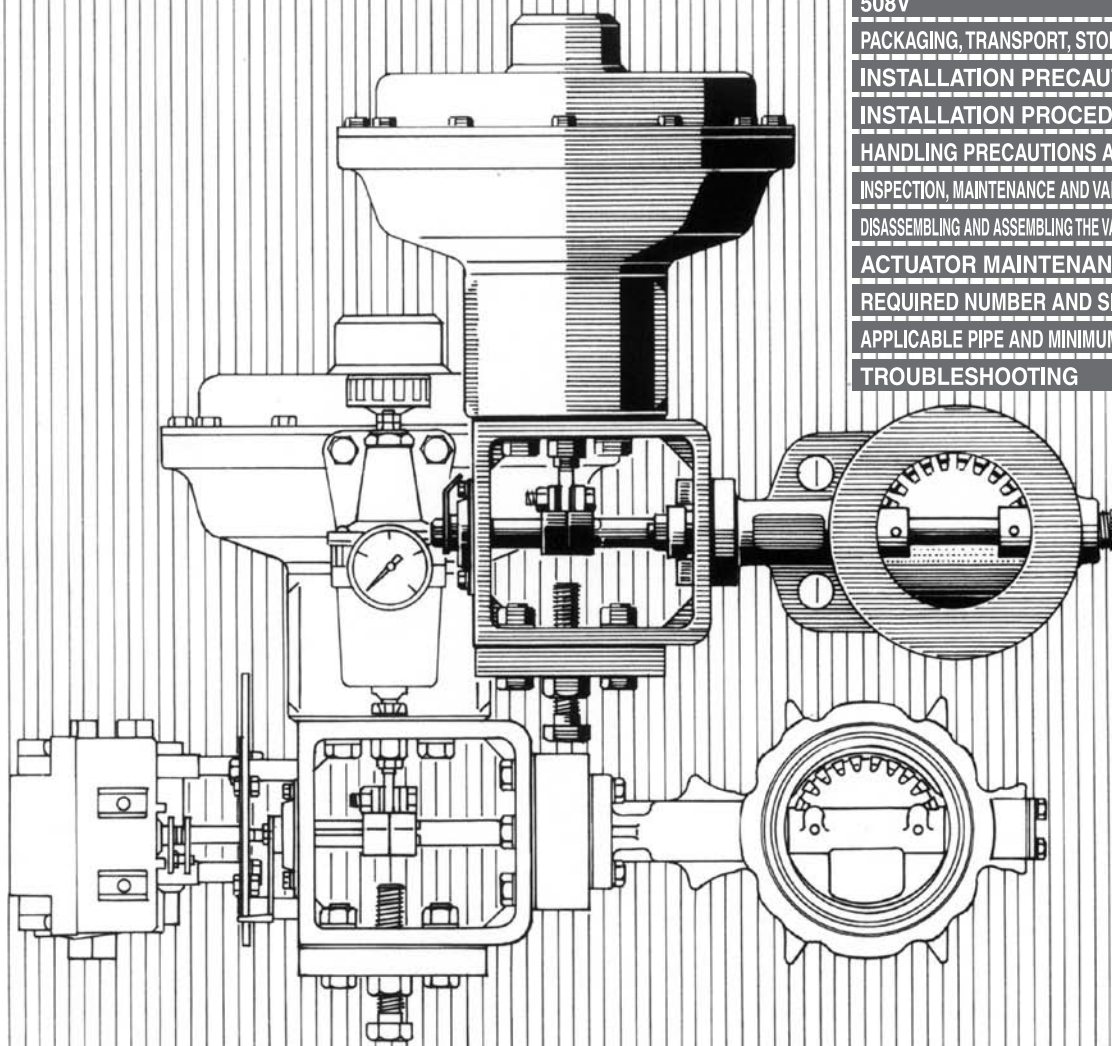


Rotary Control Valve 507V/508V

INSTRUCTION MANUAL



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**This instruction manual explains standard usage of
the Rotary Control Valve “507V and 508V”.**

Please read this manual thoroughly in order to ensure correct use of the product.

