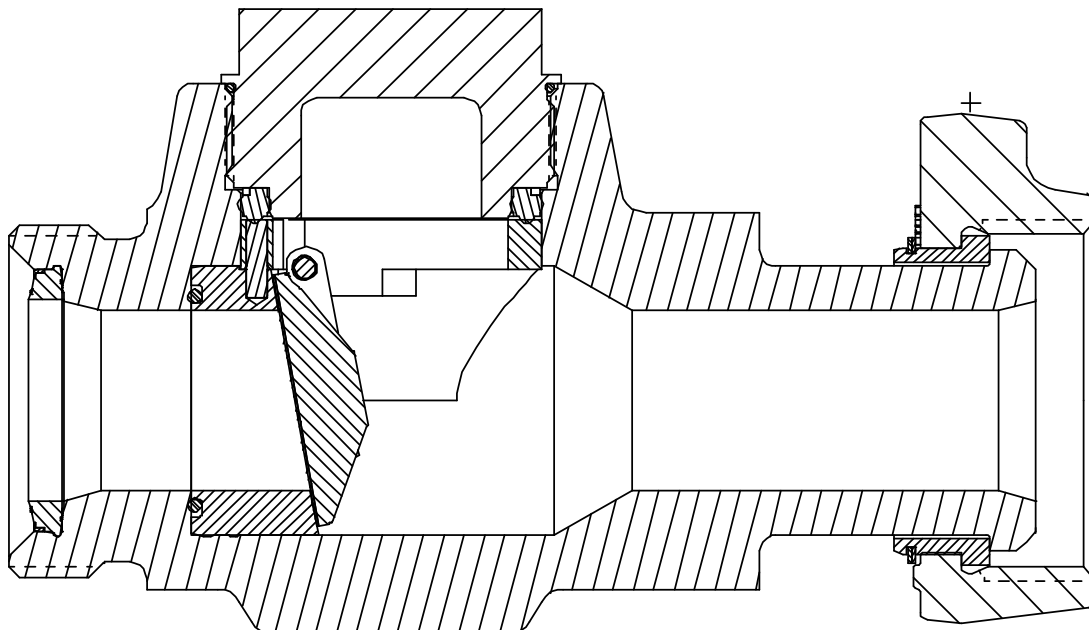


OPERATING AND MAINTENANCE MANUAL, TOP ENTRY CHECK VALVE

Rev	ECN No.	Date	Reviewed By	Approved By	Status
H	5016839	28-NOV-2006	Darby, Scott A.	Douglas, Don	RELEASED

Summary:

Operating, maintenance, and storage instructions - WECO® Top-Entry Flapper Check Valve.

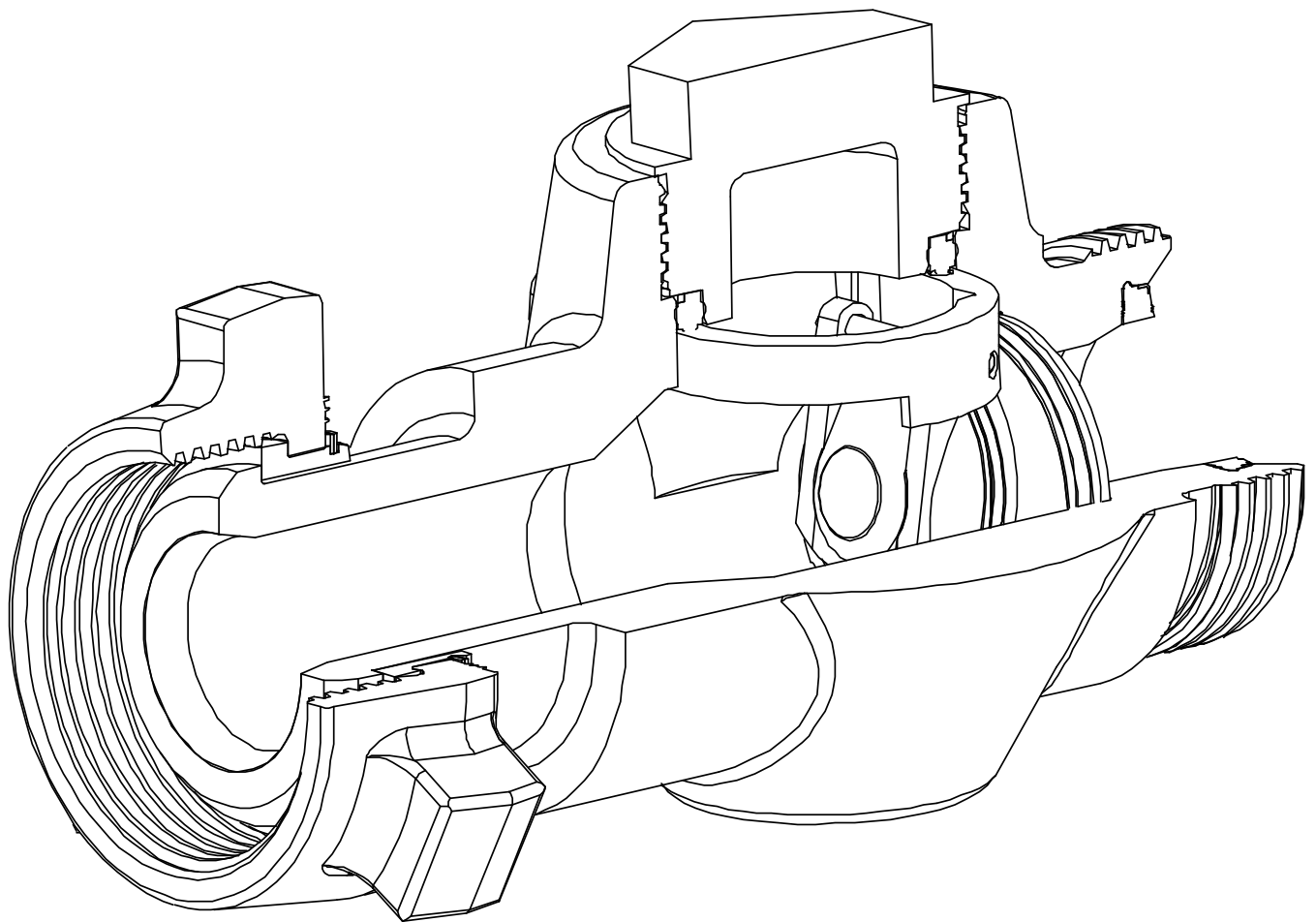


NOTES:

