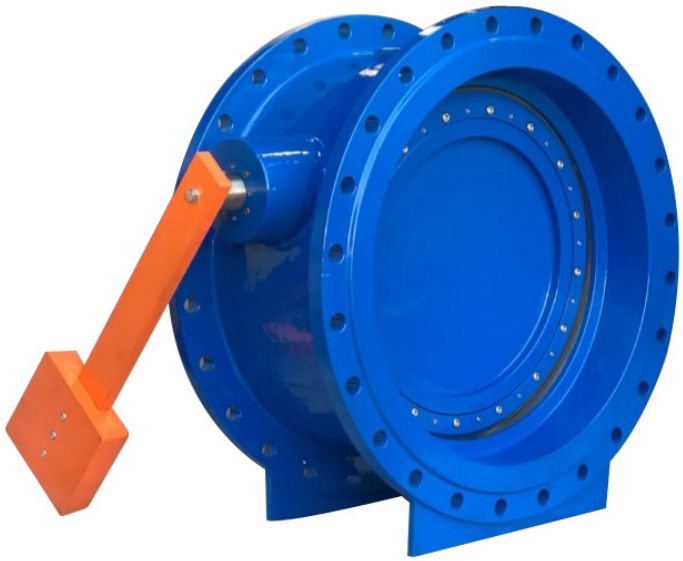
V202
TILTING CHECK VALVE

Product Description

TVN V202 Tilting Check Valve is the non-return valve preferred in pipe networks where faster closure is required. Through the counter lever and weight attached to its shaft, ensures a soft open depending on the speed of the flow and maintains reduced closing times when flow stops.
With its disc design where the center is shifted in two axis, this leads to a big improvement on decreasing operation torque values, lowering the friction on disc sealing area and extended service life.



Technical Data	
Size range	DN150 - DN2000
Pressure range	PN 10 -16 - 25 - 40
Temperature	-10°C to +130 °C
Design	EN 12334 / EN 16767
Face to face	EN 558 Series 14 / DIN 3202 F4
Flange drilling	EN 1092 - 2 / ISO 7005 - 2
Coating	Electrostatic Powder Epoxy
Testing	EN 12266-1
Marking	EN 19
Operation	Counter Lever and Weight

Application Range

- Water treatment and distribution systems
- Mining industry
- Shipbuilding and drilling facilities
- Chemical and petrochemical plants
- Food and chemical enterprises
- Oil and gas processes
- Fire extinguishing systems
- HVAC systems

Related Products

- V106 Double Eccentric Butterfly Valve
- V151 Gate Valve
- V251 Dismantling Joint
- V702 Y-Strainer

IRRIGATION

POTABLE WATER

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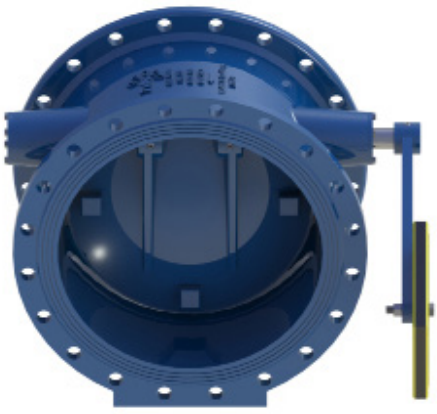
Product Features

