



# **Toyo Valve**

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## Operation Manual

For  
Floating Type Ball Valves  
【Screwed 3-Way 2-Seated】

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.

This manual applies to manual operation of screwed ends floating type 3-way 2-seated ball valves.

For electric or pneumatic valve operation, refer to the operation manual provided by relevant actuator manufacturer.

## CAUTION AND WARNING

To ensure safe and trouble-free function and performance, please read all the contents of this manual before handling, transportation, mounting, operation and maintenance of valves. Keep this manual in a convenient place for your valve operators' easy access.

The signal words "WARNING" and "CAUTION" are defined as follows:



Indicates a potentially hazardous situation which, if not avoided, will result in death or serious injury.



Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.



Indicates a prohibited action that must not be carried out.



Indicates a mandatory action that must be carried out.

## 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.

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## I . Construction and design features

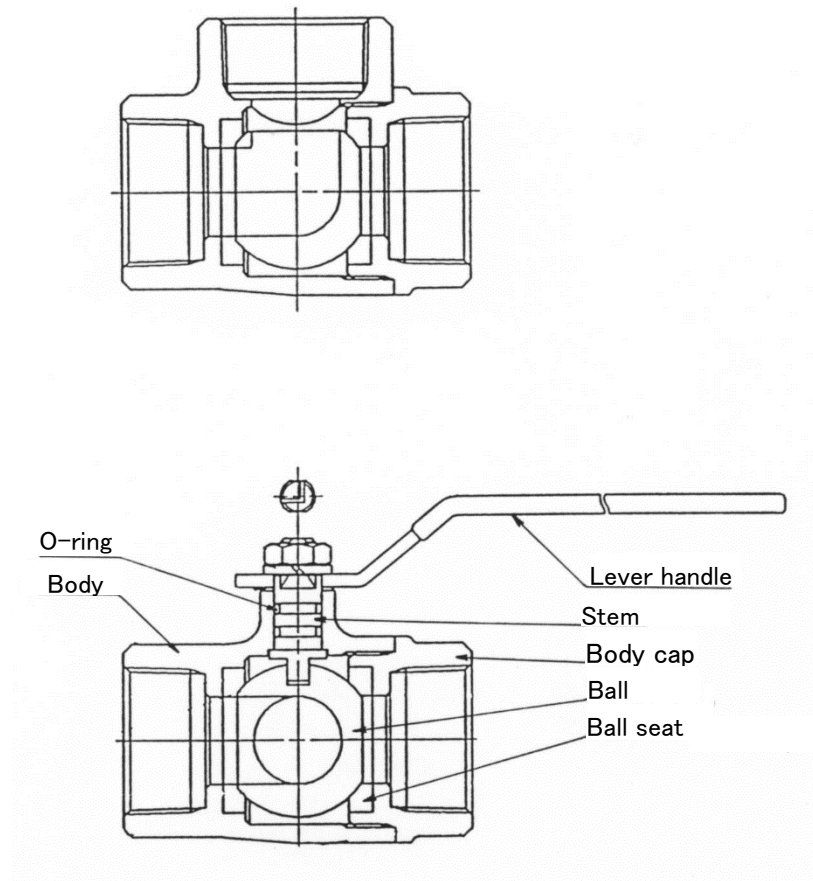
## I . Construction and design features

### 1. Construction and design features

1.1 Typical construction is shown as illustrated below.

1.2 The stem rotation by 90° switches fluid flow direction.

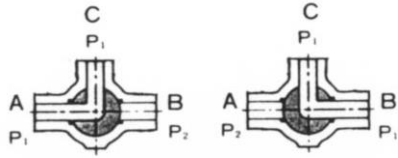
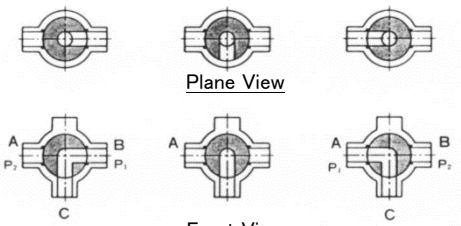
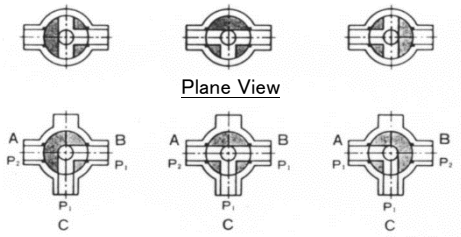
1.3 Switch form can be selected at your option by rearranging stopper to keep the 90° operator angle.



