

# FIGURE HPA HIGH PERFORMANCE BUTTERFLY VALVE



## INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

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### SCOPE

The purpose of this manual is to ensure that the valves supplied are properly installed, handled, operated and maintained to give trouble free performance.

This manual covers FNW high performance butterfly valves from 2"–24" wafer and lug designs.

#### NOTES:

- Read the manual carefully before removal, installation, maintenance or operation of the valve.
- Refer to general arrangement drawings to identify the design as valves may vary in features and parts.
- Pay attention to cautions and illustrations carefully.

# FIGURE HPA HIGH PERFORMANCE BUTTERFLY VALVE



## 1. SAFETY INSTRUCTIONS

**Do not exceed the valve pressure-temperature rating limitations.** Exceeding the pressure-temperature rating limitations marked on the valve may result in significant damage to the valve and personal injury. Users of these valves should ensure that the process design pressure-temperature is less than or equal to the rated pressure-temperature of the valves. If required, user should incorporate appropriate limiting and monitoring devices in the system for safe operation of the valve.

**Use the valve for specified application only.** User to ensure that the valve is used only for the specified application as agreed between the manufacturer and the purchaser.

**Follow the safety rules and regulations.** User must be aware of all the safety rules and regulations related to the environment in which the valve is to be used.

**Do not disassemble the valve or remove it from the pipeline while the valve is pressurized.** Disassembling or removing a pressurized valve will result in uncontrolled pressure release. Always isolate the relevant part of the pipeline, release the pressure from the valve and remove the media before moving the valve. Be aware of the type of media involved. Protect people and the environment from any harmful or poisonous substances. Make sure that no dust or dirt can enter the pipeline during valve maintenance.

**Beware of disc movement and keep hands, tools and other foreign objects out of the valve opening while valve is actuated.** Disconnect supply sources and make sure valve actuation is in "fail safe" state before performing any work. Failure to do this may cause damage and/or personal injury.

## 2. DELIVERY

- 2.1 HPA Butterfly Valves are shipped with the disc in fully closed position for the protection of the disc.
- 2.2 The valve specification details are marked on the nameplate and valve body. A typical nameplate is shown in Fig. 1.
- 2.3 The valves are delivered with end protecting caps to avoid damage of internals and flange facing.
- 2.4 Handwheels for gear operated valves are packed separately in the same packing box. The pin is attached to the gear box shaft using an adhesive tape.
- 2.5 For lever operated valves, the hand lever is either assembled with the valve or shipped loose depending on size.

PROD. CODE:-
REF NO:-
SIZE (NPS):-
ASME BODY PR. CLASS:-
PR. AT 38°C (100°F):-
Pmax (Tallow):-
BODY/DISC:-
STEM/SEAT:-
SR. NO:-
TAG NO:-
MFG DATE:-

**Fig. 1** Sample nameplate



### CHECK:

- Tag numbers and details of valves upon receipt.
- Valves thoroughly for any damages that may have occurred during transit.
- Condition of end protectors.

In case of any discrepancies in the above-mentioned details or discovery of any kind of damage to the valve upon delivery, please contact a FNW or manufacturer representative.

## 3. VALVE HANDLING AND STORAGE

### 3.1 HANDLING

- 3.1.1 Valve shall be properly supported and secured before moving to prevent possible damage to valve and property or harm to personnel.
- 3.1.2 Do not drag the valve on the ground during transportation. A minimum of one-foot height from the ground is recommended while moving the valve.
- 3.1.3 When handling the valve or the valve package, bear in mind its weight. Never lift the valve or valve package near the actuator or operator. Do not sling crane straps or wires around any automation components such as lever, gear, actuator, accessories and tubing to avoid any load acting on it. Place the lifting device securely around the valve body while handling the valve. Refer to Fig. 2.

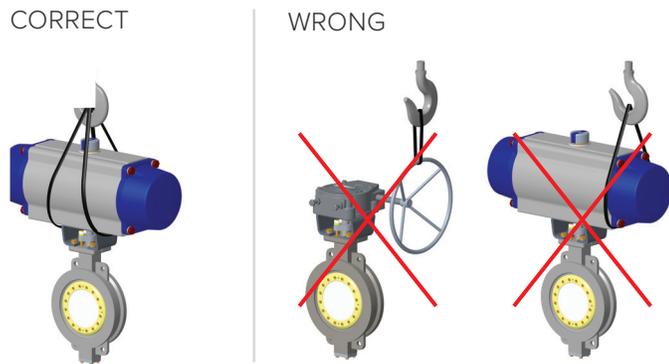


Fig. 2 Lifting the valve

- 3.1.4 Valve shall not be handled with the handwheel fixed to the gear unit. The handwheel shall be dismantled before handling and transporting of the valve.
- 3.1.5 Extreme care shall be taken to check that the stem and automation components (such as lever, gear, actuator, accessories, and tubing) are not bent, pinched or damaged during handling.

### 3.2 STORAGE

- 3.2.1 Clean the valves and ensure that end protectors are in place before the valves are stored, as dry contaminants like dust, sand, grit, etc. can scratch the metal seating surfaces and the soft inserts, leading to leakages on full pressure operation.
- 3.2.2 Valves shall be stored in an indoor/covered area which is dust free, dry and well ventilated to protect from rain and storm. Refer to Fig. 3.

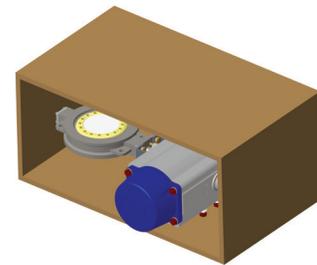


Fig. 3 Properly covered storage

- 3.2.3 The valve shall always be maintained in an ambience with temperature higher than the dew point with a preferred range from 40°C to 29°C at the storage location to avoid collection of water droplets on the valve surface.
- 3.2.4 Do not keep the valve directly on the floor. Valve shall be placed on a wooden pallet with at least 6" from the floor.
- 3.2.5 Care should be exercised not to damage the extended portions of the stem housing and automation components during storage.
- 3.2.6 Do not apply tar, grease or any other foreign materials inside the valve aside from proper lubrication, as it could impair valve performance.

