



Toyo Valve

Operation Manual

for

Bronze and Brass Gate, Globe and Check Valves

[Threaded]

[Soldered]

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 bronze and brass inside screw gate, inside screw 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.

Index

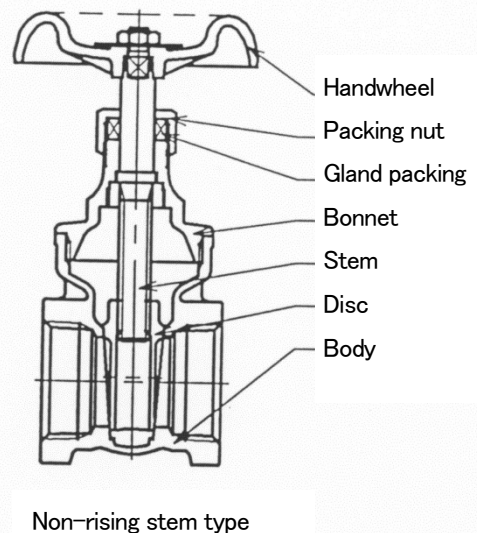
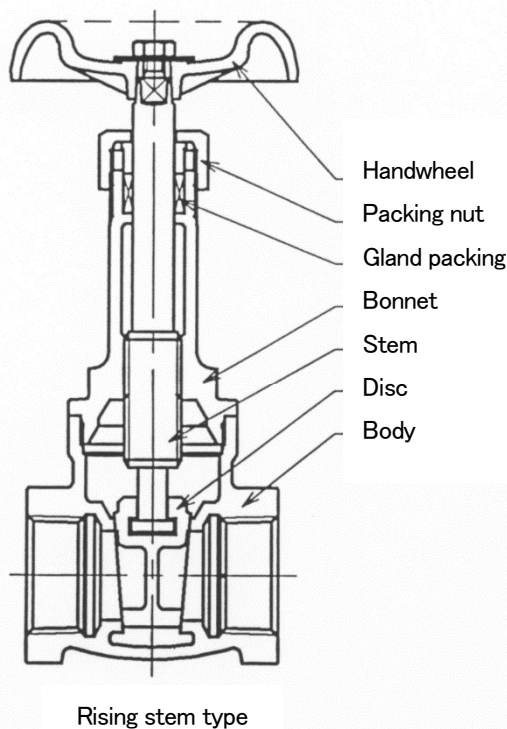
	Page
I . Construction and design features	
Inside screw gate valve	2
Inside screw globe valve	3
Swing check valve	4
Lift check valve	5
Lift check valve with spring	6
II . Operator	7
III . Transportation and storage	9
IV . Piping and mounting	11
Threaded	12
Soldered	16
V . Valve operation	20
VI . Periodic inspection	24

I . Construction and design features

I . Construction and design features

1. Inside screw gate valve

- 1.1 The typical valve construction and parts names are as illustrated below.
- 1.2 There are rising stem type which stem threads are engaged with bonnet threads and non-rising stem which stem threads are engaged with disc threads.
- 1.3 The space for rising stem is required for valve operation of rising stem type and not for non-rising stem type.
- 1.4 Open or close position cannot be checked outside the valve for non-rising stem type.
- 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.

