



# **Toyo Valve**

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## **Operation Manual**

for

Cast Iron Gate, Globe and Check Valves

[Flanged]

We appreciate your purchasing our products.  
Ensure to read all the contents of this manual before piping and using them.  
Also keep this manual to the  
place accessible to the operator.

**KITZ CORPORATION**

This manual applies to manual operation of cast iron outside screw and yoke gate, inside screw gate, outside screw and yoke globe and swing check valves.

## CAUTION AND WARNING

To ensure safe and trouble-free function and performance, please read all the contents of this manual before handling, transportation, mounting and operation of the valves.

Keep this manual to the place accessible to the operator.

The signs “WARNING” and “CAUTION” are defined as follows:



**WARNING**

Indicating potentially hazardous conditions which may result in serious injury to personnel, if such warnings shall be ignored.



**CAUTION**

Indicating potentially hazardous conditions which may result in minor or moderate injury to personnel or property damage, if such conditions shall be ignored.



Indicates prohibition of an action.



Indicates mandatory implementation of an action.

## NOTES TO USERS

This manual covers normal usage of our products. Technical data and instructions for operation, maintenance and inspection of the products are prepared in consideration of safety. However, they are good only to cover typical applications as a general guideline to users. If technical assistance beyond this manual is required, contact KITZ Corporation or its distributors.

The illustrations given in this manual do not introduce all details. If more detailed data are needed, refer to our relevant valve assembly drawings.

※ Any information provided in this manual is subject to change at any time without notice, which cancels all previous issues.

## Contents

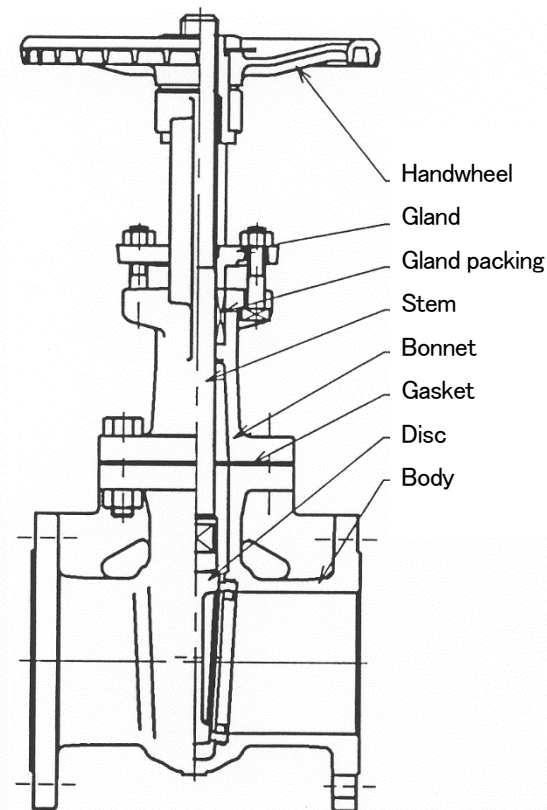
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## I . Construction and design features

## I . Construction and design features

### 1. Outside screw and yoke gate valve

- 1.1 The typical valve construction and parts names are as illustrated below.
- 1.2 The stem threaded part is exposed outside the bonnet, known as outside screw and the handwheel rotation fitted to the stem top lifts or drops the stem and disc together.
- 1.3 The space for rising stem is required for valve operation.
- 1.4 Outside screw part does not contact fluid directly and this design has better corrosion and abrasion resistance than inside screw design.
- 1.5 Gate valve is designed to be used at fully open or close position.  
Usage at intermediate position should damage the valve disc and seats.
- 1.6 Fluid is bi-directional.

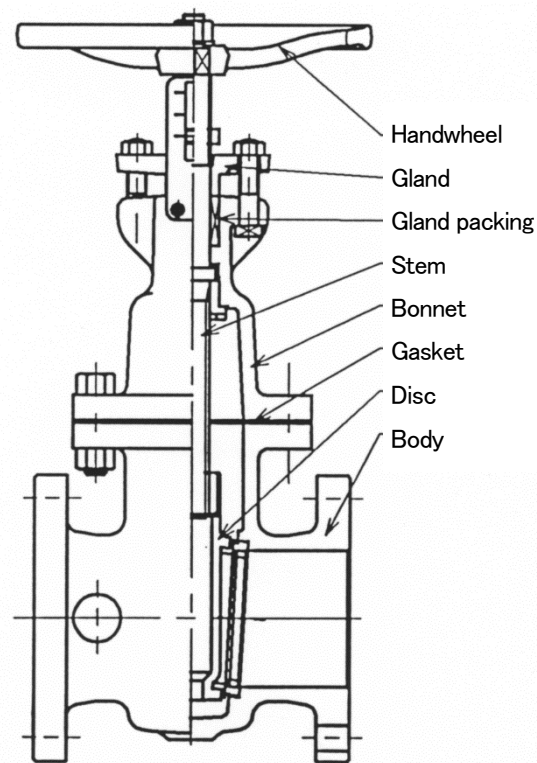


This illustration shows typical construction.

## I . Construction and design features

### 2. Inside screw gate valve

- 2.1 The typical valve construction and parts names are as illustrated below.
- 2.2 Non-rising stem which stem threads are engaged with disc threads.
- 2.3 The space for non-rising stem is not required for valve operation.
- 2.4 Open or close position cannot be checked outside the valve for non-rising stem type without opening indicator.
- 2.5 Gate valve is designed to be used at fully open or close position.  
Usage at intermediate position should damage the valve disc and seats.
- 2.6 Fluid is bi-directional.



This illustration shows typical construction.

## I . Construction and design features

### 3. Outside screw and yoke globe valve

3.1 The typical valve construction and parts names are as illustrated below.

3.2 The stem threaded part is exposed outside the bonnet, known as outside screw and the handwheel rotation fitted to the stem top lifts or drops the stem and disc together.

