



## 1. Valve preservation and handling

### 1.1 Preparation and preservation for shipment

All valves are properly packed in order to protect the parts that are prone to deterioration during transportation and storage on site. In particular, the following precautions should be taken:

- The valves must be packed with the disc in the closed position. The flange sealing surfaces of the valves will be protected against dust. The end faces of the valves must be protected with plastic or wooden discs fixed with straps.
- Bare Shaft Valves: Ends of the shaft must be protected with plastic tubes.
- All valves must be placed in an enclosed area in order to protect against dust. The valves should not be exposed to water or rain. Place the valves on high ground with their covers to protect against flooding.
- All actuated valves must be securely palletted and crated with particular attention, in order to ensure that the parts of actuator (especially pneumatic piping or accessories) do not extend beyond the skid/crate.

### 1.2 Handling requirements

#### 1.2.1 Packed valves

Lifting and handling of the packed valves in crates should be carried out by a fork lift truck, and the packed valves in cases should be carried out in the lifting points and in the center of gravity position which have been marked.

Lifting and handling of all packed valves must be appropriately carried out according to the safety regulations.

#### 1.2.2 Unpacked valves

The lifting and handling of these valves have to be carried out within carrying limits by using appropriate means. The handling must be carried out on pallets, protecting the machined surfaces to avoid any damage.

For large dimension valves, the sling and the hooking of the load must be carried out using appropriate tools (brackets, hook, fasteners, ropes) and load balancing tools to prevent them from falling or moving during the lifting and handling.

### Caution

When the valves are being lifted or handled, there should be no moving contact between parts. The actuator wheel and disc edge should be protected.

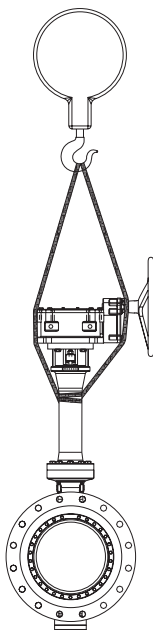


Figure 1 Flange type in horizontal pipeline  
( size : 3" ~ 20" )

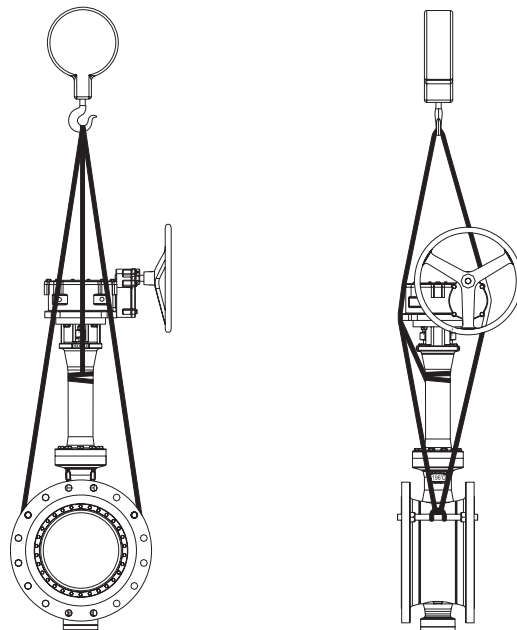
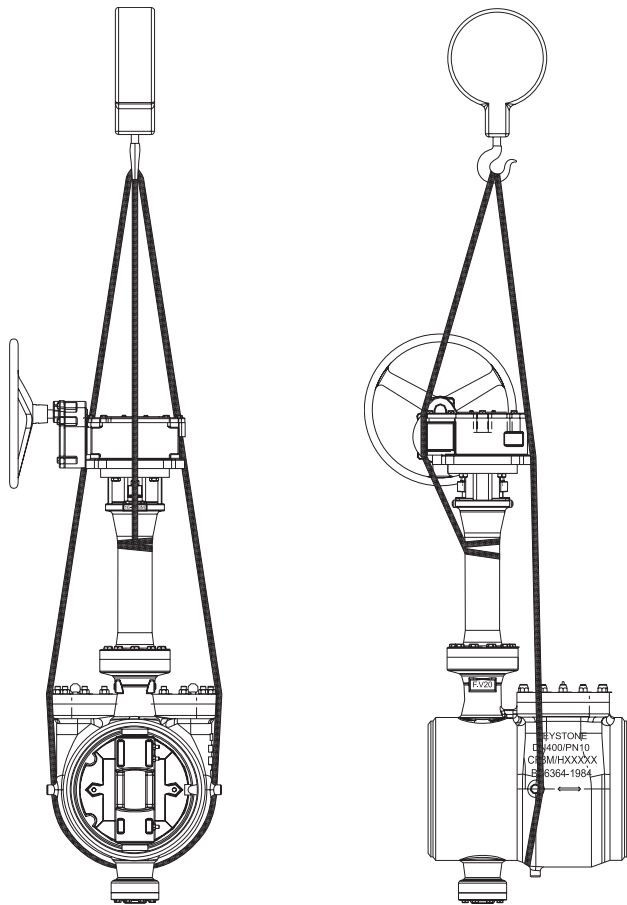