#### DO NOT:

- Store the valve outdoors.
- Store valve without end protectors.
- Place or drag the valve on the floor.
- Place and/or handle valve in positions that may damage the valve or its accessories.



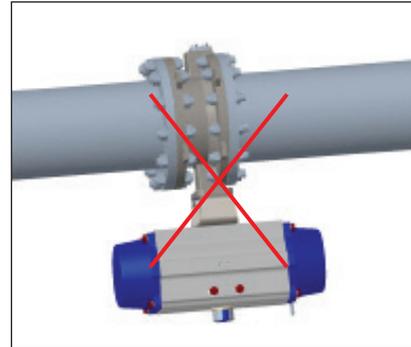
#### CAUTION:

- Improper storage and/or handling may cause valve assembly damage or deformation, which will affect performance of the valve. Disc/seat damage can impair sealing capabilities and increase operation torque.
- Valve must not be stored for more than 2 years.
- When valves are stored for a long time, open and close the valve once every 3 months.

## 4. VALVE INSTALLATION

### 4.1 GENERAL

- 4.1.1 Carefully unpack the valve and check for tags or identification plates, etc. If the nameplates and/or tags are lost or destroyed during shipment or storage, or if it is not legible, contact an FNW or manufacturer representative for assistance before installing the valve.
- 4.1.2 Check valve for any damage and check condition of end protectors. Upon discovery of any damage, contact an FNW or manufacturer representative prior installation.
- 4.1.3 Look for any special warning tags or plates attached to the valve; if there are any, take appropriate action.
- 4.1.4 HPA Series butterfly valves are recommended to mount the valve in the preferred flow.
- 4.1.5 Never install the valve with the actuator on the underneath side of the pipeline. Refer to Fig. 4.
- 4.1.6 It is recommended to remove all foreign particles from the pipeline by flushing it with a suitable fluid. Corrosion inhibitors shall be added to the flushing medium to prevent any corrosion from trapped fluids.
- 4.1.7 Remove the valve end protectors and protective sheath within the flow bore of the valve.
- 4.1.8 After removal of end protectors, thoroughly clean valve ports and cavities and ensure the flange gasket faces are free from dust or debris.



**Fig. 4** Incorrect mounting position (picture for reference).

- 4.1.9 Gasket contact faces of the valve and pipe flanges shall be inspected thoroughly for scratches or any defects.
- 4.1.10 After cleaning, operate the valve for at least two complete cycles before installing.



### CAUTION:

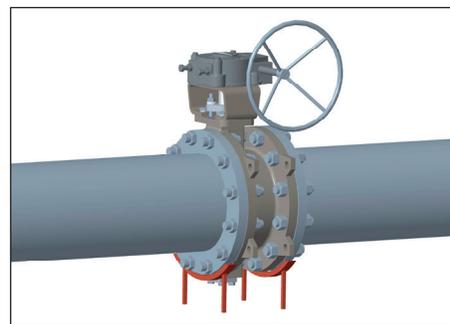
- If valve is not cleaned or if cleaning is done only after valve installation, valve cavities may form a natural trap in the piping system and any impurities not dissolved or washed out by the flushing fluid/line fluid may settle in such cavities and adversely affect valve performance.
- Only properly qualified personnel must do the installation.

### 4.2 FLANGED ENDS

Refer Appendix section A1 for applicable standards.

- 4.2.1 The valve shall be in the closed position during installation process, except in case of fail OPEN valves; in such case additional care shall be taken not to damage the disc surface by any debris.
- 4.2.2 The pipes must be properly aligned, and provisions made to minimize stresses from thermal expansion. Always review pipe manufacturer's recommendations.
- 4.2.3 In cases of pipes with long overhangs, adequate support shall be provided at the flange ends of the pipe to avoid bending of pipes due to weight of the valve. Refer to Fig. 5.
- 4.2.4 Align the bolt holes of the valve end flange and pipe flange.

- 4.2.5 Insert gasket and tighten the bolts. Flange bolts shall be tightened evenly, using a torque wrench, in cross rotation to prevent damage to flanges.
- 4.2.6 For sequence of tightening of bolts. Refer to Appendix, section A2.



**Fig. 5** Support to the valve (picture for reference).

# FIGURE HPA

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### 4.3 CLEANING AND TESTING

- 4.3.1 Clean the pipeline by flushing the system with a compatible liquid to remove any contaminants that may be present in order to avoid scratches being formed on the sealing surfaces by these contaminants.
- 4.3.2 While testing the pipeline, ensure that the media is clean and free from sand, dirt, pebbles, etc. Add corrosion inhibitors to the testing media to avoid any internal corrosion of the valve.
- 4.3.3 Operate the valve once to check for smooth operation.
- 4.3.4 If no obvious problems are observed, test pressure according to applicable standard may be applied and leak tightness and operability may be checked.



#### CAUTION:

The improper alignment of the pipe and the valve during installation can lead to unbalanced tightening of the flanges which may cause excessive stress on the bolts and lead to leakage. Ensure all nuts, flanges and cables are properly fastened.



#### CAUTION:

- Faulty installation may lead to valve and/or pipeline damage.
- Avoid contact with the valve closure element during cycling.
- During shell test, the valve shall be in the partially open position to prevent the seat from being subjected to the shell test pressure.