ROTARY CONTROL VALVE STANDARD SPECIFICATIONS

Disc type	507V	
Body shape (Connection)	Wafer type	
Valve nominal size	50mm to 200mm	250mm to 400mm
Flange accommodation	JIS 10K/16K, ANSI 150Lb, etc	JIS 10K, ANSI 150Lb, etc
Face-to-face dimensions	Manufactured standard	
Max. working pressure	Refer to "Table of Allowable differential pressure" on page 3.	
Service temperature	Cast steel valve body: -10 to 400 degrees C Stainless steel valve body: -50 to 400 degrees C	
Seat leakage rate	ANSI B16.104-76 CLASSII	
Standard materials	Body	SCPH2/SCS14
	Disc	SCS14
	Stem	SUS630 (option: SUS316)
	Bearings	RPTFE(for 200 degrees C or less), Carbon Graphite (for exceed 200 degrees C)
	Gland packing	RPTFE(for 200 degrees C or less), Grafoil (for exceed 200 degrees C)

507 V Seat leakage rate

Nominal size	% of MAX.Cv
50	0.5
80	0.5
100	0.5
150	0.5
200	0.5
250	0.5
300	0.5
350	0.5
400	0.5

Disc type	508V	
Body shape (Connection)	Wafer type	
Valve nominal size	50mm to 200mm	250mm to 600mm
Flange accommodation	JIS 5K/10K/16K/20K, ANSI 150Lb, etc	JIS 10K/16K, ANSI 150Lb, etc
Face-to-face dimensions	JIS B2002 series 46/ISO 5752 wafer butterfly valve (short)	
Max. working pressure	Shut-off pressure 1.6 MPa	Shut-off pressure 1.0M Pa
Service temperature	EPDM: -20 to 120 degrees C, NBR: -10 to 80 degrees C	
Allowable temperature in continuous use	EPDM: 0 to 70 degrees C, NBR: 0 to 60 degrees C	
Seat leakage rate	Tight shut-off	
Standard materials	Body	FCD450
	Disc	SCS14 SCS13
	Stem	SUS420J2
	Gland packing	EPDM and NBR (core-reinforced)

Remark 1: For details, see "GENERAL CATALOG".

Remark 2: The standard bearing and gland packing of the 507V are "RPTFE", and thus the maximum operational temperature of both cast steel and stainless steel valve bodies is 200 degrees C. If the operational temperature will exceed 200 degrees C, the bearing shall be carbon graphite and the gland packing shall be Grafoil. Please note this difference when ordering.

Remark 3: Please contact our sales dept. any information regarding 65A and 125A for 508V.

508V ALLOWABLE DIFFERENTIAL PRESSURE FOR 6X AND 6W

(kPa)

Nominal size		Valve opening							
mm	inch	0°	10°	20°	30°	40°	50°	60°	70°
50	2	1600	685	334	148	86	59	45	40
80	3	1400	694	475	308	176	116	69	47
100	4	800	765	575	315	204	133	69	37
150	6	1600	783	546	360	219	152	90	44
200	8	1600	676	453	287	178	124	79	44

508V ALLOWABLE DIFFERENTIAL PRESSURE ON STEM

(kPa)

Nominal size		Valve opening							
mm	inch	0°	10°	20°	30°	40°	50°	60°	70°
50	2	1600	685	334	148	86	59	45	40
80	3	1600	694	475	308	176	116	69	47
100	4	1600	765	575	315	204	133	69	37
150	6	1600	783	546	360	219	152	90	44
200	8	1600	676	453	287	178	124	79	44
250	10	1000	562	233	149	84	58	37	21
300	12	1000	220	232	149	84	58	37	21
350	14	1000	367	222	116	65	45	29	16
400	16	1000	209	118	58	52	46	33	25
450	18	1000	223	197	115	56	48	33	26
500	20	1000	162	143	97	55	44	30	23
600	24	1000	246	171	110	54	49	41	27

The above is based on the result at our test plant. The test was conducted with fresh water at ambient temperature. Therefore, please use the data for reference only. Consult us if you have a question or doubt.