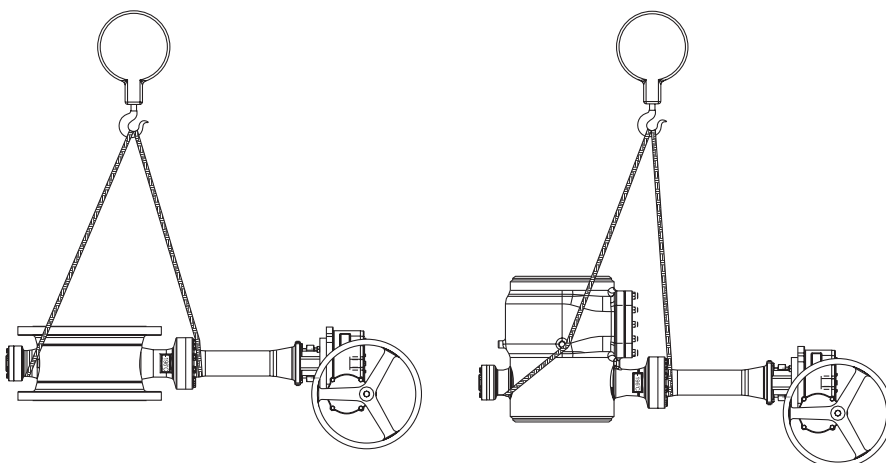
Figure 2 Flange type in horizontal pipeline  
( size : 22" ~ 36" )

**Butt weld type in horizontal pipeline**



**Figure 3**

**Flange type & Butt weld type in vertical pipeline**



**Figure 4**

**1.3 Storage and preservation before installation**

- Valves have to be stocked in an enclosed, clean and dry storage room.
- Discs must be in the closed position, and the end faces must be protected with plastic or wooden discs fixed with straps or rope. If possible, keep the original protection.
- Periodical checks have to be carried out in the storage area to ensure that above conditions are maintained.

**Caution**

*For valve handling or lifting, the lifting equipment (fasteners, hooks, etc.) must be sized and selected while taking into account the valve weight indicated in the packing list and/or delivery note. Lifting and handling must be done only by qualified personnel*

*Fasteners with sharp ends must have their ends protected by plastic covers.*



**Warning**

Ensure that the valve and transport equipment are never lifted directly above any workers or other areas in which a possible fall could cause damage.

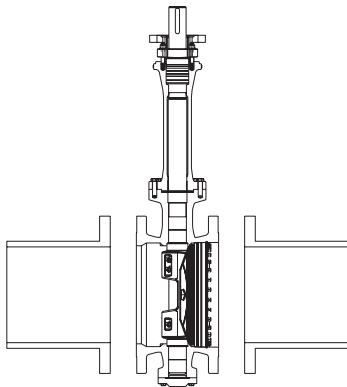
**1.4 Movement & handling of valve**

- Valve installed in horizontal pipeline  
Flange type : From Figure 1, 2, connect the lower bonnet to the cover hub at the bottom of the body and attach the lifting strap securely.  
Butt weld type : From Figure 3, attach the lifting strap to the valve securely.
- Valve installed in vertical pipeline  
Flange type : From Figure 4, connect the lower bonnet to the cover hub at the bottom of the body and attach the lifting strap securely.  
Butt weld type : From Figure 4, attach the lifting strap to the valve securely.

