FLOWSERVE

Worcester Controls

18484-F

2½" – 6" 45, 2" – 4" 59 Three-piece Ball Valve Including PT Series

Installation, Operation and Maintenance Instructions

CAUTION: Flowserve recommends that all products which must be stored prior to installation be stored indoors, in an environment suitable for human occupancy. Do not store product in areas where exposure to relative humidity above 85%, acid or alkali fumes, radiation above normal background, ultraviolet light, or temperatures above 120°F or below 40°F may occur. Do not store within 50 feet of any source of ozone.

A. INSTALLATION

1. Valve may be installed for flow or vacuum in either direction. Valves with upstream relief hole (V3 option) are one-way valves. Use care to exclude pipe sealants from valve cavity.

2. For weld end style valves (SW, BW):

***Note**: Prior to welding, THOROUGHLY CLEAN ALL JOINT SURFACES to prevent contamination.*

The PT59 and PT45 "AG" & "GG", and the 2" PT59 "AZ" & "GZ" valves (identified with V67 option code) are compatible with welding temperatures and therefore are weld-as-is and do not have to be disassembled prior to being welded inline. A red welding tag will be attached to the valve. If for some reason these valves are disassembled, new "S" gasket, grafoil laminated gasket or Graph-Lock body seals, and new seat back seals must be used to prevent leakage. When welding these valves, the ball must be open to prevent adhesion of weld spatter to the ball. Use STICK or MIG welding and allow valve and joint to cool to the touch between passes. All other valves are not compatible with welding temperatures and must be welded inline as follows:

a. Tack weld valve in place.

b. With the valve open, remove all of the body bolts or studs and remove the center section from the valve. Note: For 2" AF59 valves, spread pipe ends to clear centering rings. Close valve and remove the ball, seats and both body seals. Return the body back to its original position in the pipeline and temporarily secure it with two body bolts or studs diagonally opposite each other.

c. Proceed to weld valve inline. If gas welding, do not play flame on valve body.

d. Allow valve to cool, remove two body bolts or studs and reassemble the valve. Note that all valves with Teflon or UHMWPE body seals are reassembled using the original white Teflon or opaque white UHMWPE body seals, while 2½" 45 and 2" 59 valves with "S" gasket body seals are reassembled using new "S" gaskets, 2" 59 valves with Graph-Lock body seals are reassembled using new Graph-Lock body seals, and valves with Grafoil laminated gaskets are reassembled using new gaskets. "S" gaskets, Graph-Lock body seals and Grafoil laminated gaskets are shipped separately from the valve and the temporary seals, found in the valve as received, are not to be reused. The wide flange of the "S" gaskets must face the valve body.

e. Tighten the body bolts or studs evenly and diagonally opposite each other, alternating in a criss-cross pattern to the following torques:

Carbon Steel Bolts or Studs			Stainless Steel Bolts or Studs		
Bolt Dia.	**in-lbs**	**ft.-lbs**	**Bolt. Dia.**	**in-lbs**	**ft.-lbs**
7/16"	480-540	40-45	7/16"	336-384	28-32
½"	720-780	60-65	½"	504-552	42-46
9/16"	1080-1140	90-95	9/16"	682-730	57-61
⅝"	1370 -1430	114-119	⅝"	972-1020	81-85
¾"	1800-1860	150-155	¾"	1402-1450	117-121

3. **CAUTION**

a. The "S" gasket body seals (G & M) and Graph-Lock body seals (Z), found in some 2½" 45, 2" 59 valves, Grafoil laminated gaskets (G), and the seat back seals (used with "A" or "G" seated valves) are not reusable. Upon disassembly of the valve, the seals must be replaced. Also ensure that the Teflon coating of the "S" gasket is not scratched or damaged during installation. Light lubrication of these seals and gaskets can help to prevent damage.

b. If graphite parts are used, handle them gently on the flat surfaces rather than the O.D. These parts can be easily damaged by squeezing the O.D. These parts will not work if they are cracked or broken. Light flaking of the material is acceptable.

c. The ball used in "A" or "G" (filled metal) seated valves has a special anti-galling coating. DO NOT use uncoated balls with filled metal seats. To ensure proper contact with the seat, do not drop, dent or scratch the ball during handling.