#### CHECK:

- Installation of the valve as per the piping drawing.
- End protectors are not removed during storage and only to be removed before valve installation.
- General pipe and valve cleanliness.
- Face to face and/or end to end dimensions.
- Conformance of piping connectors with relevant standards or norms.
- Parallelism of piping flanges or piping connectors.
- Alignment of the bolt holes of the pipe and valve flanges.
- For availability of enough space for the valve and its accessories and for easy operation.
- The suitability and efficiency of valve and accessories support.

# FIGURE HPA

## HIGH PERFORMANCE BUTTERFLY VALVE



### 5. VALVE OPERATION

#### 5.1 GENERAL

- 5.1.1 Operational life of the valve can be maximized if the valve is used within the rated range, in accordance with pressure, temperature and corrosion data.
- 5.1.2 For arrangement of the internal construction, refer to the Exploded View of the valve.

#### 5.2 ACTUATION

General instructions given below, refer to separate operator IOMs for further details.

- 5.2.1 **Mechanism:** The stem of the valve is rotated by using a wrench/handle/lever for small sized valves and by a gear unit in case of larger valves. Electric/hydraulic/pneumatic actuators can also be used for actuation.
- 5.2.2 **Wrench/handle/lever operated** valves shall be opened or closed by turning the operator by a quarter turn (90°).
  - Valve in open position – the operator is in parallel (in-line) with the valve or pipeline.

- Valve in closed position – the operator is perpendicular (crossed) with the valve or pipeline.

- 5.2.3 **Gear units** are provided on valves for easier operation. Usually, clockwise operation is for closing and anti-clockwise is for opening of the valve. The position of the valve can be noted by the position indicator provided on top of the gear unit. The number of turns will depend on the gear unit used. Gear units are of the self-locking type (i.e., the line fluid will not make the valve rotate) and the gear units have factory-set mechanical stopper screws for setting the exact opening and closing positions.

Refer to section 8.4 for how to adjust the mechanical stoppers, if required.

- Worm gear operators are packed with grease. Normally the grease is suitable for -20°C (-4°F) to 80°C (176°F). For other applications, consult the nearest FNW or manufacturer representative.



#### CAUTION:

- HPA series butterfly valves are quarter-turn valves (i.e., 90° rotation of the disc makes the valve either fully opened or fully closed).
- Butterfly valves employed for throttling duties shall be limited to a max pressure drop of 20% of the inlet. Pressure at max open position.
- Recommended controls angles are between 25°-70°. Preferred angles for control valve sizing is 60°-65° open.
- Valve is to be operated for maximum 5 m/s velocity for liquids and 100 m/s for gaseous fluids.



#### CAUTION:

- Keep hands, tools and other foreign objects out of the internals of valves. A remotely actuated valve might close without warning causing physical damage and personal injury. Disconnect valve from supply sources and make sure valve automation is in fail safe state before performing any maintenance work.
- In cases when valves are supplied as bare stem as per customer requirements, please ensure that the connecting devices for operator do not exert any axial or radial loads on the valve stem as it may lead to bending of the stem and excessive loading on the ball. Ensure the end cover of actuator position is interchanging to valve position when installing/mounting actuator to valve. Brackets, mounting hardware of product, are designed to support the weight of the automation assembly. Do not apply additional weight as this may result in leakage and performance failure of the valve assembly, causing possible seat damage and increase operation torque.
- Bare stem position indicator: When valve is closed, the position of the stem double-D or keyway is perpendicular to pipeline; when valve is open, the position of the stem double-D or keyway is parallel to pipeline.

# FIGURE HPA

## HIGH PERFORMANCE BUTTERFLY VALVE



- Grease should be changed as follows: If operated frequently, after approximately 3 years. If operated rarely, after approximately 5 years.
- Recommended Greases: Servo gem EP2 (Extreme Pressure), Mobilux EP2, Oline EP2, Chevron EP2.

5.2.4 **Electric actuator**, which gives a multi-turn output, is fitted on the gear unit. The actuator drives the gear unit which in turn rotates the stem. Electrically actuated valves are provided with declutching mechanism for manual operation of the valve. For electric actuators, FNW or manufacturer recommends to strictly adhere to the instructions as per actuator manufacturer’s manual.

5.2.5 **Pneumatic or hydraulic actuator** is fitted directly on the valve, without a separate gear unit, unless a separate manual override is requested as these actuators have built-in quarter turn mechanisms. For these actuators, FNW or manufacturer recommends to strictly adhere to the instructions as per actuator manufacturer’s manual.

### 5.3 FIRE SAFETY (FIRE SAFE DESIGN)

In the event of fire, the soft seals may burn out. In this condition, the line pressure pushes the metal seat ring against the disc. The disc makes contact with the metal seat ring to provide a fire safe metal sealing. Valves are tested to meet the fire safety requirements of international standards according to either API 607.

**CAUTION:**

- Apply gradual force on the handwheel of the gear operator and do not apply sudden impacts.
- Do not apply extra leverage (using pipe/bar) when the end stops of the gear operator reach its extreme position.

**DO:**

- Ensure that the valves in the pipeline affected by a fire are replaced as soon as possible for satisfactory performance.

**CAUTION:**

- Use the valve only for applications for which it is designed and recommended for to avoid unexpected failure of the valve.
- Suspended particles in the line fluid may damage the soft components in valve.

## 6. TROUBLESHOOTING

The table below lists some common problems that may be encountered with double eccentric butterfly valves, the probable causes and recommended remedy to the problems. However, judgment and experience must be applied when working on the valves in actual field, based on site conditions.