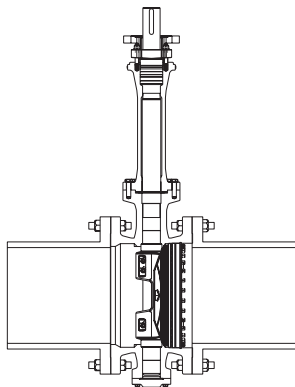


### Important

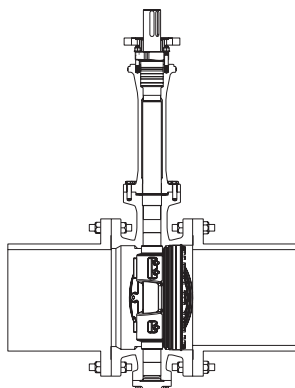
It is recommended to flush the pipe before installation of valve. If this is not possible, the valve must be set with the disc in full-open position before flushing.



(a) Spread the flanges with the adequate tooling. Insert some flange bolts to support the valves.



(b) Insert the gaskets and remove the flange spreads.



(c) Close the valve clockwise, return to open position and cross-tighten all bolting

Figure 6 Existing system

## 2. Valve installation

### 2.1 Inspection

- Carefully remove the valve from the shipping package avoiding any damage to the valve.
- Carefully clean the surface as well as the inside of the valve using an air line to ensure that there are no solid particles within the valve.
- Check the seat and the surface of the disc for any possible damage.

### Caution

Inspect the disc edge to ensure that it is not damaged during handling. This is especially important in case of valves shipped with the disc in the open position and with a fail-open actuator.

- Confirm that the materials of construction listed on the valve nameplate are appropriate for the service intended and are as specified.

### 2.2 Flange and pipe compatibility (see Figure 5)

- Check that the flange drilling pattern of valve and pipe matches before assembly.
- Flanges have to meet the following requirements :
  - The inside diameter of the face should be :
    - D min. : The valve Q-dimension + adequate disc clearance.
    - D max. : The optimum inside diameter (ID) is equal to the inside diameter of flange standard EN 1092-1, table 8, type 11. For larger than D max inside diameters or other flange types please contact your local Tyco Sales organization, as larger inside diameters might result in reduced valve functionality.

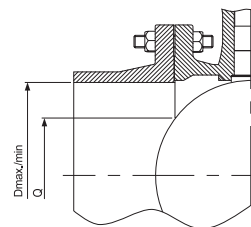


Figure 5 Flange and pipe compatibility

**Note :** Use flange gaskets. Use flange bolting in agreement with appropriate standard.

### 2.3 Installation

- Keystone recommends that the optimum valve installation is one where the stem is in the horizontal plane so as to minimize any problems associated with solid particles present in the fluid that could deposit in the lower bearing area.
- The plate indicating the preferred flow direction can be fixed on either flange. (The valve, however, is designed to withstand the differential pressure in both directions.)
- Particular care should be taken with valves equipped with fail-open actuators.
- If the valve has welded ends, both the welded pipe and valve should be perfectly cleaned using a cloth with acetone or similar product.
- Check the plate for the preferred flow direction for sealing, then insert the valve between the edges of the pipe to be welded. Carry out an initial accurate spot welding, verifying the perfect alignment of the edge and axis of the valve.
- Carry out the welding of the edge, alternating between both ends to reduce the tension introduced by the welding.



### Important

It is important that the inter-pass temperature does not exceed 150°C (302°F).

- Existing system (see Figure 6)
  - 1 Check whether the flange distance meets the valve face-to-face dimensions. Spread the flanges with adequate tooling for easy insertion of the valve.
  - 2 Insert some flange bolts in the pipe flanges, to help you support the valve after insertion.
  - 3 Insert the valve between the flanges, centralize the valve body and insert gaskets, all flange bolts. Hand tighten the flange-bolts.
  - 4 Maintain the valve flange alignment while gradually removing the flange-spreaders and hand tightening the flange-bolts.
  - 5 Slowly close and open the valve to check for adequate disc clearance.
  - 6 Cross-tighten all bolting to the proper torque. Do not over tighten.