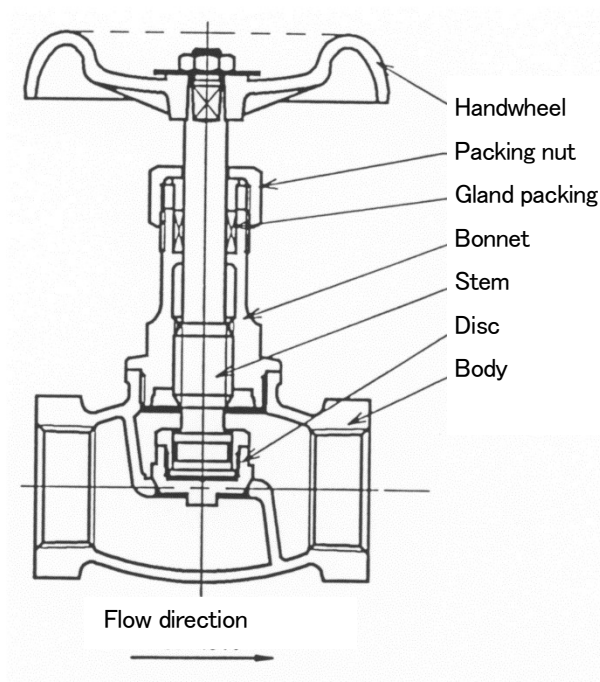


This illustration shows typical construction.

I . Construction and design features

2. Inside screw globe valve

- 2.1 The typical valve construction and parts names are as illustrated below.
- 2.2 Rising stem type which stem threads are engaged with bonnet threads.
- 2.3 The space for rising stem is required for valve operation.
- 2.4 Globe valve is designed to be used at fully open, fully close or intermediate position for flow control.
- 2.5 Globe valve has higher fluid resistance from its construction.
- 2.6 Globe valve requires higher operational torque to close the valve with full fluid resistance to the disc.
- 2.7 Fluid is uni-directional.



This illustration shows typical construction.

I . Construction and design features

3. Swing check valve

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

3.2 The hinge pin clamps the arm and disc.

The disc moves upwards uni-directionally with fluid flow.

3.3 Swing check valve is used to have uni-direction of fluid and to prevent back flow.

3.4 Fluid is uni-directional.

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

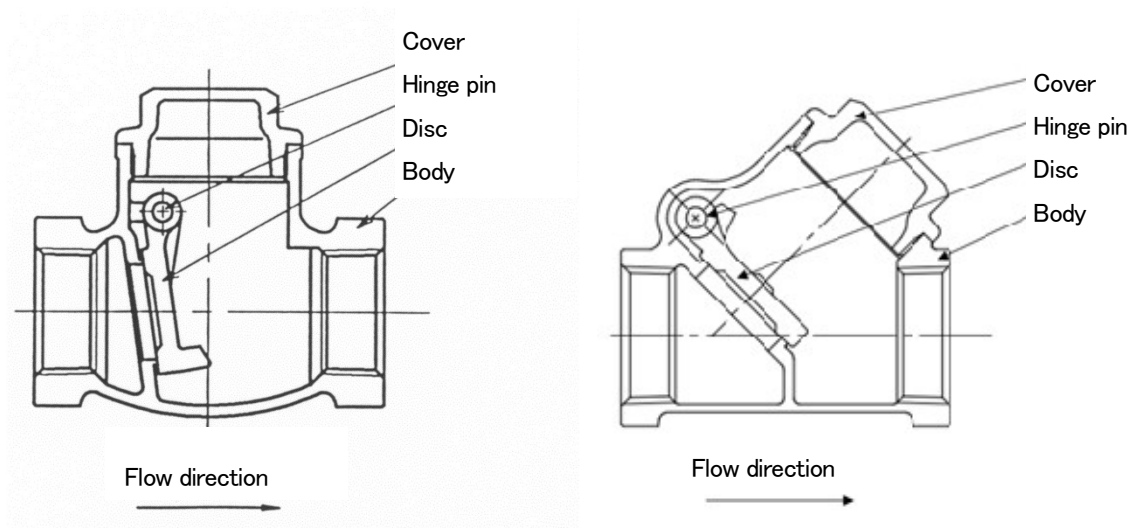
At vertical piping, the valve should have upward flow and be installed in accordance with the arrow on the body.

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

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

3.7 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 cycles of the valves.

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



This illustration shows typical construction.