Symptom	Possible Cause	Corrective Action
Stem packaging leaks from top	<ol style="list-style-type: none"> <li>1. Gland bolts loose</li> <li>2. Packaging damaged or missing</li> <li>3. Seal misaligned</li> </ol>	<ol style="list-style-type: none"> <li>1. Tighten the bolts</li> <li>2. Replace packaging (shut down first)</li> <li>3. Replace and aligned it correctly</li> </ol>
Body gasket leaking	<ol style="list-style-type: none"> <li>1. Body bolts loose</li> <li>2. Body gasket damaged</li> </ol>	<ol style="list-style-type: none"> <li>1. Tighten the body bolts</li> <li>2. Remove gasket</li> </ol>
Valve leaks at closed position	<ol style="list-style-type: none"> <li>1. Seat is worn or damaged</li> <li>2. Disc edge is worn or damaged</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace seat as described in disassembly and assembly</li> <li>2. Replace the disc. (Consult factory for potential application problem.)</li> </ol>

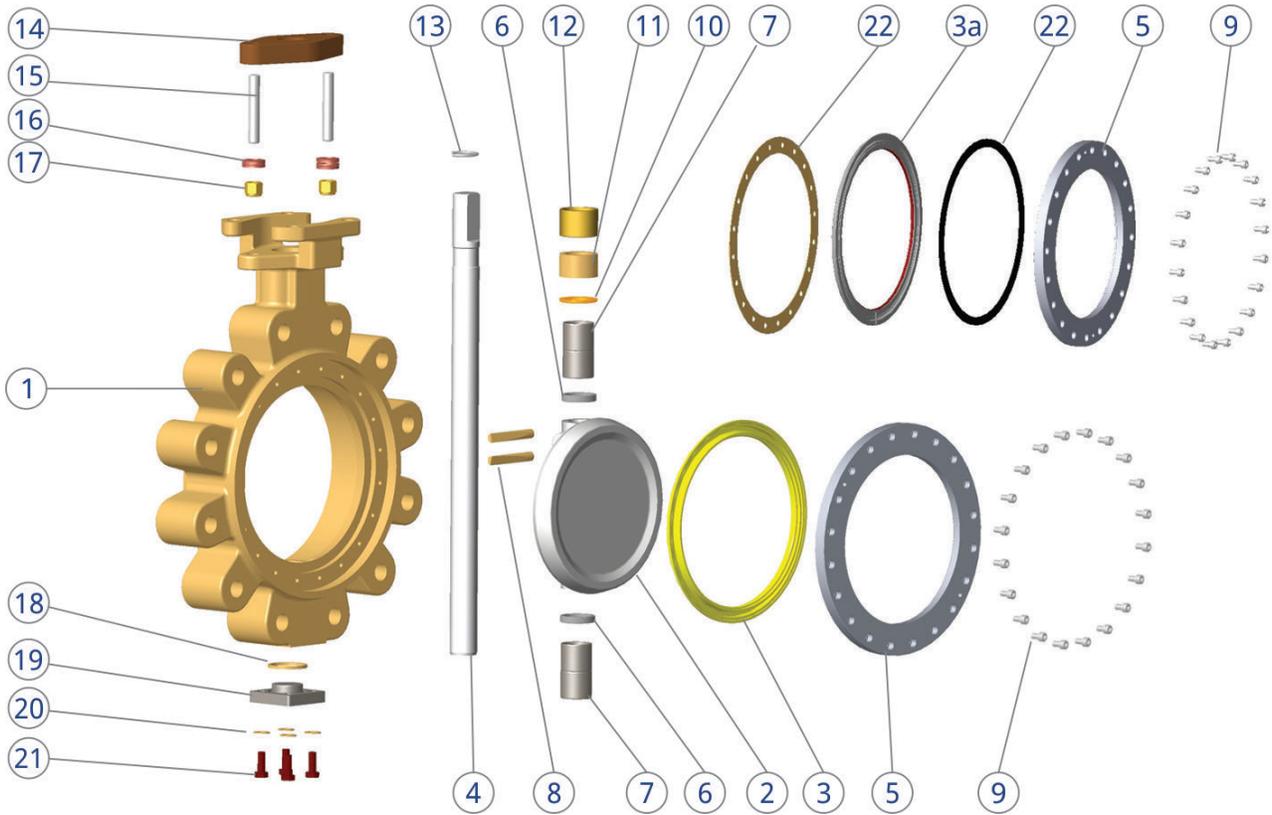
**Table 1** Troubleshooting check list

# FIGURE HPA HIGH PERFORMANCE BUTTERFLY VALVE



## 7. EXPLODED VIEW

A: 2"-12" (Lug/Wafer)