- GGG40/50 Ductile Iron Body & Disc allows high impact and streching resistance
- Double Eccentric / Double Offset Disc Design
- Resilient Seated Type (Metal seated type optional)
- Disc sealing ring EPDM as default. NBR or VITON options are available
- Block moulded solid/one-piece T-shaped disc sealing ring extends drop-tight sealing life time
- The open/close speed can be adjusted by modifying the counter lever length and weight. For adjustable shut off speed, TVN V203 Tilting check valve with hydraulic damper type is advised.
- With extended shafts located on both sides of the body, lever position can be replaced on both sides. Two counter lever option is also available upon request.
- Possible to install on horizontal and vertical pipelines with varied flow directions. It is necessary to mention the lever positioning requirements according to your project in order to arrange the lever side and position during prodution.
- Easy to replace disc sealing ring without dismantling the valve from the pipeline and without dismantling the disc from the valve itself just by taking out the retaining ring through its bolts. It is easy to replace the disc sealing ring without any additional equipments
- SS308/316 grade stainless steel welding seat on the body is manufactured through automatic welding machines and microfinished precise milling operation. When disc is fully closed, disc sealing ring applies equal pressure on every point on the welding seat.
- Drop-tight closure
- Triple O-ring feature on both shafts ensures high sealing
- Shafts are equipped with bronze bushings having high corrosion resistance
- Ensures minimized pressure loss and increased energy efficiency with double shaft design
- Low torque requirements during operation
- Easy to install on the line, light weight and occupies less space
- Full coating on the body and disc internally & externally with an average of 250 microns. Higher coating thicknesses are available when required.
- WRAS approved coating available upon request which meets hygienic requirements for potable water applications
- Maintenance free design
- For proper installation, direction arrow on the body should be considered.
- Balanced positioned lifting holes on the body ease transportation and installation
- Hydrostatic test pressure for seat: PN x 1.1 , for shell: PN x 1.5 according to EN 12266-1.



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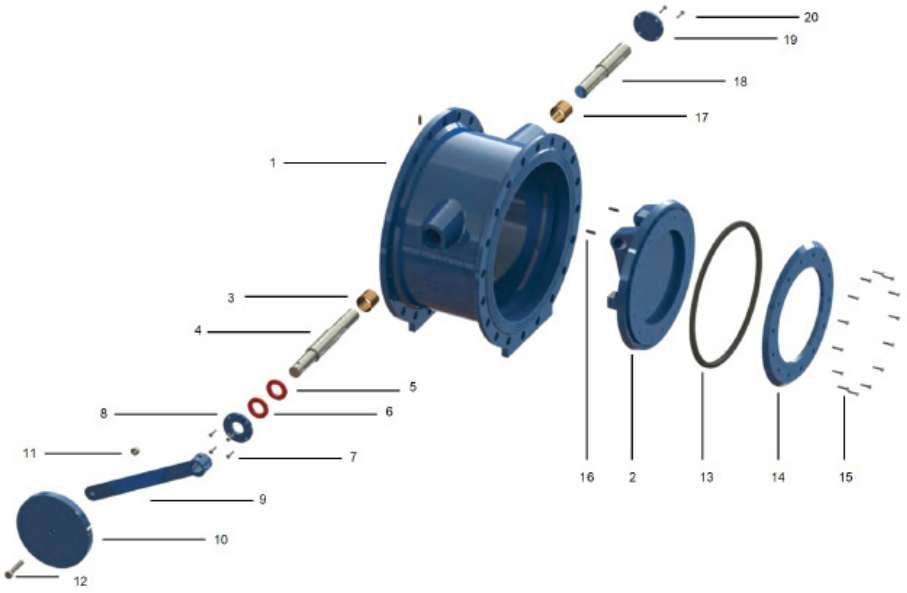
Material List



No	Part	Material
1	Body	GGG50 Ductile Iron
2	Disc	GGG50 Ductile Iron
3	Bushing	Bronze
4	Shaft	AISI 420 / 304 / 316 Stainless Steel
5	Inner O-Ring	EPDM
6	Outer O-Ring	EPDM
7	Bolts	A2 (AISI304) / A4 (AISI316) Stainless Steel
8	Upper Shaft Cover	ST37 Steel
9	Counter Lever	GGG50 Ductile Iron
10	Counter Weight	ST37 Steel
11	Nut	ST37 Steel
12	Bolts	ST37 Steel
13	Sealing Gasket	EPDM
14	Retaining Ring	ST37 / AISI 304 / AISI 316 Stainless Steel
15	Bolts	A2 (AISI304) / A4 (AISI316) Stainless Steel
16	Shaft Bolt	A2 (AISI304) / A4 (AISI316) Stainless Steel
17	Bushing	Bronze
18	Shaft	AISI 420 / 304 / 316 Stainless Steel
19	Shaft Cover	ST37 Steel
20	Bolts	A2 (AISI304) / A4 (AISI316) Stainless Steel