I . Construction and design features

4. Lift check valve

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

4.2 The disc moves vertically to the seats along the cover guide.

4.3 Lift check valve is used to have uni-direction of fluid and to prevent back flow.

4.4 Fluid is uni-directional.

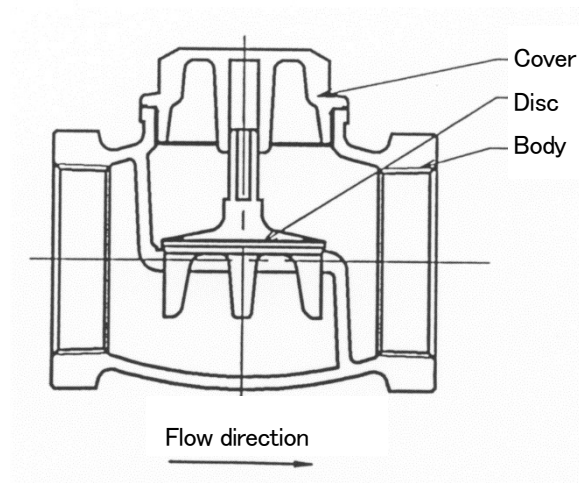
4.5 Lift check valve is used for horizontal piping only.

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 cycles of the valves.

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



This illustration shows typical construction.

I . Construction and design features

5. Lift check valve with spring

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

5.2 The disc moves vertically to the seats along the cover guide.

The spring reduces water hammer occurrence by making disc holder closing movement smooth.

5.3 Lift check valve is used to have uni-direction of fluid and to prevent back flow.

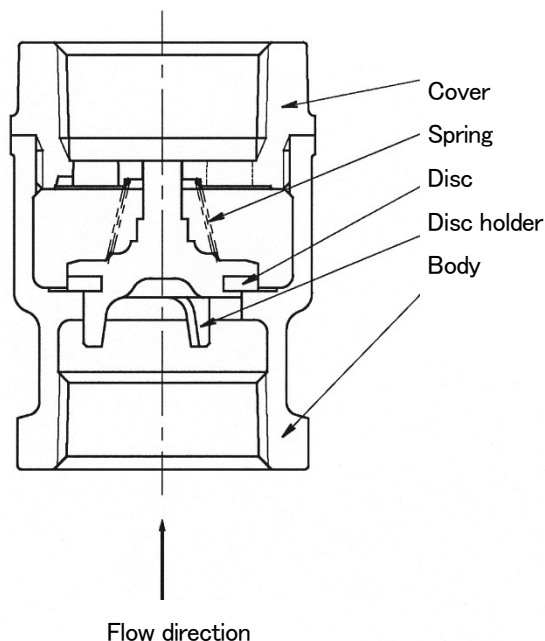
5.4 Fluid is uni-directional.

5.5 At vertical piping, the valve should have upward flow.

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

5.7 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 cycles of the valves.

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



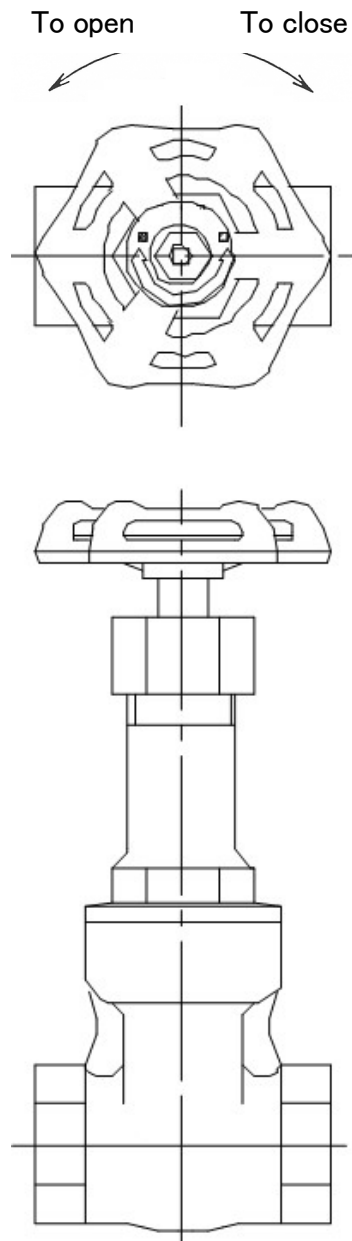
This illustration shows typical construction.

