

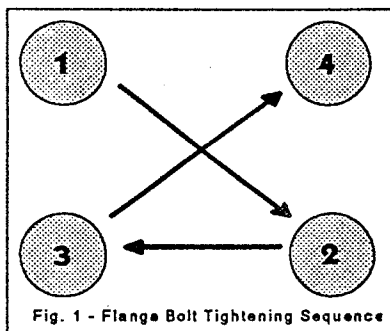
# INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

## F91C150/300 AND F91S150/300 UNIBODY FLANGED END BALL VALVES

### A. INSTALLATION

1. The above listed standard valves are Bi-directional and as such can be installed for flow in either direction.
2. When installing a flanged valve, always be sure that new flange gaskets of the proper material for the intended service media are used. For example, if the above valves were purchased for their API-607 fire-safe rating, the use of rubber gaskets would defeat this purpose.
3. When installing flange bolts, always tighten in a sequential pattern as indicated in Figure 1. Bolts should be tightened to the appropriate torque as specified by SAE for the grade bolts being used.

**NOTE:** After bolts have been tightened, it is good practice to re-check flange bolt torques 1/2 to 1 hour after initial tightening (particularly when stainless steel bolting is used).



### B. VALVE OPERATION

1. Milwaukee Ball Valves feature Quarter-Turn operation. Turning the valve handle 90° counter-clockwise will fully open the valve.
2. The valve handle also serves as a ball orifice position indicator. When the valve handle is parallel to the pipe, the valve is open, when perpendicular to the pipe, the valve is closed.
3. Milwaukee Valves are designed to provide optimum bubble tight performance when properly selected in accordance with the valves pressure/ temperature rating unless otherwise noted in the seat material selection chart. See Table #3.

4. To provide the longest possible service life, a hand-operated ball valve should be operated in either it's full open or fully closed position. If an intermediate operating position is to be utilized, consult the factory. Excessive pressure drops could adversely affect the service life of the valve.
5. Milwaukee valves are factory assembled using an F.D.A. approved lubricant. If the presence of this lubricant is objectionable, the valve can be ordered from the factory assembled without lubricant by specifying the "AD" option. If the lubricated valve is already in the field, the lubricant can be removed by thoroughly flushing the valve with a solvent.
6. The below listed torques are the normal expected maximum breakaway torques. These values represent the force required to begin to open the valve. Typically, this breakaway torque is the maximum requirement of the valve during a close to open, open to close cycle. Bear in mind that these values 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 will cause an increase in torque requirements. If these valves are to be automated, a 20% safety factor for clean, on-off-service should be added to the published torque to arrive at a minimum actuator output requirement. For sizing an actuator for severe applications, always consult your Milwaukee distributor.

VALVE SIZE	0-300 PSID MAXIMUM BREAKAWAY OR MAXIMUM RUN TORQUE (in lbs.)	301-740 PSID MAXIMUM RUN TORQUE (in lbs.)	Cv
1/2	40	40	15
3/4	60	60	25
1	125	125	37
1½	190	190	90
2	240	300	120
3	500	750	460
4	900	1,000	640
6	1,900	N/A	1,025

## C. MAINTENANCE

During its normal service life, the only maintenance that may be required by your Milwaukee ball valve should be periodic stem seal adjustment. If leakage at the stem is noted, simply tighten packing plate bolts until leakage subsides. 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 timely maintenance could result in 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. Installations that do not allow access to valve stem area for maintenance should be avoided.

## D. REBUILDING

**WARNING:** Most standard bi-directional ball valves on the market today, regardless of manufacturer, can trap fluids under pressure in the valve cavity when closed. If your Milwaukee ball valve has been used to conduct hazardous media, the following steps should be taken *prior* to removal from line.

**CAUTION:** Always advise maintenance personnel when they are maintaining or rebuilding a valve that has been conducting a hazardous material. The use of eye protection and protective clothing must be stressed.

1. Relieve line pressure.
2. Place the 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 pipeline.
3. To replace seats and seals.
  - a. Place the valve in a vise or other suitable retention tool in such a fashion so as to allow access to the valve retainer.

**NOTE:** Before attempting to remove the valve retainer, refer to TABLE #2 "Assembly Torque Requirements." If a properly sized retainer wrench is not available, strict adherence to Step b. is *critical*.

