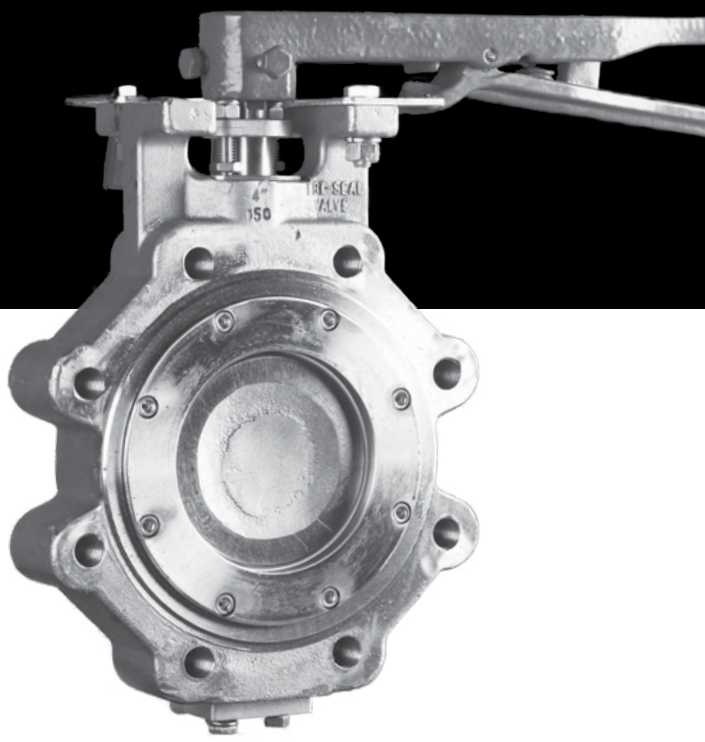
OPERATING AND MAINTENANCE INSTRUCTIONS

FIRE-FLEX HIGH PERFORMANCE FIRE-SAFE BUTTERFLY VALVE

2 1/2 - 24", 1150/2150 and
1151/2151 ANSI Class 150



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MPI MCWANE PLANT & INDUSTRIAL

TRI-SEAL VALVE

FIRE-FLEX HIGH PERFORMANCE BUTTERFLY VALVE

The Tri-Seal Valve Fire-Flex Series Butterfly valves contain improvements and refinements not found in any other high performance butterfly valves. These features serve to insure a long and trouble-free life as well as provide much simple and less expensive maintenance when required.

A. DESIGN FEATURES

1. The Fire-Flex features an exclusive resilient and metallic seating arrangement, under normal operating temperatures, that assures bubble tight shutoff affected by the pressure-activated resilient seat. In the event of a fire, the 304 stainless steel metal seat provides sealing conforming to API 607 4th edition requirements without relying on springs, system pressure, or the complete destruction of the resilient seat. The flexible graphite packing and gaskets prevent external leakage, avoiding the possibility of intensifying fire.

2. Body Design – The Fire-Flex valve employs a rugged one-piece body design with an integrally cast travel stop and installation guides for flange bolts. These guide holes have sufficient clearance to allow flexibility for misalignment of mating flanges.

3. Shaft Design – The Fire-Flex shaft is a double offset style with one-piece construction design through 16" size, two-piece construction 18" and larger.

4. **Gland Design –** The Fire-Flex packing gland is a flexible graphite design. This design offers excellent sealing characteristics at the temperature rating of the valve, as well as the higher temperature that would be seen in the event of a fire.

5. Disc Design – The Fire-Flex disc is of rugged construction with a sealing edge that is a segment of a ball. Once the disc is forced into the seat, a bubble-tight seal is affected. Any change of position of the disc once it is forced into the seat will not affect performance. The result being that (within the width of the edge) an exact stop position is not critical.

B. INSTALLATION

1. The Fire-Flex Series valves are bi-directional, and as such can be installed for flow in either direction. However, a preferred flow is indicated.

2. When installing a butterfly valve always be sure that the new flange gasket of the proper material for the intended service media are used.

3. When installing flange bolts, always tighten bolts in a sequential pattern, shown in Fig. 1. Bolts should be tightened to the appropriate torque, as specified by SAE for the bolting material used.