3.3 The space for rising stem is required for valve operation.

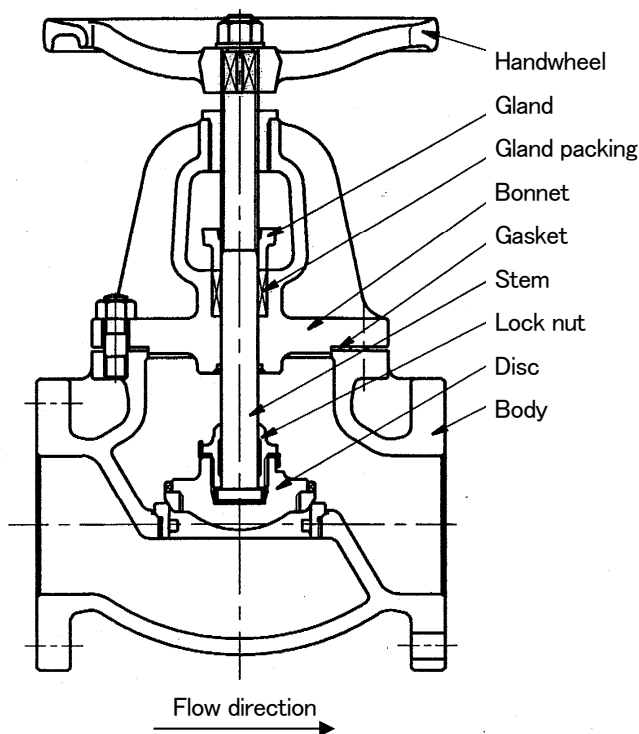
3.4 Outside screw part does not contact fluid directly and this design has better corrosion and abrasion resistance than inside screw design.

3.5 Globe valve is designed to be used at fully open, fully close or intermediate position for flow control.

3.6 Globe valve has higher fluid resistance due to its construction.

3.7 Globe valve requires higher operational torque to close the valve with full fluid resistance to the disc.

3.8 The flow is uni-directional.



This illustration shows typical construction.

## I . Construction and design features

### 4. Swing check valve

4.1 The typical valve construction and parts names are as illustrated below.

4.2 The hinge pin clamps the arm and disc.

The disc moves upwards uni-directionally with fluid flow.

4.3 Swing check valve is used to flow the service fluid one-way and to prevent back flow.

4.4 The flow is uni-directional.

4.5 Swing check valve is used for both horizontal and vertical piping.

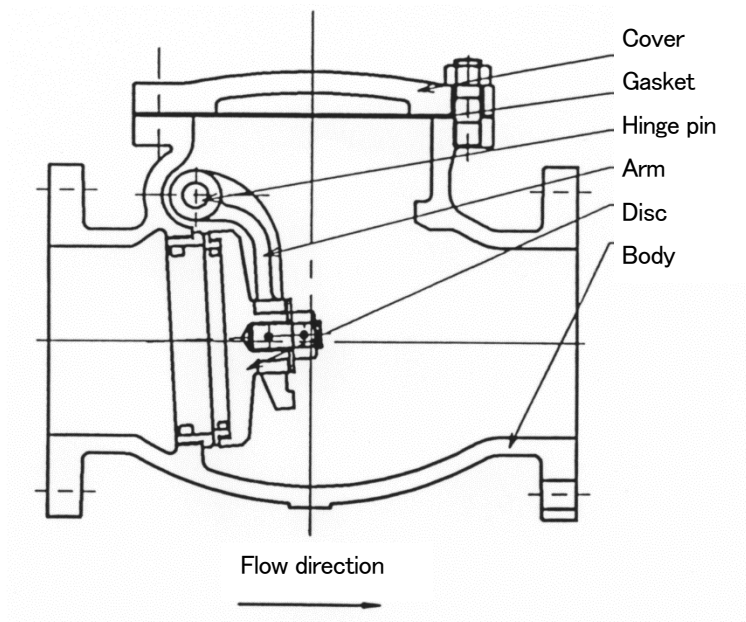
At vertical piping, the valve should have upward flow and be installed in accordance with the arrow on the body.

At horizontal piping, the valve should be installed with upright position.

4.6 When enough fluid flow cannot be obtained, the disc may flap the body seat to make a noise, known as chattering.

4.7 Fluid vortex, turbulence and pulsation are expected at pump outlet and downstream of reducer and elbow, which may damage the valves and result in shortening life circles of the valves.

It is recommended to place valves at the distance of 6 times nominal bore size or further from these devices.



This illustration shows typical construction.

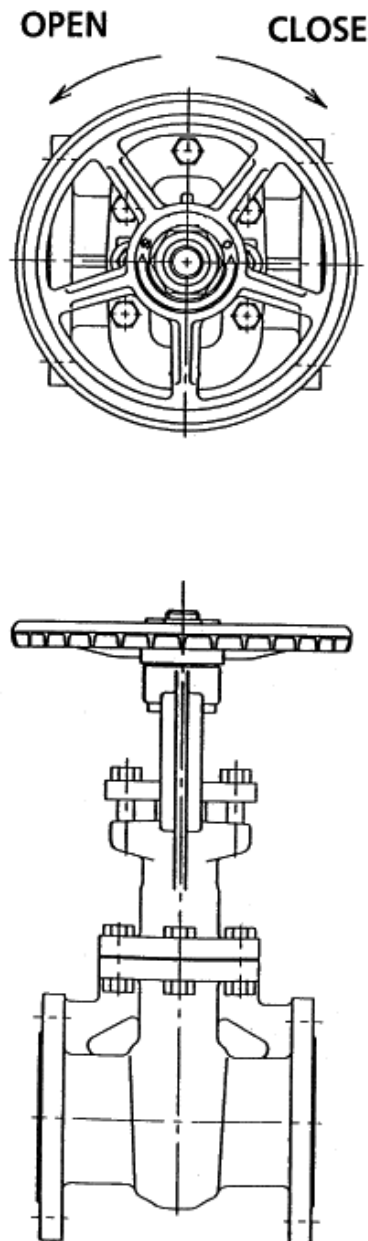


## II . Operator

## II. Operator

### 1. Handwheel

- 1.1 Handwheel is directly mounted on the valve stem.
- 1.2 Clockwise operation of handwheel closes the valve and counterclockwise operation of handwheel opens the valve as indicated on the handwheel arrow.
- 1.3 Handwheel operating torques are different depending on the valve types and the opening degrees.







### III. Transportation and storage

### III. Transportation and storage

#### 1. Transportation

##### 1.1 Warning and caution for transportation

 <b>WARNING</b>	
	(1) Keep off the valve lifting area to prevent personal injury caused by unsecured valves.

 <b>CAUTION</b>	
	(1) Pay attention not to damage painted valve surfaces during transportation, which may subsequently cause corrosion to the valve. Repair is required if the surface is damaged.  (2) Pay attention to handling and storage of carton packed products. The high humidity may damage the cartons.



##### 1.2 Transportation

- 1.2.1 Keep the packings as they are during transportation. Provide appropriate protection covers if they are found missing during transportation.
- 1.2.2 Handle valves carefully so that they may not fall or drop on the ground. Any extraordinary mechanical impact should be avoided.