B. OPERATION

1. The operation consists of turning the handle and/or stem ¼ turn clockwise to close and ¼ turn counter-clockwise to open. When stop plate pointer and/or stem flats or groove is in line with the pipeline, the valve is open. This valve may also be automated.

2. Worcester valves will provide bubble-tight shutoff when used in accordance with Worcester's published pressure/temperature ratings. Valves with "G" seats meet the leakage rates of ANSI B16.104 Class VI.

3. It is not good practice to leave a ball valve partly open (throttling operation) without knowledge of the pressure drop and flow at that position. This information can be obtained from the factory.

4. As shipped from the factory, valves (except oxygen prepared (V20, V33 or prefix code "x") and valves with V38 or V46 option) contain a silicone-based lubricant. This is for break-in purposes and may be removed with a solvent if found to be objectionable for a particular application. Lacquer thinner will remove the lubricant. "A" or "G" (filled metal) seated valves should not be operated without a break-in lubricant.

5. Media which can solidify, crystallize or polymerize should not be allowed to stand in valve cavities.

6. **Torque Requirements**: Operating torque requirements will vary depending on the length of time between cycles, line pressure, type of valve seats, and the media in the system. For a detailed analysis of valve torque requirements, see the Worcester Actuator Sizing Manual.

C. MAINTENANCE

If seepage is noted at stem, tighten retaining nut ⅛ turn at a time until seepage stops.

CAUTION: Excessive tightening causes higher torque and shorter stem seal life.

D. REBUILDING

⚠ WARNING: BALL VALVES CAN TRAP PRESSURIZED FLUIDS IN BALL CAVITY WHEN CLOSED.

Special handling and cleaning procedures are necessary for oxygen and vacuum service valves. Refer to industry practices when overhauling these units.

If the valve has been used to handle hazardous media, it must be decontaminated before disassembly. It is recommended that the following steps be taken for safe removal and disassembly:

- Relieve the line pressure. Operate the valve prior to attempting removal from line.
- Place valve in half open position and flush the line to remove any hazardous material from valve body.
- All persons involved in the removal and disassembly of the valve should wear the proper protective clothing such as a face shield, apron, etc.

1. A standard repair kit may be ordered for these valves consisting of seats, seat back seals (for use with "A" or "G" seats only), body seals, thrust bearing stem seal(s), and Belleville washers (used with graphite stem seal or V51 option only.) Specify the valve size and series, the material of the seat and body seal and the "R" number (Revision No.) of the valve or for non-standard valve, the "P" number, "T" number, "C" number or similar number. The information is found on either the stop plate, mounting bracket nameplate or the nameplate on the valve body. Some Series, such as PT, AF and V51 option have their own repair kits, which are ordered by the prefix or adding V51 suffix. If valve body is stainless steel, place a "6" after valve size in repair kit ordering code.

NOTE: *The V51 high-cycle stem packing option can not be used with AF Series, or oxygen service valves, or valves with "X" or "G" seats.*

Repair Kit Ordering Examples:

3" RK 45 RT R2
3" RK 59 PT R2 V51
4" RK 45 PT TO914
2" 6AF RK59 PZ RO

CAUTION: If the seats and seals installed differ from those removed, the valve nameplate or stop must be replaced or remarked to indicate the altered materials and ratings or valve tagged to so indicate.