WECO® Top-Entry Flapper Check Valves

Operating and Maintenance Instructions

**2" 15,000 PSI, 3" 15,000 PSI, 4" 15,000/10,000 PSI
STANDARD SERVICE**



1.0 WARNINGS

FMC cannot anticipate all of the situations a user may encounter while installing and using FMC products. Therefore, the user of FMC products **MUST** know and follow all applicable industry specifications on the safe installation and use of these products. Refer to the FMC product catalogues, product brochures and installation, operating and maintenance manuals for additional product safety information or contact FMC at 800-772-8582.



WARNING: Failure to follow these warnings could result in serious injury or death!

1. Do not mix or assemble components, parts or end connections with different pressure ratings. Mismatched parts may fail under pressure.
2. Do not use or substitute non-FMC components or parts in FMC products and assemblies.
3. Do not strike, tighten or loosen pressurized components or connections.
4. Do not exceed the rated working pressure or temperature rating of the product.
5. Complete and proper make-up of components and connections is required to attain rated working pressure.
6. Do not use severely worn, eroded or corroded products. Contact FMC for more information on how to identify the limits of erosion and corrosion.
7. Follow safe practices when using products in overhead applications. Products not properly secured could fall.
8. Select only appropriate product and materials for the intended service:
9. Do not expose standard service products to sour gas fluids. (Refer to NACE MR0175). Do not interchange sour gas with standard service components.

10. Use appropriate safety precautions when working with ferrous products in below freezing temperatures. Freezing temperatures lower the impact strength of ferrous materials.
11. Follow manufacturers instructions and Material Safety Data Sheet directions when using solvents
12. Make certain that personnel and facilities are protected from residual hazardous fluids before disassembly of any product.
13. If any leakage is detected from FMC products, remove them from service immediately to prevent potential damage and personal injury.

2.0 SAFETY INSTRUCTIONS

The applications of FMC products are in working environments where general personnel safety procedures and policies **MUST** be followed. Always use appropriate protective equipment in high pressure, extreme temperature or severe service applications.

3.0 OPERATING INSTRUCTIONS

Flowline check valves are used as isolation valves. Full flow is allowed through the valve in the designated flow direction while flow is prevented through the valve in the opposite flow direction. The check valve is designed for applications that allow free movement of the flapper. If the flapper is kept from moving freely by a blockage in the line, then extreme damage to the valve can occur.

1. Prior to installation, the check valve should be inspected for proper operation and orientation. The valve should be free of contamination and the flapper should move freely. The flapper seal surface should be inspected prior to use for signs of erosion or rubber disbonding.
2. It is very important to verify the check valve's flow direction. The check valve is unidirectional. To identify flow direction, the top entry check valve has an arrow forged into both sides of the body. Additionally, the flapper may be observed in the valve bore when out of the Flowline.



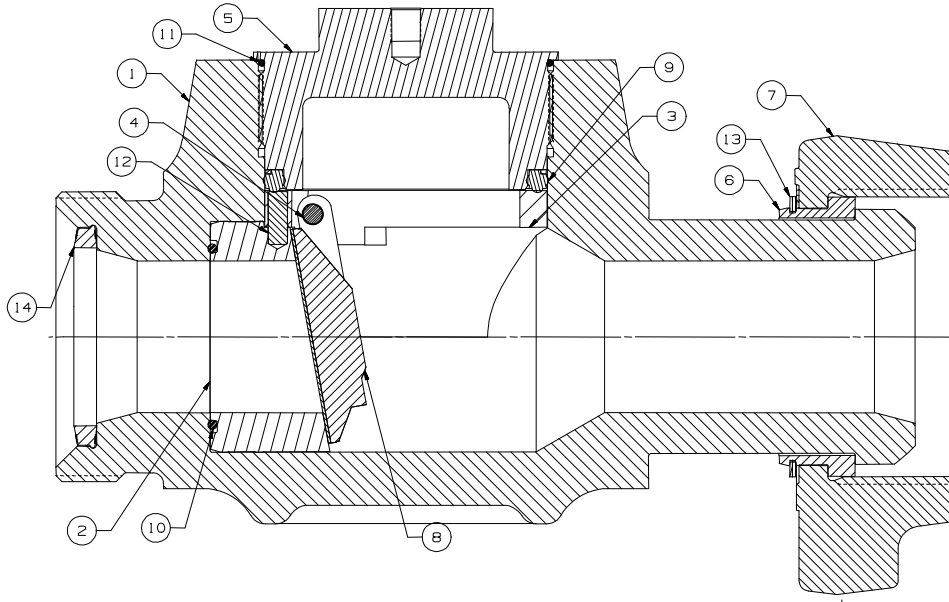
WARNING: If the Flowline check valve is installed the wrong way in a flow line, the flow in the intended direction will be shut off and this could result in a hazardous condition.



WARNING: Never look into the valve bore while the valve is in a Flowline. Pressure and fluids could escape from the valve causing bodily injury.