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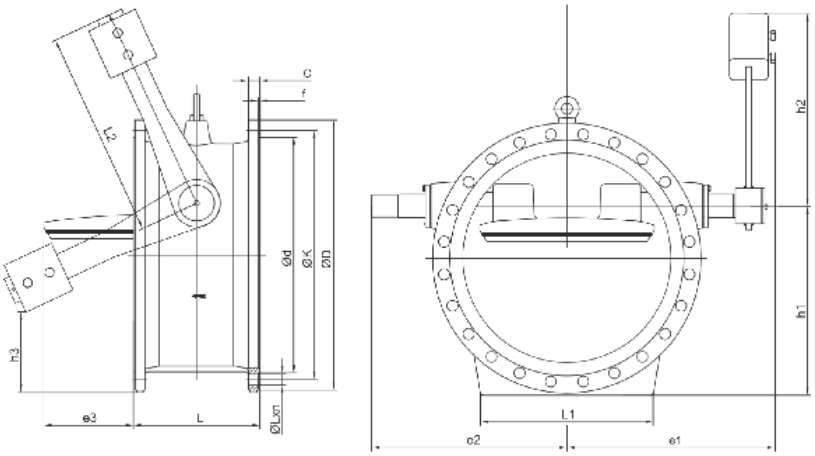
Dimension Table



Nominal Diameter			PN 10												
DN	L	f	ØD	ØK	Ød	b	Ølxn	L2	e1	e2	e3	h1	h2	h3	Weight (kg)
100	190	3	220	180	156	19	19x8	-	-	-	-	-	-	-	-
125	200	3	250	210	184	19	19x8	-	-	-	-	-	-	-	-
150	210	3	285	240	211	19	23x8	-	-	-	-	-	-	-	-
200	230	3	340	295	266	20	23x8	200	268	252	35	220	188	107	50
250	250	3	405	350	319	22	23x12	300	325	305	68	265	285	92	70
300	270	4	460	400	370	24.5	23x12	300	340	317	87	315	285	142	105
350	290	4	505	460	429	24.5	23x16	400	410	382	117	357	372	140	170
400	310	4	565	515	480	24.5	28x16	400	440	412	138	400	372	182	220
450	330	4	615	565	530	25.5	28x20	450	470	443	165	442	418	204	275
500	350	4	670	620	582	28.5	28x20	500	520	490	188	470	465	200	320
600	390	5	780	725	682	30	31x20	600	590	567	238	580	555	267	440
700	430	5	895	840	794	32.5	31x24	700	700	661	305	640	653	273	560
800	470	5	1015	950	901	35	34x24	800	745	711	355	723	743	314	810
900	510	5	1115	1050	1001	37.5	34x28	900	800	780	400	797	830	348	1100
1000	550	5	1230	1160	1112	40	37x28	1000	870	863	460	887	935	360	1220
1100	590	5	1355	1270	1218	53.5	37x32	-	-	-	-	-	-	-	-
1200	630	5	1455	1380	1328	45	41x32	-	-	-	-	-	-	-	-
1300	670	5	1585	1490	1432	59	42x32	-	-	-	-	-	-	-	-
1400	710	5	1675	1590	1530	46	44x36	-	-	-	-	-	-	-	-
1500	750	5	1820	1700	1640	47	44x36	-	-	-	-	-	-	-	-
1600	790	5	1915	1820	1750	49	50x40	-	-	-	-	-	-	-	-
1800	870	5	2115	2020	1950	52	50x44	-	-	-	-	-	-	-	-
2000	950	5	2325	2230	2150	55	50x48	-	-	-	-	-	-	-	-