2. Disassembly of Valve:

   a. Place valve in open position. Remove all body nuts and bolts or studs and lift out center section from between pipe ends. The 2" AF59 valve requires spreading the pipe ends to clear the pipe end centering rings. Remove handle assembly (if any) by unscrewing hex head screw.

   b. With valve in closed position, remove old seats, seat retainer(s) (if present), seat back seals (if any), body seals and ball.

   c. Prevent stem from turning by holding inside body. (The ball can be inserted and prevented from rotating with a non-metallic rod such as a screwdriver handle. This will hold the stem stationary without damaging the ball.)

   d. Remove retaining nut, and stop (or spacer, if actuated valve) from stem.

   e. Push stem into body cavity and remove. Retain follower and centering washer(s). There are no washers on 2" and 2½" valves.

   f. Remove and discard stem seal(s), stem seal protector (if any) and thrust bearing, which may be stuck on the stem or in the body cavity. Remove Belleville washer(s) (if any).

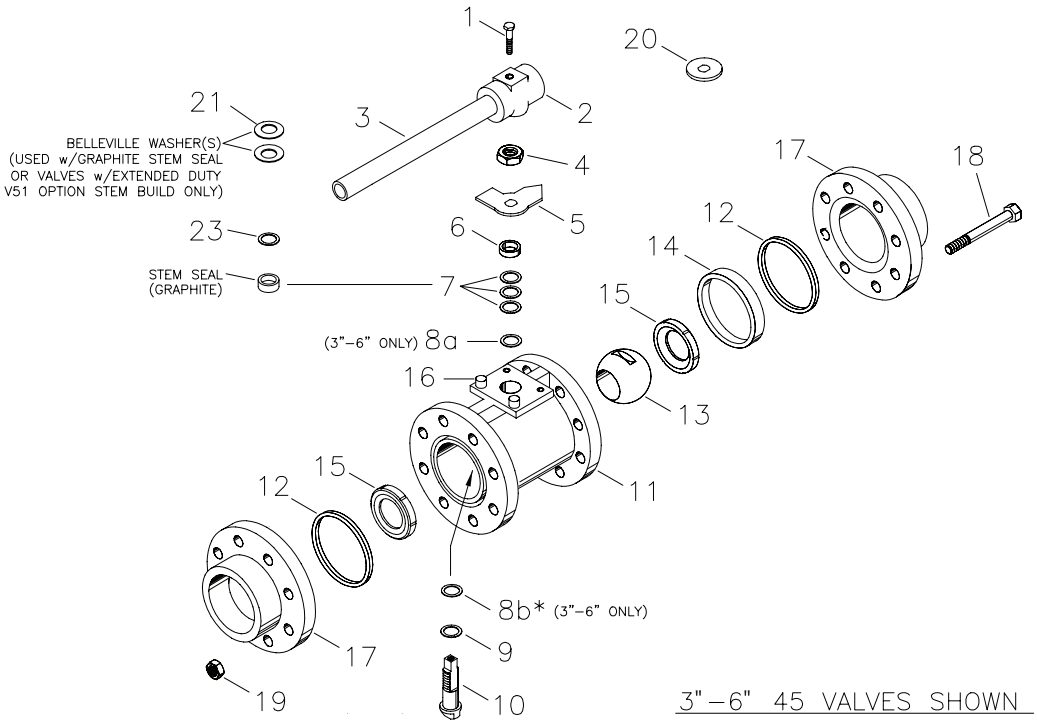
3. Visual Inspection:

   a. The ball and the surfaces against which the seats and seals are installed should be clean, undamaged, and free of pit marks and scratches. Light marring from the action of the ball against the seats is normal and will not affect the operation of the valve. Visible tracking is normal. Tracking which can be felt is a potential problem.

   b. The stem and body surfaces that the thrust bearing and stem seals contact must be undamaged, clean, and free of pit marks and scratches.

Visit www.boighill.com to request a quote.