This illustration shows typical construction.

## I . Construction and design features

### 2. Switch form and fluid flow direction

Port type	Switch form	Fluid flow direction
<p>Horizontal 3-way 2-seated L-port</p>	 <p style="text-align: center;">Form 1                      Form 2</p>	<ol style="list-style-type: none"> <li>1. Form 1 : A ⇔ C</li> <li>2. Form 2 : B ⇔ C</li> <li>3. Seat leakage will happen when P<sub>2</sub> pressure is higher than P<sub>1</sub> pressure on each Form.</li> </ol>
<p>Vertical 3-way 2-seated L-port</p>	 <p style="text-align: center;">Plane View</p> <p style="text-align: center;">Front View</p> <p style="text-align: center;">Form 1                      Form 2                      Form 3 0° Position                      90° Position                      180° Position</p>	<ol style="list-style-type: none"> <li>1. Switch from Form 1 to Form 3 in turning the ball 180 deg., B ⇔ C become A ⇔ C.</li> <li>2. Switch from Form 1 to Form 2 in turning the ball 90 deg., C port become close. Seat leakage will happen when C port pressure is higher than other port.</li> <li>3. Seat leakage will happen when P<sub>2</sub> pressure is higher than P<sub>1</sub> pressure on Form. 1 and Form 3.</li> </ol>
<p>Vertical 3-way 2-seated T-port</p>	 <p style="text-align: center;">Plane View</p> <p style="text-align: center;">Front View</p> <p style="text-align: center;">Form 1                      Form 2                      Form 3 0° Position                      90° Position                      180° Position</p>	<ol style="list-style-type: none"> <li>1. Switch from Form 1 to Form 3 in turning the ball 180 deg., B ⇔ C become A ⇔ C.</li> <li>2. Switch from Form 1 to Form 2 in turning the ball 90 deg., Port A, B and C will be able to flow any direction.</li> <li>3. Seat leakage will happen when P<sub>2</sub> pressure is higher than P<sub>1</sub> pressure on Form. 1 and Form 3.</li> </ol>

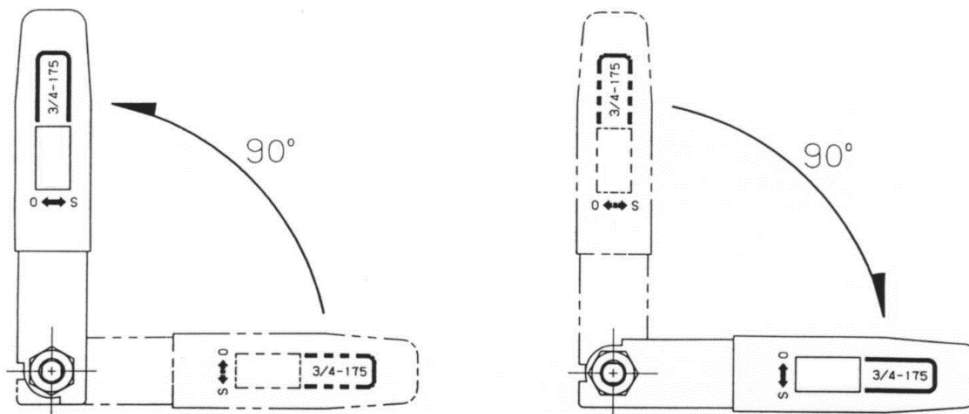
## Ⅱ . Operating device

## II. Operating device

### 1. Lever handle

1.1 Lever handle is directly mounted on the valve stem.

1.2 Rotating the lever handle by  $90^\circ$  will switch forms.







### III. Transportation and storage

### III. Transportation and storage

#### 1. Transportation

##### 1.1 Caution at transportation

 <b>CAUTION</b>	
	(1) 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.

#### 2. Storage

##### 2.1 Caution at storage

 <b>CAUTION</b>	
	(1) DO NOT store valves in the corrosive environment, which may cause corrosion from the valve threaded areas.  (2) DO NOT place any objects on valves, and DO NOT step on them. Overloading may cause damage to valves.  (3) DO NOT pile up products carelessly to avoid damage to the products and personal injury caused by unstable piling.
	(4) Keep the valves in the open position during storage. Storing the valves in halfway position may deform the ball seats, leading to the internal leakage.