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Nominal Diameter			PN 16												
DN	L	f	ØD	ØK	Ød	b	Ølxn	L2	e1	e2	e3	h1	h2	h3	Weight (kg)
100	190	3	220	180	156	19	19x8	-	-	-	-	-	-	-	-
125	200	3	250	210	184	19	19x8	-	-	-	-	-	-	-	-
150	210	3	285	240	211	19	23x8	-	-	-	-	-	-	-	-
200	230	3	340	295	266	20	23x12	200	268	252	35	220	188	107	50
250	250	3	405	355	319	22	28x12	300	325	305	68	265	285	92	70
300	270	4	460	410	370	24.5	28x12	300	340	317	87	315	285	142	105
350	290	4	520	470	429	26.5	28x16	400	410	382	117	357	372	140	170
400	310	4	580	525	480	28	31x16	400	440	412	138	400	372	182	220
450	330	4	640	585	548	30	31x20	450	470	443	165	442	418	204	275
500	350	4	715	650	609	31.5	34x20	500	520	490	188	470	465	200	320
600	390	5	840	770	720	36	37x20	600	590	567	238	580	555	267	440
700	430	5	910	840	794	39.5	37x24	700	700	661	305	640	653	273	560
800	470	5	1025	950	901	43	41x24	800	745	711	355	723	743	314	810
900	510	5	1125	1050	1001	46.5	41x28	900	800	780	400	797	830	348	1100
1000	550	5	1255	1170	1112	50	44x28	1000	870	863	460	887	935	360	1220
1100	590	5	1355	1270	1218	53.5	44x32	-	-	-	-	-	-	-	-
1200	630	5	1485	1390	1328	57	50x32	-	-	-	-	-	-	-	-
1300	670	5	1585	1490	1432	59	50x32	-	-	-	-	-	-	-	-
1400	710	5	1685	1590	1530	60	50x36	-	-	-	-	-	-	-	-
1500	750	5	1820	1710	1640	62.5	57x36	-	-	-	-	-	-	-	-
1600	790	5	1930	1820	1750	65	57x40	-	-	-	-	-	-	-	-
1800	870	5	2130	2020	1950	70	57x44	-	-	-	-	-	-	-	-
2000	950	5	2345	2230	2150	75	62x48	-	-	-	-	-	-	-	-

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Dimension Table

Nominal Diameter	PN 25														
DN	L	f	ØD	ØK	Ød	b	Ølxn	L2	e1	e2	e3	h1	h2	h3	Weight (kg)
100	190	3	235	190	156	19	23x8	-	-	-	-	-	-	-	-
125	200	3	270	220	184	19	28x8	-	-	-	-	-	-	-	-
150	210	3	300	250	211	20	28x8	-	-	-	-	-	-	-	-
200	230	3	380	310	274	22	28x12	200	268	252	35	220	188	107	50
250	250	3	425	370	330	24.5	28x16	300	325	305	68	265	285	92	70
300	270	4	485	430	389	27.5	31x16	300	340	317	87	315	285	142	105
350	290	4	555	490	448	30	34x16	400	410	382	117	357	372	140	170
400	310	4	620	550	503	32	37x16	400	440	412	138	400	372	182	220
450	330	4	670	600	548	34.5	37x20	450	470	443	165	442	418	204	275
500	350	4	730	660	609	36.5	37x20	500	520	490	188	470	465	200	320
600	390	5	845	770	720	42	41x20	600	590	567	238	580	555	267	440
700	430	5	960	875	820	46.5	44x24	700	700	661	305	640	653	273	560
800	470	5	1085	990	928	51	50x24	800	745	711	355	723	743	314	810
900	510	5	1165	1090	1028	55.5	50x28	900	800	780	400	797	830	348	1100
1000	550	5	1320	1210	1140	60	57x28	1000	870	863	460	887	935	360	1220
1100	590	5	1420	1310	1240	64.5	57x32	-	-	-	-	-	-	-	-
1200	630	5	1530	1420	1350	69	57x32	-	-	-	-	-	-	-	-
1300	670	5	-	-	-	-	-	-	-	-	-	-	-	-	-
1400	710	5	1755	1640	1560	74	62x36	-	-	-	-	-	-	-	-
1500	750	5	1865	1750	1678	77.5	62x36	-	-	-	-	-	-	-	-
1600	790	5	1975	1860	1780	81	622x40	-	-	-	-	-	-	-	-
1800	870	5	2195	2070	1985	88	70x44	-	-	-	-	-	-	-	-
2000	950	5	2425	2300	2210	95	70x48	-	-	-	-	-	-	-	-

