



Toyo Valve

Operation Manual

For
PN16L TYPE BUTTERFLY VALVE

(WAFER and LUG TYPE)

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 the manual PN16L type butterfly valve of wafer and lug type.

For actuators of automatically operated valve, refer to the operation manual of relevant actuators prepared by the manufacturers.

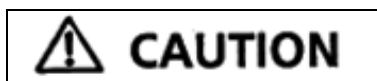
CAUTION AND WARNING

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 is designed to show an appropriate usage of products for transportation, storage, installation, operation and maintenance.

Be sure to read the manual before starting any of transportation, storage, installation, operation, maintenance, and handling valves. Also be sure to read the operation manual (No. D33-V) enclosed with the product in the package.

This manual does not cover the whole scope of conceivable usage of products for transportation, storage, installation, operation and maintenance. If technical assistance beyond the scope of this manual is required, contact KITZ Corporation or its distributors.

The specifications for transportation, storage, installation, operation and maintenance described in this manual have been determined with valve maintenance taken into consideration. DO NOT use products beyond the specifications.

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

* Any information provided in this operation manual is subject to revision at any time without notice.

This edition cancels all previous issues.

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CHAPTER I

Construction and Design Features

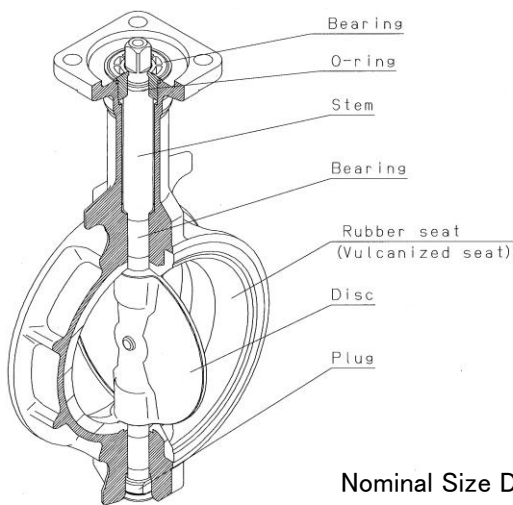
I Construction and Design Features

PN16L Butterfly Valves

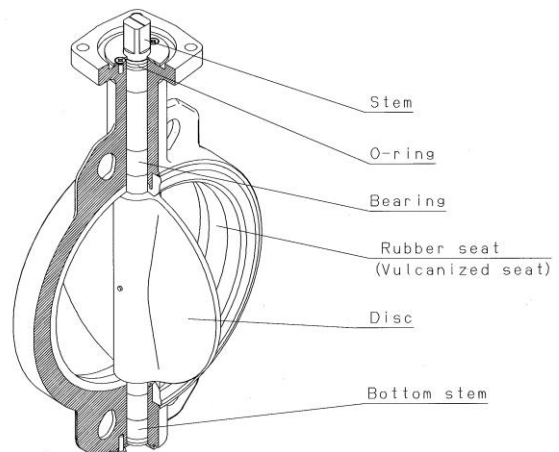
1. Construction and Function

- 1.1 The valve design and the name of the parts are shown below.
- 1.2 90° rotation of the stem opens and closes the valve.
- 1.3 Butterfly valve is serviceable in fully open, closed and intermediate position for flow control.
- 1.4 L type butterfly valve has center drive mechanism.
- 1.5 The bi-directional flow is available for butterfly valve.

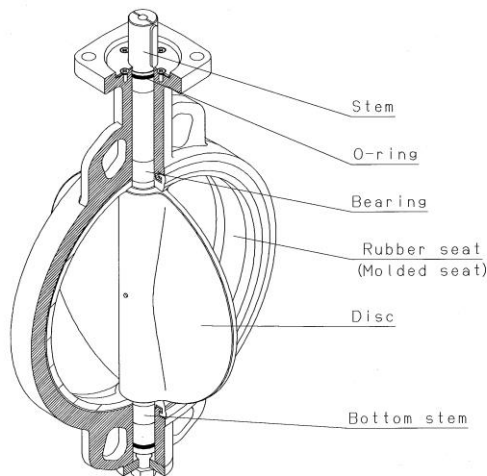
Nominal Size DN50 to DN200
(with vulcanized seat construction)



Nominal Size DN250 to DN300
(with vulcanized seat construction)



Nominal Size DN350 to DN600
(with molded seat construction)



This drawing shows a typical construction of valve.

I Construction and Design Features

2. General Feature

2.1 Vulcanized seat is applied for the valve with nominal size up to DN300, and Molded seat inserted for DN 350 to DN 600.

The valves with nominal size DN 50 to DN 300 have the vulcanized seat applied and is usable for high flow speed (max. 4m/sec), control and vacuum line without any options due to the construction which the body and rubber seat are integrated into the body.

The valves with nominal size DN 350 & larger ensure the performance equivalent to vulcanized seat type by optional specification (adhesion of rubber seat and body).

2.2 Face to face dimension should comply with EN 558 Basic series 20.

2.3 Actuator mounting flange should comply with ISO 5211 except outside diameter.

2.4 Lower operating torque ensure operability and durability of the valves.

2.5 Stem is designed to be blow-out proof.

2.6 Double seals are applied at the stem to prevent external leakage.

2.7 The valve has the longneck design for easier installation of 50mm insulation.

2.8 Lug type butterfly valves are available to use the pipe end service on following conditions;

- a) Non-shock water
- b) Lever or gear operated type (not automatic operated type)
- c) Maximum pressure; Full working pressure of the valve
- d) To be locked on full closed position
- e) Within 4 days *1

*1 It is recommended to use the blank flange for long period of time beyond 4 days.

If the valve is used beyond of these conditions, it may cause the external leakage.

I Construction and Design Features

3. Valve Specification and Pressure-Temperature Rating

3.1 Valve Specification

3.1.1 Maximum service pressure:

PN 16 1.6 MPa (16bar)

3.1.2 Service temperature range:

NBR seat from 0°C (*) to +70°C

EPDM seat from -10°C (*) to +120°C

(Continuous service temperature range from 0°C (*) to +100°C

(Refer to P-T chart for more details)

HT-EPDM seat from 0°C (*) to +135°C

* Media should not be frozen.

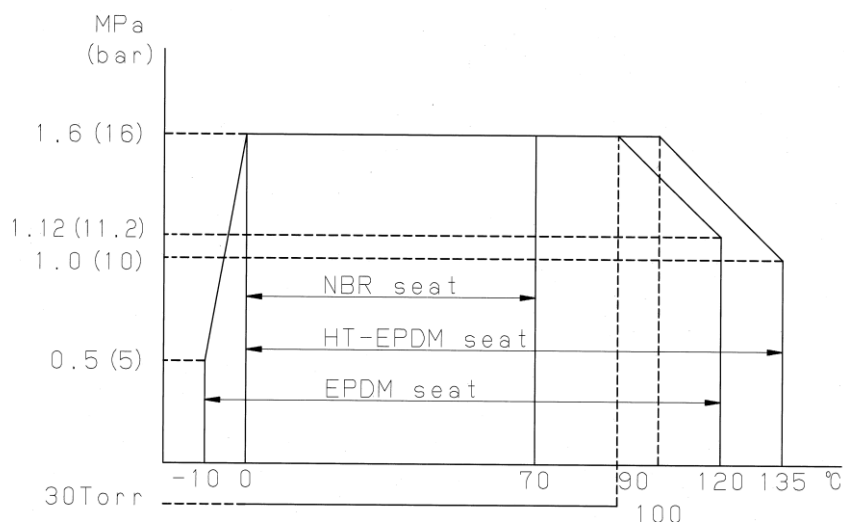
3.1.3 Shell test pressure

PN 16 2.4 MPa (24bar)

3.1.4 Seat test pressure

PN 16 1.76 MPa (17.6bar)

3.2 Pressure-Temperature Rating.



Note: Valves should not be used exceeding the P-T Rating .

Contact KITZ or its authorized distributors beforehand for advice in case of vacuum service.

I Construction and Design Features

4. Minimum Inside diameter of Applicable Pipes

Never apply the pipes with smaller inside diameter than the figures shown in the following table.