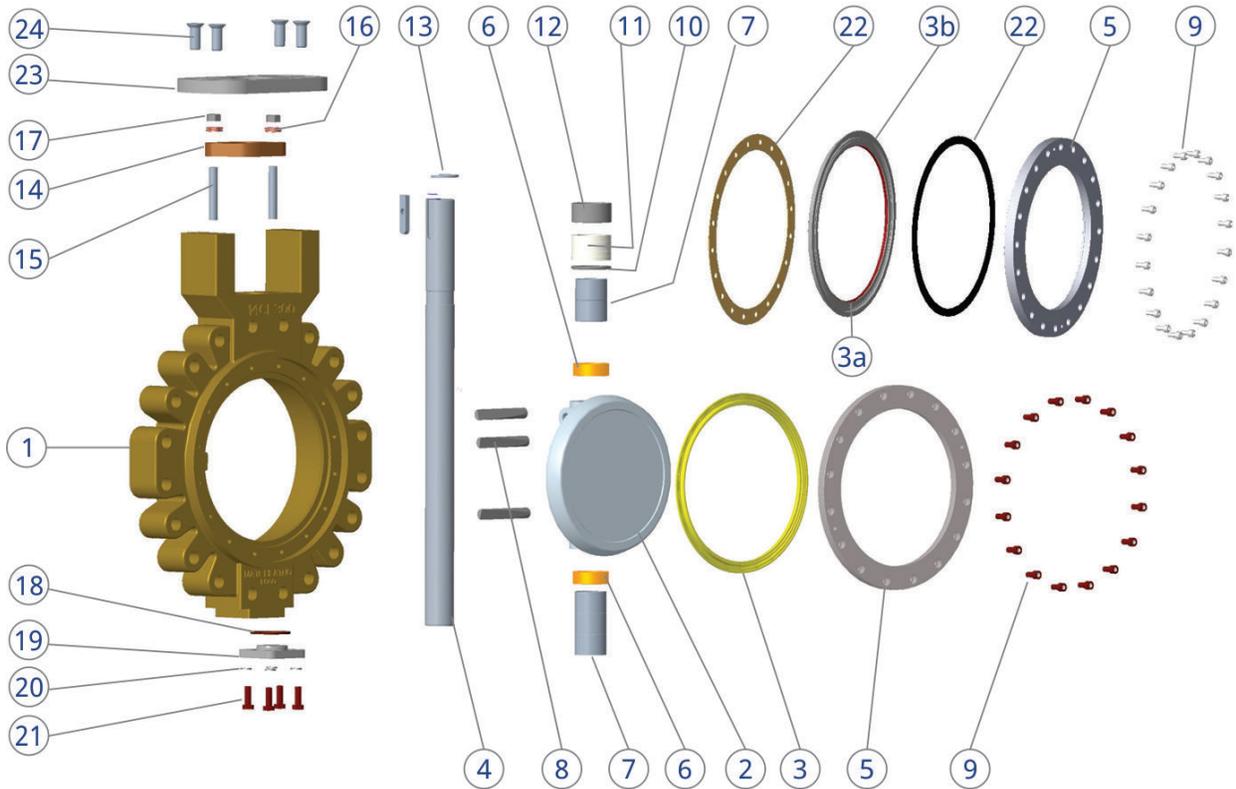
Item	Description
1	Body
2	Disc
3	Seat (Soft) Seat (Fire Safe)
4	Stem (Soft Seat) Stem (Fire Seat)
5	Seat Retaining Ring
6	Disc Spacer
7	Bearing (Soft Seat) Bearing (Fire Safe)
8	Wedge Pin
9	Retainer Screw
10	Packing Spacer

Item	Description
11	Gland Packing (Soft Seat)
12	Gland Packing (Fire Safe)
13	Stem Retainer
14	Gland Flange
15	Stud
16	Belleville Spring
17	Hex Nut
18	Cover Gasket (Soft Seat) Cover Gasket (Fire Safe)
19	Bottom Cover
20	Punch Washer
21	Hex Hd Screw
22	Seat Gasket (Fire Safe)

# FIGURE HPA HIGH PERFORMANCE BUTTERFLY VALVE



B: 14"–24" (Lug/Wafer)



Item	Description
1	Body
2	Disc
3	Seat (Soft) Seat (Fire Safe)
4	Stem (Soft Seat) Stem (Fire Seat)
5	Seat Retaining Ring
6	Disc Spacer
7	Bearing (Soft Seat)
8	Wedge Pin
9	Retainer Screw
10	Packing Spacer
11	Gland Packing (Soft Seat)
12	Gland Packing (Fire Safe)

Item	Description
13	Stem Retainer
14	Gland Flange
15	Stud
16	Belleville Spring
17	Hex Nut
18	Cover Gasket (Soft Seat) Cover Gasket (Fire Seat)
19	Bottom Cover
20	Punch Washer
21	Hex Hd Screw
22	Seat Gasket (Fire Safe)
23	Mounting Plate
24	Counter Sunk Screw

## 8. PERIODIC MAINTENANCE



### CAUTION:

- For your safety, it is important that these precautions be taken before removal of the valve from the line or before disassembly.
- De-pressurize the line before removing the bolting.
- Wear protective clothing and equipment appropriate for the line fluid.
- Ensure cavity pressure is relieved.
- Cycle the valve several times before disassembly to relieve pressure completely.
- Disconnect valve from supply sources and make sure valve actuation is in fail safe state before performing any maintenance work.

### 8.1 GENERAL

- 8.1.1 For extended valve life and better operability, FNW or manufacturer recommends periodic inspection and maintenance of the valves as per the procedure explained below. To avoid valve failure during operation, all valves in a process plant should be periodically inspected thoroughly to detect the wear of disc, seats, seals and even body. It is recommended that on such occasions seats, seals and bushings should be replaced.
- 8.1.2 The type of process, fluids involved, working conditions and location of the valves in the process plants will determine the frequency of periodic inspection/maintenance to be made at the time of partial or total shutdown of the plant. Preventive maintenance is essential as failure to do so may cause an emergency shutdown of the plant.
- 8.1.3 Use genuine FNW spare parts only for maintenance and replacements. Refer to Section 9.
- 8.1.4 Studs and nuts fixing pipeline flanges and valves to be properly tightened and in position, if found loose.
- 8.1.5 Gland nuts and bolts to be inspected and ensured that they are intact and not loosened during service. Properly tighten the nuts by means of spanner or wrench if found loose. Over tightening of gland nut may damage the gland seal packing and stem.

- 8.1.6 Once the valve is repaired, it should undergo a complete set of tests to make sure that the valve is adequate for required working conditions. Hydro/ Pneumatic tests should be carried out as per the specifications relevant to the valve (Refer to GAD or specifications related to order).

### 8.2 OPERABILITY AND TORQUE

- 8.2.1 Check for ease of operation of the valve.

### 8.3 STEM LEAKAGE

- 8.3.1 Any major leakage at the stem region can easily be detected by observing for unexpected pressure drops in the pipeline.
- 8.3.2 Minor leakage at the stem region may be detected by using soap bubbles, after removing the operator (actuator/gear/lever) unit.