- b. Using a grease pencil or other suitable non-destructive marking method, make a scribe mark across one section of the raised face flange including split. Measure and take note of the dimensional relationship between the raised face portion of the valve flange and the retainer. Using a suitable piece of hex stock, begin to remove the retainer while using the scribe mark to count the number of rotations required to break thread engagement of the retainer. Be sure to write down

all data for reference when re-installing the retainer.

- c. Place valve in its closed position and remove body seal, ball and seats.

**NOTE:** If the condition of the ball surface allows for its re-use, be careful to handle and store the ball in such a fashion so as to prevent subsequent damage to its critical surfaces.

- d. Remove the valve handle and packing plate and remove the valve stem through the body cavity.
  - e. Remove the stem thrust washer from the stem (or the valve body cavity if the washer did not remove from the cavity with the stem).
  - f. Remove the follower.
  - g. Remove stem seal(s).
  - h. Examine all metallic sealing surfaces such as ball, stem shank and the surfaces on the retainer and body that contact the seats and body seal.

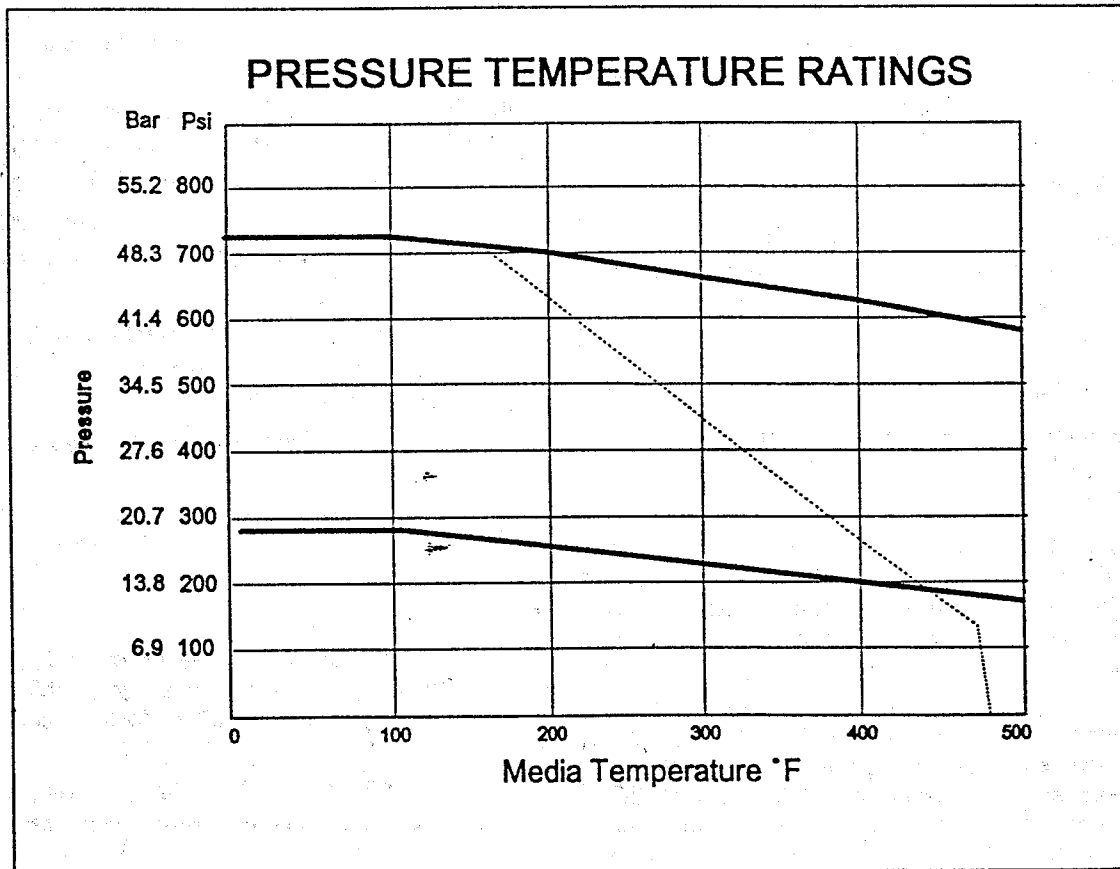
In some cases, slight scratches across the sealing surfaces of the retainer, body and stem can be removed using a fine emery cloth. If scratches on sealing surfaces of retainer or body are severe and cannot be removed, the entire valve must be replaced. If ball and/or stem is excessively damaged, ball and stem kits can be ordered. Consult the factory.