### 2.4 Sources of possible danger

This section contains some examples of possible foreseen danger sources.

#### 2.4.1 Mechanical

When manual operators are used, available space should be checked in order to avoid hands being clamped.

#### 2.4.2 Electrical

If static charges can initiate explosions, the valve should be grounded.

#### 2.4.3 Thermal

If the valve is used in applications with cryogenic temperature, the outside of the body might be cold. Sufficient measure should be taken to avoid frostbite. A manual operated valve should be opened and closed with sufficient protection for the personnel operating the valve. For example: protection gloves.

#### 2.4.4 Operational

Closing a valve too fast may result in water hammer in the upstream part of the pipeline. Water hammer results in excessive stresses in the valve and will cause severe damage. Water hammer should be avoided in all circumstances. Due to differential pressure across the valve disc, butterfly valves have the tendency to be closed by the flow. Care should be taken when unlatching the valve operating mechanism.

### 2.5 Valve verification

- 1 Check for leakage near the valve stem.

#### Caution

*Tighten the packing just enough to prevent stem leakage. Over-tightening will decrease packing life and increase operation torque (see Figure 7).*

- 2 Check the operation of the valve by stroking it between its full-open and full-close positions. To verify the valve orientation, the stem key should rotate clockwise to a position parallel to the pipe flanges.
- 3 For an automated valve, set the minimum air pressure, oil pressure and electrical voltage, in order to operate the actuator correctly.
- 4 Valves must be maneuvered through a complete opening/closing cycle.

## 3. Valve maintenance

The Keystone Fig V20 has been designed to require minimum maintenance.

### 3.1 Packing (see Figure 8)

If stem leakage is observed through the packing, tighten the gland bridge nuts slowly and evenly from both sides until the leakage stops.



#### Warning

Do not over-tighten packing gland nuts. Over-tightening will decrease packing life and increase operation torque. When tightening the gland bridge nut, use half-turn increments until leakage stops.

To replace the packing, proceed as follows:

- 1 Remove the gear/actuator and relevant connecting keys. Note the actuator position relative to the valve position for reassembly of gear/actuator later.
- 2 Remove the gland bridge, nut & bolt and spring washer ②③.
- 3 Remove the gland bridge, gland bushing ②⑤ and packing set ②②.
- 4 Carefully clean packing cavity and stem ⑦ in bonnet.
- 5 Open the new packing set ②②, insert the packing in the same sequence as removed. When assembling the packing, the assembly sequence should not change. (see Figure 9)

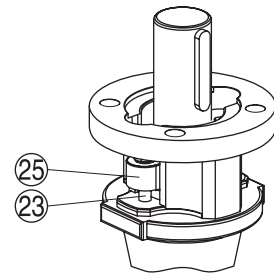


Figure 7 Check of gland bridge nut

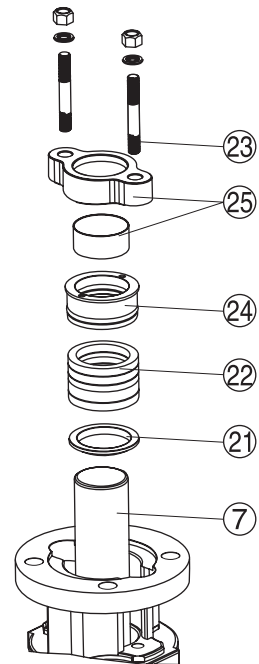


Figure 8 Assemble packing

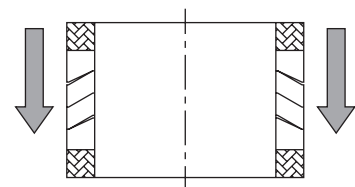


Figure 9 Packing set

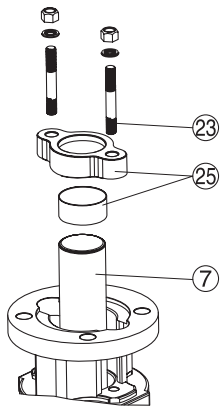


Figure 10 Assemble gland bridge

- 6 Carefully clean the gland bushing and gland bridge (23), and then insert in the respective sequence. (see Figure 10)
- 7 Reassemble the gland bridge bolt (23) in accordance with page 8, then assemble the nut by hand.
- 8 Reassemble the key (27) on the end of the upper stem (7).
- 9 Reassemble the gear or actuator, and close the valve.