That will cause unwanted contact of the valve disc with the pipe ends.

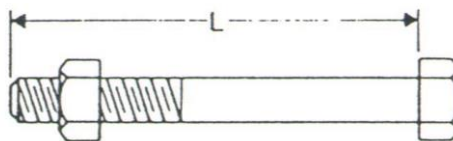
And the protrusions of the valve disc are shown in the following table.

Valve nominal size		Pipe inside diameter (mm)	Protrusions of Valve disc (mm)
DN	NPS		
50	2	32	4
65	2-1/2	52	10
80	3	75	18
100	4	92	25
125	5	118	35
150	6	145	48
200	8	195	69
250	10	244	90
300	12	292	110
350	14	332	128
400	16	379	142
450	18	427	161
500	20	473	179
600	24	566	214

5 Size and Number of Mounting Bolt and Nut

5.1. WAFER TYPE

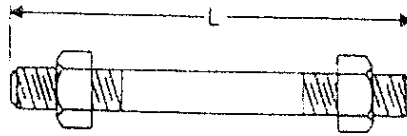
Hexagonal Bolt and Nut (L=mm)



I Construction and Design Features

Flange : PN16 (Steel/Ductile Iron)			
DN	Bolt Size	Length(L)	No.
50	M16	105	4
65	M16	105	4
80	M16	105	8
100	M16	115	8
125	M16	115	8
150	M20	120	8
200	M20	130	12
250	M24	150	12
300	M24	160	12
350	M24	170	16
400	M27	200	16
450	M27	210	20
500	M30	230	20
600	M33	270	20

Both threaded bolt and nut (L=mm)

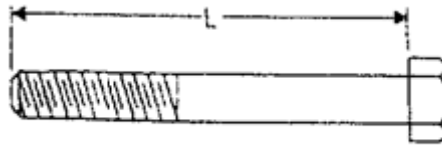


Flange : PN16 (Steel/Ductile Iron)			
DN	Bolt Size	Length(L)	No.
50	M16	125	4
65	M16	130	4
80	M16	130	8
100	M16	135	8
125	M16	140	8
150	M20	145	8
200	M20	150	12
250	M24	170	12
300	M24	190	12
350	M24	190	16
400	M27	220	16
450	M27	240	20
500	M30	260	20
600	M33	300	20

I Construction and Design Features

5.2. LUG TYPE

Hexagonal Bolt (L=mm)



Flange : PN16 (Steel/Ductile Iron)			
DN	Bolt Size	Length(L)	No.
50	M16	38	8
65	M16	40	8
80	M16	40	16
100	M16	40	16
125	M16	40	16
150	M20	45	16
200	M20	45	24
250	M24	53	24
300	M24	60	24
350	M24	60	32
400	M27	70	32
450	M27	75	40
500	M30	80	40
600	M33	90	40

I Construction and Design Features

6. Chemical Resistance Guide

FLUID \ MATERIAL	DISC				SEAT			
	AL-BRZ	DUCTILE	304	316	NBR W-NBR	EPDM HT-EPDM	FKM	VMQ
Acetic acid (10%)	×	△	◎	◎	×	○	×	◎
Air	◎	◎	◎	◎	◎	◎	◎	◎
Ammonia(anhydrous liquid)	×	○	◎	◎	△	○	×	△
Ammonia(solution)	×	○	◎	◎	○	○	×	-
Ammonium Sulfate	×	△	○	○	◎	◎	○	-
Animal Oil	○	◎	◎	◎	◎	○	○	-
Calcium Carbonate	×	×	○	○	◎	◎	◎	-
Carbonic Acid	-	×	○	○	○	○	◎	×
Chlorinated Water	×	-	-	△	○	-	◎	-
Ethane	-	○	○	○	◎	×	◎	×
Ethyl Alcohol	○	○	◎	◎	○	◎	○	◎
Freon 12	◎	○	-	◎	○	◎	△	×
Gasoline(refined/unleaded)	○	○	◎	◎	△	×	◎	×
Hydrochloric Acid	×	×	×	×	△	○	◎	-
Hydrogen Gas(cold)	◎	○	◎	◎	○	○	◎	-
Lubricating Oil(petroleum base)	○	◎	◎	◎	◎	×	◎	×
Methyl Alcohol	◎	○	◎	◎	○	◎	△	◎
Mineral Oil	○	○	◎	◎	◎	×	◎	○
Natural Gas	◎	◎	◎	◎	○	×	◎	◎
Oxygen(cold)	◎	○	◎	◎	○	○	◎	◎
Petroleum Oil(refined)	○	-	◎	◎	○	×	○	-
Propane Gas	-	○	○	◎	◎	×	◎	×
Sea Water	◎	×	○	○	◎	◎	◎	-
Soybean Oil	-	△	◎	◎	◎	△	◎	◎
Sulfuric Acid (7%)	×	×	△	○	○	○	◎	×
Sulfuric Acid (20%)	×	×	×	×	×	○	◎	×
Sulfurous Acid	×	×	○	○	△	△	◎	×
Steam(100°C)	◎	◎	◎	◎	×	○	△	-
Vegetable Oil	○	△	◎	◎	◎	△	◎	◎
Water(hot,150° F)	◎	△	◎	◎	×	○	◎	◎

◎ : Excellent ○: Good △: Poor ×: Very Poor -: Please Contact us

When fluid be used not listed here, contact us beforehand for advice.

Properties/applications shown are typical. Your specific application should not be undertaken without independent study and evaluation for suitability. While the utmost care has been used in compiling this date, We assume no responsibility for errors.

I Construction and Design Features

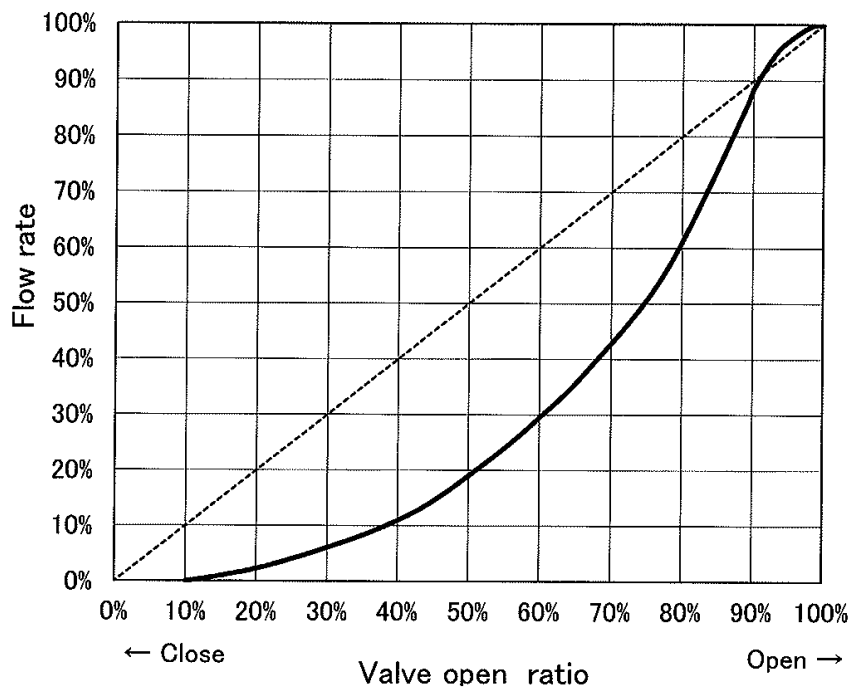
7. Flow coefficients and the flow characteristic curve

The flow coefficients (Kv and Cv) in the fully open position are shown in the following table.

DN	Kv	Cv
50	107	124
65	233	270
80	342	397
100	578	671
125	873	1013
150	1321	1532
200	2407	2792
250	3470	4025
300	5181	6010
350	6487	7525
400	8690	10080
450	11310	13120
500	13784	15990
600	20422	23690

$$\times \quad C_v = 1.16 \times K_v$$

The flow characteristic curve is shown in the graph.