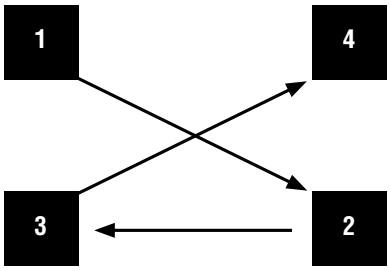


Figure 1: Flange bolt tightnening sequence

NOTE: After bolts have been tightened, it is good practice to recheck flange bolt torques one-half to one hour after initial tightening (particularly when stainless steel bolting is used).
WARNING: As is the case with most valve types available on the market today, (regardless of manufacturer), valve stem seals may require periodic adjustment, therefore, installations that do not allow access to the valve stem should be avoided.

C. VALVE OPERATION

1. All Tri-Seal Valve Fire-Flex Butterfly Valves feature ¼ turn operation. Turning the valve handle 90 degrees clockwise will fully close the valve, while 90 degree counter-clockwise rotation will fully open the valve. The valve handle also serves as a disc position indicator. When the valve handle is parallel to the pipe the valve is open, when perpendicular to the pipe the valve is closed. To disengage the handle from the locking plate, simply squeeze the bottom lever of the handle.

2. All Tri-Seal Valve Fire-Flex Butterfly valves are designed to provide bubble tight performance when properly selected in accordance with the valve's pressure/temperature rating, unless otherwise noted in the seat material selection chart.

3. To provide the longest possible service life, a hand-operated butterfly valve should be operated in either its fully open or fully closed position. However, a 10 position locking plate is provided if an intermediate operating position is desired.
4. The torques listed under "Break Away" at the end of this instruction sheet are the normal expected breakaway torques. These values represent the maximum force required to begin to open the valve at specified differential pressures. Typically, this breakaway torque is the maximum torque requirement for the valve during a closed-to-open, open-to-close cycle. Bear in mind that these have been confirmed by laboratory testing of each valve size while pressurized with water to its maximum pressure rating (certain highly viscous or abrasive services could cause an increase in torque requirements).

D. MAINTENANCE

During its normal service life, the only maintenance that may be required by your Tri-Seal Valve Fire-Flex butterfly valve should be periodic stem seal adjustment. If leakage at the stem is noted, simply tighten the packing plate until leakage subsides. DO NOT OVER TIGHTEN, AS PREMATURE WEAR COULD RESULT.

It is impractical to predict frequency of stem adjustment, as it is influenced by such factors as frequency of cycling and service media.

IMPORTANT: As is the case with ANY valve on the market today, it is important that stem leaks do not go unattended. Lack of maintenance of stem leakage could cause a premature need to replace stem seals.

NOTE: If operating temperature of system is substantially higher or lower than 80° F, initial stem seal adjustment may be required to prevent leakage.

E. DISASSEMBLY

WARNING: Most standard bi-directional High Performance butterfly valves on the market today, regardless of manufacturer, can trap fluid in the valve cavity when closed. If your Tri-Seal Valve Fire-Flex butterfly valve has been used to conduct a hazardous media, the following steps must be taken prior to removal from line and disassembled:

1. Relieve line pressure.
2. Place valve in its half-open position and flush the line to remove the hazardous material from the valve cavity. The valve can now be removed from the line.

NOTE: Always advise maintenance personnel when they are maintaining or rebuilding a valve that has been conducting hazardous material. Proper protective clothing and eye protection should always be utilized.

3. To disassemble entire valve:

a. Having assured that BOTH line and valve cavity pressures have been relieved, remove the valve from the line.

b. Place the valve in a vice or other suitable retention tool that will adequately support the valve while it is being disassembled.

c. Remove valve handle, gear operator or actuator.

d. To access the seats (PTFE and metal back up) remove outer seat retainer and inner seat retainer by the appropriate method listed below, wafer style 2 ½ - 14 only. With the valve rotated so the shaft side of disc is on the seat retainer side (past full open), rotate the seat retainer such that the notches are no longer in the 12 and 6 o'clock positions. Lift outer seat retainer to remove from valve then lift out inner seat retainer. Any Grafoil gasket material should be removed. Lift the backup metal seat out of the body by prying it from its outside edge or inside lock lip.

e. Remove hex head cap screws, lock washers and positioning plate from top mounting flange.

f. Remove self-locking gland retainer hex nuts and gland retainer.

g. Remove jam nuts, shaft retaining plate and outer gland ring.

h. Remove shaft retaining ring (2 ½ " through 14" only) stem packing and inner gland ring.

i. Remove hex head cap screws, lock washers, and cap on the bottom of the valve.

j. Remove key (2 ½ "- 8") or pins (10"- 24") from disc and shaft assembly.