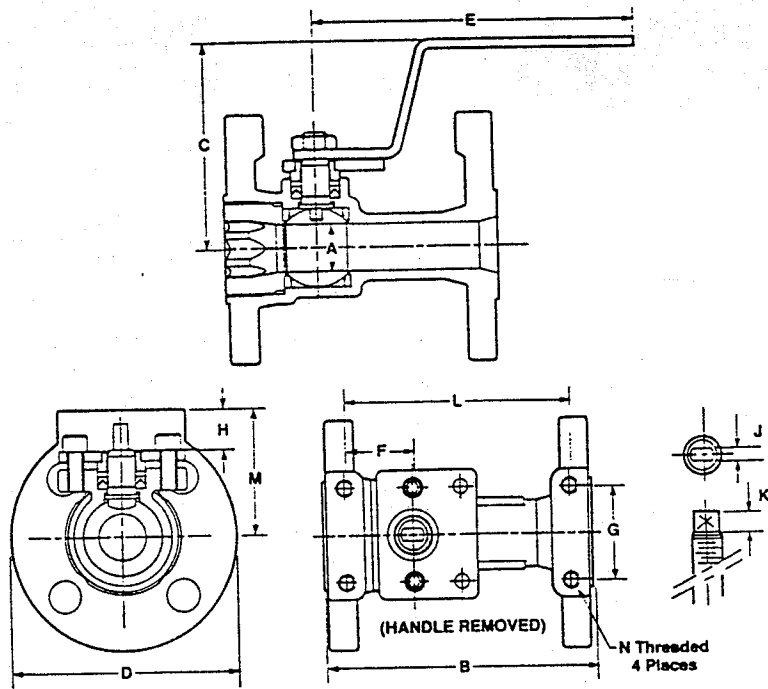
4. Re-assembly -- Having assured that all critical surfaces have been inspected, cleaned and/or replaced, re-assembly can begin.
  - a. Lightly lubricate seats and body seal using a grease that is compatible with the service media.
  - b. Install body side seat.
  - c. Install the new thrust washer on the stem and install through the body cavity.
  - d. Install stem seal(s).
  - e. Install packing plate with the capscrews loosely assembled.
  - f. Rotate stem so that stem flats are perpendicular to valve body. This will allow for ball installation.
  - g. Re-install ball.
  - h. Place seal on retainer.
  - i. Place retainer side seat on retainer and re-install retainer in accordance with reference data generated in Step 3B or to the torques listed in Table #2.

**NOTE:** To prevent galling of retainer threads, lubricate retainer threads with an anti-galling compound (i.e. Lockite Anti-Seize).
  - j. Tighten packing plate capscrews in accordance with torque requirements listed in Table #2.
  - k. Re-install stop plate, handle and handle nut.

TABLE 2 RE-ASSEMBLY TORQUES

NOMINAL SIZE	PACKING CAPSCREW TORQUE (in - lbs)	RETAINER * TORQUE (ft - lbs)	HANDLE NUT TORQUE (in - lbs)
1/2"	25 - 50	40 - 60	25 - 50
3/4"	40 - 60	40 - 60	50 - 75
1"	40 - 60	100 - 150	50 - 75
1 1/2"	50 - 75	200 - 250	75 - 100
2"	50 - 75	250 - 300	75 - 100
3"	50 - 75	500 - 600	100 - 125
4"	50 - 75	700 - 900	100 - 125
6"	75 - 100	1100 - 1300	100 - 125