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 the handwheel opens the valve as indicated on the handwheel arrow.
- 1.3 Handwheel operating torques are different by the valve types and the opening degrees.





III. Transportation and storage

III. Transportation and storage

1. Transportation

1.1 Caution at transportation

 CAUTION	
	<ul style="list-style-type: none">● 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

 CAUTION	
	<ul style="list-style-type: none">● DO NOT store valves in the corrosive environment, which may cause corrosion from the valve threaded areas.● DO NOT place any objects on valves, and DO NOT step on them. Overloading may cause damage to valves.● DO NOT pile up products carelessly to avoid damage to the products and personal injury caused by unstable piling.

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. Installation (Threaded)



1.1 Caution at installation



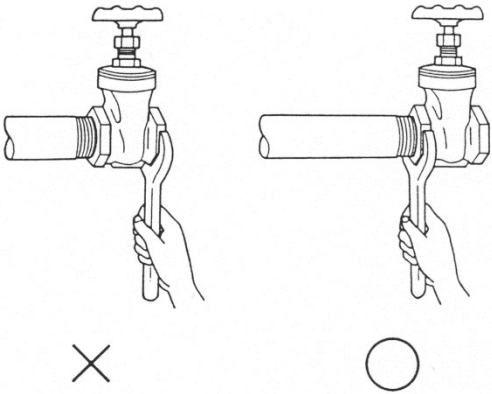
 CAUTION	
	<ul style="list-style-type: none">● Keep a secure footing for valve installation and operation.● Sufficient lighting should be prepared for valve operation.● Piping should be properly supported, if needed.

- 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 forced to be installed in 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.
- 1.1.6 Lift check valves should be installed to horizontal piping only.
- 1.1.7 Fluid flow should be upward for lift check valves with springs if they are installed to vertical piping.

IV. Piping and mounting

1.2 Caution at piping and mounting

 WARNING	
	<ul style="list-style-type: none">● Keep off the working area to prevent personal injury if valves are installed at higher places.

 CAUTION	
	<ul style="list-style-type: none">● Pay attention not to damage threaded areas and seat surfaces during mounting work.● DO NOT disassemble valves during mounting work.● Check valves are provided with fillers inside for seat damage protection during transportation. Ensure to remove them completely before mounting valves.● Globe and check valves should be mounted in accordance with arrows indicated on valve bodies.● They should be centered properly so that the piping be straight lines to prevent excessive pipe stress to the valves.● Use sealing materials applicable to the temperature and the fluid at threaded areas.● Use spanners or any other appropriate tools. It is prohibited to use a pipe wrench for valves.● Fit spanners on the valve ends to be connected with pipes. Do not fit them on the other ends. <div data-bbox="742 1373 1236 1765"></div> <ul style="list-style-type: none">● Do not overtighten piping, which may damage valve internals.● Retighten gland packings before operation. Packing tightening stress may be lowered due to the stress relaxation during transportation and storage, which may cause leakage.

IV. Piping and mounting

1.2.1 Check the followings before valve mounting.

- (1) Service conditions should be within the valve specifications.
- (2) Valve threads should correspond with piping threads.
- (3) No damage should be found on valve and piping threads.
- (4) The threads dimensions should correspond with the applicable standards.

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 flashing.

IV. Piping and mounting

1.3 Piping and mounting (Threaded)

1.3.1 Make sure that valves and pipes should be threaded properly.

1.3.2 Remove all foreign objects such as cutting oil and spatters from pipe internals and threaded areas with detergent or waste cloth.

1.3.3 Apply sealing material such as sealing tape to the pipe threads.

1.3.4 Use appropriate tools to thread valves into pipes.

1.3.5 Do not apply any excessive torques to thread pipe ends into valves. The torques should be within the following ranges.