For key removal: grind off spot welds and punch out key.

For pin removal: All dowel pins have been drilled and tapped to facilitate their extraction. The thread sizes are as follows: 10"-20" = ¼ - 20, 24" = 3/8-16.

k. Slide shaft from valve body, lift out disc and thrust washers located at the top and bottom of shaft bore.

l. Care should be taken when replacing the bearings, as they can be damaged while pressing them out.

F. REASSEMBLY

Having assured that all critical surfaces have been inspected, cleaned and/or replaced, reassembly can begin.

1. If replacing shaft bearings, carefully press bearings into the shaft bore of the valve body until bearings are flush with shoulder inside bore.

2. While holding the thrust washers against the milled spot faces on the O.D. of the disc, insert the disc into the valve and align the disc shaft bore with the body bore.
NOTE: Be sure that the disc is orientated such that the "T" on the keyed disc (8" and smaller) or the dowel pin holes (10" and larger) are located toward the side opposite of the seat retainer and near the packing side.

3. Insert the shaft through the shaft bore and disc, ensuring proper alignment of the key way or pinholes to the same of the disc.

4. Press the key or dowel pins in place and stake to secure.
NOTE: Key should be tack-welded to insure proper operation.

5. Making sure disc is rotated fully CCW, lay first Grafoil gasket in seat counter bore, insert metal back up seat into body, making sure back lock lip is in place. Lay second Grafoil on top of metal seat. Place inner seat retainer into body. Lay third Grafoil gasket on top of inner seat retainer. Insert the seat into the seat retainer ensuring the flat back of the seat is flush with the top edge of the retainer.
CAUTION: Care must be exercised to assure the seat is not installed upside down. Install the seat retainer springs, with seat retainer notches located at the 6 and 12 o'clock positions insert the retaining springs as follows: insert the straight leg of the retaining spring into the hole located at the bottom of the groove on the OD of the retainer to the left of the notch that is located at 12 o'clock, making sure that other end of the spring is extending to the right. Then insert the remaining spring into the hole located to the right of the notch located at 6 o'clock with the opposite end extending to the left. NOTE: See enclosed drawing for location of retaining springs.

6. With the valve still in the full CCW position and laying flat on a safe working surface, place the seat retainer, seat and seat retainer springs into the valve body, such that the seat retainer is locked into place. Rotate disc to the fully closed position. On lug valves the seat retainer screw should not be tightened until the disc is in the closed position.

7. To secure the seat retainer to the valve body use the following procedure:
WAFER (2 ½ "-14") ONLY – With one side of the seat retainer pressed into the valve body, depress seat retainer seat retaining spring and push the seat retainer down so that it is flush to .010 above the body. Rotate seat retainer until the notches are in the 6 and 12 o'clock positions locking the retaining springs in place.
LUG (and Wafer 16"-24") – Install and tighten socket head cap screws insuring the retainer is bottomed in body.

8. Install inner gland ring into shaft bore. Install flexible graphite stem packing.

9. Install shaft-retaining ring into groove on shaft. Slide outer gland ring onto the shaft and place nameplate and shaft retaining plate onto gland retaining studs. Secure with jam nuts.

10. Install gland retainer plate and secure finger tight with self-locking retainer nuts. Tighten as required when installed into service.

11. Install end cap with Grafoil seal onto bottom of the valve and secure with lock washer and hex head cap screws.

12. Place positioning plate onto mounting flange and secure finger tight with lock washers and hex head cap screws. NOTE: The overhang of the plate should be behind and to the right of the seat retainer while looking at the retainer side of the valve.

13. With the valve in an approximate closed position, slide the handle onto the shaft so that the bottom tang of the handle engages the positioning plate. Secure handle to shaft by tightening hex head cap screw on handle. Rotate the valve to its fully closed position if the handle is not locked into the last notch of the positing plate.

G. COMMON PROBLEMS encountered with high performance butterfly valves (with associated corrective action options):

1. Shaft Leakage:
a. Tighten gland retainer nuts (careful not to over tighten – just enough so leakage stops.)
b. Replace gland packing.