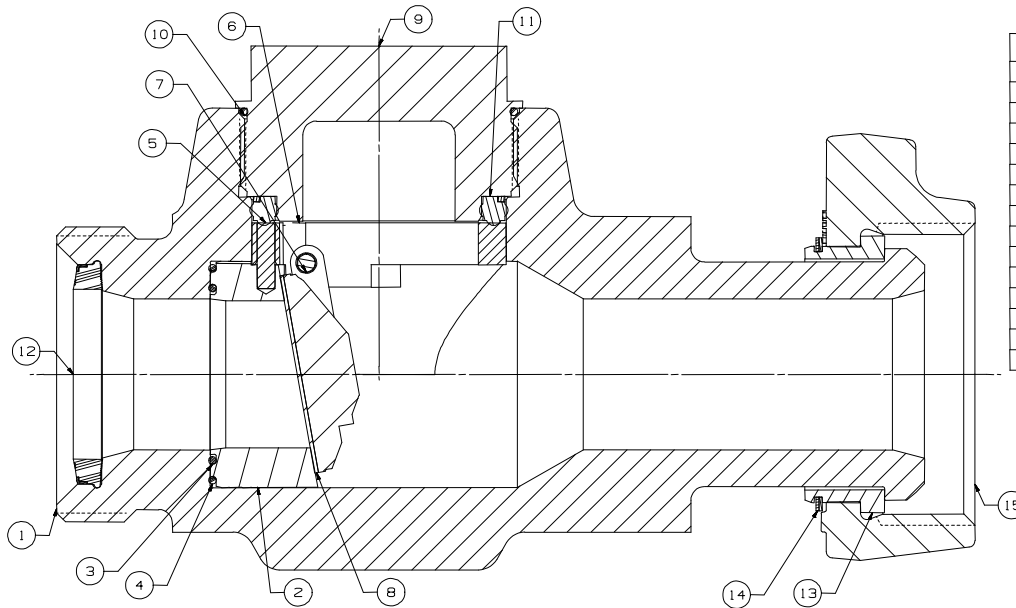
3. To ensure proper operation, the check valve must be installed with the flow bore horizontal, level and upright, as gravity will bias the flapper closed. The top entry check valve has a body cap, which designates the top of the valve. The check valve may be installed in the vertical position only if gravity will close the valve, i.e. the flow direction is up.
4. The valve should be thoroughly flushed with clean fresh water after each use and the bore of the valve should be sprayed with a light oil or comparable corrosion inhibitor.
5. To prevent leakage, malfunctions resulting from internal wear or seal degradation, the user must establish a preventative maintenance and inspection program. This program must include:
 1. Inspection of parts to detect loss of wall thickness that may result in decreased pressure capacity.
 2. Routine replacement of seals and inspection for proper operation.

4.0 MAINTENANCE INSTRUCTIONS



ITEM	DESCRIPTION	QTY
1	BODY	1
2	SEAT	1
3	PIVOT PIN RETAINER:	1
4	PIVOT PIN:	1
5	BODY CAP:	1
6	RETAINER SEGMENT:	3
7	DETACHABLE NUT UNION:	1
8	FLAPPER:	1
9	BODY CAP SEAL:	1
10	O-RING: UNIFORM #344	1
11	O-RING: UNIFORM #260	1
12	ALIGNMENT PIN:	1
13	RETAINER RING: EXTERNAL	1
14	SEAL RING:	1

2-Inch and 4-Inch Models



ITEM	DESCRIPTION	QTY
1	TE BODY:	1
2	SEAT:	1
3	O-RING: UNIFORM #234	1
4	O-RING: UNIFORM #240	1
5	PIN, ALIGNMENT:	1
6	RETAINER, PIVOT PIN:	1
7	PIVOT PIN:	1
8	FLAPPER: MOLDED	1
9	BODY CAP:	1
10	O-RING: UNIFORM #248	1
11	SEAL, BODY CAP:	1
12	SEAL RING:	1
13	RETAINER SEGMENT:	3
14	RETAINER RING: EXTERNAL	1
15	DETACHABLE NUT:	1

3-Inch Model

There are two types of repair for the top entry check valve. The two levels are described below as well as a description of the kits that are available.

4.1 Standard Repair

The first type of repair is the most common and involves replacing all of the most commonly worn internal components. Document MSP500000057 describes a standard repair in detail including the tools required. A standard repair is what will most likely be performed whenever the flapper is replaced due to wear. Section 4.3 below includes details of the kits used for a standard repair. The items listed in the kit are what should be replaced in a standard repair.

4.2 Seat Repair

The second type of repair involves replacing the seat. The seat should only be replaced when the sealing face becomes unable to seal with the flapper. The seat is designed for long life and should not need frequent replacing. The seat is pressed into the body and a shop environment with special tools is required to replace it. Document MSP500000462 describes a seat replacement in detail including the tools required. Section 4.3 below includes details of the kits used for a seat repair. The items listed in the kit are what should be replaced in a seat repair.