III. Transportation and storage

2. Storage

2.1 Caution for storage

 CAUTION	
	<div><div>(1) DO NOT store valves in the corrosive environment, which may cause corrosion from the valve threaded areas.</div><div>(2) DO NOT remove protection covers until installation. They prevent foreign objects from intruding into the valve interior and damaging the ball or ball seats.</div><div>(3) DO NOT place any objects on valves, and DO NOT step on them. Overloading may cause damage to valves.</div><div>(4) DO NOT pile up products carelessly to avoid damage to the products and personal injury caused by unstable piling.</div></div>

2.2 Storage



- 2.2.1 Store valves at dust-free, least humid and well ventilated places. Indoor storage is recommended.
- 2.2.2 It is not recommended to store valves directly on the ground or concrete floor.
- 2.2.3 Take appropriate measures to prevent valves from direct exposure to dust, rain and sunlight, if valves should be stored outdoors.



## IV. Piping and mounting

#### IV. Piping and mounting

##### 1. Installation (flanged)

###### 1.1 Caution for installation



 <b>WARNING</b>	
	(1) Check the valve specifications with catalogs and/or attached nameplate before piping. Service beyond the valve specifications may cause fluid leakage and valve malfunctions.

 <b>CAUTION</b>	
	(1) Keep a secure footing for valve installation and operation. (2) Sufficient lighting should be prepared for valve operation. (3) Piping should be properly supported, if needed.

- 1.1.1 Allow sufficient room for operation, installation and subsequent maintenance of valves, considering the valve height and the stem direction.
- 1.1.2 Take appropriate measures for smooth operation, inspection and maintenance of valves if they are installed in a small spaces.
- 1.1.3 Try not to install valves in the places where valve functions may be hampered by outer forces such as vibrations.
- 1.1.4 It is recommended to install valves to horizontal pipes in upright positions.
- 1.1.5 Fluid flow should be upward for swing check valves if they are installed to vertical piping.

#### IV. Piping and mounting

##### 1.2 Caution for piping and mounting

 <b>CAUTION</b>	
	<ul style="list-style-type: none"><li>(1) Keep off the valve lifting area to prevent personal injury caused by unsecured valves.</li><li>(2) Pay attention not to catch fingers between flanges during mounting work.</li><li>(3) Pay attention not to damage flange and seat surfaces.</li><li>(4) Pipes should be properly supported, if needed.</li><li>(5) Check valves are provided with fillers inside for seat damage protection during transportation. Ensure to remove them completely before mounting valves.</li><li>(6) Globe and check valves should be mounted in accordance with arrows indicated on valve bodies.</li><li>(7) Retighten gland bolts before operation. Packing tightening pressure may be lowered due to the stress relaxation during transportation and storage, which may cause leakage from gland area.</li><li>(8) Ensure to insert new gaskets for valve mounting.</li></ul>



#### IV. Piping and mounting

1.2.1 Check the followings before valve mounting.

- (1) Service conditions should be within the valve specifications.
- (2) Valve flanges should correspond with piping flanges.
- (3) No damage should be found on flange surfaces.
- (4) Length between pipe flanges should correspond with the valve face-to-face dimensions including gasket thickness.
- (5) Valve and pipe centers should be aligned accurately.
- (6) Bolting holes of flanges should be arranged symmetrically lined up against the center line of flanges.

1.2.2 Remove foreign objects such as sand, dust and welding spatters from the connecting pipe interior before valve mounting.

1.2.3 Handle valves carefully so that they may not fall or drop on the ground. Any extraordinary mechanical impact should be avoided.

1.2.4 Remove protection covers just before valve mounting.

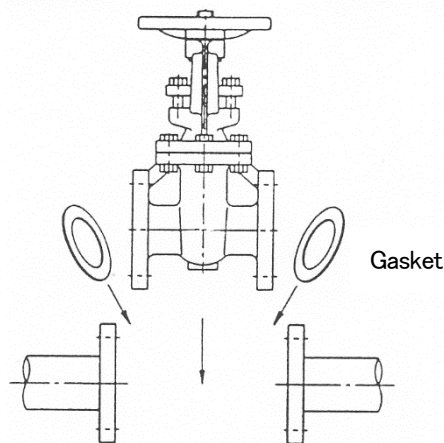
1.2.5 All tightened areas should be checked after valve mounting. Retighten them, if needed.

1.2.6 The valve and pipe interior should be flushed to remove foreign objects. DO NOT operate valves during flushing.

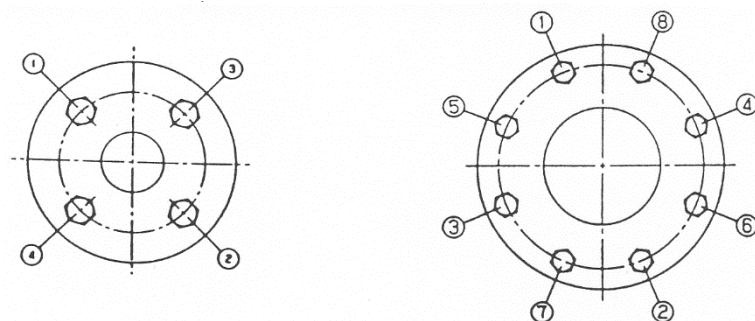
#### IV. Piping and mounting

##### 1.3 Piping and mounting (flanged)

- 1.3.1 Make sure that pipes are aligned accurately.
- 1.3.2 Length between pipe flanges should correspond with the valve face-to-face dimensions including gasket thickness.
- 1.3.3 Mount the valve between pipe flanges. Thread bolts through bottom bolt holes and tighten them temporarily.
- 1.3.4 Insert gaskets between valve and pipe flanges. It is recommended to apply the lubricant (gasket paste) to gasket faces.



- 1.3.5 Make sure of correct alignment of gaskets.
- 1.3.6 Thread bolts through the other bolt holes and tighten them lightly.
- 1.3.7 Tighten them evenly, gradually and alternately on diagonal line shown as follows. The ends of all tightened bolts should protrude equally from the nuts.






- 1.3.8 Increase line temperature and pressure gradually at test operation. Retighten the threaded areas, if needed.

## V. Valve operation

## V. Valve operation

### 1. Caution for operation

 <b>CAUTION</b>	
	<p>(1) DO NOT apply excessive torque to the valve operating device.</p> <p>(2) DO NOT loosen bolts and nuts of gland and bonnet of pressurized valves.</p> <p>(3) DO NOT use valves at intermediate position. It may damage stem and disc.</p>
	<p>(4) Retighten gland bolts and nuts evenly before using valves. Over-tightening may cause not smooth operation.</p> <p>(5) Temperature variation may cause stress relaxation of gland packing. Retighten bolts and nuts after temperature increase or decrease, if needed.</p> <p>(6) Open the valve gradually to prevent damage to pipes when the valve handles high temperature fluid such as steam.</p> <p>(7) Close the valve gradually to prevent water hammer if the valve handles liquid.</p> <p>(8) Take appropriate measures to prevent pipes and valves from freezing.</p>

### 2. Valve operation (gate and globe valves)

- 2.1 Clockwise operation of handwheel closes the valve and counterclockwise operation of handwheel opens the valve as indicated on the handwheel arrow.
- 2.2 Handwheel operating torques are different depending on the valve types and the valve opening degrees.
- 2.3 Turn the handwheel of gate valve to the open direction by about 90° after reaching fully close position to remove thermal stress of the pipes and to make the valve reopening easier and smoother.