Size	1/8	1/4	3/8	1/2	3/4	1
Torque N-m	20~29	20~29	20~29	20~29	39~49	49~59




Size	1-1/4	1-1/2	2	2-1/2	3 and up
Torque N-m	59~69	69~78	78~88	108~118	127~137



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

IV. Piping and mounting

2. Installation (Soldered)

2.1 Caution at installation

 WARNING																													
	<p>(1) The sealing materials determines the characteristic of service fluid and service range of pressure and temperature. Check the valve specifications with the catalogs and/or marking on the valve. Service beyond the valve specifications may cause fluid leakage and valve malfunctions.</p> <p>(2) The maximum service pressure and temperature of solder jointed valves are limited by the properties of solder material or valve themselves whichever smaller value. Information on typical solder material is provided below.</p> <p style="text-align: center;">Maximum service pressure (Mpa)</p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">Solder</th> <th rowspan="2">Temp. °C</th> <th colspan="3">Nominal Pipe Size</th> </tr> <tr> <th>1/4 to 1</th> <th>1 1/4 to 2</th> <th>2 1/2 to 4</th> </tr> </thead> <tbody> <tr> <td rowspan="4" style="text-align: center;">Tin – silver 96.5 – 3.5</td> <td style="text-align: center;">38</td> <td style="text-align: center;">3.45</td> <td style="text-align: center;">2.76</td> <td style="text-align: center;">2.07</td> </tr> <tr> <td style="text-align: center;">66</td> <td style="text-align: center;">2.76</td> <td style="text-align: center;">2.41</td> <td style="text-align: center;">1.90</td> </tr> <tr> <td style="text-align: center;">93</td> <td style="text-align: center;">2.07</td> <td style="text-align: center;">1.72</td> <td style="text-align: center;">1.38</td> </tr> <tr> <td style="text-align: center;">121</td> <td style="text-align: center;">1.38</td> <td style="text-align: center;">1.21</td> <td style="text-align: center;">1.03</td> </tr> </tbody> </table> <p>(3) Copper tubes should not be used for saturated steam service.</p>				Solder	Temp. °C	Nominal Pipe Size			1/4 to 1	1 1/4 to 2	2 1/2 to 4	Tin – silver 96.5 – 3.5	38	3.45	2.76	2.07	66	2.76	2.41	1.90	93	2.07	1.72	1.38	121	1.38	1.21	1.03
Solder	Temp. °C	Nominal Pipe Size																											
		1/4 to 1	1 1/4 to 2	2 1/2 to 4																									
Tin – silver 96.5 – 3.5	38	3.45	2.76	2.07																									
	66	2.76	2.41	1.90																									
	93	2.07	1.72	1.38																									
	121	1.38	1.21	1.03																									
	<p>(4) Servicing fluid velocity of 3m/sec. or more might cause erosion to copper tubes. Limit the service velocity to 2m/sec. For higher velocity, contact KITZ for technical advice.</p>																												

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

2.1.1 Allow sufficient room for safe and easy operation, installation and subsequent maintenance of valves.



2.1.2 For smooth operation, inspection and maintenance of valves take appropriate measures for valves which are forced to be installed in small spaces.




2.1.3 Try not to install valves in the places where valve functions may be hampered by such outer forces as vibrations and others.

IV. Piping and mounting

2.1.4 It is recommended to install valves on horizontal piping in a upright position.

2.2 Caution at piping and mounting

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

 CAUTION	
	<p>(1) DO NOT use a solder material of tin-lead 50-50 rating, which is hazardous to human health.</p> <p>(2) DO NOT use a solder material with melting point of 450°C or higher, because resultant crack on valve or copper tube surface may cause fluid leakage.</p> <p>(3) DO NOT connect other than ASTM B 88 "Seamless copper water tube" Type K, L or M.</p>
	<p>(4) Take care not to damage the seat surfaces and inside of socket during installation.</p> <p>(5) Prepare a solder material with melting point of 300°C or lower.</p> <p>(6) A solder material of tin-silver 96.5-3.5 rating is recommended.</p> <p>(7) Keep valves fully open position during valve installation in order to protect the ball surface.</p> <p>(8) Piping should be no offset to prevent excess piping stress to the valve.</p> <p>(9) Sufficient lighting should be prepared for valve installation</p> <p>(10) Retighten the gland before operation. Packing tightening force may be lowered due to the stress relaxation, which may take place during transportation and storage, leading to the occurrence of leakage through the gland area.</p> <p>(11) Piping should be properly supported, if needed.</p>