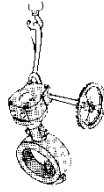


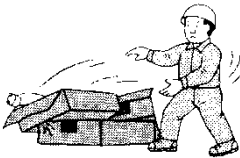

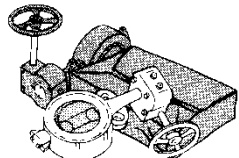

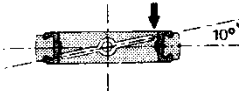



CHAPTER II

Transportation and Storage of Valves

II Transportation and Storage of Valves

Warnings and Cautions for Transportation and Storage



 WARNING		
	<p>① When moving a valve with a crane or other lifting devices, firmly hold the valve with a belt, paying an attention not to damage the valve stem and operator. Keep off the valve lifting area to protect injuries caused by unsecured valves.</p>	<p>①</p> 
 CAUTION		
	<p>② Don't drop valves on the ground. Don't place other objects on top of valves, or don't step on them. Overloading may damage valves, or cause injury to those handling valves.</p> <p>③ Don't stack valves high. Unstable stacking could result in damage to valves, or injury to those handling valves.</p> <p>④ Don't leave valves uncrated. Take an appropriate measure to prevent intrusion of foreign objects into valves which may cause damage to valve internals during operation.</p> <p>⑤ Don't place valves where they are directly exposed to dust, rain or sunlight.</p> <p>⑥ Don't store valves in the corrosive environment, which may cause corrosion on threaded portions of valves.</p>	<p>②</p>  <p>③</p>  <p>④</p> 
	<p>⑦ Store crated valves indoors in a dry and well ventilated place. Maximum humidity of 75% and maximum temperature of 60°C are recommended.</p> <p>⑧ For long term storage, leave the valve disc open approximately by 10° to prevent rubber liners from permanent deformation.</p> <p>⑨ High humidity may deteriorate quality of carton cases used to pack valves. Care should be taken when handle such deteriorated carton cases.</p> <p>⑩ Take care not to damage the valve painting surfaces during transportation, which may subsequently cause corrosion and get the valve rusty. Touch-up the damaged surfaces adequately.</p>	<p>⑧</p>  <p>⑨</p> 



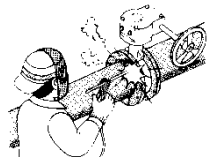

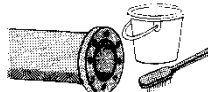
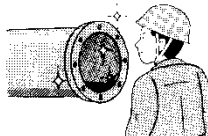
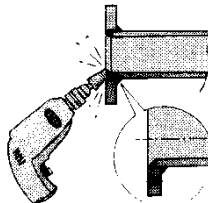
CHAPTER III

Valve Installation

III Valve Installation



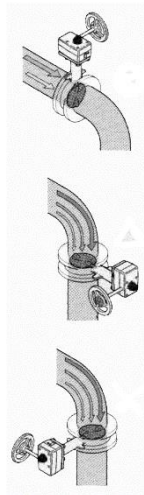

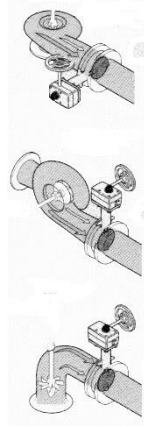
1. Warnings and Cautions for Preparation of Valve installation

 WARNING	
	<p>① Check the valve specifications with the identification plate or tag and the relevant product catalog, to ensure that the exact valves specified in your piping arrangement plan are provided. The service fluid, pressure and temperature determine the compatibility of trim and sealing materials. Incorrect application of a specific valve could be hazardous.</p>

 CAUTION		
	<p>② Before mounting valves, ensure to weld flanges to pipes first, and wait until the welded areas have cooled down to an ambient temperature. It may cause a damage to rubber liners that flanges are first jointed with valves and then welded to pipes.</p>	<p>②</p> 
	<p>③ Clean flanges with a synthetic detergent to make them rust-free. Also ensure that EPDM liners of valves are oil-free.</p> <p>④ Flange faces are required to be free from scratches, distortion or unevenness.</p> <p>⑤ Edges of flange welded areas shall be thoroughly chamfered to protect rubber liners of valves.</p> <p>⑥ Prior to valve mounting, clean the pipe bores to remove rusts, dusts, scales, welding spatters and other foreign objects which may affect valve sealing performance.</p>	<p>③</p>  <p>④</p>  <p>⑤</p> 



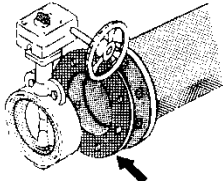
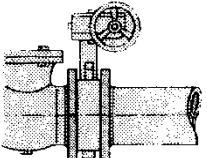

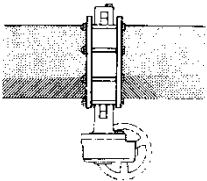
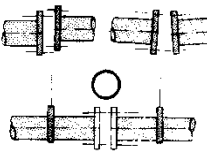
III Valve Installation

2. Warnings and Cautions for Valve installation Position and Location.

 CAUTION		
	<p>① A butterfly valve is provided with a disc shaped closure member, which is supported with a stem assembled in its core during opening and closing operation. This design, therefore, needs care for valve mounting position and location, to minimize an influence of the change of fluid velocity and line pressure.</p>	<p>③</p> 
	<p>② Ensure not to mount butterfly valves on the downstream side of elbows, reducers or control valves, where a considerable change of fluid velocity takes place. Should it be, however, found inevitable, ensure that valves shall be mounted 10 times as long as their nominal diameters apart.</p> <p>③ Where the piping system turns, ensure to mount valves as illustrated here.</p> <p>④ At the outlet of a pumping system, ensure to mount valves as illustrated here.</p> <p>⑤ Take proper actions to prevent danger when valves are installed where the following conditions exist:</p> <ul style="list-style-type: none"> (a). Questioned durability of valve materials against snow load or wind freezing. (b). Mechanical or electrical damage caused by flood. (c). Valve operation failure or wear caused by dust. (d). Material deterioration caused by radiation. (e). Electrical corrosion. (f). Bacterial corrosion. (g) Accelerated load when valves are installed on mobile equipment or apparatus to affect mechanical strength of valves. <p>⑥ Our valves are designed and constructed to have sufficient strength for underground service. However, besides operation and maintenance difficulty, electric or galvanic corrosion and bacterial corrosion are inherent problems. Sufficient and adequate care must be taken beforehand to inhibit or prevent such type corruptions occurring on this kind of installation..</p>	<p>④</p> 

III Valve Installation

3. Warnings and Cautions for Valve installation

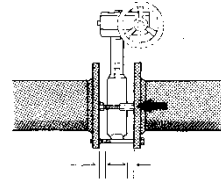
 CAUTION		
	<ul style="list-style-type: none"> ① Don't use gaskets between valves and flanges. ② Don't directly joint butterfly valves with check valves or pumps, which may contact valve discs during service and damage them. ③ In case of valves larger than ND350, ensure that valve operators shall not be positioned downwards as illustrated here. This may cause an external fluid leakage. 	<p>①</p>  <p>②</p> 
	<ul style="list-style-type: none"> ④ Ensure that each couple of pipe flanges are parallel without slippage or inclination as illustrated here. ⑤ Support the upstream and downstream pipes and make a correct centering. Incorrect centering of pipes is a major cause for an external fluid leakage through piping connection areas. ⑥ Try not to install valves in the places where valve functions may be hampered by outer forces such as vibrations. ⑦ Keep the firm footing for valve installation and operation. ⑧ Use supports for firmly holding pipes if needed to avoid excessive load caused by valve mass or valve operation. ⑨ Prepare sufficient room and lighting for valve installation and operation, considering the valve height and the stem direction. ⑩ Safety measures shall be sufficiently taken for foreign object in fluid, which may cause seat damage and external leakage. ⑪ Customers shall be contact KITZ or its authorized distributors beforehand for deepwater service, advising all details of your technical requirements. ⑫ Customers shall be contact KITZ or its authorized distributors beforehand for automatic act function and system service, advising all details of your technical requirements. 	<p>③</p>  <p>④⑤</p> 

III Valve Installation

4. Valve Installation Procedure

4.1 Set jack bolts under the pipes for flat support at the same height, and adjust the flange-to-flange distance so that some 6mm to 10mm room may be allowed beside the both sides of the valve body.