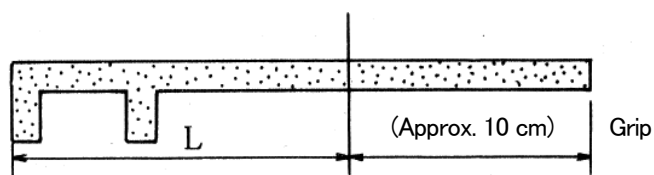
### V. Valve operation

3. When the special tool illustrated below is used for easy valve operation, do not apply excessive torque to the valve.

Refer to the following guidelines for dimensions of the tool.

(Unit: cm)

Size (A) mm	Globe valve		Gate valve	
	JIS10K・ASME150	JIS20K・ASME300	JIS10K・ASME150	JIS20K・ASME300
	L	L	L	L
40	7	18.5	8	13
50	10	20	8	20
65	20	28.5	15	30
80	22.5	46	15	32
100	38	65	25	44
125	66	115	36	60
150	68		51.5	62
200	75		59	67
250			67	82
300			80	104



## V. Valve operation




### 4. Daily inspection

Daily inspection is very important for safe and satisfactory operation of valves. The followings are inspection to be performed daily during operation.

To check	Valve type	Area	Method	Measure
External leakage	Gate Globe	Gland	Visual Liquid soap	Retighten gland bolt Retighten gland packing
	All	Flange	Visual Liquid soap	Retighten flange bolt Replace gasket
		Threads	Visual Liquid soap	Retighten all threads Replace the related parts
		Body surface	Visual Liquid soap	Replace the valve
Abnormal noise	All	Valve body	Listening	Contact a piping engineer
		Loosened bolts	Listening	Retighten bolts
		Pipe vibration	Listening	Contact a piping engineer
Loosened bolts/nuts	All	Bolts/nuts	Visual Touch	Retighten bolts and nuts
Seat leakage	All	–	–	Remove foreign objects Disassembling inspection (Lap the seat surface) Replace the valve
Valve operation	Gate Globe	Operating position	Visual	Make the position as instructed
	All	Non-smooth operation	Touch Listening	Apply lubricant to friction area Disassembling inspection Check and adjust the tightening torque of the gland packing

V. Valve operation

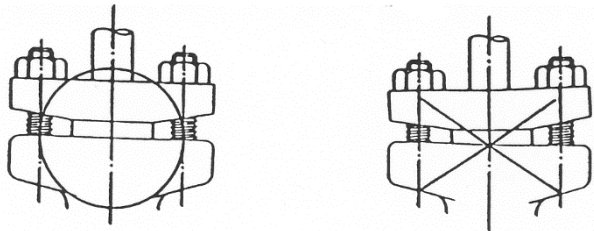
5. Remedial measure

 <b>CAUTION</b>	
	(1) Wear protective items such as goggles, gloves and working boots.
	(2) Take safety measures against toxic, flammable and corrosive fluid.
	(3) Reduce line pressure to the atmospheric level before retightening gland and flange bolts and nuts.
	(4) Operators should take protective measures to prevent direct exposure to the fluid in case the fluid spouts out from flange areas.
	(5) Reduce line pressure to the atmospheric level when packing and gaskets are replaced, or bolts and nuts are loosened. Operator should take protective measures to prevent direct exposure to the fluid in case the fluid spouts out from valves.
	(6) DO NOT apply lubricant to pipes and valves which handle oxygen.

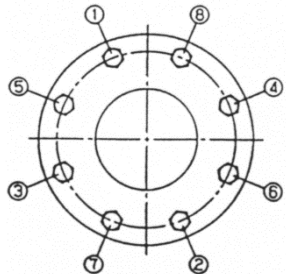
5.1 Leakage from gland area

Retighten gland bolts and nuts when leakage is found from the gland area. If retightening gland bolts and nuts cannot solve the leakage, the gland packing should be replaced with new ones.

5.2 Leakage from flange area



Tighten flange bolts evenly, gradually and alternately on diagonal line shown as follows.



## V. Valve operation

### 6. Troubleshooting

Trouble	Possible cause	Measure
Operation impossible	The stem screw sticks after the valve is left fully closed/open for a long period.	Lubricate the joint of the stem screw and the yoke sleeve.
	Foreign objects sticks to seat	Flush out the foreign objects with fluid flow, and then evenly apply grease to the threaded portions.
Excessive operation torque	Foreign objects sticks to stem	Remove the foreign objects and check the valve
	Foreign objects are piled up at the valve body bottom	Flush out the foreign objects with fluid flow
	Gland bolts are overtightened.	Loosen gland bolts and retighten them adequately
Stem damage	Excessive operation torque is applied.	Replace the damaged parts
Leakage from gland area	Gland bolts are loosened.	Retighten gland bolts
	Gland bolts are unevenly tightened.	Tighten gland bolts evenly
	Gland packing is damaged.	Replace the gland packing
	Stem is damaged.	Replace the stem
Seat leakage when valve is in the fully closed position.	Valve seat is damage due to cavitation.	Contact a piping engineer
	Valve seat is deformed.	Contact a piping engineer
Noise and vibration	Bolts and nuts are loosened.	Retighten bolts and nuts



## VI. Periodic inspection

## VI. Periodic inspection

### 1. Periodic inspection



- 1.1 Carry out periodic inspection of the valves mounted to piping approximately once a year.
- 1.2 Ensure smooth operation and sufficient function of valves.
- 1.3 Refer to daily inspection page for inspection items and methods.
- 1.4 Carry out a periodic inspection on the valves which are not operated for long period or not inspected daily.
- 1.5 It is extremely important to check valves when they are used under the following service conditions.
  - a) Valve performance failure could result in shutdown of an entire plant operation.
  - b) Choking of fluid is expected.
  - c) Valve interior corrosion or abrasion is expected.
- 1.6 It is recommended to replace gland packing at periodic inspection.



## VI. Periodic inspection

### 2. Maintenance inspection

Perform seat leakage, shell leakage and operation tests, if needed, at maintenance inspection of the facility. If any defects are found, perform disassembling inspection.