### Caution

*Do not force actuator on the stem! This should be a free moving fit.*

- 10 Cycle the valve.
- 11 Pressurize the pipeline again
- 12 If a leak is detected, tighten the gland bridge nut slowly and evenly until the leakage stops.

### 3.2 Seat elements disassembly (see Figure 11)

- 1 Close the valve.
- 2 Check that the actuator is in the closed position.
- 3 Remove the valve from the pipeline, and place it on the worktable such that the disc side is facing upwards and the valve seat can be seen.
- 4 Cut the wire (26) on the adjust screw (14).
- 5 Pull out the adjust screw (14).
- 6 Pull out the locking ring (13) by using the end of a sharp tool.
- 7 Remove the adjust ring (12) and retaining ring (11) in that sequence.
- 8 Remove the backing ring (10) and seat (9).
- 9 Clean the inside of the body (1), disc (6), seat (9), and etc. by using a dry towel or an air line.
- 10 Keep the disc edge and surface of the seat clean.

### Note :

For butt weld ends, the port cover bolt & nut (3) should first be removed, and the port cover (30) separated from the gasket (28), before performing the above steps.

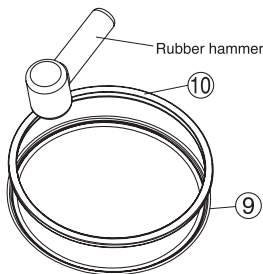


Figure 12 Assemble seat & backing ring

### 3.3 Seat elements assembly (see Figure 11)

- 1 Close the valve.
- 2 With one side of the new metal seat (9) facing the backing ring (10), use a rubber hammer or attach them by hand (see Figure 12).
- 3 Apply a thin film of molybdenum disulphide or PTFE to the seat (9).
- 4 Place the seat (9) and backing ring (10) into the body (1) slowly.
- 5 Assemble the retaining ring (11), adjust ring (12), locking ring (13) in that order.
- 6 Turn the adjust screw (14) in accordance with the torque of page 6.
- 7 Close the disc (6), then turn the adjust screw (14) according to the indicated torque value on page 6.
- 8 Attach the wire (26) to the adjust screw (14).
- 9 For butt weld type, combine the gasket (28) and port cover (30) using the screw & nut (3).
- 10 After several cycles, ensure that the seat (9) and the middle of the disc (6) are still aligned.

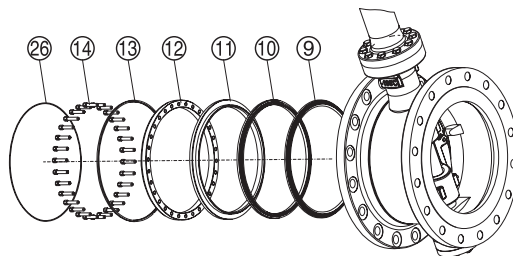


Figure 11 Assemble seat

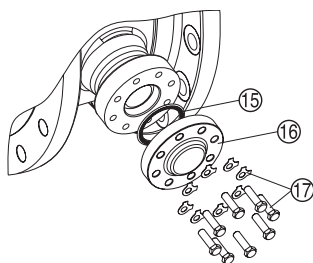


Figure 13 Assemble bottom cover

### 3.4 Bottom & port cover gasket maintenance (see Figure 13)

To replace the spiral wound gasket of the bottom & port cover, proceed as follows:

- 1 Remove the screw & nut & washer (17) and separate the cover (16).
- 2 Remove the spiral wound gasket (15).
- 3 Clean the groove for the spiral wound gasket (15) in the valve body (1).
- 4 Insert the spiral wound gasket (15) and assemble the screw (17) hole in the center.
- 5 Assemble the screw & nut & washer (17), in accordance with the torque on page 6.