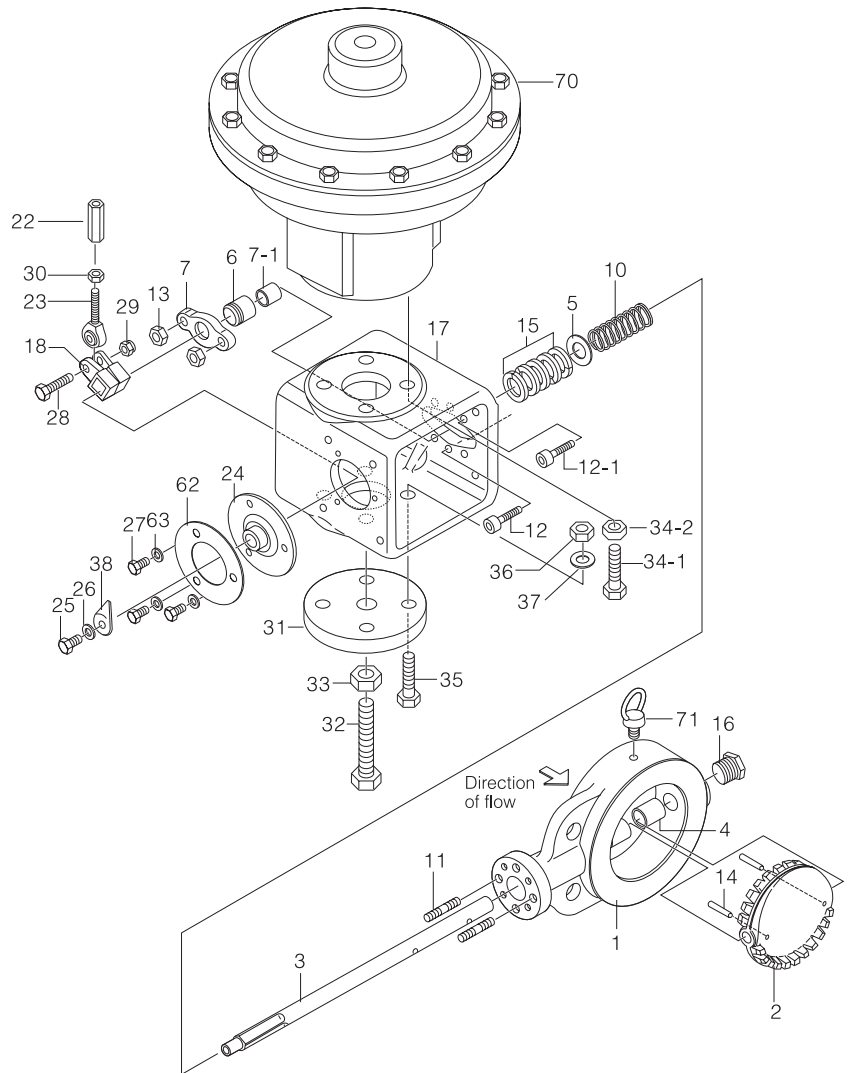
507V-6Z

Expanded View

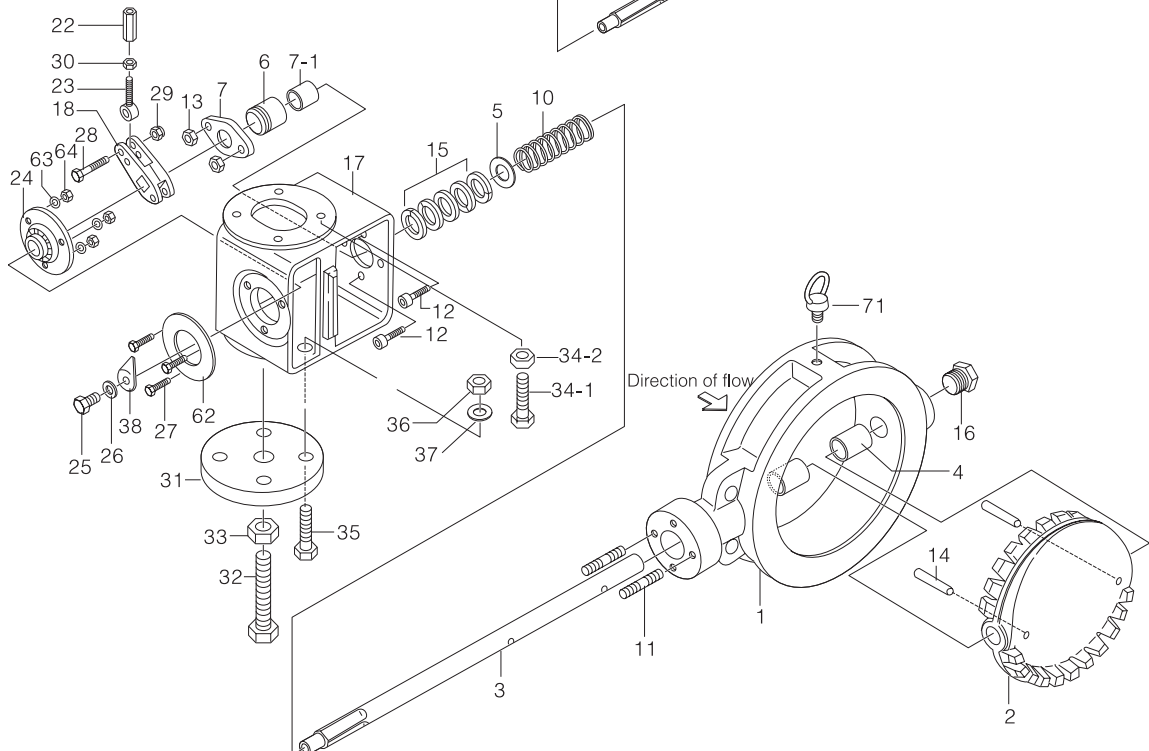
507V-6Z (Diaphragm) Parts list (50 mm to 400 mm)