# FIGURE HPA HIGH PERFORMANCE BUTTERFLY VALVE



## 8.4 GEAR STOPPER ADJUSTMENT PROCEDURE

- 8.4.1 Before changing the setting, ensure that the nut locking washer is intact. If not intact, then only proceed for resetting.
- 8.4.2 Loosen the lock nut by unlocking the nut washer. Loosen left side bolt for one rotation. Rotate the handwheel in the clockwise direction to close the valve till it is stopped by the left side bolt.
- 8.4.3 The adjustment of valve should be within  $\pm 5^\circ$  of mean position indicated by the indication plate.
- 8.4.4 Check valve leakage after adjustment. If valve is found leaking again repeat the procedure. If no leakage is detected, then tighten the lock nut and lock washer.

## STOPPER BOLT ARRANGEMENT

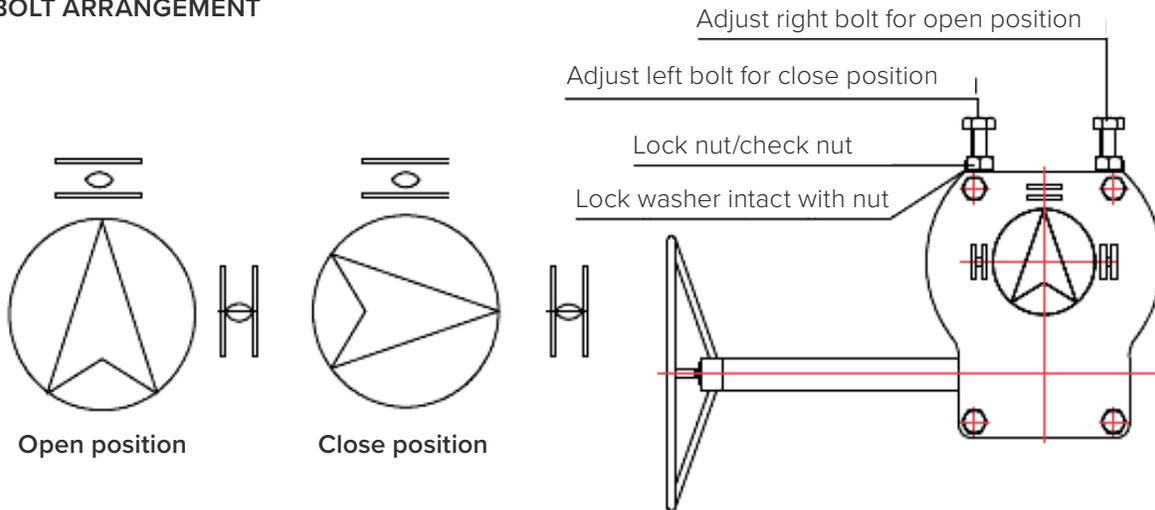


Fig. 6 Gear unit



### CAUTION:

- If complete disassembly becomes necessary, replacement of seats and all seals is recommended.
- Once the valve is dismantled, the soft seals and gasket shall be changed. Make sure these parts are available before dismantling of valve.

## 8.5 DISMANTLING PROCEDURE

- 8.5.1 Depressurize the line and open the valve to drain the line.
- 8.5.2 Before removal from the line, cycle (open and close) the valve to relieve residual pressure in the body cavity.
- 8.5.3 Always fully close valve before removing from line to avoid damage to disc.
- 8.5.4 Valves shall be slung and supported properly before loosening flange bolts.
- 8.5.5 Place the valve on a platform or base and transport to repair shop.
- 8.5.6 Before disassembly, cycle (open and close) the valve several times to clear it of fluid; then flush with water.
- 8.5.7 Valve shall be positioned vertically by resting body side flange on clean ground surface (preferably covered with rubber sheet).

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- 8.5.8 Close the valve completely and remove operator unit. Unscrew the lever lock bolt. Lift the lever by pressing the latch of the lever out of the stem in case of hand lever operated valve.
- 8.5.9 Disconnect supply source and remove the pneumatic/electric/hydraulic actuator unit. Do not remove a spring return actuator unless a stop-screw is carrying spring force. Lift the gear operator out of the stem by removing the bolts in case of gear operated valve.
- 8.5.10 Secure body in a suitable clamping device without damaging it.
- 8.5.11 Remove all retainer screws (9) and remove the seat retainer (5).
- 8.5.12 Remove the seat (04) and replace it.
- 8.5.13 Remove counter sunk screws (24) and mounting plate (23) on wafer and lug valve sizes above 12" (see 9 B). For double flange type (see 9 C), remove hex bolts (23), spring washers (25) and bracket (23).
- 8.5.14 Remove the hex nuts (17) and Belleville washer (16) from gland flange (17) and remove the gland flange(14). The studs (15) do not have to be removed.
- 8.5.15 Remove the wedge pin welds by grinding or machining off the welds and remove the wedge pin (8).
- 8.5.16 Remove the stem retainer (snap ring) (13) and pull the stem (3) out and remove the disc spacers (6), gland (12) gland packing (11).
- 8.5.17 Gently pull the disc (2) from the body (1).
- 8.5.18 Remove the bottom flange bolt (21), spring washers (20) and remove the bottom cover (19).
- 8.5.19 Remove the bottom gasket (18).
- 8.5.20 Remove top bearings (7) either from top of the valve or the waterway.
- 8.5.21 Remove the bottom bearings (7).



## CAUTION:

- Before removal of the valve, ensure that the line is fully depressurized.
- Improper handling may cause disc damage or deformation of stem or seat, which will affect sealing and operational torque of the valve.
- Ensure that the disassembled components are kept in a clean place so that there will be no damage to the components.