4.3 Kits Available

There are three types of kits available for servicing top entry check valves. Table 1 below contains the part numbers for the kits available:

Table 1: Top Entry Check Valve Kit Part Numbers:

	Standard Repair Kit P/N	Seat Kit P/N	Elastomer Set P/N
2' 15,000 psi	P528681	P528685	P528686
3" 15,000 psi	P522215	P525507	P523359
4" 15,000 psi	P525441	P525508	P525505
4" 10,000 psi	P525441	P525509	P525505

- Repair Kit: This is the most commonly needed kit and consists of the parts recommended for changing when replacing the flapper. This kit does not allow for service of the seat. The following parts are included in the repair kit:

Item Description
Flapper
Alignment Pin
Pivot Pin
Body Cap Seal
O-Ring (Body Cap)

- **Seat Kit:** This is a less commonly needed kit and only consists of the parts required to replace a seat. Be sure to order the correct seat kit as there are different ones depending the rating of the valve. The following parts are included in the seat kit:

2-Inch & 4-Inch Seat Kit

Item Description
Seat
O-Ring (Face Seal)

3-Inch Seat Kit

Item Description
Seat
O-Ring (Large Face Seal)
O-Ring (Small Face Seal)

- **Elastomer Set:** Order this set when stocking just the internal elastomers. The following parts are included in the elastomer set:

Item Description
Body Cap Seal
O-Ring (Body Cap)

5.0 STORAGE INSTRUCTIONS

When not in use, the valve should be stored in an area that protects it from sun, rain, sand, and other debris. Before storing the valve, ensure that the operating fluids have been removed by flushing with water. After cleaning, fully drain all fluids from the valve and spray the valve with a water displacing lubricant such as a Teflon / oil mix. Spray inside both flow bores as far into the valve as possible. Also spray the threads of the union ends. During long-term storage keep the valve dry and painted to prevent corrosion.

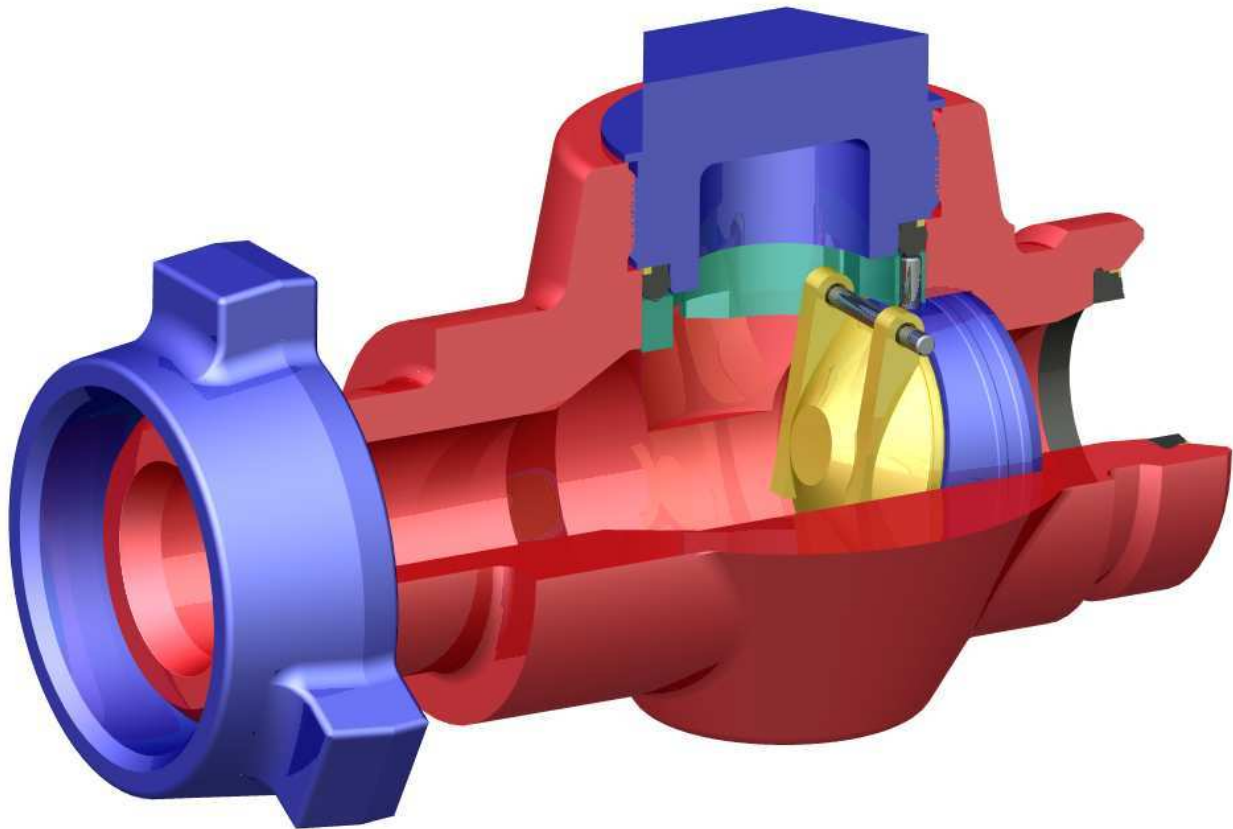
PRODUCT DATA SHEET, TOP ENTRY CHECK VALVE

Rev	ECN No.	Date	Reviewed By	Approved By	Status
D	5015323	08-FEB-2006	Darby, Scott A.	Douglas, Don	RELEASED

Summary:

Top Entry Check Valve product line.

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Key Features

- Designed for long life – better erosion characteristics.
- Low differential straight open path through valve. Flapper can open fully – better flow dynamics.
- Stainless steel internal components, including flapper, pivot pin, and the pin retainer ring.
- Forged body (not cast). Coarse ACME body cap thread for easy maintenance.
- Replaceable stainless steel seat. Reduces need to scrap bodies.
- Easily serviced – flapper assembly replaced from top without removing from installation.