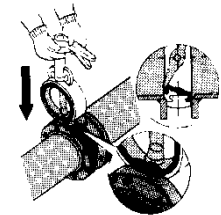
4.1



4.2 Ensure to leave the valve disc left open by 10° from the full closed position, when the valve is mounted on or dismantled from pipes.

4.3 Mount the valve carefully so that flange faces may not damage rubber liners and temporarily set a couple of boltings into lower bolt holes of two pipe flanges

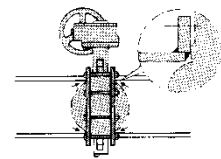
4.3



4.4 Then, set another couple of boltings into higher bolt holes of two flanges, make correct centering between pipes and the valve, and align them by temporary tightening of boltings.

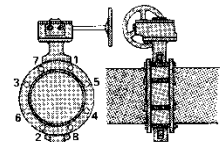
4.5 Trialily open the valve to check if there is no disturbing contact between the valve disc and the flanges.

4.5



4.6 Remove the jack bolts, set all boltings around the valve body and tighten them alternately and diagonally till the flanges contact the valve body.

4.6



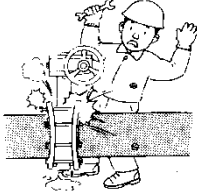
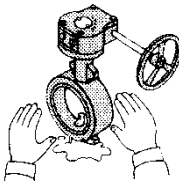


CHAPTER IV

Operation and Maintenance

IV Operation and Maintenance

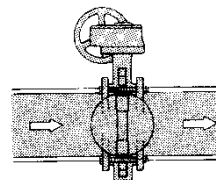
1. Warnings and Cautions for Operation and Maintenance

 WARNING																
	<p>① When valves need to be dismantled, ensure to thoroughly relieve the line pressure beforehand. Loosening piping bolts under the line pressure causes a danger. Any residual fluid left inside the pipeline must be completely drained to prevent an injury caused to those handling valves.</p> <p>② Safety measures shall be sufficiently taken when valves used for toxic or explosive fluid service are dismantled or disassembled. Also safety measures shall be taken to store or dispose valves used for toxic or explosive fluid service. They need to be isolated not to allow any access by strangers.</p> <p>③ Handling pneumatically or electrically actuated valves needs a careful study and implementation of the contents of operation and maintenance manuals provided, prior to any action to be taken.</p> <p>④ Safety measures shall be sufficiently taken for external fire, which may damage the function of valve sealing.</p> <p>⑤ Safety measures shall be sufficiently taken for surface temperature in case of high fluid temperature.</p> <p>⑥ The maximum flow velocity (m/s) shall be according to EN593 as follows:</p> <table border="1" style="margin: 10px auto; border-collapse: collapse; text-align: center;"> <thead> <tr> <th rowspan="2">PS (bar)</th><th colspan="2">Flow Velocity</th></tr> <tr> <th>Liquid fluids</th><th>Gaseous fluids</th></tr> </thead> <tbody> <tr> <td>10</td><td>3</td><td>30</td></tr> <tr> <td>16</td><td>4</td><td>35</td></tr> <tr> <td>25</td><td>5</td><td>40</td></tr> </tbody> </table>	PS (bar)	Flow Velocity		Liquid fluids	Gaseous fluids	10	3	30	16	4	35	25	5	40	<p>①</p>  <p>②</p> 
PS (bar)	Flow Velocity															
	Liquid fluids	Gaseous fluids														
10	3	30														
16	4	35														
25	5	40														

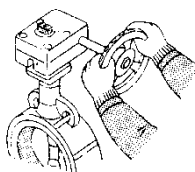
IV Operation and Maintenance**⚠ CAUTION**

- ⑦ Ensure to fully open valves when the piping systems are subjected to a loop test or leak detection with the test pressure higher than the nominal pressure of valves. Butterfly valves are not designed to play a role of gate valves. Application of high pressure to fully closed butterfly valves may damage rubber liners.
- ⑧ Valves equipped with manual operators such as levers, handwheels or gears must be only manually operated. Application of an excessive external force to operate valves may result in malfunction of valves and their operating devices.
- ⑨ When a gear operator is provided with a locking device. Ensure to unlock the device by loosening a butterfly bolt (Part No.132) before gear operation. If you have set a valve operating position for repeated use in the future, fix such a position with the locking device by tightening the butterfly bolt.
- ⑩ Don't manipulate the stopper bolts provided to gear operators. Incorrectly aligned valve operating positions may cause internal fluid leakage.
- ⑪ Throttling service with the disc opened by 30° or narrower may cause cavitation in the downstream pipe, resulting in vibration of the piping system and noise emission. Users are recommended to contact KITZ Corporation for technical advice when valves are used for throttling service.
- ⑫ Users are also recommended to carry out periodic inspections to check at least the following:
 - To check the valve operating position.
 - To check loosened boltings and consequent external fluid leakage.
 - To check vibration and noise emission of piping system.
- ⑬ Wear the protective items such as goggle, gloves, and safety shoes.
- ⑭ Before dismantling valves from the pipe, mark the valve body and coupled pipe flanges with their original position. Reinstall the valve on pipelines according to the marks after reassembly.

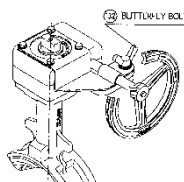
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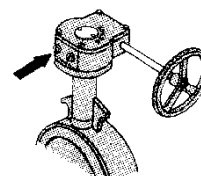
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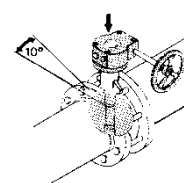
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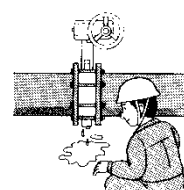
⑩



⑪



⑫



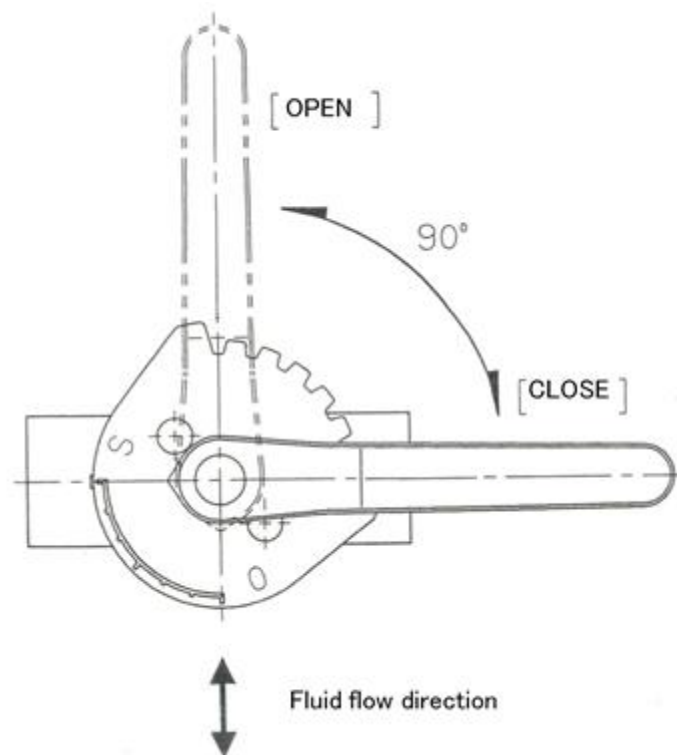
IV Operation and Maintenance

2. Valve Operation

2.1 Lever Handle Type

2.1.1 The lever handle is directly mounted on the valve.

2.1.2 Turning the lever handle 90° clockwise will close the valve, and turning the lever handle 90° counterclockwise will open the valve.