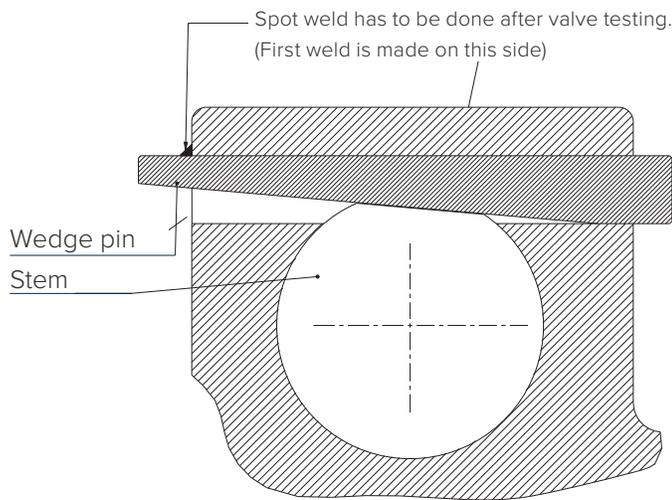
## 8.6 REPAIR OF COMPONENTS

- 8.6.1 The metallic parts should be cleaned.
- 8.6.2 After cleaning components, examine for damaged parts. Ensure that there are no scoring marks on the metallic sealing surfaces. Check the seals for scratches/wear.
- 8.6.3 Replace the damaged parts. The parts such as seats and stem packing bearings are recommended to be replaced with new ones whenever the valve is disassembled.

## 8.7 ASSEMBLY PROCEDURE

- 8.7.1 Inspect and clean all parts to make sure they are free of dust, grit or other material. A new set of gasket and seals shall be used once the valve is disassembled. Refer to Section 9 for recommended spare parts. Replace any damaged parts.
- 8.7.2 Before assembly, visually inspect all the valve components for damage. Look for damage to the seating areas on the disc and check parts as per bill of material.
- 8.7.3 Apply rust preventative oil to parts, wherever applicable (i.e., body and disc stem bore in case of CS material).
- 8.7.4 Place the body (1) on a clean work surface. Install the bearings (7) with the help of mandrill into the upper stem bore and lower stem bore of the body. Refer to 9A, 9B, 9C for quantity of bearings required for each construction.
- 8.7.5 Place the cover gasket (18) from bottom side.
- 8.7.6 Assemble bottom cover (19) and fasten the bolts (21) with spring washers (20) of bottom cover.
- 8.7.7 For smooth assembly of the stem (3) into the disc (2), it may be necessary to coat the stem (3) and disc bore lightly with a lubricant compatible with the media to be handled by the valve.

- 8.7.8 Slide the stem (3) through the top bearing (08) and engage the top disc spacer (6) toward the bonnet when applicable, place the disc (2) and slide the stem (3) through disc stem bore. Place the lower disc spacer (6) and push the stem through lower bearing (7) into the body (1).
- 8.7.9 Insert the wedge pins (8) into disc holes for wedge pin. Take care that pin flat surface matches to stem flat surface and drive them into place. When pins are correctly installed, the drive shaft will be as shown in Fig. 7. Cycle the disc 4 to 5 times.
- 8.7.10 Place the packing spacer (10) into stuffing box region and insert the set of gland packing (11) into stuffing box above the packing spacer.



**Fig. 7**

- 8.7.11 Place the gland (12) above the gland packing.
- 8.7.12 Install the stem retainer (snap ring) (13) on the stem.
- 8.7.13 Fix the gland flange assembly (14) through stem, insert the Belleville washers (16) and install nut (17), tighten the nut (17) slowly till to the ISO top flange.
- 8.7.14 Install the Seat (3) into the Seat Retainer Ring (5).
- 8.7.15 Insert the seat and seat retainer assembly into the body with disc in closed position. Apply anti-seize grease for threading area. Insert the retainer bolts in alternating sequence.
- 8.7.16 Cycle the disc and set disc in closed position.
- 8.7.17 Disc pins to be Tig spot welded after leakage testing.
- 8.7.18 When the gear operator or hand lever or actuator is reassembled on the valve, it may be necessary to adjust gear operator or hand lever, or actuator

travel stops to ensure proper setting of the butterfly in the open and closed position).

- 8.7.19 In case of gear operated valves, install bracket and coupling and fix the gear unit. Ensure smooth operation of valve during opening and closing.
- 8.7.20 In case of actuated valves, install the actuators per manufacturer's IOM. Ensure the indicator of actuator position is matching to valve position when installing and mounting actuator to valve.
- 8.7.21 After assembly, the valve shall be tested for leakage across the seats and through the stem seals.

## 8.8 PROCEDURE FOR GLAND PACKING REPLACEMENT

If further adjustment of the gland packing is inappropriate, adopt the following procedure for its removal and replacement.

- 8.8.1 Remove the operator (lever, gear box or actuator) in accordance with section 8.5.
  - Remove key from shaft (if applicable).
  - Remove gland nuts.
  - Remove gland, gland flange.
  - Remove gland packings using a pointed instrument.
- 8.8.2 Fit new gland packing rings.
- 8.8.3 Refit gland and gland flange.
- 8.8.4 Refit gland nuts, tighten evenly until heavy resistance is felt. During this operation, turn the stem to ensure that the packing is not over tightened.
- 8.8.5 Refit the operator.

# FIGURE HPA HIGH PERFORMANCE BUTTERFLY VALVE



## 8.9 PROCEDURE FOR SEAT REPLACEMENT

- 8.9.1 Remove the retainer ring as per procedure described in section 8.5.
- 8.9.2 Remove retainer ring gasket in fire safe seat design. This is not applicable for soft seat.
- 8.9.3 Remove fire safe seat/soft seat.
- 8.9.4 Remove body gasket (applicable for fire safe design).
- 8.9.5 If the seat is tight, move the disc to open position and if still tight, gently drive the seat out of the body using smooth blunt instrument.
- 8.9.6 Ensure that all components are clean. Position the disc in closed position.
- 8.9.7 Refit components by using steps in section 8.7.