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TILTING DISC CHECK VALVE ADVANTAGES

- Quick closing system
- Stability at low and pulsating flow
- Moderate pressure drop
- Tight sealing of metal seats Seat contacts don't occur until the disc is seated and closed.

DOUBLE OFFSET

A high performance tiling disc check valve has double offset pivot (hinge pin) design.
The pivot offsets are made when constructing the valve with hinge pins which are located behind the centerline of sealing surface and slightly to one side of pipe centerline.

The offset purpose is to reduce rubbing and thus wear between seat and seal while valve is travelling.

MANUAL

This manual will provide you with the information to properly install and maintain the check valve to ensure a long service life. The Tilting Disc Check Valve is ruggedly constructed with rubber or stainless steel trim to give years of trouble free operation. The valve should be installed in water pipelines three diameters downstream of pumps to prevent reverse flow.

The valve is designed to open after pump start and allow water to flow through the pipeline or water main while creating a minimal amount of headloss. A top or bottom mounted oil dashpot may be included to control the opening and closing of the valve. The valve size, cold working pressure, and model number are stamped on the nameplate for reference.

RECEIVING AND STORAGE

Inspect valves upon receipt for damage in shipment. Unload all valves carefully to the ground without dropping. When lifting, the valve should be lifted with straps or bolts in the flange holes. The valve should never be lifted by the dashpot assembly.

The valves should remain crated, clean and dry until installed to prevent weather related damage. For long-term storage greater than six months, the valves should be stored indoors or the ends of the valve should be sealed with plastic wrap to prevent weather related damage.

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DESCRIPTION OF OPERATION

The Tilted Disc Check Valve consists of two body sections bolted together at a central 55-degree diagonal flange assembly, forming a single valve body. The inlet body section contains a seat ring positioned and captured by the diagonal flanges.
The outlet section contains two eccentrically located pivot pins from which a disc, containing a beveled disc ring, pivots 40 degrees from the closed to the fully open position.

The location of the eccentric pivot trunnions allows the seating surface of the disc ring to rotate away from the seating surface of the seat ring, without contact, when the valve opens.
Conversely, during closing the seating surface of the disc ring moves into the seating surface of the seat ring without contact, until final sealing contact is made.
A small amount of clearance exists between the pivot pin and the pivot pin bushing when the disc ring makes full contact with the seat ring to ensure a tight seal.

The flow area throughout the valve equals or exceeds the flow area of the pipe, thus minimizing the head loss through the valve.

Upon pump start-up, the forward flow of water will start to rotate the disc about the pivot pins until the disc rotates through a 40-degree arc and contacts the integral body stops.
The partially balanced disc assists in opening the disc and stabilizes the disc in low-flow cases where the valve remains partially open.