Design Ratings

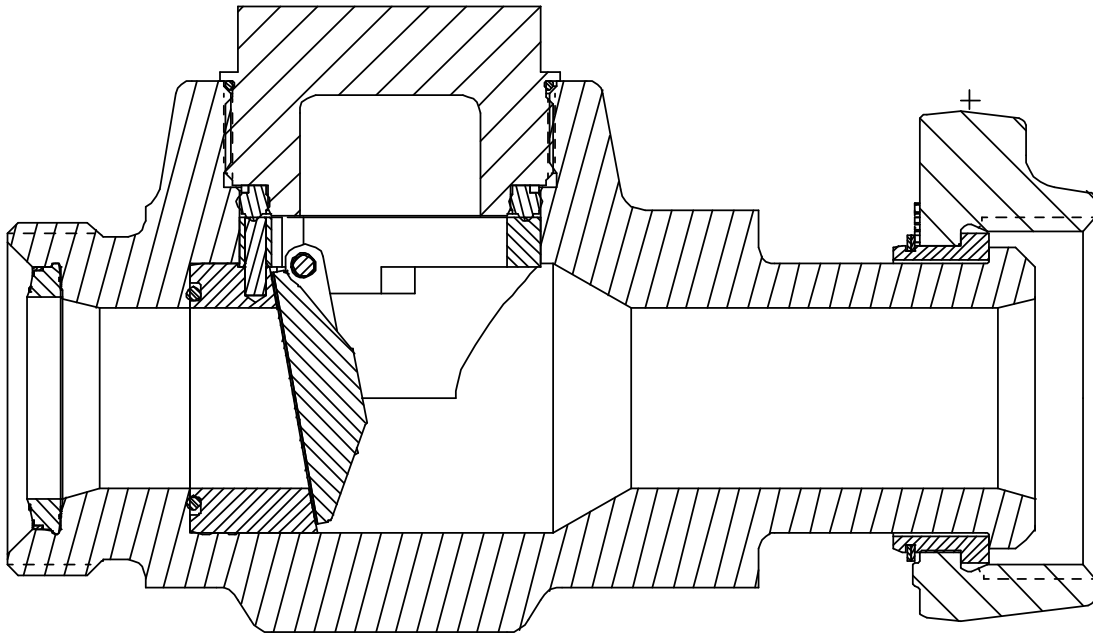
- | | | |
|---|--|---|
| <ul style="list-style-type: none"> • 2" 1502, 15,000 psi standard service • Bore: 1.87" • End to end: 13.13" • Weight: 68 lbs • Temp: -20F to 250F | <ul style="list-style-type: none"> • 3" 1502, 15,000 psi standard service • Bore: 2.75" • End to end: 15.67" • Weight: 115 lbs • Temp: -20F to 250F | <ul style="list-style-type: none"> • 4" 1502, 15,000 psi, 1002, 10,000 psi std. service • Bore: 1502: 3.50", 1002: 3.88" • End to end: 19.75" • Weight: 273 lbs • Temp: -20F to 250F |
|---|--|---|

REPAIR KIT INSTRUCTIONS, TOP ENTRY CHECK VALVE

Rev	ECN No.	Date	Reviewed By	Approved By	Status
G	5014326	22-JUL-2005	Darby, Scott A.	Douglas, Don	RELEASED

Summary:

Repair kit instructions for the WECO® Top-Entry Flapper Check Valve.

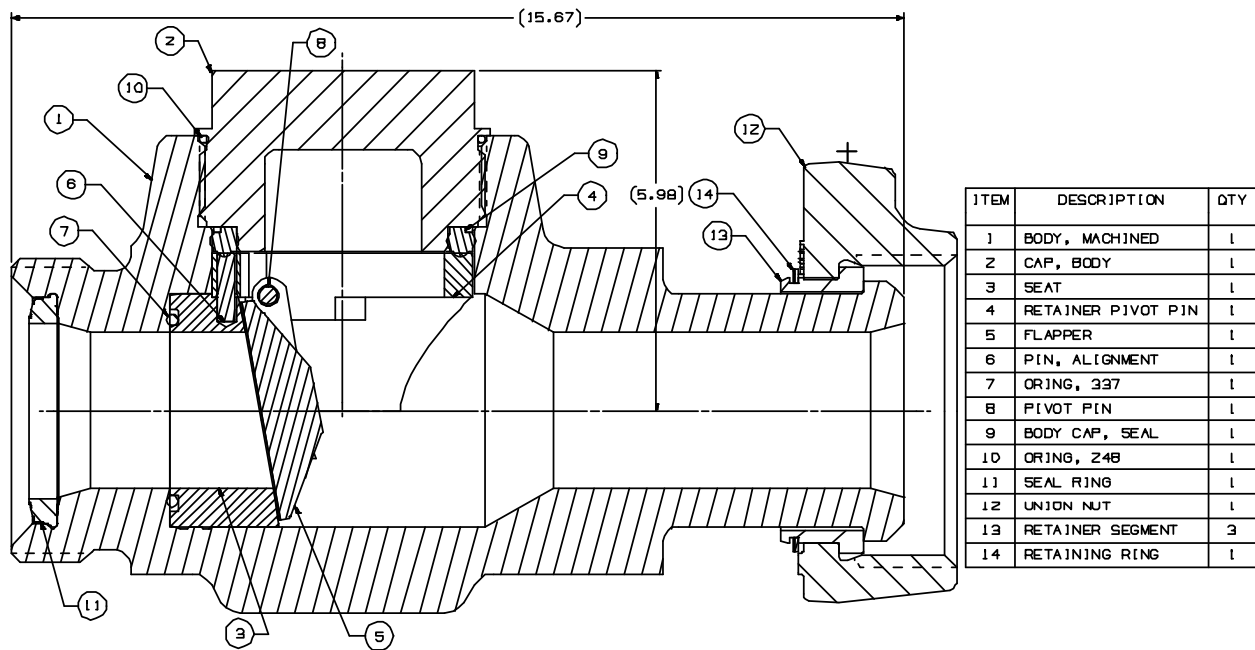


NOTES:

WECO® Top-Entry Flapper Check Valves

Repair Instructions:

2” 15K PSI, 3” 15K PSI, 4” 15K, 10K PSI, Standard Service



1.0 DISASSEMBLY

1. Remove the Top Entry check valve from service and verify that all pressure is bled from the valve.
2. Loosen the body cap (2) and remove it from the body. A hammer wrench can be obtained from FMC as part number P524505 that will work with the 3” or 4” body cap. Part number P528680 is used for the 2” body cap. If this is not available, then a pipe or chain wrench can be used.
3. If the body cap seal (9) still remains in the body, remove it.
4. Remove the pivot pin retainer (4) (the flapper and pivot pin will come out with it). Take care to protect the flapper/pivot pin retainer assembly as it comes out of the body, do not let it fall out of the body.
 - To remove the pivot pin retainer, prevent it from cocking while pulling it straight out. Using spray lubricant will ease its removal.