##### 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.

## IV. Piping and mounting

## IV. Piping and mounting

### 1. Caution at installation

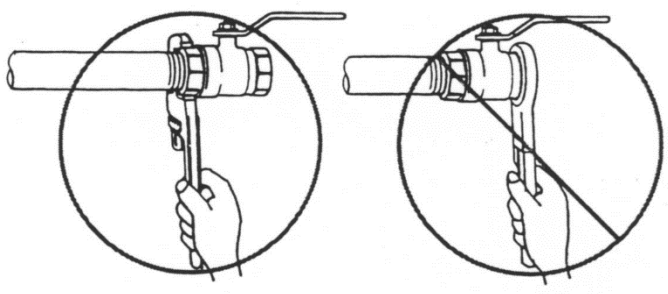
 <b>CAUTION</b>	
	<ul style="list-style-type: none"><li>(1) Keep a secure footing for valve installation and operation.</li><li>(2) Sufficient lighting should be prepared for valve operation.</li><li>(3) Piping should be properly supported, if needed.</li></ul>

- 1.1 Allow sufficient room for operation, installation and subsequent maintenance of valves.
- 1.2 Take appropriate measures for smooth operation, inspection and maintenance of valves if they are forced to be installed in small spaces.
- 1.3 Try not to install valves in the places where valve functions may be hampered by outer forces such as vibrations.
- 1.4 It is recommended to install valves to horizontal pipes in upright positions.

### IV. Piping and mounting

2 Warning and caution at piping and mounting

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

<b>⚠ CAUTION</b>	
<b>⊘</b>	(1) DO NOT disassemble valves during installation.
<b>!</b>	<p>(2) Take care not to damage threaded areas and seat surfaces during installation.</p> <p>(3) Use appropriate sealing materials in threaded areas, considering temperature, types and other conditions of the media.</p> <p>(4) DO NOT use pipe wrenches on valves. Use spanner or other proper tools for valve installation.</p> <p>(5) Apply a spanner to the valve end on the connecting pipe side. DO NOT apply a spanner on the other side.</p> <div style="text-align: center;">  <p style="text-align: right;">Prohibition</p> </div> <p>(6) DO NOT apply any external force counterclockwise around the body-cap joints of valves, since it would unintended loosen the joints.</p> <p>(7) DO NOT overly thread pipes into the valves. Excessive insertion of pipes into the valves may end up damaging the valve seats.</p> <p>(8) Keep valves original position during valve installation in order to protect the ball surface.</p>

## IV. Piping and mounting

- 2.1 Check the followings before valve mounting.
  - 2.1.1 Service conditions should be within the valve specifications.
  - 2.1.2 Valve threads should correspond with piping threads.
  - 2.1.3 No damage should be found on the valve and pipe threads.
  - 2.1.4 Make sure pipe threads comply with the relevant standards by using thread gauges.
- 2.2 Before installation, the inside and threaded areas of the connecting pipes should be cleaned to remove any foreign object such as cuttings, dust or oil.
- 2.3 Handle valves carefully so that they may not fall or drop on the ground. Any extraordinary mechanical impact should be avoided.
- 2.4 Remove the protection covers just before installation.
- 2.5 Check all threaded areas after installation and retighten them, if needed.
- 2.6 Flush piping after installation to assure removal of any foreign object.  
DO NOT operate the valves during flushing.

## IV. Piping and mounting

### 3. Piping and mounting procedures

3.1 Ensure the connecting areas of pipes to valves are threaded.

3.2 Remove all foreign objects such as cuttings and oil from pipes, inside pipes and threaded connections of valves by using detergents and waste cloth.

3.3 Apply sealing agents or seal tapes, to the threads of pipes.

3.4 Use appropriate tools to thread pipes into valves.

3.5 Do not apply an excessive torque, when threading pipes into valves. Torques should not exceed the value shown below.

Nominal	1/2 and smaller	3/4	1
Torque N·m	20 – 29	39 – 49	49 – 59

Nominal	1-1/4	1-1/2	2	2-1/2	3 and larger
Torque N·m	59 – 69	69 – 78	78 – 88	108 – 118	127 – 137




3.6 Gradually increase the pressure and temperature of pipelines, when conducting test run. Retighten all threaded areas of valves, if needed.