### 3.5 Bonnet gasket maintenance (see Figure 14)

- 1 Remove the actuator and the key ⑰ near the stem ⑦ head.
- 2 Remove the screw & washer ⑳ connecting the bonnet ⑱ and the top plate of the valve.
- 3 Separate the bonnet ⑱ from the valve.
- 4 Remove the spiral wound gasket ⑱, and clean the groove for the gasket and the stem ⑦.
- 5 Insert the spiral wound gasket ⑱ and assemble the bonnet ⑱.
- 6 Reassemble the screw & washer ⑳, in accordance with the torque on page 8.

### 4. Screw & nut torque (Nm)

Size (inch)	Gland nut (Packing)	Bonnet screw (Gasket)	Adjust screw (Seat)	Bottom cover screw (Gasket)	Port cover screw (Gasket)
3	12	30	20	30	25
4	12	30	20	30	25
5	15	35	22	30	25
6	15	35	22	30	25
8	15	40	25	35	30
10	15	40	25	35	30
12	20	40	28	35	30
14	20	40	28	40	30
16	20	40	30	40	40
18	25	60	30	40	40
20	25	60	30	40	40
22	34	60	34	46	60
24	34	60	34	46	60
28	40	80	40	60	60
30	40	80	40	60	60
32	45	100	45	60	80
34	45	100	45	60	80
36	50	100	50	60	80