#### 2.1 Warning and caution for dismantling and mounting valves

 <b>WARNING</b>	
	<ul style="list-style-type: none"><li>(1) Discharge the fluid from piping and reduce line pressure to the atmospheric level when dismantling valves.</li><li>(2) Partially open the valve and discharge the fluid and pressure trapped within the valve body before dismantling.</li><li>(3) Take protective measures against a blowout of fluid and catching fire.</li><li>(4) Keep off the valve lifting area to prevent personal injury caused by unsecured valves.</li></ul>

 <b>CAUTION</b>	
	<ul style="list-style-type: none"><li>(1) Wear protective items such as goggles, gloves and working boots.</li><li>(2) Keep a secure footing at dismantling and mounting valves.</li><li>(3) Piping and valves should be properly supported, if needed.</li><li>(4) Mark the valve body and the pipe flange at their original position before dismantling valves. Reinstall the valve to the pipe, coupling these marks.</li><li>(5) Replace the gaskets with new ones when mounting valves.</li></ul>

#### 2.2 Disassembly and assembly

Refer to 7. Disassembly and assembly of this manual for disassembly and assembly.

## VI. Periodic inspection

### 2.3 Test and inspection



Refer to the followings.

#### 2.3.1 Operation test

- (1) The valve should be operated smoothly without galling or sticking.
- (2) The stem should be firmly connected to the disc.
- (3) The center of the disc should be located upward from the center of the body seat at fully close position for gate valve. There should be no disc remained in the valve port.
- (4) The disc should be seated to the body seat completely at fully close position for globe valve. No offset of disc and seat center should be acceptable.
- (5) The disc should move to the stopper of the valve body at fully open position and move smoothly for check valve.

#### 2.3.2 Shell test and seat leakage test

- (1) Caution for shell test and seat leakage test

 <b>CAUTION</b>	
	<ol style="list-style-type: none"><li>(1) Wear protective items such as goggles, gloves and working boots.</li><li>(2) Take sufficient precautions before shell test and seat leakage test for safety.</li></ol>

- (2) Shell test and seat leakage test

All valves are subject to hydrostatic or pneumatic shell test and seat leakage test at the specified test pressures after assembly. Refer to JIS B2003 and other standards for testing conditions.



## VII. Disassembly and assembly



## VII. Disassembly and assembly

### 1. Outside screw and yoke gate valve

#### 1.1 Disassembly procedure

##### 1.1.1 Caution for disassembly

 <b>WARNING</b>	
	(1) Take protective measures against a blowout of the fluid and catching fire.

 <b>CAUTION</b>	
	(1) Wear protective items such as goggles, gloves and working boots. (2) Pay attention not to catch fingers during disassembly. (3) Use appropriate equipment to lift valves when disassembling heavy valves.

##### 1.1.2 Before disassembly

- (1) Disassemble valves at a dust-free area.
- (2) Pay attention not to damage body seat, disc, stem threads and flange surfaces.
- (3) Mark the valve body and bonnet flanges at their original position before disassembling valves. Couple these marks at assembly. Also the disc and body should be marked so that the disc can be mounted at its original position.

## VII. Disassembly and assembly



### 1.1.3 Disassembly

- (1) Turn the disc to intermediate position.
- (2) Loosen wheel nut.
- (3) Loosen gland nuts.
- (4) Remove bonnet bolts and nuts.
- (5) Remove bonnet upward from body slowly with stem and disc together so that the disc should not drop to the body. Check the disc original position.
- (6) Remove disc from stem.
- (7) Remove gasket from bonnet flange.
- (8) Turn the handwheel clockwise to disengage stem from yoke sleeve.
- (9) Remove stem from bonnet.
- (10) Remove gland nuts, gland, gland packing and other parts from bonnet.
- (11) Remove wheel nut, handwheel, yoke sleeve and other parts from bonnet.

## VII. Disassembly and assembly

### 1.2 Assembly

#### 1.2.1 Caution for assembly

 <b>CAUTION</b>	
	<ul style="list-style-type: none"><li>(1) Wear protective items such as goggles, gloves and working boots.</li><li>(2) No fire should be allowed in working area.</li><li>(3) Pay attention not to catch fingers during work.</li><li>(4) Replace packing and gasket with new ones for satisfactory sealing performance.</li><li>(5) Use appropriate equipment to lift valves when assembling heavy valves.</li></ul>

#### 1.2.2 Before assembly

- (1) Check all parts before assembly. Replace the valve, if needed.
- (2) Clean the reuse parts to remove oil, dust and other foreign objects.
- (3) Assemble valves at dust-free area.
- (4) Pay attention not to damage body seat, disc, stem threads and flange surfaces.
- (5) Adjust coupling marks provided before assembly.
- (6) All bolts and nuts should be tightened securely.