On pump shutdown, the forward velocity of the water starts to diminish, until the disc is no longer held against the body stops and the partially balanced disc will move to the closed position. When the forward velocity reaches zero, the disc will have moved to the closed position and the reversal of flow is checked.
The 40-degree travel of the disc and the partially balanced disc reduces the potential for check valve slam and water hammer normally associated with conventional swing check valves.
However, ideal hydraulic conditions are not always predictable and the potential for water hammer can still exist.
Applications with a potential for valve slam include high-head pumping, multiple high service pumps, and the use of hydro-pneumatic surge tanks. If the reversal of flow occurs before the disc has a chance to fully close, it will be driven to the closed position by the rapid flow reversal.
For these rapid flow reversal conditions, a bottom mounted hydraulic dashpot can be fitted in the bottom inspection port, provided that sufficient clearance is provided for installation.
The bottom mounted oil dashpot will control the last 10 degrees of disc travel between 1 and 5 seconds. A top mounted dashpot can also be used.
A top mounted oil dashpot performs the same function as a bottom dashpot and in addition, independently controls the full open and closing strokes between 5 and 30 seconds to prevent line surges.

INSTALLATION

The installation of the valve is important for its proper operation. The Tilted Disc Check Valve can only be used for horizontal flow or vertical flow-up applications.

CAUTION

For horizontal flow applications, the valve must be installed with both of the eccentric pivot pin trunnions located above the horizontal centerline of the valve and they must be level to the horizontal plane of the valve.

Each valve is provided with a flow arrow integrally cast on the valve body and a flow arrow printed on the metal label attached to the valve. These flow arrows must point in the direction the water will flow, when the system is operating.
The valve and adjacent piping must be supported and aligned to prevent cantilevered stress being transferred to the valve's flanges when installing the flange bolts or studs. For raised face applications, a ductile iron valve body should be specified.

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CAUTION

The valve must be mated with flat-faced flanges or damage may result. The use of excessive bolt torque can damage the valve. When mating the check valve with butterfly isolation valves, the clearance between the butterfly disc and the fully open check valve stem must be checked. A spacer pipe is sometimes needed. See the valve arrangement drawing for disc clearance dimensions.

FLANGED ENDS

The flange should be mated with flat-faced pipe flanges equipped with resilient gaskets. Higher strength bolts should only be used with full-face gaskets.

INSTALLATION

Lower valve into the pipeline using slings or chains around the valve body. Eye bolts or bars can also be used in the bolt holes. Lubricate the flange bolts and insert them around the flange. Lightly turn bolts until gaps are eliminated. The tightening of the bolts should then be done in graduated steps using the cross-over tightening method. Recommended lubricated torques for use with resilient gaskets (75 durometer). Do not exceed bolt rating or crush gasket more than 50 percent of its thickness.

VALVE CONSTRUCTION

The standard Tilted Disc Check valve is ruggedly constructed of cast iron. The internal metal components are aluminum bronze or stainless steel.

MAINTENANCE

The operation of the valve can be seen by observing the movement of the indicator pointer on the side of the valve (6" and larger sizes). The valve should move about 40 degrees from the closed to the fully open position.
It is normal for the valve to not fully open in cases where the fluid velocity is less than 8 ft/sec or a Top Mounted Oil Dashpot is installed.

LUBRICATION

The Tilted Disc Check Valve is provided with grease fittings (23) located on the pivot pin covers. The valve's pivot trunnions must be lubricated at least monthly or as conditions dictate with a waterproof, FDA or ANSI/NSF 61 approved grease. Using a cartridge grease gun, pump grease into each grease fitting using 8 full strokes of the grease gun lever.

INSPECTION

Periodic inspection for leakage can be performed by placing a listening device or an ear on the valve while it is closed and the line is under pressure. If leakage is heard, close the isolation valve and drain the valve connection, and inspect the seating surfaces for wear or mineral deposits. Clean or repair trim as needed.

WARNING

Removal of inspection covers without draining the pipeline and valve may cause serious injury.

The inspection hole covers can be removed from the valve to facilitate internal inspection of the valve. A hoist or jacking mechanism should be used to lift the disc to inspect the seating surfaces. If replacement of the disc, pivot pin bushings, disc ring, or seat ring is required, the valve must first be removed from the line.