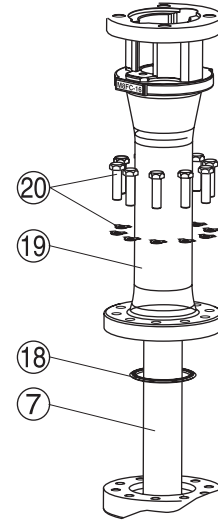


Figure 14 Assemble extension bonnet

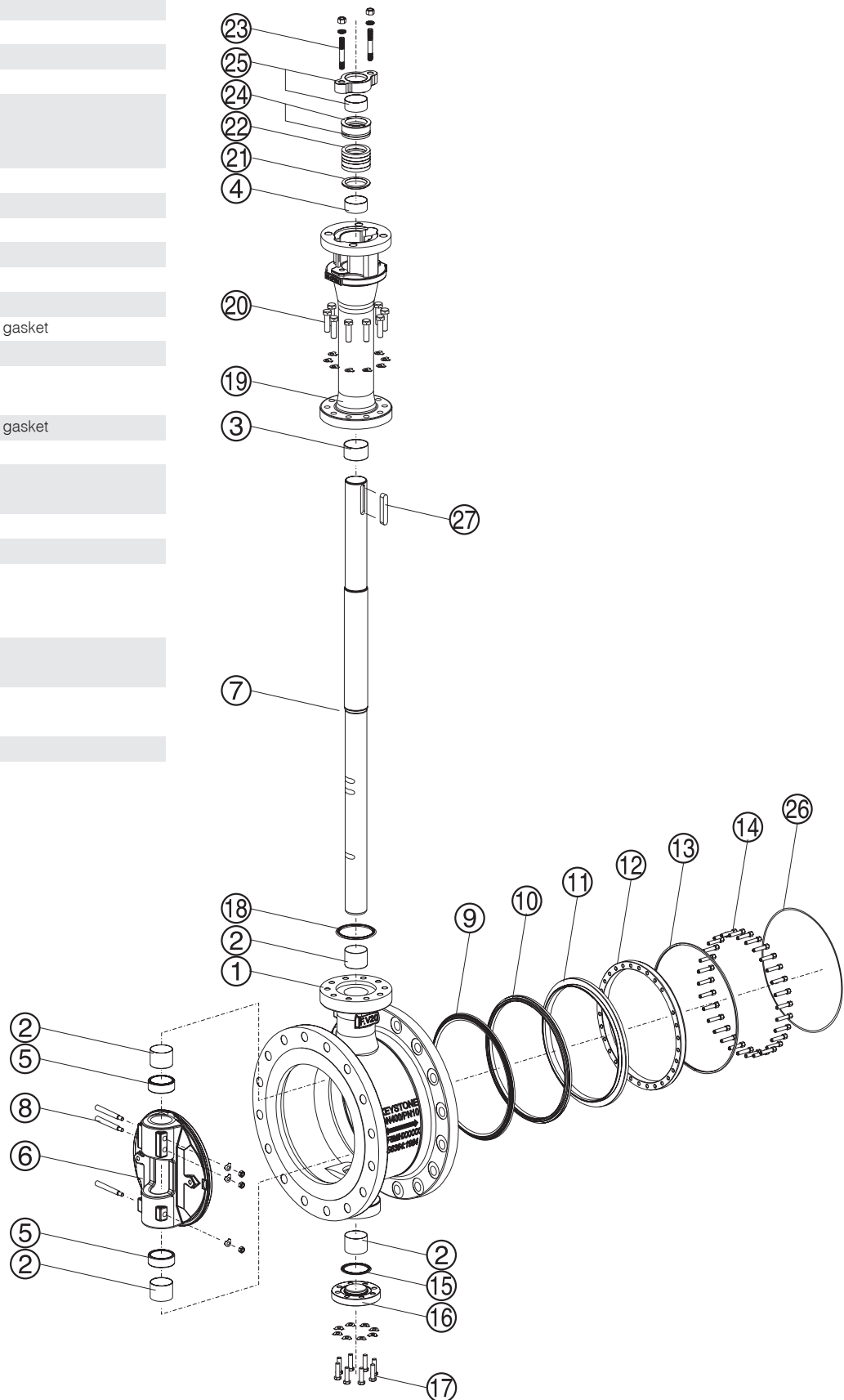
### 5. Troubleshooting guide

Symptom	Possible cause	Resolution
Valve does not rotate	1. Packing is too tight	1. Loosen gland bridge nut
	2. Actuator has failed	2. Replace or repair
	3. Valve packed with debris	3. Flush or clean valve to remove debris
	4. Stem key has sheared	4. Determine cause of shearing and correctly replace stem key
Stem packing leaking	1. Gland bridge nut too loose 2. Packing damaged	1. Tighten gland bridge nut 2. Replace packing
Bottom cover leaking	1. Bottom cover bolt too loose 2. Spiral wound gasket damaged	1. Tighten bottom cover bolt 2. Replace gasket
Valve seat leaking	1. Valve not fully closed 2. Debris trapped in valve 3. Actuator set to stop incorrectly 4. Seat damaged	1. Close valve 2. Cycle and flush (with valve open) to remove debris 3. Reset actuator stopper 4. Replace seat
Jerky operation	1. Packing is too tight	1. Loosen gland bridge nut, retighten
	2. Oil supply inadequate	2. Increase oil supply
	3. Actuator & stem misaligned	3. Realign actuator