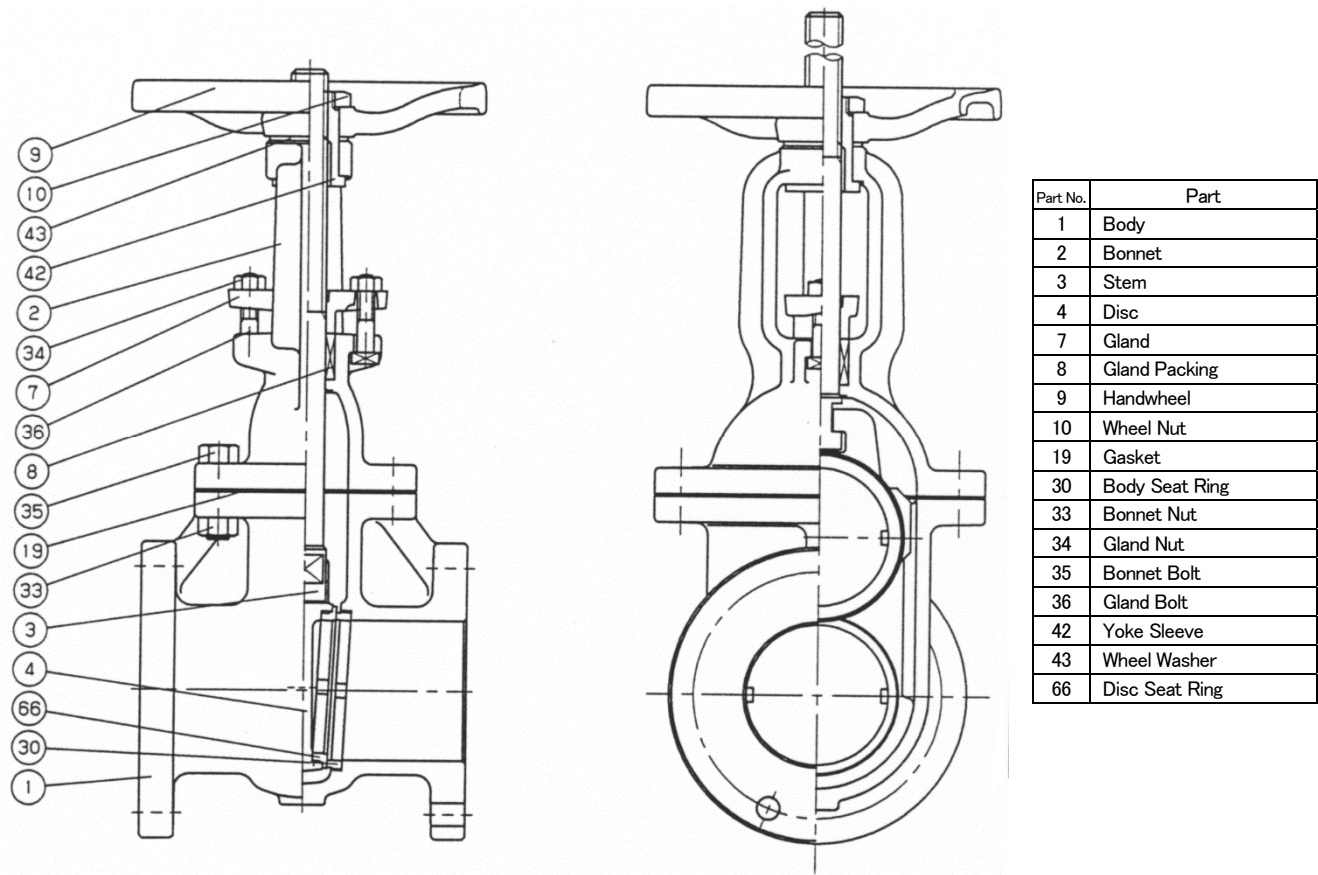
## VII. Disassembly and assembly

### 1.2.3 Assembly

- (1) Mount yoke sleeve and handwheel to bonnet and tighten wheel nut.
- (2) Assemble gland packing and gland to bonnet and tighten gland bolts temporarily.
- (3) Insert stem from lower bonnet to engage yoke sleeve. Turn handwheel to counterclockwise direction to set stem at intermediate position.
- (4) Mount gasket on bonnet flange.
- (5) Assemble disc to stem and place them inside body in accordance with disc guide. Make sure the disc original position with coupling marks provided before assembly.
- (6) Tighten bonnet bolts and nuts evenly, gradually and alternately on diagonal line.
- (7) Tighten gland nuts adequately. Too much tightening may cause not smooth operation.
- (8) Check each threaded portion. Retighten them, if found loosened.

VII. Disassembly and assembly

1.3 Construction





This illustration shows typical construction.  
Refer to the approved drawing for disassembly and assembly.



## VII. Disassembly and assembly

### 2. Inside screw gate valve

#### 2.1 Disassembly procedure

##### 2.1.1 Caution for disassembly

 <b>WARNING</b>	
	(1) Take protective measures against a blowout of fluid and catching fire.

 <b>CAUTION</b>	
	(1) Wear protective items such as goggles, gloves and working boots. (2) Pay attention not to catch fingers during disassembly. (3) Use appropriate equipment to lift valves when disassembling heavy valves.

##### 2.1.2 Before disassembly

- (1) Disassemble valves at dust-free area.
- (2) Pay attention not to damage body seat, disc, stem threads and flange surfaces.
- (3) Mark the valve body and bonnet flanges at their original position before disassembling valves. Couple these marks at assembly. Also the disc and body should be marked so that the disc can be mounted at its original position.

## VII. Disassembly and assembly



### 2.1.3 Disassembly

- (1) Turn the disc to intermediate position.
- (2) Loosen wheel nut.
- (3) Loosen gland nuts.
- (4) Remove set bolt and plate from bonnet.
- (5) Remove bonnet bolts and nuts.
- (6) Remove bonnet upward from body slowly with stem and disc together so that the disc should not drop to the body. Check the disc original position.
- (7) Remove stem from bonnet.
- (8) Remove gasket from bonnet flange.
- (9) Remove wheel nut, handwheel and indicator from stem.
- (10) Remove bonnet bush from lower bonnet.
- (11) Remove stem from lower bonnet.
- (12) Remove gland nuts, gland, gland packing and other parts from bonnet.

## VII. Disassembly and assembly

### 2.2 Assembly

#### 2.2.1 Caution for assembly

 <b>CAUTION</b>	
	<ul style="list-style-type: none"><li>(1) Wear protective items such as goggles, gloves and working boots.</li><li>(2) No fire should be allowed in working area.</li><li>(3) Pay attention not to catch fingers during work.</li><li>(4) Replace packing and gasket with new ones for satisfactory sealing performance.</li><li>(5) Use appropriate equipment to lift valves when assembling heavy valves.</li></ul>

#### 2.2.2 Before assembly

- (1) Check all parts before assembly. Replace the valve, if needed.
- (2) Clean the reuse parts to remove oil, dust and other foreign objects.
- (3) Assemble valves at dust-free area.
- (4) Pay attention not to damage body seat, disc, stem threads and flange surfaces.
- (5) Adjust coupling marks provided before assembly.
- (6) All bolts and nuts should be tightened securely.