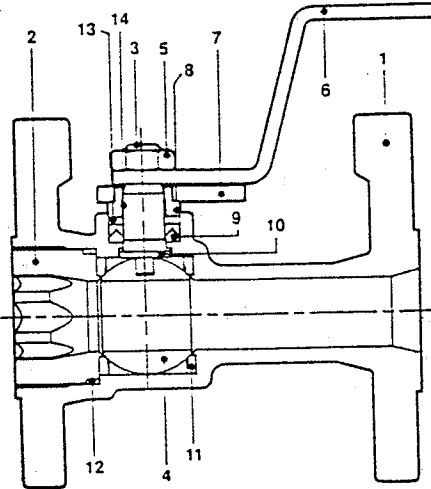
**ANSI 150 LB. - DIMENSIONS-INCHES**

SIZE	A	B	C	D	E	F	G	H	J	K	L	M	N
1/2	.50	4.25	2.50	3.50	5.06	.81	1.75	.71	.20	.32	2.88	1.88	5/16 - 18
3/4	.69	4.62	3.65	3.88	5.97	.94	1.75	.57	.28	.48	3.13	2.06	5/16 - 18
1	.88	5.00	3.80	4.25	5.97	1.25	1.75	.82	.28	.48	4.19	2.46	5/16 - 18
1½	1.25	6.50	4.77	5.00	8.85	1.81	1.75	.06	.45	.63	5.63	2.50	5/16 - 18
2	1.50	7.00	4.72	6.00	8.85	2.07	2.25	.31	.45	.63	6.19	3.00	5/16 - 18
3	2.31	8.00	6.80	7.50	11.00	3.09	3.50	.34	.45	1.20	7.13	3.75	3/8 - 16
4	3.12	9.00	7.96	9.00	14.12	3.92	4.00	.30	.66	1.38	8.00	5.27	7/16 - 14
6	4.50	10.50	9.44	11.00	18.00	4.70	4.00	.58	.91	1.88	9.44	6.63	7/16 - 14

**ANSI 300 LB. - DIMENSIONS-INCHES**

SIZE	A	B	C	D	E	F	G	H	J	K	L	M	N
1/2	.50	5.50	2.50	3.75	5.06	.81	1.75	.71	.196	.32	4.00	1.88	5/16 - 18
3/4	.69	6.00	3.65	4.62	5.97	.94	1.75	.84	.275	.48	4.38	2.31	5/16 - 18
1	.88	6.50	3.80	4.88	5.97	1.25	1.75	.91	.275	.48	5.69	2.56	5/16 - 18
1½	1.25	7.50	4.77	6.12	8.85	1.81	1.75	.62	.451	.63	6.56	3.06	5/16 - 18
2	1.50	8.50	4.72	6.50	8.85	1.97	2.25	1.10	.451	.63	7.50	3.80	5/16 - 18
3	2.31	11.12	6.80	8.25	11.00	2.91	3.50	1.18	.451	1.20	9.88	4.60	3/8 - 16
4	3.12	12.00	7.96	10.00	14.12	3.92	4.00	.80	.661	1.35	10.68	5.77	7/16 - 14
6	4.50	15.88	9.44	12.50	18.00	4.70	4.00	1.11	.912	1.88	14.38	7.38	7/16 - 14

# MATERIAL LIST



PART	F91C 150/300	F91S 150/300
1. Body	Carbon Steel ASTM-A216 WCB	Stainless Steel ASTM A351/A744 GR. CF8M
2. Ball Retainer	Carbon Steel ASTM-A216 WCB	Stainless Steel ASTM A351/A744 GR. CF8M
3. Stem	Stainless Steel ASTM-A276 Type 316	Stainless Steel ASTM-A276 Type 316
4. Ball	Stainless Steel ASTM-A276 Type 316	Stainless Steel ASTM-A276 Type 316
5. Lever Nut	Stainless Steel 18-8	Stainless Steel 18-8
6. Handle	1/2"-2" Stainless Steel Type 304 3"-6" Ductile Iron	1/2"-2" Stainless Steel Type 304 3"-6" Ductile Iron
7. Packing Plate	1/2"-2" Stainless Steel Type 304 1 1/2"-6" ASTM A351 GR. CF8M	1/2"-2" Stainless Steel Type 304 1 1/2"-6" ASTM A351 GR. CF8M
8. Gland Follower	Stainless Steel Type 304	Stainless Steel Type 304
9. Packing	Graphite	Graphite
10. Thrust Washer	Reinforced PTFE w/15% Glass Fiber	Reinforced PTFE w/15% Glass Fiber
11. Seat (02 Standard)	w/15% Glass Filled Reinforced PTFE	w/15% Glass Filled Reinforced PTFE
12. Retainer Seal	PTFE	PTFE
13. Ground Washer	Graphite	Graphite
14. Bearing, Gland Follower	PTFE	PTFE

# ORDERING INFORMATION

## 4" F90SS150R-02-XH-AD

Size  
1/2" - 6"

Family:  
F90 = Unibody Flanged,  
Non API Fire Safe  
F91 = Unibody Flanged,  
API Fire Safe

Body Material:  
C = Carbon Steel  
S = Stainless Steel  
M = Monel  
H = Hastalloy C

Ball/Stem Material:  
C = Carbon Steel-Plated  
S = Stainless Steel  
M = Monel  
H = Hastalloy C