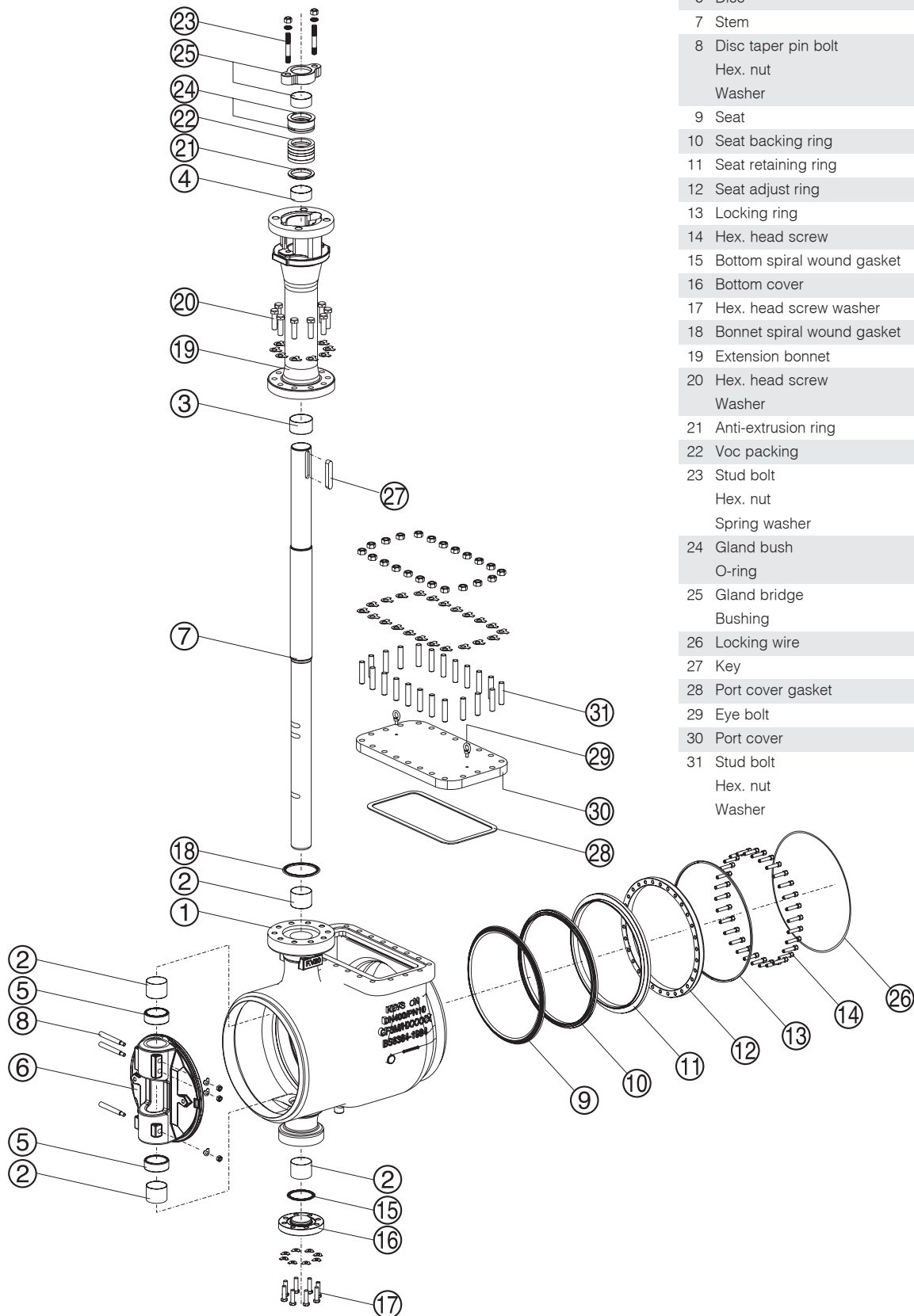
### Part name

- 1 Body
- 2 Bearing
- 3 Bearing
- 4 Bearing
- 5 Spacer
- 6 Disc
- 7 Stem
- 8 Disc taper pin bolt
- Hex. nut
- Washer
- 9 Seat
- 10 Seat backing ring
- 11 Seat retaining ring
- 12 Seat adjust ring
- 13 Locking ring
- 14 Hex. head screw
- 15 Bottom spiral wound gasket
- 16 Bottom cover
- 17 Hex. head screw
- Washer
- 18 Bonnet spiral wound gasket
- 19 Extension bonnet
- 20 Hex. head screw
- Washer
- 21 Anti-extrusion ring
- 22 Voc packing
- 23 Stud bolt
- Hex. nut
- Spring washer
- 24 Gland bush
- O-ring
- 25 Gland bridge
- Bushing
- 26 Locking wire
- 27 Key

### Flange type



### Butt weld type



### Part name

- 1 Body
- 2 Bearing
- 3 Bearing
- 4 Bearing
- 5 Spacer
- 6 Disc
- 7 Stem
- 8 Disc taper pin bolt
- Hex. nut
- Washer
- 9 Seat
- 10 Seat backing ring
- 11 Seat retaining ring
- 12 Seat adjust ring
- 13 Locking ring
- 14 Hex. head screw
- 15 Bottom spiral wound gasket
- 16 Bottom cover
- 17 Hex. head screw washer
- 18 Bonnet spiral wound gasket
- 19 Extension bonnet
- 20 Hex. head screw
- Washer
- 21 Anti-extrusion ring
- 22 Voc packing
- 23 Stud bolt
- Hex. nut
- Spring washer
- 24 Gland bush
- O-ring
- 25 Gland bridge
- Bushing
- 26 Locking wire
- 27 Key
- 28 Port cover gasket
- 29 Eye bolt
- 30 Port cover
- 31 Stud bolt
- Hex. nut
- Washer