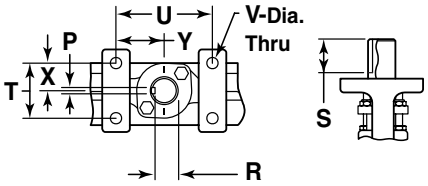
2. Leakage between Flange and Valve:
a. Tighten flange bolts.
b. Replace flange gasket.

3. Leakage through Valve Seat:
a. Clean seat and retainer groove. Replace seat.
b. Reposition seat on disc if evidence of minor damage is visible.
c. Replace disc and shaft assembly.

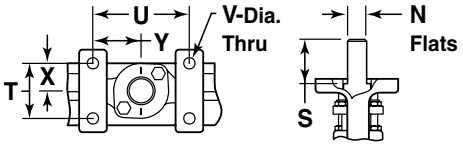
4. Excessive Torque:
a. Check alignment of valve actuator and adjust if side loading is evident.
b. Replace bearings if slight galling has occurred on shaft.
c. Replace bearing and shaft if galling is excessive.

MATERIALS OF CONSTRUCTION - ANSI CLASS 150

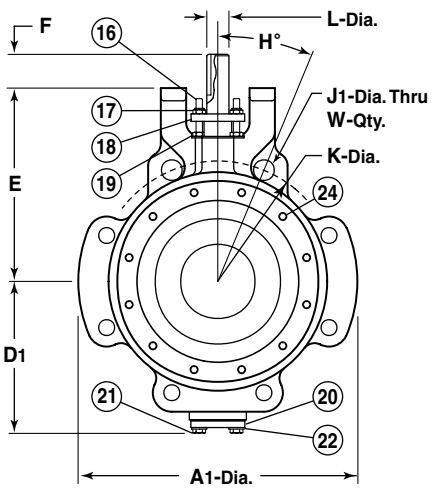
Keyed Stem
10"-24" Cl. 150
8"-12" Cl. 300



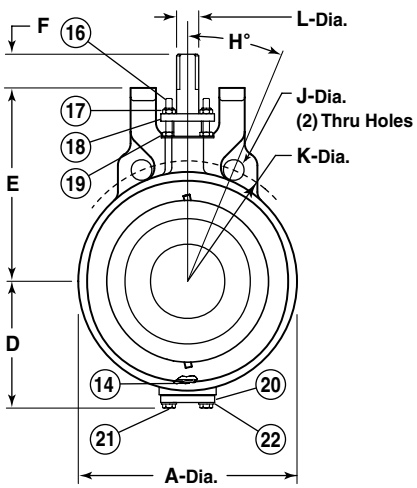
Flatted Stem
21/2"-8" Cl. 150
3"-6" Cl. 300