2.2.1 Check the following items before valve mounting :




- (1) Service conditions should be within the valve specifications.
- (2) Appropriate solder material should be chosen.
- (3) Appropriate copper tube should be chosen.
- (4) No damage should be found on valve and pipe ends.

2.2.2 Before installation, the inside of the connecting pipes should be cleaned to remove any foreign object such as sand, dust, spatter or cutting oil.

IV. Piping and mounting

- 2.2.3 Handle valves carefully so that they may not fall or drop on the ground. Any extraordinary mechanical impact should be avoided.
- 2.2.4 Remove the protection covers just before installation.
- 2.2.5 Retighten threaded parts after installation, if needed.
- 2.2.6 Flush piping after installation with all valves fully opened, to assure removal of any foreign object.
DO NOT operate the valves during flushing.

2.3 Piping and mounting (Soldered)

 CAUTION	
	<p>(1) DO NOT apply heat to the center of valve body, which may cause damage the packing or ball seats. Heating time for soldering work should be in any case minimized to protect damage the sealing material.</p>
	<p>(2) DO NOT place any other objects on valves, and DO NOT step on them. Over loading may damage valves.</p>
	<p>(3) DO NOT operate the soldered valve until the valve has been cooled down for protection of sealing materials.</p>
	<p>(4) Soldering should be carried out the by qualified person and procedure.</p>
	<p>(5) Wear appropriate protective item such as mask when soldering is carried out, because fume has toxic element and hazard for health.</p>
	<p>(6) After cooling down, retighten the gland to make sure leak-free performance of the valve. The gland might have been loosened due to thermal expansion of packing ring.</p>

- 2.3.1 Remove burrs from a cut edge of the copper tube with a reamer or a grinder. A deformed edge must be repaired.
- 2.3.2 Polish the external surface of the tube and valve socket to a glossy finish, using a sand paper or a steel wire blush, and clean them with clothes.
- 2.3.3 Apply some flux thinly and evenly to the polished surfaces of the tube. Make sure to use flux evenly when using a solder, which contains flux. No flux must be applied to the inside of the valve sockets.

IV. Piping and mounting

2.3.4 Insert the tube into the valve socket until the end of the tube contacts the internal shoulder of the valve socket. Rotate the tube a few times so that the flux may be evenly applied. Make sure to fully opened position the valve before heating.




2.3.5 Soldering procedure is as follows;

- (1) During heating, cover the body with a wetted cloth to prevent damage of gland packing, o-rings and ball seats.
- (2) Preheat the tube evenly to 100 °C between 30 – 40 mm distance from valve end to joint area, using an open-flame torch.
- (3) Heat the jointed area to an adequate temperature and press a solder wire around the jointed area.
- (4) Check that, due to a capillary phenomenon, melted solder evenly penetrates into the jointed surface.
- (5) Visually check that the tube and the valve socket are now firmly jointed continuous fillet.
- (6) Cool the valve body with a wetted cloth, as soon as the solder becomes solid. Do not operate the valve until the valve body has been cooled down.
- (7) After cooling, remove all flux to prevent surface corrosion.
- (8) Flush the tube and valve interior with water to remove all internal residues, as soon as piping installation is completed.