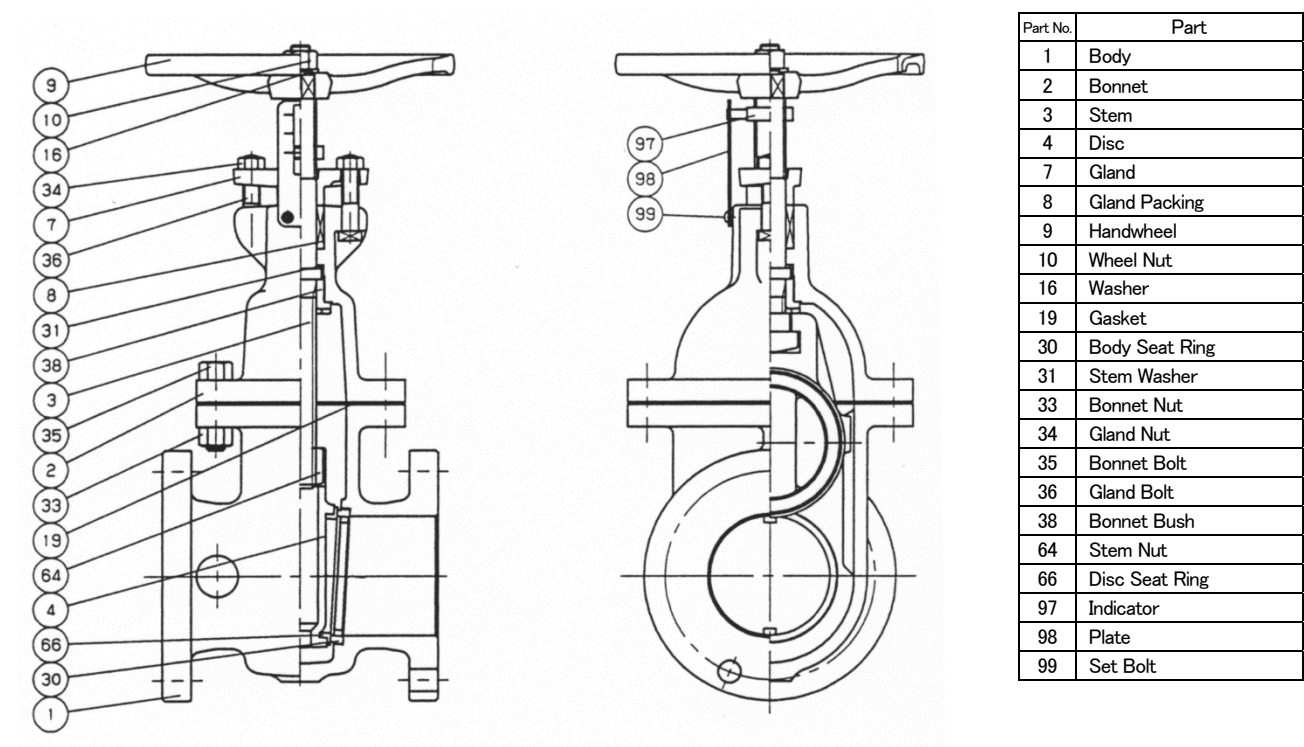
## VII. Disassembly and assembly

### 2.2.3 Assembly

- (1) Assemble gland packing and gland to bonnet and tighten gland bolts tentatively.
- (2) Insert stem from lower bonnet.
- (3) Assemble bonnet bush to bonnet.
- (4) Assemble indicator, handwheel and wheel nut to stem.
- (5) Assemble disc to stem to set it at intermediate position.
- (6) Mount gasket on bonnet flange.
- (7) Mount bonnet to body to place disc inside body in accordance with disc guide. Make sure the coupling marks and the disc original position before assembly..
- (8) Tighten bonnet bolts and nuts evenly, gradually and alternately on diagonal line.
- (9) Adjust indicator with disc fully close position. Assemble indicator to bonnet with set bolt.
- (10) Tighten gland nuts adequately. Too much tightening may cause non-smooth operation.
- (11) Check each threaded portion. Retighten them, if found loosened.

VII Disassembly and assembly

2.3 Construction





This illustration shows typical construction.  
Refer to the approved drawing for disassembly and assembly.



## VII Disassembly and assembly

### 3. Outside screw and yoke globe valve.

#### 3.1 Disassembly procedure

##### 3.1.1 Caution for disassembly

 <b>WARNING</b>	
	(1) Take protective measures against a blowout of fluid and catching fire..

 <b>CAUTION</b>	
	(1) Wear protective items such as goggles, gloves and working boots. (2) Pay attention not to catch fingers during disassembly. (3) Use appropriate equipment to lift valves when disassembling heavy valves.

##### 3.1.2 Before disassembly

- (1) Disassemble valves at dust-free area.
- (2) Pay attention not to damage body seat, disc, stem threads and flange surfaces.
- (3) Mark the valve body and bonnet flanges at their original position before disassembling valves.  
Couple these marks at assembly.



## VII. Disassembly and assembly



### 3.1.3 Disassembly

- (1) Turn the disc to intermediate position.
- (2) Loosen wheel nut.
- (3) Loosen gland nuts.
- (4) Remove bonnet bolts and nuts.
- (5) Remove bonnet upward from body slowly with stem and disc together so that the disc should not drop to the body.
- (6) Remove gasket from bonnet flange.
- (7) Turn the handwheel clockwise to contact yoke bush.
- (8) Remove wheel nut and handwheel.
- (9) Turn the stem clockwise from lower bonnet to disengage stem from yoke bush.
- (10) Remove stem from bonnet.
- (11) Remove gland nuts, gland, gland packing and other parts from bonnet.

## VII. Disassembly and assembly

### 3.2 Assembly

#### 3.2.1 Caution for assembly

 <b>CAUTION</b>	
	<ul style="list-style-type: none"><li>(1) Wear protective items such as goggles, gloves and working boots.</li><li>(2) No fire should be allowed in working area.</li><li>(3) Pay attention not to catch fingers during work.</li><li>(4) Replace packing and gasket with new ones for satisfactory sealing performance.</li><li>(5) Use appropriate equipment to lift valves when assembling heavy valves.</li></ul>

#### 3.2.2 Before assembly

- (1) Check all parts before assembly. Replace the valve, if needed.
- (2) Clean the reuse parts to remove oil, dust and other foreign objects.
- (3) Assemble valves at dust-free area.
- (4) Pay attention not to damage body seat, disc, stem threads and flange surfaces.
- (5) Adjust coupling marks provided before assembly.
- (6) All bolts and nuts should be tightened securely.