Item	Qty.	Description
1	1	Hex Head Bolt
2	1	Wrench Block
3	1	Wrench Extension
4	1	Retaining Nut
5	1	Stop
6	1	Follower
7	1 or 3	Stem Seal (See Note 1)
19	6	Body Nut (2½" & 3" 45, 2" 59)
8a	1	Centering Washer (3"–6" Only)
8b*	1	Centering Washer (3"–6" Only)
9	1	Thrust bearing
10	1	Stem
11	1	Body
12	2	Body Seal (See Note 2)
13	1	Ball
14	1	Seat Retainer (See Note 3)
15	2	Seat
16	2	Stop Screw
17	2	Pipe End (BW, SE, SW)
18	6	Body Bolt (2½" & 3" 45, 2" 59)
	8	Body Bolt (4" 45, 3" 59)
	8	Body Studs (6" 45, 4" 59)
	4	Body Bolt (2" 59 4-Bolt Design)
19	6	Body Nut (2½" & 3" 45, 2" 59)
	8	Body Nut (4" 45, 3" 59)
	16	Body Nut (6" 45, 4" 59)
	4	Body Nut (2" 59 4-Bolt Design)
20	1	Spacer (Actuated Valves Only – See Note 1)
21	1 or 2	Belleville Washer (See Note 1)
22	2	Centering Ring (2" AF59 only)
23	1	Stem Seal Protector (V51 Option Only)
24	2	Seat Back Seal (Used with "A" or "G" Seats Only)



3"–6" 45 VALVES SHOWN

*This washer is not used on all 3"–6" valves. Reuse existing washer when present.

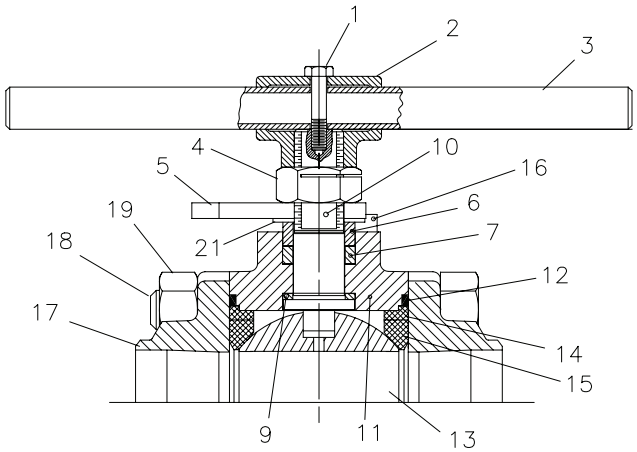
NOTE 1:
(1) GRAPHITE STEM SEAL IS USED WITH 2" AF59 AND VALVES WITH FILLED METAL (G) OR HIGH-PER FILL (X) SEATS, INCLUDING (1) OR (2) BELLEVILLE WASHERS.

(3) POLYFILL STEM SEALS, (1) PEEK STEM SEAL PROTECTOR, (1) POLYFILL THRUST BEARING AND (2) BELLEVILLE WASHERS ARE USED WITH EXTENDED DUTY V51 OPTION STEM BUILD.

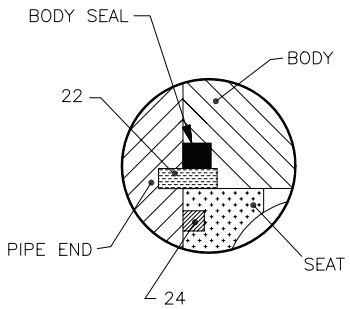
WHEN (2) BELLEVILLE WASHERS ARE USED THE SPACER IS DELETED.

NOTE 2:
SOME 2" AND 2½" VALVES MAY USE METAL "S" GASKETS.

NOTE 3:
MOST 2" 59 4-BOLT VALVES DO NOT USE SEAT RETAINERS. FOR 2" 59 4-BOLT VALVES WITH FILLED METAL (A) OR (G), OR HIGH-PER FILL (X) SEATS, TWO-SEAT RETAINERS ARE USED (ONE ON EACH END OF VALVE).



2" 59 4–BOLT



4. Reassembly:

***NOTE**: Valves with a pressure relief hole in the ball (V3) must be re-assembled with the hole upstream when valve is closed, to ensure that cavity relief is upstream. Any valve with this V3 option will have an arrow on the body pointing downstream. This arrow is stamped on the body or on a metal tag welded to the body.*

a. Lightly lubricate the ball, seats, body seals, seat back seals (if used), stem seal(s), stem seal protector (if any) and thrust bearing with a lubricant compatible with the media being handled, except for valves with V20, V33 or V38 options which are assembled dry. White petroleum jelly is a good general-purpose lubricant. For oxygen prepared valves (prefix code "X") use a PTFE-based lubricant such as Fluorolube S-30 or equivalent.