V. Valve operation

V. Valve operation

1. Caution at operation

 CAUTION	
	<ul style="list-style-type: none"> ● DO NOT apply excessive torque to the valve operating device. Manual valve should be operated manually not by special tool. ● DO NOT loosen bolts and nuts of gland and bonnet of pressurized valves. ● Avoid usage of gate valves at intermediate position, which may damage stem and disc.
	<ul style="list-style-type: none"> ● Retighten packing nut or gland nut before operation. Packing tightening pressure may be lowered due to the stress relaxation during transportation and storage, which may cause leakage from packing or gland area. ● Open the valve gradually to prevent damage to pipes when the valve handles high temperature fluid such as steam. ● Close the valve gradually to prevent water hammer if the valve handles liquid. ● Take appropriate measures not to freeze pipes and valves.

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 by 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 to the pipes, which makes the valve reopening easier and smoother.

V. Valve operation

3. Daily inspection

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



To check	Valve type	Area	Method	Measure
External leakage	Gate Globe	Gland	Visual Liquid soap	Retighten packing nut
	All	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 threads	Listening	Retighten all threads
		Pipe vibration	Listening	Contact a piping engineer
Loosened threads	All	Threads	Visual Touch	Retighten all threads
Seat leakage	All	—	—	Remove foreign objects Replace the valve
Valve operation	Gate Globe	Operating position	Visual	Make the position as instructed
	All	Not smooth operation	Touch Listening	Disassembling inspection Replace the valve

(NOTE) Don't reuse the valve that is not using gasket between body and body cap.

In this case, change the valve to the new one.

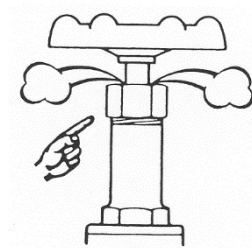
V. Valve operation

4. Remedial measure

 CAUTION	
	<ul style="list-style-type: none"> ● Wear protective items such as goggles, gloves and working boots. ● Reduce line pressure to the atmospheric level before retightening.

4.1 Leakage from gland area

Retighten packing nut to not excessively heavy level when leakage is found from gland packing area.



5. Trouble shooting

Trouble	Possible cause	Measure
Operation impossible	Foreign objects stuck to seat	Flash out the foreign objects with fluid flow
Excessive operation torque	Foreign objects stuck to stem threads	Remove the foreign objects and check the valve
	Foreign objects are piled up at the valve body bottom	Flash out the foreign objects with fluid flow
	Over-tightened gland packing	Loosen packing nut and retighten them adequately
Leakage from packing	Too loose gland packing	Retighten gland packing
	Damaged gland packing	Contact a piping engineer Replace the gland packing
	Damaged stem	Replace the valve
Seat leakage at fully close position	Damaged stem (by cavitation)	Contact a piping engineer
	Deformed seat	Contact a piping engineer
Noise and vibration	Loosened threads	Retighten threads

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 page 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.

2. Maintenance inspection

Perform seat leakage, shell leakage and operation tests, if needed, at maintenance inspection of the facility. If any defects are found, replacement of the valve is recommended.

2.1 Warning and caution at dismantling and mounting valves

 WARNING	
	<ul style="list-style-type: none"> ● Discharge the fluid from piping and reduce line pressure to the atmospheric level when dismantling valves. ● Discharge the fluid and pressure trapped within the valve body with the valve intermediate position before dismantling. ● Operator should take protective measures against the spouting fluid and igniting. ● Keep off the working area to prevent personal injury if valves are installed at higher places.

 CAUTION	
	<ul style="list-style-type: none"> ● Wear protective items such as goggles, gloves and working boots. ● Keep a secure footing at dismantling and mounting valves.

VI. Periodic inspection

2.2 Test and inspection



Refer to the followings.

2.2.1 Operation test

- (1) The valve should be operated smoothly without galling or sticking.
- (2) 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.
- (3) 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.
- (4) The disc should move to the stopper of the valve body at fully open position and move smoothly for check valve.

2.2.2 Shell test and seat leakage test

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

 CAUTION	
	<ul style="list-style-type: none">● Wear protective items such as goggles, gloves and working boots.● Take sufficient precautions before shell test and seat leakage test for operation safety.

- (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 B2003 and other standards for testing conditions.