IV Operation and Maintenance

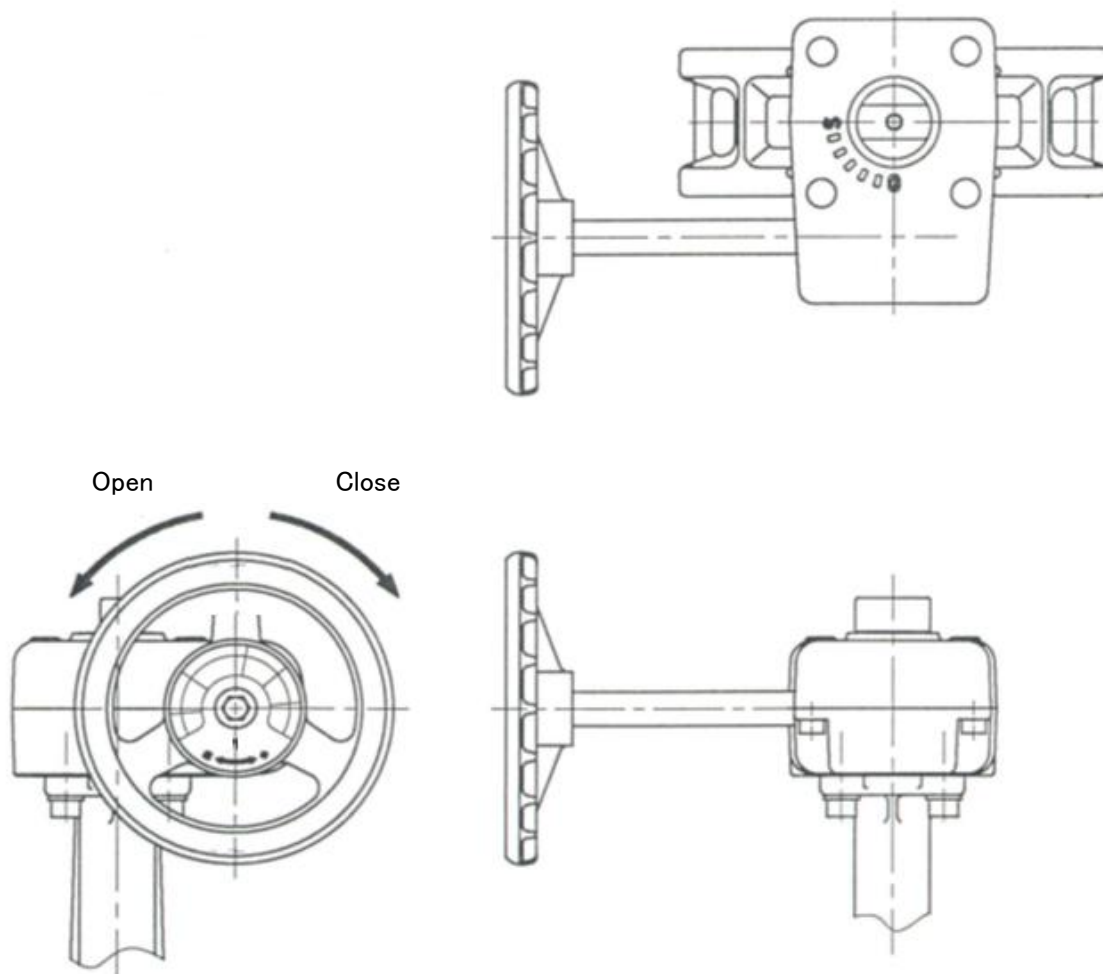
2.2 Gear Type

2.2.1 The worm gear operation device is mounted on the valve.

2.2.2 According to the letter or arrow on the handwheel, turning the handwheel clockwise will close the valve, and turning the handwheel counterclockwise will open the valve.

2.2.3 Hand wheel operating torque depends on the nominal size and opening position.

2.2.4 Worm gear operator is to transmit a large torque to valve stem, converting a torque from drive shaft by means of reduction gearing unit using worm gears.



IV Operation and Maintenance

3. Valve Maintenance

In order to operate your valves safely and satisfactorily, the Valve Maintenance is very important.
Here are the Items and Trouble solution.

Items	Areas to be inspected	Inspection Method	Countermeasures
External Leakage	Connection area	Visual check Soap water	Retighten piping bolts evenly and alternately in a star pattern.
	Body surface	Visual check Soap water	Change the valve.
Abnormal Noises	Valve body	Auditory check	Consult a piping engineer.
	Loosened bolts	Auditory check	Retighten bolts.
	Vibration of pipes	Auditory check	Contact a piping engineer
Loosened bolts and nuts	Bolts and nuts	Visual and Tactile check	Retighten bolts and nuts.
Seat leakage	—	—	Remove the foreign objects on seat rubber. Disassemble and inspect the valve. *1 Change the valve.
Valve operation	Valve position	Visual check	Make sure that the valve is in predetermined open/close position.
	Disturbed operation	Visual and tactile check	Inspect the dismantled valve. Change the valve.

* 1 The valves with nominal size DN200 & smaller cannot be disassembled.
Change the valve in that case.

CHAPTER V

Periodic Inspection

V Periodic Inspection

1. Periodic Inspection

- 1.1 Carry out periodic inspection about once a year with the valve installed on pipelines.
- 1.2 Ensure the smooth operation and sufficient valve function to be inspected.
- 1.3 Refer to Section IV.3 (Valve Maintenance) for the inspection items to be inspected and inspection methods.
- 1.4 Carry out the periodic inspection of valves, which are not operated for long period or not daily inspected. (Check all valves.)
- 1.5 It is extremely important to check valves when the valves are used under the following services or conditions:
 - a) Erosion and corrosion of valve interior are expected.
 - b) Choking of fluid is expected.
 - c) The valve is so important for the whole plant operation.

2. Warnings and Cautions for Periodic Inspection

Make sure to read and understand all items of IV.1 (Warnings and Cautions for Operation and Maintenance) before periodic inspection.

3. Disassembly and Reassembly

Disassemble and reassemble the valve according the instruction in Section VI of this manual.

4. Test and Inspection

The followings are the main items for test and inspection.

4.1 Operation test



- (1) The valve should be operated smoothly by the lever handle or gear operator without galling or sticking.
- (2) The stem should be firmly connected with the disc.
- (3) In fully open position, the disc should be parallel to the fluid flow.

4.2 Shell test and seat leakage test

All valves should be subjected to a hydrostatic or pneumatic shell test and seat leakage test at the required pressure.

Refer to the EN 12266-1 for test methods.

V Periodic Inspection**4.3 Cautions for shell test and seat leakage test**

 CAUTION	
	<ul style="list-style-type: none">① Wear the protective items such as goggle, gloves and safety shoes.② Take some precautions before shell test and seat leakage test for operators' safety.③ Testing media should be used in according with EN12266-1.④ Take care of safety issues such as visual inspection of tightened boltings and external leakage at each stage of pressure increment, when air or nitrogen gas is used as testing media.



CHAPTER VI



Disassembly and Reassembly of Valves

VI Disassembly and Reassembly of Valves

1. Disassembly

1.1 Warnings and Cautions for Safety

 WARNING	
	<ul style="list-style-type: none">① Operator should take an appropriate caution for not being exposed to the fluid or not to catch fire.② Take attention to blow out the stem and bottom stem when disassembly the valve. Because line pressure may come into the stem hole on the disc during in service.

 CAUTION	
	<ul style="list-style-type: none">① Wear the protective items such as goggles, gloves and safety shoes.② Take care not to catch fingers during disassembly.③ When disassembling valves of big mass one, use an appropriate lifting machine for safety operation.

1.2 Before Disassembly

1.2.1 Place the valve in a dust-free place.

1.2.2 Take care not to damage the sealing surfaces such as disc seat surface and seat rubber.

VI Disassembly and Reassembly of Valves

1.3 Disassembly Procedure (DN 50 to DN 200)

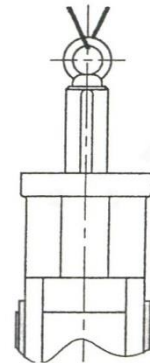
- 1.3.1 Remove the valve operator (lever handle, gear, pneumatic or electrical actuators) from the body (1) by removing the bolting.
- 1.3.2 The rubber seat of the body is vulcanized to the body, so it cannot be disassembled.
- 1.3.3 The upper stem and disc are pressed in, so they cannot be disassembled.
- 1.3.4 If any damage is detected on the body, replace it for new one.

1.4 Disassembly (DN 250 & DN 300)

- 1.4.1 Give adequate match marks on edges of the operators (gear, pneumatic or electrical valve actuator) and the body (1) for right and easy reassembly. Remove the operators from the body by removing the bolting.