TROUBLESHOOTING

Several problems and solutions are presented below to assist you in trouble shooting the valve assembly in an efficient manner.

TROUBLESHOOTING

The valve opens automatically without the need of a power source to allow forward flow. The valve may not open to the full open position depending on fluid velocity but it will always open far enough to pass the flow with a minimal headloss. The valve will automatically close to prevent reverse flow through the pump. The valve has metal seats and a moderate bang during closing is normal.

1. Leakage at Valve Inspection Covers
Re-tighten bolts evenly or replace non-asbestos sheet gasket.

2. Leakage at Grease fitting
Inject grease or replace grease fitting

3. Leakage at Mating Flanges
Re-tighten bolts using the cross-over method or replace mating flange gasket. Flange gaskets are typically 70 durometer resilient material. Check alignment of mating pipe.

4. Valve Leaks When Closed
Flush debris from seat by cycling valve. Verify that valve is subject to a minimum differential pressure of at least 10 psi when closed and the isolation butterfly or gate valve is open. If leakage persists, inspect interior of valve. Clean seating surfaces. When used with a power operated control valve, there may not be sufficient reverse flow to seat the valve. These types of installations require a power outage for proper valve seating so that the pump is tripped while the control valve is open.

5. Valve Fails to Open
Check pressure differential across disc; upstream pressure must be greater than downstream pressure. Verify that the suction and discharge shutoff valves are open and there is no line blockage. Drain pipe on both sides of the valve, remove inspection cover, and inspect disc ring and seat ring for damage or wedged debris.

6. Noisy Operation
Flow noise is normal. Loud flow noise similar to hammering may be cavitation from dropping high pressures across valve; review flow velocity through valve and pump application.

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DISASSEMBLY

The valve should be removed from the pipeline for disassembly. All work on the valve should be performed by a skilled mechanic with proper tools.

WARNING

The line must be drained before removing the valve or pressure may be released causing injury.

1. Lay valve on flat surface or bench with the inlet flange face down.
2. Using a flat-nosed punch, drive out the two locating pins
3. Remove the indicator jam nut, lockwasher, pointer, pivot pin cover bolts and covers.
4. Remove the pivot pins. The end of the pin is tapped for insertion of threaded rod.
5. Attach a hoist to the outer flange of the valve to support the weight of the outlet body section of the valve and remove the diagonal flange bolts.
6. Using the hoist, raise the outlet body section of the valve. If the valve sections are joined tightly by the gasket, lift the valve and hammer the inlet body section down with a soft-blow hammer or block of wood. Once the body sections are separated, raise the outlet section to clear the disc pivot trunnions and place the outlet section on a wooden skid.
7. Remove the pivot pin bushings from the disc pivot trunnions on 12" and larger valves. They may be set in place with sealant so apply heat to the disc trunnions with a propane torch to soften the Loctite if necessary.
8. Thread an eye bolt into one of the threaded holes in the disc's rectangular pad. Using a nylon sling through the disc trunnions and eye bolt, lift the disc straight up while maintaining its 55 degree tilt.
9. Place the disc on a wooden skid and using the nylon sling through just the eye bolt, turn the disc over with the disc ring facing up.

All parts can now be easily inspected for wear or damage and replacement parts can be ordered as needed. If replacing the seat or disc ring, it is recommended that they be replaced as a set. The pivot pins should fit tightly in the body, but there should be ample clearance between the pins and the bushings.

REASSEMBLY

All parts must be clean and gasket surfaces should be cleaned with a stiff wire brush in the direction of the serrations or machine marks. Worn parts, gaskets, and seals should be replaced during reassembly.

1. Place the seat body half, with the inlet flange face down on a wooden skid.

2. Install a lightly lubricated seat ring seal in the register of the seat body half.

3. Install the seat ring with the serrated surface toward the seal, into the register of the body seat half.

4. With the disc on a wooden skid, and the disc ring register up, place a lightly lubricated disc ring seal onto the disc register.