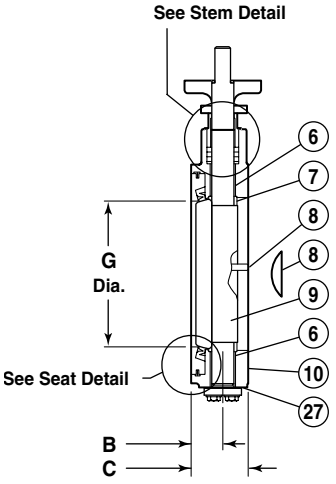


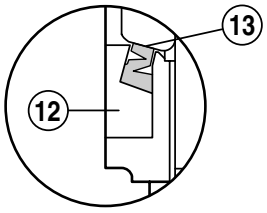
Lug Style



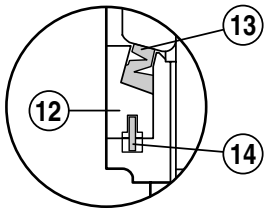
Wafer Style



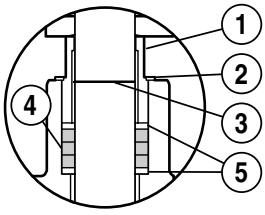




Lug Style
Seat Detail



Wafer Style
Seat Detail



Stem Detail

MATERIALS OF CONSTRUCTION

Materials		Carbon Steel	Stainless Steel
Part	Name	1150 / 1151 / 1300 / 1301	2150 / 2151 / 2300 / 2301
1	Outer Gland Ring	300 Series Stainless Steel	
2	Shaft Ret. Plate	300 Series Stainless Steel	
3	Shaft Ret. Ring	300 Series Stainless Steel	
4	Packing	Flexible Graphite	
5	Inner Gland Ring	316 Stainless Steel	
6	Bearing	Bronze or Microlube Coated Stainless Steel	
7	Thrust Washer	316 Stainless Steel	
8	Key/Pin	Key 316 or 17-4 Stainless Steel / PIN 316 Stainless Steel	
9	Shaft/Disc Assembly	2 1/2" -10" (316 Stainless Steel Shaft / CF8M Disc) 12" - 36" (17.4 Shaft / CF8M Disc)	
10	Body	ASTM A216 Grade WCB	ASTM A351 Grade CF8M
12	Seat Retainer	ASTM A515 or 516 GR 70	ASTM A240 GR 316 SS
12A	Inner Seat Retainer	ASTM A515 or 516 GR 70	ASTM A240 GR 316 SS
13	Seat	PTFE/RPTFE	
13A	Backup Seat	304 SS Plated w/Grafoil Gaskets	
14	Retaining Spring	Inconel X750	
16	Stud	18-8 Stainless Steel	
17	Self Locking Nut	18-8 Nyloc Stainless Steel	
18	Gland Retainer	300 Series Stainless Steel	
19	Jam Nut	18-8 Stainless Steel	
20	End Cap	316 Stainless Steel	
21	Hex Head Cap Screw	18-8 Stainless Steel	
22	Split Lockwasher	18-8 Stainless Steel	
23	Name Plate	300 Series Stainless Steel	
24	Sockethead Cap Screw	18-8 Stainless Steel	
27	End Cap Seal	Grafoil	

Note: Listed are standard materials of construction. Optional Materials may be substituted. Please consult the How to Order guide for various trims. Teflon® & Viton® are registered trademarks of DuPont Dow Elastomers.

TECHNICAL DATA

Valve Operating and Rating Information

Pressure Rating at 100°F
Class 150: 285 PSIG (A216 Gr. WCB)
275 PSIG (A351 Gr. CF8M)

Class 300: 740 PSIG (A216 Gr. WCB)
720 PSIG (A351 Gr. CF8M)

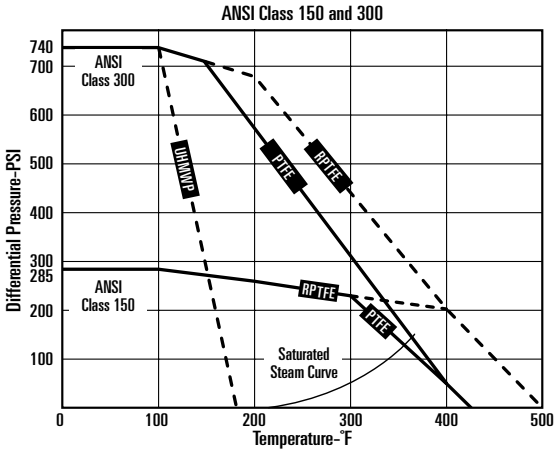
Minimum Operating Temperature
-35°F

Maximum Temperature for Seats and Seals at 0 PSIG
PTFE 425°F
Reinforce PTFE 450°F
UHMWPE 180°F

Steam Rating (Saturated)
PTFE 70 WSP
RPTFE 150 WSP
(On/off service only. For throttling application, consult factory.)

Technical Charts and Data

Pressure Temperature Chart

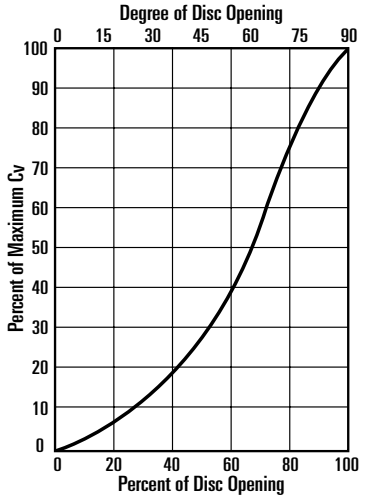


NOTE: Maximum continuous operating temperature. Consult factory for application above those shown.