- 1.4.2 Remove the end plate bolts (35), and remove the end plate (147) from the body (1).

- 1.4.3 Remove the gland plate bolts (36), and remove the gland plate (144) from the body (1), then pull out the stem (3) from the body(1) by making use of the tapped hole on the top of the stem(3).

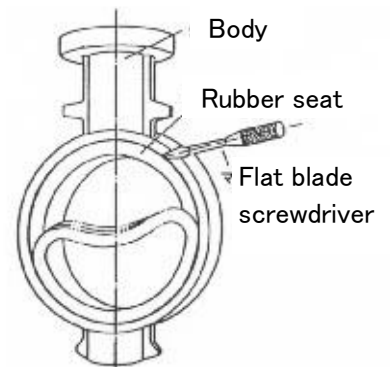
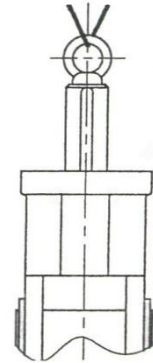


- 1.4.4 Insert the rod, whose diameter is smaller than that of the stem (3), from the top hole of the body (1), and hammer it lightly to remove the bottom stem (103).
- 1.4.5 Remove the disc (4) from the body (1) taking care not to damage the edge of the disc (4).
- 1.4.6 The rubber seat (106) is vulcanized to the body (1), so it cannot be disassembled
- 1.4.7 Remove the bearings (67A, B and C) and O-rings (45A and B) from the stem (3) and bottom stem (103).

VI Disassembly and Reassembly of Valves

1.5 Disassembly Procedure (DN 350 to DN600) For PN16L

- 1.5.1 Give adequate match marks on edges of the operators (gear, pneumatic or electrical valve actuator) and the body (1) for right and easy reassembly. Remove the operators from the body (1) by removing the bolting.
- 1.5.2 Remove the support bolt (A) from the end plate (147).
- 1.5.3 Remove the end plate bolts (35), and remove the end plate (147) from the body (1).
- 1.5.4 Remove the gland plate bolts (36), and remove the gland plate (144) from the body (1), then pull out the stem (3) from the body (1) by making use of the tapped hole on the top of the stem(3).
- 1.5.5 Insert the rod, whose diameter is smaller than that of the stem (3), from the top hole of the body (1), and hammer it lightly to remove the bottom stem (103).
- 1.5.6 Remove the disc (4) from the body (1) taking care not to damage the edge of the disc (4).
- 1.5.7 Remove the rubber seat (106) by inserting a flat blade screwdriver between the body (1) and the rubber seat (106) to make the space and putting the hand into that space to pull the rubber seat (106) out.
- 1.5.8 Remove the bearing (67A, B and C) and O-rings (45A and B) from the stem (3) and bottom stem (103).



VI Disassembly and Reassembly of Valves

1.6 Disassembly Procedure (DN 350 to DN600) For (A)PN16L

1.6.1 Give adequate match marks on edges of the operators (gear, pneumatic or electrical valve actuator) and the body (1) for right and easy reassembly. Remove the operators from the body (1) by removing the bolting.

1.6.2 For DN 500 and DN600, remove the support bolt (132) from the end plate (147).

1.6.3 Remove the end plate bolts (35), and remove the end plate (147) from the body (1).

1.6.4 Remove the snap ring (48), then pull out the stem (3) from the body (1) by making use of the tapped hole on the top of the stem (3).

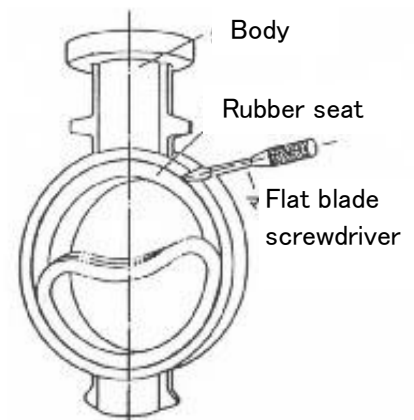
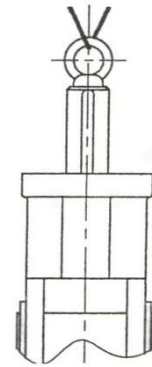
1.6.5 Insert the rod, whose diameter is smaller than that of the stem (3), from the top hole of the body (1), and hammer it lightly to remove the bottom stem (103).

1.6.6 Remove the disc (4) from the body (1) taking care not to damage the edge of the disc (4).

1.6.7 Remove the rubber seat (106) by inserting a flat blade screwdriver between the body (1) and the rubber seat (106) to make the space and putting the hand into that space to pull the rubber seat out. (Refer to FIG. Right)

1.6.8 Remove the O-rings (45A and 45B) from the gland (74).



1.6.9 Remove the O-ring (45C) from the end plate (147).



VI Disassembly and Reassembly of Valves

2 Reassembly

2.1 Cautions for safety

 CAUTION	
	<ul style="list-style-type: none">① Wear the protective items such as goggle, gloves and safety shoes.② Take care not to catch fire during reassembly.③ Take care not to catch, fingers during reassembly.④ O-ring shall be used new one. The reuse of o-rings may cause leakage.⑤ When reassembling valves of big mass one, use appropriate lifting machine for safety operation.

2.2 Before Reassembly

- 2.2.1 Check all necessary parts before reassembly. If the valve is found dissatisfactory in its function, replace the valve.
- 2.2.2 In case the parts are reused, ensure to clean the parts to completely remove the oil, dust and other foreign objects.
- 2.2.3 Reassemble the valve at a dust-free place.
- 2.2.4 Take care not to damage the seating area of the disc and rubber seat.

VI Disassembly and Reassembly of Valves

2.3 Reassembly Procedure (DN 50 to DN 200)

- 2.3.1 Prepare the valve without the operator (Bare stem).
- 2.3.2 Adjust open and closed position of the disc in line with the operator. Fix the body (1) to mount the operator, tightening the bolting. Ensure the fully closed position of the disc by operating the operator.



2.4 Reassembly Procedure (DN 250 & DN 300)

- 2.4.1 Install the bearings (67A, B and C) and O-rings (45A and B) on the stem (3) and bottom stems (103).
- 2.4.2 Press the disc (4) into the body (1) with fully opening position. Take care not to damage the disc edge. Apply a little grease (*1) to the top and the bottom of the disc (4), and the rubber seat (106), and its sealing area for easy works. Make sure that the holes of the body (1) are correctly aligned with those of the disc (4) by looking from the body top and bottom. (Before reassembly, make sure for the correct direction of the stem (3) and the disc (4).)
- 2.4.3 Insert the bottom stem (103) into the body (1) with the wooden hammer. Apply grease (*2) lightly to the bottom stem (103).
- 2.4.4 Insert the stem (3) into the body (1) with the wooden hammer matching the hole configuration (Square or Hexagon or key groove) of the disc (4). Apply grease (*2) lightly to the stem (3).
- 2.4.5 Install the gland plate (144) to the body (1).
- 2.4.6 Install the end plate (147) to the body (1).
- 2.4.7 Adjust the disc (4) and the valve operation device to appropriate open/close position. Install the operators with applicable bolting. Make match the marks provided before disassembly.

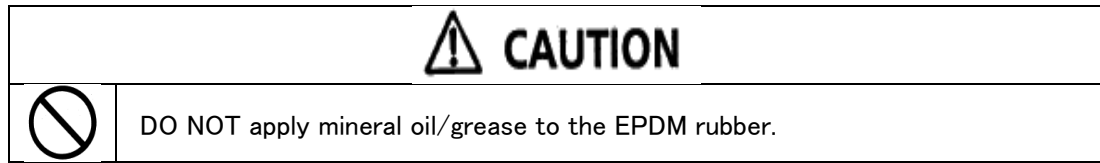
(*1) Silicon grease, SHIN-ETSU CHEMICAL, "KF-96-100000 cSt" or higher grade is recommended. Other approved greases can be substituted.

(*2) SUMICO LUBRICANT, "Moly Rubber Grease No.1" is recommended.