5. Assemble the disc ring with the serrated face toward the seal.

6. Place a small amount of Loctite thread locking compound on each of the retaining screws and thread them into the tapped holes in the disc. Tighten them initially hand tight and then using the cross-over tightening method, torque each screw in graduated steps.

7. Thread in eye bolt into one of the threaded holes in the disc's rectangular pad. Insert a nylon sling through the eye bolt and attach the loops of the sling to the hook of a hoist. Carefully turn over the disc, using the hoist, making sure that the beveled seating surface of the disc ring does not make contact with metal or hard surfaces.

REASSEMBLY

8. Install the pivot pin bushings into the disc pivot trunnions.

9. Remove the nylon sling from the eye bolt and place it through the disc's pivot trunnions bores and attach the loops of the sling to the hoist. Attach a short chain from the hoist's hook to the eyebolt and adjust the length of the chain to keep the disc at a 55 degree angle when housing the disc.

10. Slowly lower the disc into the beveled seat ring, using care not to drop or allow the disc to swing into the seat ring. After the disc is in place, carefully align the disc's pivot trunnions, so they are at equal distance from the diagonal flange locating pin holes and that the disc ring is parallel to the seat ring.

11. Lightly lubricate and install the diagonal flange gasket or O-ring seal on the face of the seat body half diagonal flange and align the holes in the gasket with the holes in the flange. The two small holes must be aligned with the two locating pin holes.

12. Install two temporary slip-fit locating pins into the seat body half's diagonal flange. Hoist the pivot body half over the seat body half and lower the diagonal flange with 1/2" of the mating flange. Align the locating pin holes. Once the diagonal flanges are aligned, the pivot body half can be lowered.

13. Apply a lubricant to the flange bolt threads. Once all of the diagonal flange bolts are inserted, tighten them hand tight. The torquing of the diagonal flange bolts should then be done in three graduated steps using the cross-over tightening method to load the bolts evenly.

14. Remove the temporary slip-fit locating pins from the diagonal flange and install the permanent locating pins. 15. Insert the indicator shaft assembly through the 9/16" diameter hole in the indicator pivot pin and insert the assembly into the body trunnions bore. Align the slot in the indicator pin, which is threaded into the disc. Install the pivot pin into the opposite trunnions bore.

16. Install the two indicator o-ring seals into the grooves of the indicator shaft. Make sure that the seals are not twisted within the grooves. Apply some grease on the seals. Lightly lubricate the pivot pin cover gasket and place it on the machined face of the indicator pin cover and install the cover over the indicator shaft. Insert the pivot pin cover bolts and tighten hand tight. The torquing of the bolts should be done in two graduated steps using the cross-over tightening method to load the bolts evenly.

17. Install the external indicator washer over the indicator shaft. Place the indicator pointer on the end of the indicator shaft. The pointer should point toward the letter "C" cast on the indicator pivot pin cover. Slip the indicator lockwasher and jam nut while holding the indicator pointer. Do not over-tighten.

18. Lightly lubricate the opposite pivot pin cover gasket and place it on the machined face of the pivot pin cover and install the cover to the other pivot body half's trunnions boss. Insert the pivot pin cover bolts and tighten hand tight. The torquing of the bolts should be done in two graduated steps using the cross-over tightening method to load the bolts evenly.

19. Lightly lubricate the inspection hole gasket on the machined face of the inspection hole cover and install the cover to the inspection hole port located on each body half. Insert the cover bolts and tighten hand tight. The torquing of the bolts should be done in two graduated steps using the cross-over tightening method to load the bolts evenly.

20. The pivot trunnions must be lubricated with a waterproof, FDA approved grease, as outlined in the maintenance section. Install grease fittings and pump grease into each fitting until the grease is observed at the interface of the pivot pin bushing's inside diameter and the pivot pin's outside diameter.

21. Operate the valve several times, with the use of a hoist, to ensure correct operation before reinstalling the valve.