Flow Coefficients (Cv)

Valve Size (in.)	CV Flow Coefficient	
	Class 150	Class 300
2 ½	90	
3	205	205
4	403	403
5	640	
6	1075	1075
8	2243	1950
10	3885	3100
12	5925	4400
14	7307	
16	10,050	
18	13,075	
20	18,050	
24	26,863	
30	Consult Factory	
36		

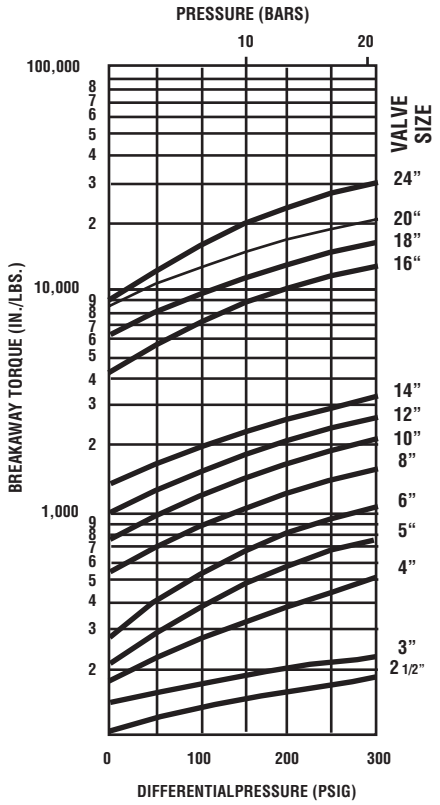
Flow Characteristics Curve



NOTE: Flow coefficients (Cv) based on ambient water temperature

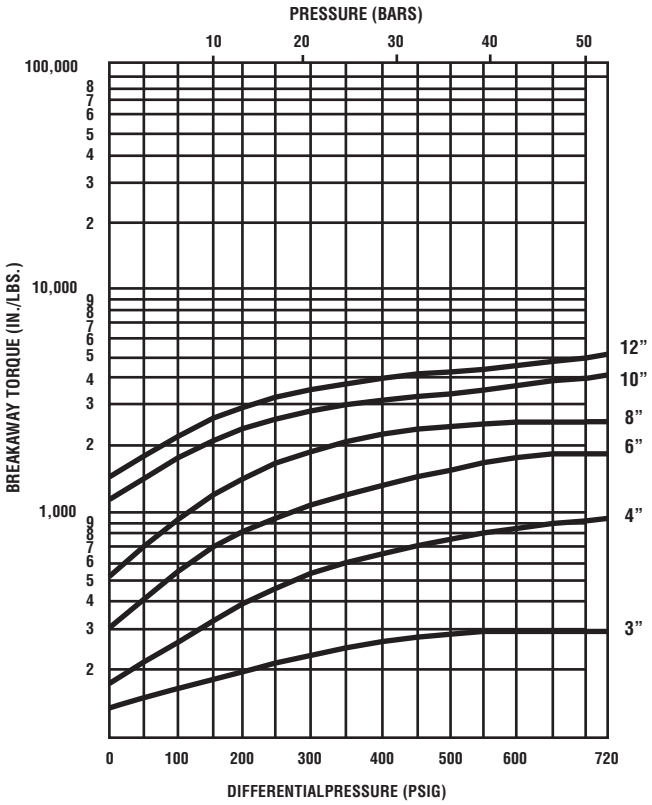
TECHNICAL DATA

Torque - ANSI Class 150



NOTE: Torques based on clean service only. Certain highly viscous or abrasive services could increase these values.

Torque - ANSI Class 300



NOTE: Torques based on clean service only. Certain highly viscous or abrasive services could increase these values.

Operating Torque

Firesafe Operating Torque (in-lbs.)									
PSIG	**100**		**200**		**285**		**400**	**600**	**740**
Size (in.)	**150#**	**300#**	**150#**	**300#**	**150#**	**300#**	**300#**	**300#**	**300#**
2 1/2	420		470		500				
3	500	500	610	610	720	720	750	775	8250
4	900	900	1100	1100	1300	1300	1400	1500	1700
5									
6	1600	1600	2400	2400	3000	3000	3200	3400	3500
8	2300		2900		3500				
10	3700		4400		4600				
12	7000		9100		9900				
14	9000		12000		13000				
16	14000		18000		24000				
18	18000		29000		34000				
20	22000		36000		44000				
24	27000		48000		60000				
30	29000		39000		49000				
36	48000		69000		82000				

NOTE: All torques based on clean service without safety factor

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Kennedy Valve | Tyler Union | McWane Ductile | Waterman | Tri-Seal Valve