VI Disassembly and Reassembly of Valves**2. 5 Reassembly Procedure (DN 350 to DN 600) for PN16L**

 CAUTION	
	DO NOT apply mineral oil/grease to the EPDM rubber.

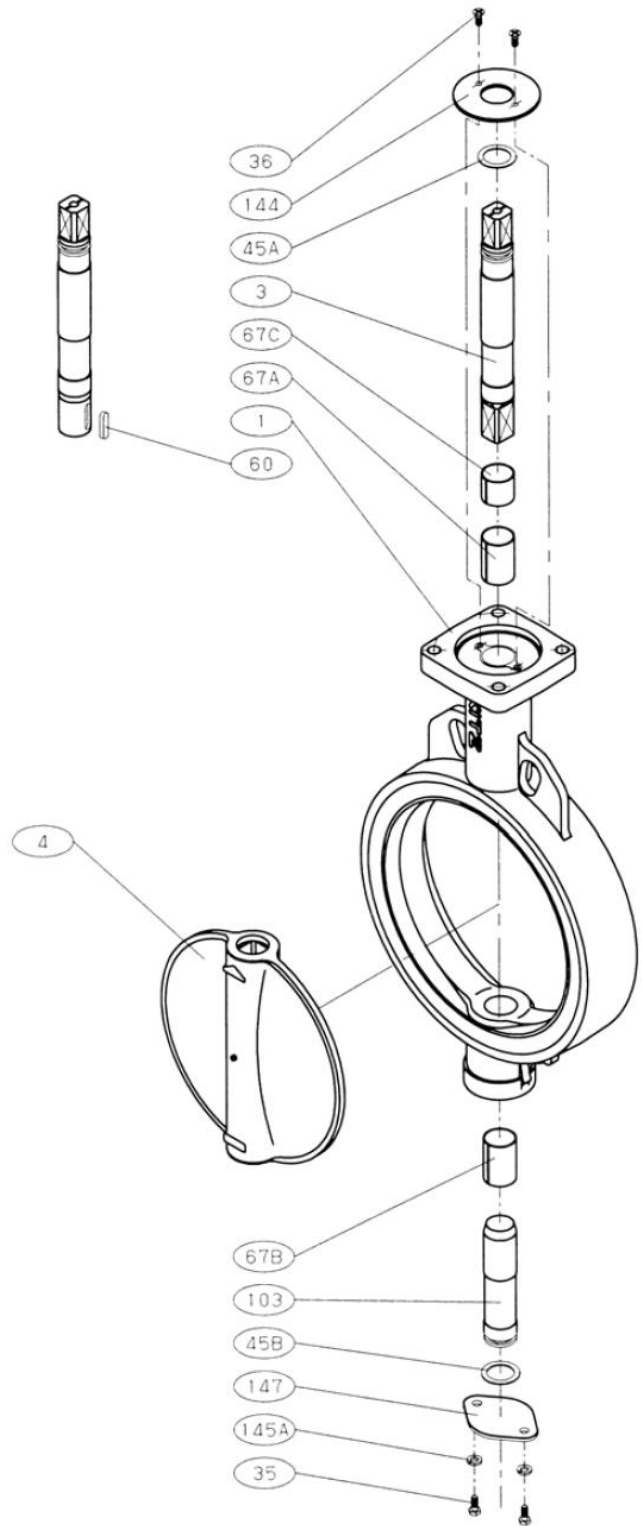
- 2.5.1 Install the bearings (67A, B and C) and O-rings (45A and B) on the stem (3) and bottom stem (103).
- 2.5.2 Place the body (1) upside down. Press down the rubber seat (106) and insert it into the body (1). Match the groove of the body (1) with the projection of the rubber seat (106).
- 2.5.3 After insertion, align the holes of the rubber seat (106) with those of both side of the body (1).
- 2.5.4 Apply some greases to the stem hole of the rubber seat (106) for easy works. (*1)
- 2.5.5 Press the disc (4) into the body (1) with fully open position. Take care not to damage the disc edge. Apply a little grease (*1) to the top and bottom of the disc (4), and the rubber seat (106), and its sealing area for easy works. Make sure that the holes of the body (1) are correctly aligned with those of the disc (4) by looking from the body top and bottom. (Before reassembly, make sure for the correct direction of the stem (3) and disc (4).)
- 2.5.6 Insert the bottom stem (103) into the body (1) with the wooden hammer. Apply grease (*2) lightly to the bottom stem (103).
- 2.5.7 Insert the stem (3) with the wooden hammer into the body (1) matching the hole configuration of the disc (4). Apply grease (*2) lightly to the stem (3).
- 2.5.8 Install the gland plate (144) to the body (1) with applicable bolting..
- 2.5.9 Install the end plate (147) to the body (1) with applicable bolting..
- 2.5.10 Adjust the support bolt (A) to position the disc (4) in the center of the rubber seat (106). Then fix the support bolt (A) with the seal washer (155) and the hexagon nut (13).
- 2.5.11 Adjust the disc (4) and the valve operator to appropriate open/close position. Install the operator with applicable bolting. Make match the marks provided before disassembly.
- (*1) Silicon grease, SHIN-ETSU CHEMICAL, "KF-96-100000 cSt" or higher grade is recommended. Other approved greases can be substituted.
- (*2) SUMICO LUBRICANT, "Moly Rubber Grease No.1" is recommended.

VI Disassembly and Reassembly of Valves**2.6 Reassembly Procedure (DN 350 to DN 600) for (A)PN16L**

- 2.6.1 Place the body (1) upside down. Press down the rubber seat (106) and insert it into the body (1). Match the groove of the body (1) with the projection of the rubber seat (106).
- 2.6.2 After insertion, align the holes of the rubber seat (106) with those of both side of the body (1).
- 2.6.3 Apply some greases to the stem hole of the rubber seat (106) for easy works. (*1)
- 2.6.4 Press the disc (4) into the body (1) with fully open position. Take care not to damage the disc edge. Apply a little grease (*1) to the top and bottom of the disc (4), and the rubber seat (106), and its sealing area for easy works. Make sure that the holes of the body (1) are correctly aligned with those of the disc (4) by looking from the body top and bottom. (Before reassembly, make sure for the correct direction of the stem (3) and disc (4).)
- 2.6.5 Insert the bottom stem (103) into the body (1) with the wooden hammer. Apply grease (*2) lightly to the bottom stem (103).
- 2.6.6 Insert the stem (3) with the wooden hammer into the body (1) matching the hole configuration of the disc (4). Apply grease (*2) lightly to the stem (3).
- 2.6.7 Install the O-rings (45C) on the end plate (147). Then install the end plate (147) to the body (1) with applicable bolting.
- 2.6.8 For DN 500 and 600, adjust the support bolt (132) to the tapped hole of the end plate (147). Then fix the support bolt (132) with the seal washer (155) and the hexagon nut (133).
- 2.6.9 Install the bearing (67A) and O-rings (45A and 45B) on the gland (74). Then install the gland (74) to the body (1).
- 2.6.10 Install the snap ring (48) into the groove of the body (1).
- 2.6.11 Adjust the disc (4) and the valve actuator to appropriate open/close position. Install the actuator with applicable bolting. Make match the marks provided before disassembly.
- (*1) Silicon grease, SHIN-ETSU CHEMICAL, "KF-96-100000 cSt" or higher grade is recommended. Other approved greases can be substituted.
- (*2) SUMICO LUBRICANT, "Moly Rubber Grease No.1" is recommended.