## V. Valve operation



## V. Valve operation

### 1. Caution at operation

 <b>CAUTION</b>	
	<ul style="list-style-type: none"><li>(1) DO NOT apply excessive torque by using a pipe or any other device to operate the valve.</li><li>(2) DO NOT loosen body cap screw of pressurized valves.</li><li>(3) DO NOT the services in intermediate position for long period, which may damage ball seats and cause seat leakage.</li></ul>
	<ul style="list-style-type: none"><li>(4) Operate the valve gradually to prevent damages of pipes, when the valve handles high temperature fluid such as steam.</li><li>(5) Take appropriate measures to prevent freezing, as needed.</li></ul>

### 2. Operation

#### 2.1 Lever handle

Rotation of the lever handle by 90° will switch forms.

## V. Valve operation




### 3. Daily inspection

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

Inspection Items	Areas to be inspected	Inspection Method	Remedial Measure
External leakage	Threads	Visual Soap solution	Retighten all threads
	Body surface	Visual Soap solution	Replace the valve
Abnormal noise	Valve body	Auditory check	Contact a piping engineer
	Loosened nuts	Auditory check	Retighten nuts
	Pipe vibration	Auditory check	Contact a piping engineer
Loosened threads	Threads	Visual Auditory check	Retighten all threads
Seat leakage	—	—	Remove foreign objects Replace the valve
Valve operation	Switch form	Visual	Make the form as instructed
	Disturbed operation	Tactile Auditory check	Replace the valve.

## V. Valve operation

### 4. Remedial measure

 <b>CAUTION</b>	
	<p>(1) Wear protective items such as goggles, gloves and working boots.</p> <p>(2) Take safety measures against toxic, flammable and corrosive fluid.</p> <p>(3) Operators should take protective measures to prevent direct exposure to the fluid in case the fluid spouts out from threaded areas.</p> <p>(4) Reduce line pressure to the atmospheric level when dismantled from pipe line. Operator should take protective measures to prevent direct exposure to the fluid in case the fluid spouts out from valves.</p>
	<p>(5) DO NOT apply the lubricant to pipes and valves which handle oxygen.</p>

### 5. Trouble shooting

Defect	Possible causes	Remedial Measure
Disturbed valve operation	Foreign objects may have choked up the valve body cavity and stock around the ball seats.	Flash out the foreign objects with fluid flow. Replace the valve.
Excessive operation torque	Foreign objects stuck to stem	Remove foreign objects and inspect the valve components.
	Foreign objects may have choked up the valve body cavity and stock around the ball seats.	Flash out the foreign objects with fluid flow. Replace the valve.
Leakage from stem	Damaged O-ring	Replace the valve.
Through bore seat leakage	Damaged ball seat	Replace the valve.
Noise and vibration	Loosened threaded area	Retighten threaded parts.

## 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 the valves.
- 1.3 Refer to daily inspection (Chapter V) for inspection items and methods.
- 1.4 Carry out periodic inspection of 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) Fluid stuck is expected.
  - c) Valve interior corrosion or abrasion is expected.



## VI. Periodic inspection

### 2. Maintenance inspection

In case pipelines or facilities where valves are installed are shut down for the pipeline inspection, remove the valves from the pipelines and perform the body and seat pressure tests as well as operation tests, if needed. If any defect is found, replace the valves.

#### 2.1 Warning and caution at dismantling and mounting

 <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) Discharge the fluid and pressure trapped within the valve body with the valve intermediate position before dismantling.</li> <li>(3) Completely discharge the toxic, flammable or corrosive fluid from pipe and valve interior.</li> <li>(4) Take protective measures to prevent direct exposure to the fluid and catching fire.</li> <li>(5) 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) Apply a spanner to the valve end on the connecting pipe side, when the valves are removed from or installed to pipes.</li> </ul>

## VI. Periodic inspection

### 2.2 Disassembly

DO NOT disassemble these valves.

### 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 ball.
- (3) There should be no offset of ball port and body port.

#### 2.3.2 Shell test and seat leakage test

- (1) Caution at 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 operation 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. Refer to JIS B 2003 for testing conditions.