**CAUTION:**

- Improper handling may cause disc and seat damage or deformation of stem, which will affect sealing and operational torque of the valve.
- Faulty installation may lead to valve and/or pipeline damage.
- Ensure that the soft parts are changed once they are removed from the valve.
- Avoid contact with the valve closure element during cycling.

## 9. RECOMMENDED SPARE PARTS

- 9.1 Before the start of repair operations, we recommend that one set of spares as given in Table 2 should be available.
- 9.2 For normal operation (2 years), we recommend one set of spares to be available at site.

Item No.	Part Description
1	Seat (3)
2	Bearing (7)
3	Gland packing (11)
4	Stem Retainer (3)
5	Bottom Gasket (18)
6	Wedge Pin (8)
7	Belleville Spring (16)
8	Seat Gasket (22)

**Table 2:** Recommended spare parts list



**CAUTION:**

All equipment must be fitted only with manufacturer's original spare parts. When ordering for spare parts, always convey the following information: size of valve, sr. no. and mfg. date which is available in the nameplate tag.

## 10. DISPOSAL ACTION

### 10.1 DISPOSAL INSTRUCTIONS

- 10.1.1 Metallic components of product are to be cleaned and recycled.
- 10.1.2 Foam, Rubber, Elastomer, Polymers and Plastics components, along with packing materials are to be scrapped according to regional regulations in which they are to be disposed.
- 10.1.3 Wooden boxes may be reused based on the condition of the boxes, or they may be recycled.

## 11. CE INSTRUCTIONS

- 11.1 Each valve has a stainless-steel name plate fixed to the body.
- 11.2 The nameplate is marked with details of figure number, along with various other details such as the materials of construction, limiting temperatures and pressure rating.

# FIGURE HPA HIGH PERFORMANCE BUTTERFLY VALVE



## APPENDIX A

### TECHNICAL INFORMATION

#### A1. References

Design/pressure-temperature ratings	
API 609	Butterfly Valves: Lug- and wafer-type
ASME B 16.34	Valves: flanged, threaded and welding ends
Face-to-face dimensions	
API 609	Face-to-face and end-to-end dimensions of valves
End connections	
ASME B16.5	Pipe flanges and flanged fittings (NPS 1/2 through NPS 24)
ASME B16.47	Large diameter steel flanges (NPS 26 through NPS 60)
Fire test	
API 607	Fire test for soft seated quarter-turn valves

#### A2. Tightening sequence and torque

Tighten bolts evenly and diagonally opposite to each other or in a crisscross pattern. Use the torque figures as shown in Table 3.

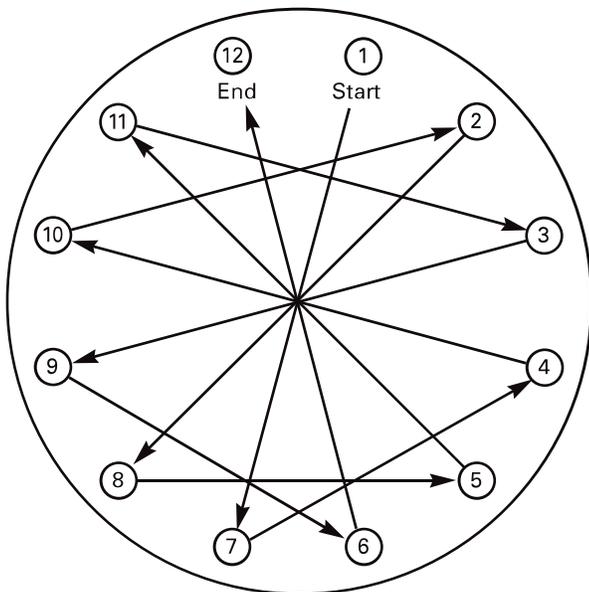


Fig. 8 Tightening sequence for 12 bolts

Thread size (inch)	Torque (Nm)
3/8	18–25
1/2	46–65
9/16	67–95
5/8	170–190
3/4	252–280
7/8	342–380
1	460–508
1-1/8	594–660
1-1/4	756–840
1-3/8	1054–1544
1-1/2	1125–1250
1-5/8	1752–2575
1-3/4	2194–3228
1-7/8	2704–3984
2	3288–4849

Table 3 Tightening torque values

# FIGURE HPA

## HIGH PERFORMANCE BUTTERFLY VALVE



### A3. Technical data

Seat material	Max operating temperature	Properties	Application
PTFE	-58°F (-50°C) – 400°F (204°C)	<ol style="list-style-type: none"> <li>1. Outstanding chemical resistance.</li> <li>2. Good Mechanical properties.</li> </ol>	Resistance to most of the chemicals and solvents.
RPTFE	-58°F (-50°C) – 428°F (220°C)	<ol style="list-style-type: none"> <li>1. Excellent mechanical properties.</li> <li>2. Excellent chemical resistance.</li> <li>3. Good temperature and pressure capabilities.</li> <li>4. Excellent abrasion resistant.</li> </ol>	Resistance to most of the chemicals and solvents.
ULTRA	-58°F (-50°C) – 500°F (260°C)	<ol style="list-style-type: none"> <li>1. Excellent mechanical properties.</li> <li>2. Excellent chemical resistance.</li> <li>3. Good temperature and pressure capabilities.</li> <li>4. Excellent abrasion resistant.</li> </ol>	Resistance to most of the chemicals and solvents.

**Table 4** Seat temperature range and general chemical resistance



#### CAUTION:

FNW does not assume responsibility for any liabilities/damages arriving out of erroneous application of its valves or imprudent operations carried out by inexperienced operators that do not comply with this manual or instructions provided by FNW. The valves shall be appropriately used for the purpose they are built for and their intended applications. Use of standard valves for special applications is not recommended unless it has been communicated and agreed to by FNW. Valves shall be operated and maintained strictly in accordance with the procedures. Operation or maintenance outside of these procedures constitutes abuse of the product and voids all warranty and claims.