- If there is difficulty in initiating removal, the flapper can be used to get it started. Open the flapper from inside the inlet bore and hammer its back side against the bottom of the pivot pin retainer. This will loosen and straighten the pivot pin retainer to the extent that it can then be lifted out by hand.
- If you do not have access to the ends of the valve or if the pivot pin retainer is especially difficult to get out, a slide hammer puller may be needed (pictured

here).



5. The pivot pin (8) can now be removed from the pivot pin retainer, allowing the flapper to be separated. Use a punch if necessary to push the pin out. Take care to prevent the flapper from falling.
6. The alignment pin (6) can be removed from the seat.
7. Clean and inspect all parts. NOTE: Do not soak elastomers in solvents.
8. Inspect the body and body cap for corrosion and erosion. Take out of service if minimum required material conditions are not met. Inspect the seat for pitting or signs of erosion. If the seat contains excessive defects to the sealing surface then replace the seat per MSP500000462. The seat is pressed into the body and requires special tools to replace. IF THE SEAT FACE IS IN GOOD CONDITION, LEAVE THE SEAT IN THE VALVE, IT IS DESIGNED FOR LONG LIFE.
9. Inspect the flapper for signs of rubber disbond or erosion. Inspect the body cap seal (9) for damage. Replace all elastomers and parts that indicate excessive wear or damage.

2.0 ASSEMBLY

1. Check/verify parts against bill of material, clean all parts and inspect for nicks or burrs.
2. Place the alignment pin (6) into the hole in the top of the seat. Lubricate the exposed portion of the alignment pin. See Figure 1 for final alignment pin location.
3. Align the flapper (5) between the holes of the pivot pin retainer (4) and insert the pivot pin (8) into the retainer and flapper. The pin should slide through and be loose fitting. Be sure that the retainer is oriented as illustrated in Figure 2.
4. Generously lubricate the body bore that will receive the pivot pin retainer of the flapper subassembly. Place the flapper subassembly down into the body while aligning the hole in the pivot pin retainer with the alignment pin in the top of the seat. Be sure that the retainer is oriented as illustrated in Figure 3.
5. Keep lowering the pivot pin retainer until the alignment hole is engaged with the alignment pin on top of the seat. Keep from cocking the retainer while lowering it. Lower the pivot pin retainer until it rests flush against the flat on top of the seat. You may need to evenly tap (lightly) the pivot pin retainer down to fully engage it.

See Figure 4. DO NOT HAMMER THE PIVOT PIN RETAINER INTO THE BODY.

6. Inspect the seat and flapper interface for proper seating. No gaps should be seen between the seat and flapper. Rotate the flapper open to ensure free and smooth operation.
7. Lubricate the gland in the top of the body that will receive the body cap seal (9).
8. Install the body cap seal (9) down into the body until it rests against the top of the pivot pin retainer (4). Make sure that the AE ring of the seal is facing up towards the body cap opening. See Figure 5.
9. Lubricate the inside diameter of the body cap seal.
10. Lightly lubricate and install the environmental o-ring (10) over the threads and onto the shoulder relief of the body cap (2).
11. Lightly lubricate the ACME threads of the body cap and body with anti-seize or equivalent.
12. Thread the body cap into the body. THE BODY CAP SEAL (9) MUST ALREADY BE IN THE VALVE PER STEP 8 ABOVE. Apply a torque of 500 ft-lb to the body cap. Be sure the body cap has fully seated against the body. There should be no gap between the body and cap. The shoulder of the body cap will bottom out against the top of the valve body. See Figure 6.
13. Install detachable nut (12) with retainer segments (13) and retainer ring (14) on male sub end. Make certain the retainer ring is correctly installed onto the retainer segments and that the retainer ring is fully seated in the groove on the retainer segments.
14. Install the seal ring (11) into the female sub end.
15. A pressure test to full working pressure should be performed on all rebuilt check valves to ensure proper operation and seal integrity.

NOTE:

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3.0 REPAIR KIT BILL OF MATERIAL AND TOOLS AVAILABLE

Table 1: Items Included, Top Entry Check Valve Repair Kit – Standard Service

Item	Description
5	Flapper
6	Alignment Pin
8	Pivot Pin
9	Body Cap Seal
10	O-Ring

Table 2: Part Numbers of Standard Repair Kits

	Standard Repair Kit P/N
2' 15,000 psi	P528681
3" 15,000 psi	P522215
4" 15,000 psi	P525441
4" 10,000 psi	P525441