   For valve repair kits with "A" or "G" seats, the filled metal seats will be lubricated at the factory. If they are not, they should be lubricated as noted in paragraph section B.4 and also as stated above. DO NOT operate a newly rebuilt valve using filled metal seats without break-in lubricant. The seat back seals will be pre-assembled to the seat backs.

b. On 3", 4" and 6" valves, reinstall stem centering washer(s) into the recesses in the body. When only one washer is used, it goes inside recess at top of the body and under the stem seal(s).

c. Place new thrust bearing on stem and insert through body cavity. The thrust bearing can be distinguished from the stem seals by the darker color of the 25% filled fluorocarbon used in the thrust bearing. Thrust bearings and stem seals are the same color and size, and are interchangeable on 2½" size valves only. For valves with graphite stem seal and thrust bearing, the stem seal is metallic sliver gray and thicker than the thrust bearing. See paragraph section A.3 for handling of graphite parts.

d. Install new stem seal(s) over the top of the stem and down into the recess in the top of the body. The follower is installed on the top of the stem seal(s). Place stop (or spacer) onto the valve stem.

   If a graphite stem seal is used and does not easily seat into the body recess, use the follower to gently push it in place. Add new Belleville washer, concave side up over follower (Belleville washer is used with graphite stem seal only).

   For valves with V51 high cycle stem packing option, the thrust bearing and stem seals are the same size and color, and they are interchangeable. A stem seal protector of PEEK material and tan in color is also used and installed over stem seals.

   Two Belleville washers are used with this V51 option and also with automated valves that have a graphite stem seal, and they are installed over the follower with the larger diameter sides touching each other. The stem spacer is not used.

e. Replace retaining nut onto stem. Using handle or wrench to prevent stem rotation, tighten the retaining nut to fully compress packing, then back off ⅛ turn. Excessive tightening causes higher torque and shorter stem seal life. For valves with graphite stem trim tighten retaining nut to fully flatten Belleville(s), then back off ⅛ turn.

f. Replace handle assembly (wrench block and wrench extension) and tighten hex head screw (manual valves only).

g. With the valve in the closed position, (stop plate pointer and/or stem flats or groove going across pipeline) install ball, new seats, seat back seals (if any), and seat retainer(s) (if used). Open the valve and install new body seals or gaskets. The optional "S" gasket body seals (2" and 2½" sizes only) are installed with the wide flanges facing inward. Before putting the center section back between the pipe ends, make sure that the seat back seals (if any) are located properly inside the seat groove. If not, seal damage and valve leakage will result.

   For 2" AF59 valves, insert centering rings into pipe ends before installing center section of valve.

h. Place center section between pipe ends and replace bolts or studs and torque to figures in paragraph section A.2.e.

   After the valve is assembled it should be cycled a few times to ensure that the valve operates smoothly with no chattering of the ball. The normal operation is an initial high torque to "break" from the closed position to a smooth running lower torque mid-cycle, to a high torque at the end of the 90° cycle or open position. The torque is similar when closing.

   When ordering parts, please provide the part name and the following information from the valve stop plate or welded on nameplate:

   1. Valve size, style and revision number:
      e.g., 3" 45 46 RT SE R2 Stem
   2. Valve size, style and five-character code, known as a "P" number, "T" number, "C" number, or similar number the designation for a non-standard product:
      e.g., 4" 4566 RT SW TO914 Ball.

   The terminology shown in the parts listings on the previous page is standard.

FLOWSERVE CORPORATION
FLOW CONTROL DIVISION
1978 Foreman Drive
Cookeville, Tennessee 38501 USA
Phone: 931 432 4021
Facsimile: 931 432 3105
www.flowserve.com

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