End Connection Type:  
150 = ANSI 150 Flanged  
300 = ANSI 300 Flanged

Seat Material:  
01 = Virgin PTFE  
02 = Reinforced PTFE  
03 = Steam Service  
(Modified PTFE)  
04 = UHMW  
Polyethylene  
05 = PFA

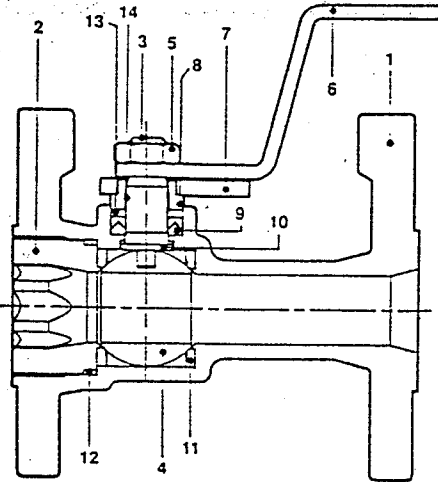
Port Size:  
R = Single Reduced Bore

External Options:  
XH = Extended Handle  
(1/2" - 2" Only)  
OH = Oval Handle  
(1/2" - 1" Only)  
OS = Stainless Oval Handle  
(1/2" - 1" Only)

Internal Options:  
AD = Assemble Dry  
CC = Chlorine Prepared  
GB = Grounded Ball  
GS = Grounded Stem  
OC = Oxygen Clean  
VB = Vented Ball  
VT = Virgin PTFE Seal

Note: If specifying more than one internal option, list ALPHABETICALLY.

# MATERIAL LIST



PART	F91C 150/300	F91S 150/300
1. Body	Carbon Steel ASTM-A216 WCB	Stainless Steel ASTM A351/A744 GR. CF8M
2. Ball Retainer	Carbon Steel ASTM-A216 WCB	Stainless Steel ASTM A351/A744 GR. CF8M
3. Stem	Stainless Steel ASTM-A276 Type 316	Stainless Steel ASTM-A276 Type 316
4. Ball	Stainless Steel ASTM-A276 Type 316	Stainless Steel ASTM-A276 Type 316
5. Lever Nut	Stainless Steel 18-8	Stainless Steel 18-8
6. Handle	1/2"-2" Stainless Steel Type 304 3"-6" Ductile Iron	1/2"-2" Stainless Steel Type 304 3"-6" Ductile Iron
7. Packing Plate	1/2"-2" Stainless Steel Type 304 1 1/2"-6" ASTM A351 GR. CF8M	1/2"-2" Stainless Steel Type 304 1 1/2"-6" ASTM A351 GR. CF8M
8. Gland Follower	Stainless Steel Type 304	Stainless Steel Type 304
9. Packing	Graphite	Graphite
10. Thrust Washer	Reinforced PTFE w/15% Glass Fiber	Reinforced PTFE w/15% Glass Fiber
11. Seat (02 Standard)	w/15% Glass Filled Reinforced PTFE	w/15% Glass Filled Reinforced PTFE
12. Retainer Seal	PTFE	PTFE
13. Ground Washer	Graphite	Graphite
14. Bearing, Gland Follower	PTFE	PTFE

# ORDERING INFORMATION

## 4" F90SS150R-02-XH-AD

Size  
1/2" - 6"

Family:  
F90 = Unibody Flanged,  
Non API Fire Safe  
F91 = Unibody Flanged,  
API Fire Safe

Body Material:  
C = Carbon Steel  
S = Stainless Steel  
M = Monel  
H = Hastalloy C

Ball/Stem Material:  
C = Carbon Steel-Plated  
S = Stainless Steel  
M = Monel  
H = Hastalloy C

Seat Material:  
01 = Virgin PTFE  
02 = Reinforced PTFE  
03 = Steam Service  
(Modified PTFE)  
04 = UHMW  
Polyethylene  
05 = PFA

External Options:  
XH = Extended Handle  
(1/2" - 2" Only)  
OH = Oval Handle  
(1/2" - 1" Only)  
OS = Stainless Oval Handle  
(1/2" - 1" Only)

Port Size:  
R = Single Reduced Bore

End Connection Type:  
150 = ANSI 150 Flanged  
300 = ANSI 300 Flanged

Internal Options:  
AD = Assemble Dry  
CC = Chlorine Prepared  
GB = Grounded Ball  
GS = Grounded Stem  
OC = Oxygen Clean  
VB = Vented Ball  
VT = Virgin PTFE Seal

Note: If specifying more  
than one internal option,  
list ALPHABETICALLY.