Table 3: Top Entry Check Valve Tool(s) Available for use with repair kit

Description	2"	3"	4"
Body Cap Wrench	P528680	P524505	P524505

4.0 APPENDIX: ASSEMBLY FIGURES

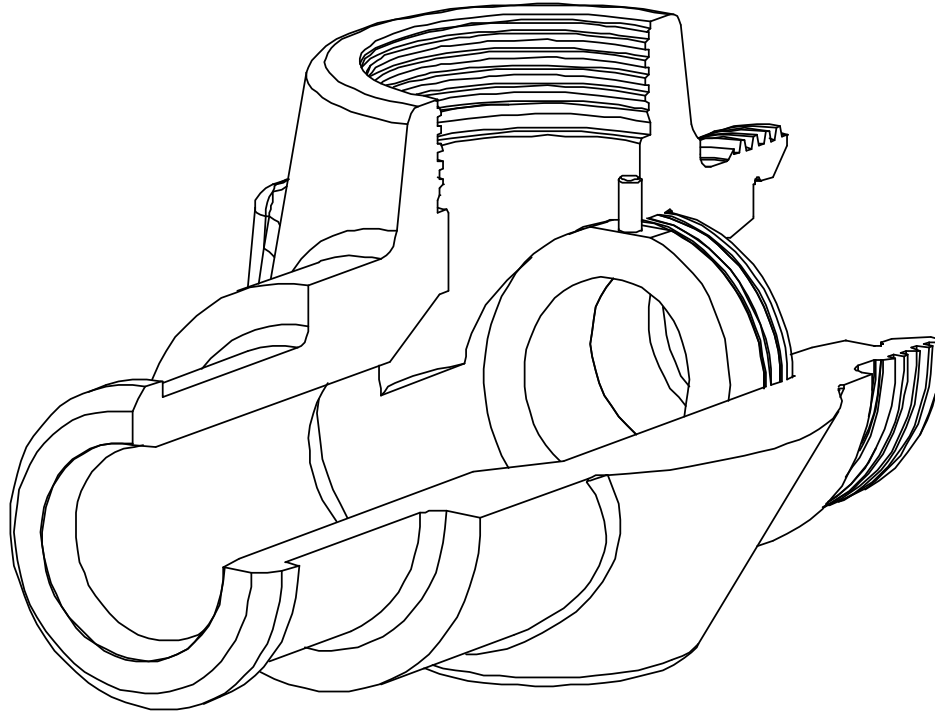


Figure 1: Alignment Pin and Seat Adjusted to Vertical

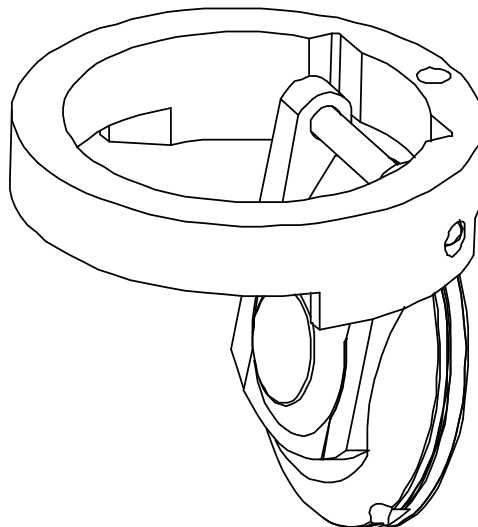


Figure 2: Flapper Assembly