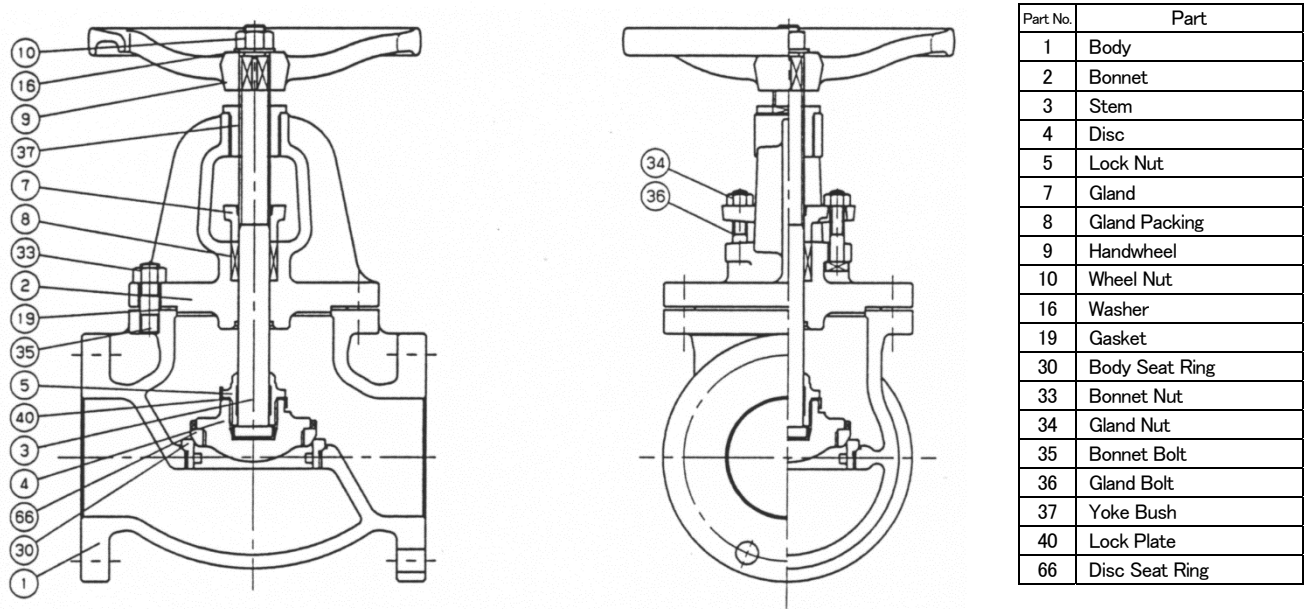
## VII. Disassembly and assembly

### 3.2.3 Assembly

- (1) Assemble gland packing and gland to bonnet and tighten gland bolts temporarily.
- (2) Insert stem from lower bonnet to engage yoke bush. Turn handwheel to counterclockwise direction to set stem at intermediate position.
- (3) Assemble handwheel to stem and tighten wheel nut.
- (4) Mount gasket on bonnet flange.
- (5) Mount bonnet to body. Make sure the coupling marks provided before assembly.
- (6) Tighten bonnet bolts and nuts evenly, gradually and alternately on diagonal line. The end of each tightened bolt should protrude equally beyond the nut.
- (7) Tighten gland nuts adequately. Too much tightening may cause non-smooth operation.
- (8) Check each threaded portion. Retighten them, if found loosened.

VII. Disassembly and assembly

3.3 Construction





This illustration shows typical construction.  
Refer to the approved drawing for disassembly and assembly.



## VII. Disassembly and assembly

### 4. Swing check valve

#### 4.1 Disassembly procedure

##### 4.1.1 Caution for disassembly

 <b>WARNING</b>	
	(1) Take protective measures against a blowout of fluid and catching fire.

 <b>CAUTION</b>	
	(1) Wear protective items such as goggles, gloves and working boots. (2) Pay attention not to catch fingers during disassembly. (3) Use appropriate equipment to lift valves when disassembling heavy valves.

##### 4.1.2 Before disassembly

- (1) Disassemble valves at dust-free area.
- (2) Pay attention not to damage body seat, disc, stem threads and flange surfaces.
- (3) Mark the valve body and cover flanges at their original position before disassembling valves.  
Couple these marks at assembly.



##### 4.1.3 Disassembly

- (1) Remove cover bolts and nuts.
- (2) Remove cover from body.
- (3) Remove gasket from cover flange.
- (4) Remove plug from body.
- (5) Remove hinge pin hanging arm with disc from body. Support the disc with hand to remove hinge pin.
- (6) Remove arm with disc from body.

## VII. Disassembly and assembly

### 4.2 Assembly

#### 4.2.1 Caution for assembly

 <b>CAUTION</b>	
	<ul style="list-style-type: none"><li>(1) Wear protective items such as goggles, gloves and working boots.</li><li>(2) No fire should be allowed in working area.</li><li>(3) Pay attention not to catch fingers during work.</li><li>(4) Replace gasket with new one for satisfactory sealing performance.</li><li>(5) Use appropriate equipment to lift valves when assembling heavy valves.</li></ul>

#### 4.2.2 At assembly

- (1) Check all parts before assembly. Replace the valve, if needed.
- (2) Clean the reuse parts to remove oil, dust and other foreign objects.
- (3) Assemble valves at dust-free area.
- (4) Pay attention not to damage body seat, disc and flange surfaces.
- (5) Adjust coupling marks provided before assembly.
- (6) All bolts and nuts should be tightened securely.

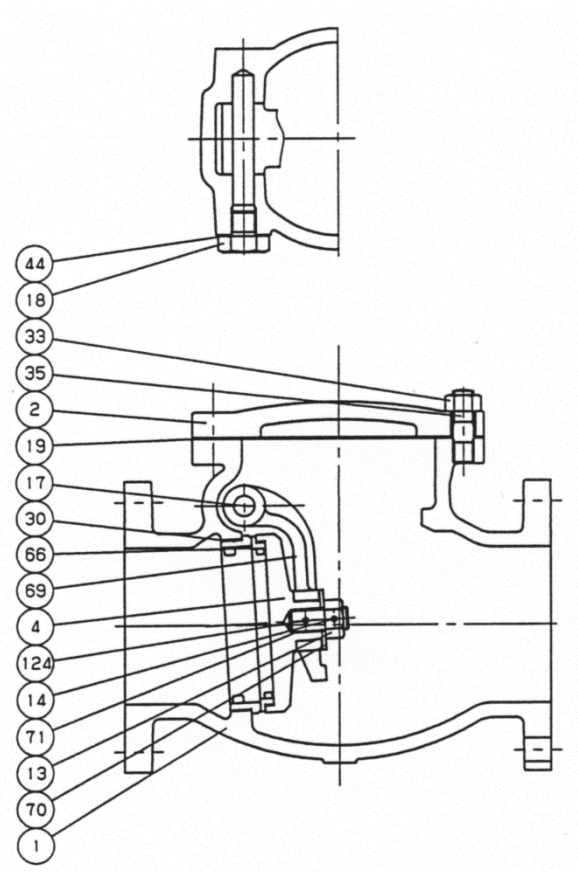
## VII. Disassembly and assembly

### 4.2.3 Assembly

- (1) Insert disc-arm subassembly to body with arm upward position.
- (2) Assemble hinge pin to disc-arm subassembly through arm hole.
- (3) Insert gasket between body and plug. Assemble plug to body.
- (4) Mount gasket on cover flange.
- (5) Mount cover to body. Make sure the coupling marks provided before assembly.
- (6) Tighten cover bolts and nuts evenly, gradually and alternately on diagonal line. The end of each tightened bolt should protrude equally beyond the nut.
- (7) Check each threaded portion. Retighten them, if found loosened.

VII. Disassembly and assembly

4.3 Construction



Part No.	Part
1	Body
2	Cover
4	Disc
13	Disc Nut
14	Split Pin
17	Hinge Pin
18	Plug
19	Gasket
30	Body Seat Ring
33	Cover Nut
35	Cover Bolt
44	Gasket
66	Disc Seat Ring
69	Arm
70	Washer
71	Disc Bolt
124	Spring Pin

This illustration shows typical construction.  
Refer to the approved drawing foe disassembly and assembly.