VI Disassembly and Reassembly of Valves

3. Exploded View Drawing. (250mm to 300mm)

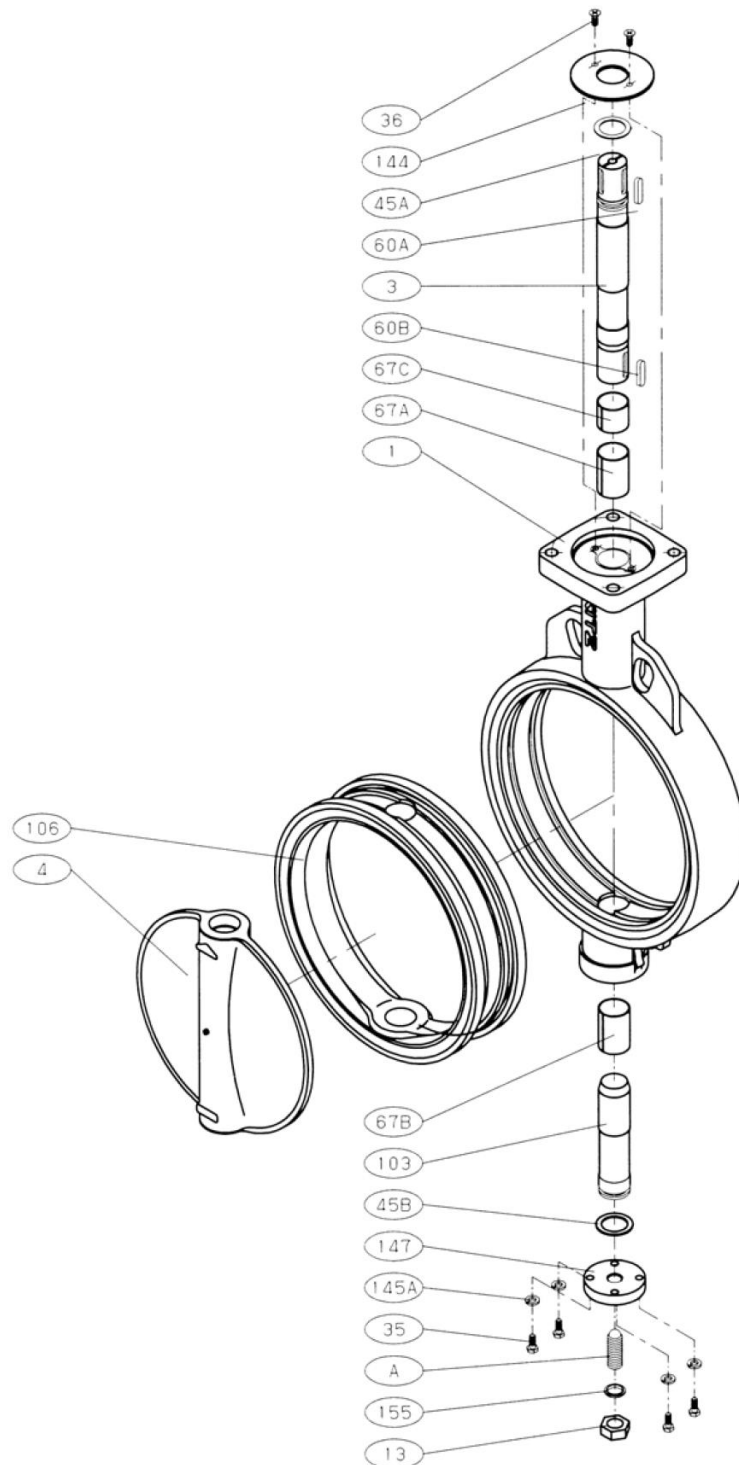


No.	Parts Name
1	Body
3	Stem
4	Disc
35	Hexagon bolt
36	Bolt
45A	O ring
45B	O ring
60	Key(SIZE 300 ONLY)
67A	Bearing
67B	Bearing
67C	Bearing
103	Bottom stem
106	Rubber seat
144	Gland plate
145A	Spring washer
147	End plate

This drawing indicates a typical construction of the valve.
Refer to the approval drawing before disassembly and assembly.

VI Disassembly and Reassembly of Valves

4. Exploded View Drawing. (350mm to 600mm) For PN16L



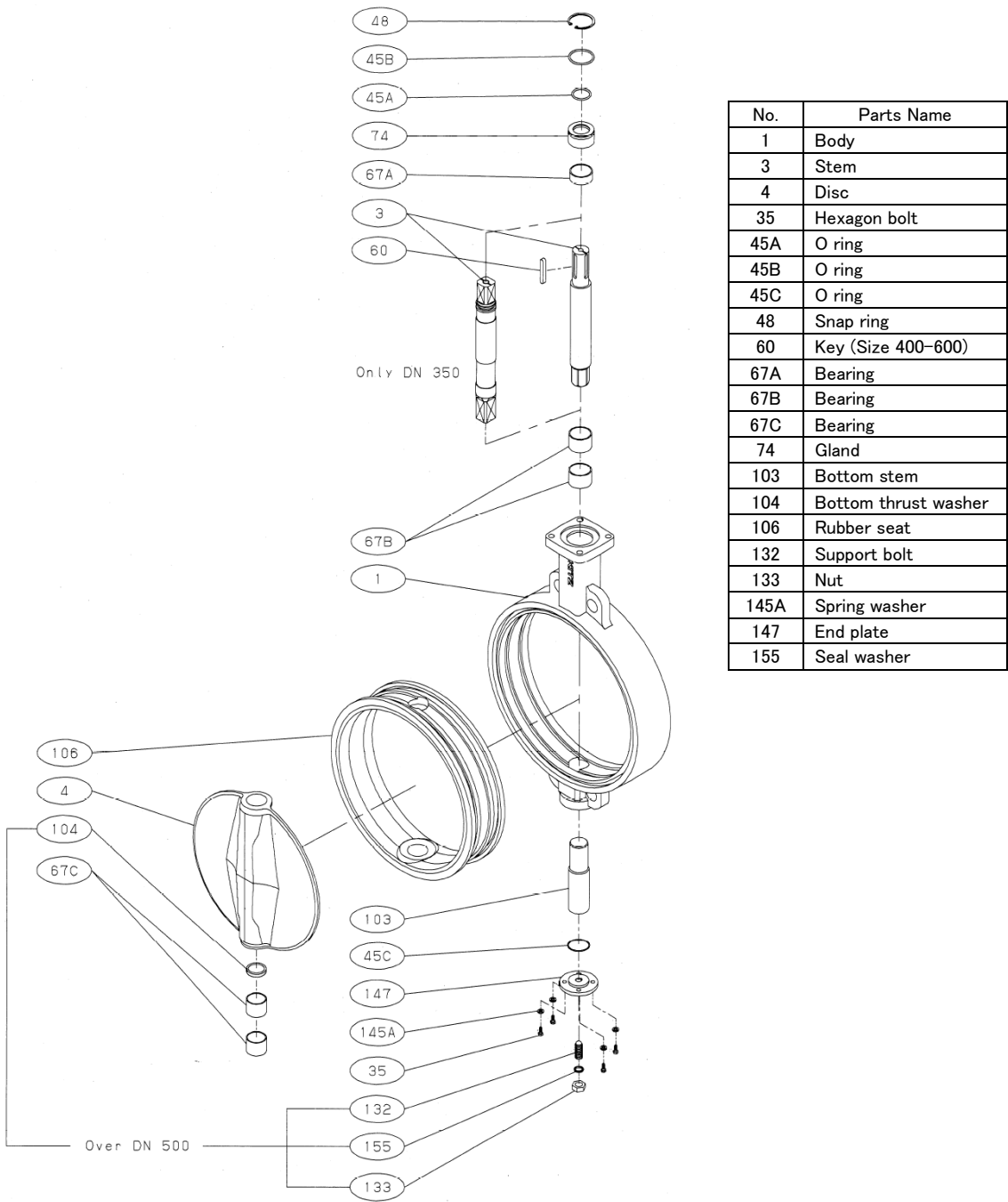
No.	Parts Name
1	Body
3	Stem
4	Disc
13	Hexagon nut
35	Hexagon bolt
36	Bolt
45A	O ring
45B	O ring
60A	Key
60B	Key
67A	Bearing
67B	Bearing
67C	Bearing
103	Bottom stem
106	Rubber seat
144	Gland plate
145A	Spring washer
147	End plate
155	Seal washer
A	Support bolt

This drawing introduces a typical construction of the valve.
Refer to the approval drawing before disassembly and assembly.

VI Disassembly and Reassembly of Valves

5. Exploded View Drawing. (DN 350 to DN 600) For (A)PN16L

This drawing introduces a typical construction of the valve
Refer to the approval drawing before disassembly and assembly



This drawing introduces a typical construction of the valve
Refer to the approval drawing before disassembly and assembly