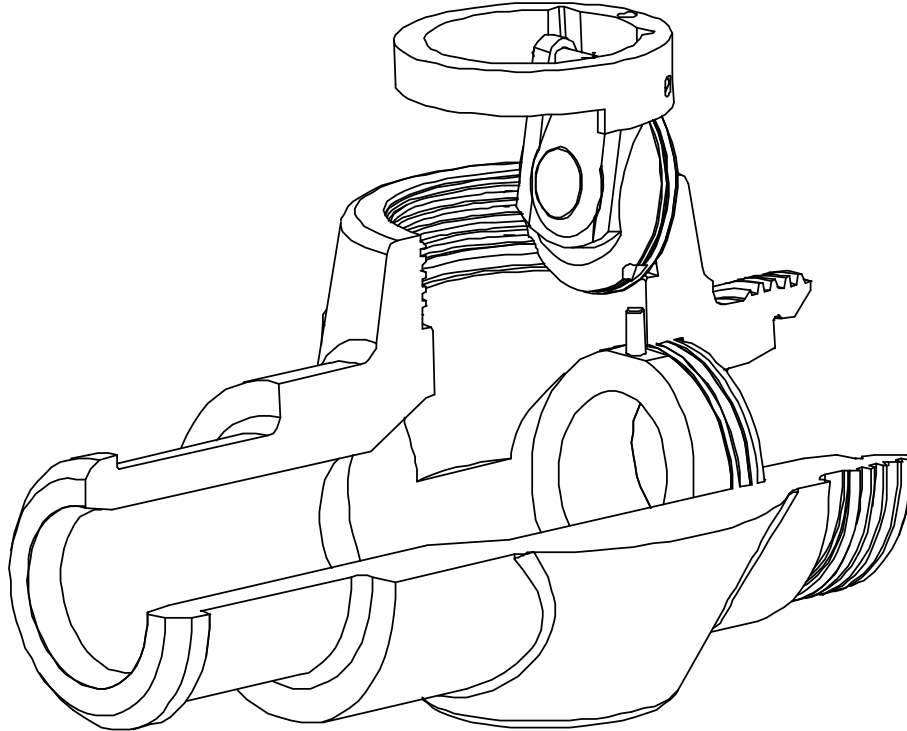


Figure 3: Flapper Assembly Orientation

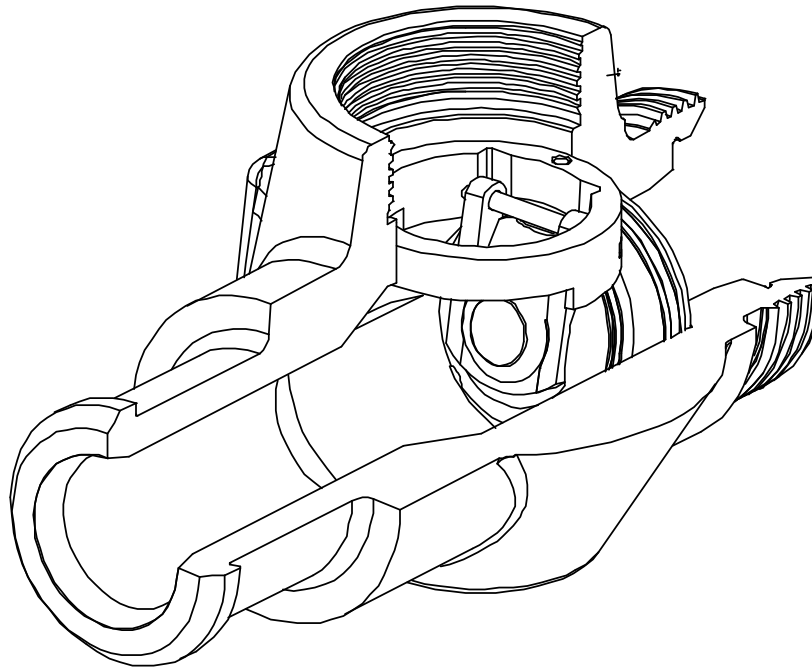


Figure 4: Flapper Assembly Installed

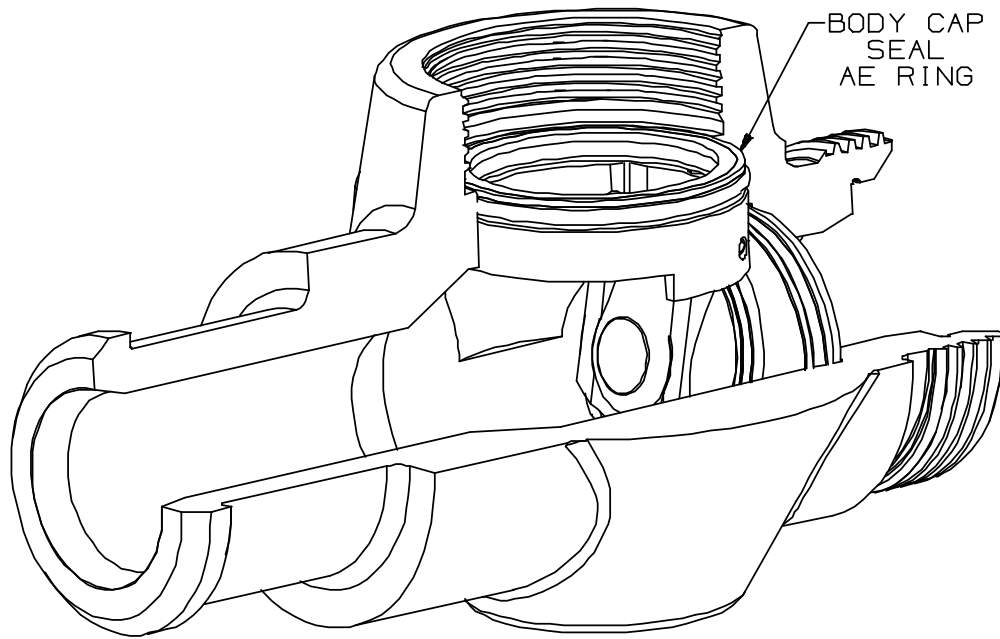


Figure 5: Body Cap Seal Installation

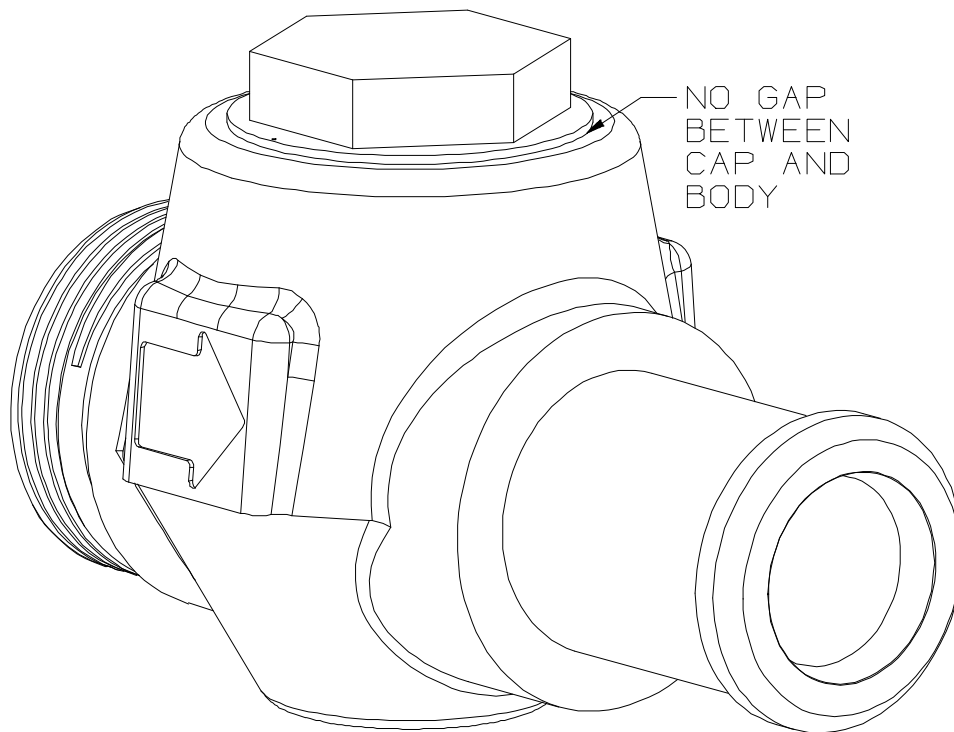


Figure 6: Body Cap Installed