No.	Description	Qty	Remarks
1	Body	1	
2	Disc	1	
3	Stem	1	
4	Bearing	2	
5	Packing retainer	1	
6	Gland bushing	1	
7	Gland flange	1	
7-1	Sub-bearing	1	
10	Spring	1	
11	Gland bolt	2	
12	Hexagon hole bolt	2	
12-1	Hexagon hole bolt	4	50mm to 200mm
13	Gland nut	2	
14	Taper pin	2	
15	Gland packing	5	
16	Bottom cover plug	1	
17	Bracket	1	
18	Linkage	2	
22	Load connecting bar	1	
23	Load end bearing	1	
24	Ball bearing unit	1	
25	Hexagon bolt	1	Not required when a positioner is installed.
26	Spring washer	1	Not required when a positioner is installed.
27	Hexagon bolt	3	
28	Hexagon bolt	1	
29	Lock nut	1	
30	Hexagon nut	1	
31	Stopper plate	1	
32	Hexagon bolt	1	
33	Hexagon nut	1	
34-1	Hexagon bolt	4	
34-2	Spring washer	4	
35	Hexagon bolt	4	
36	Hexagon nut	4	
37	Spring washer	4	
38	Indicator	1	Not required when a positioner is installed.
62	Nameplate	1	Not required when a positioner is installed.
63	Spring washer	3	
64	Hexagon nut	3	250mm to 400mm
70	Diaphragm	1	
71	Eye bolts	2	200mm to 400mm

50mm to 200mm



250mm to 400mm



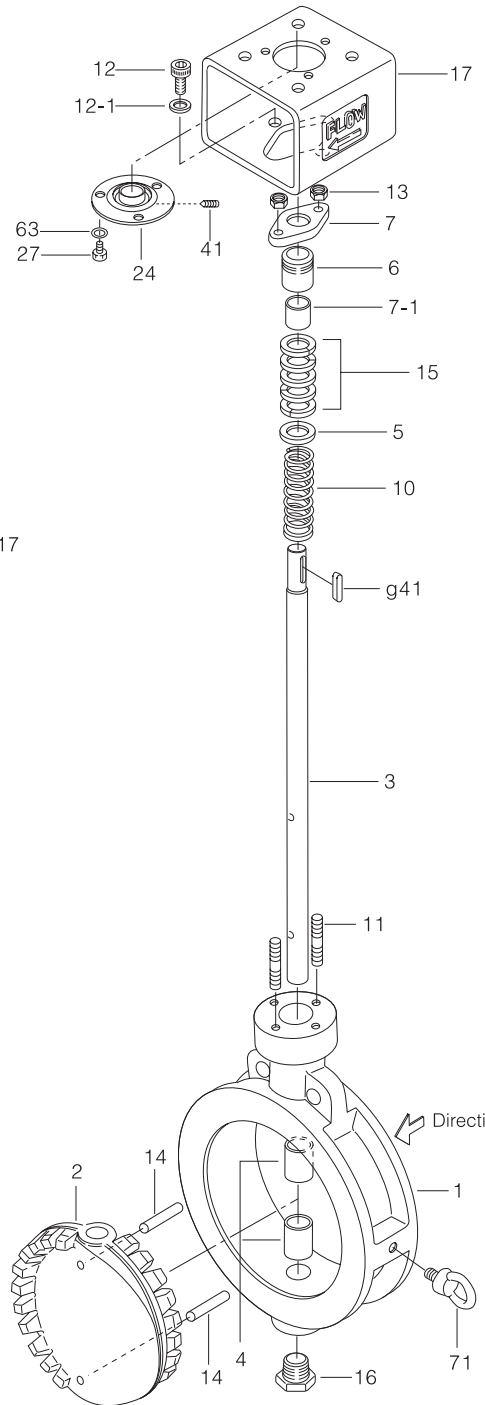
507V-03

Expanded View

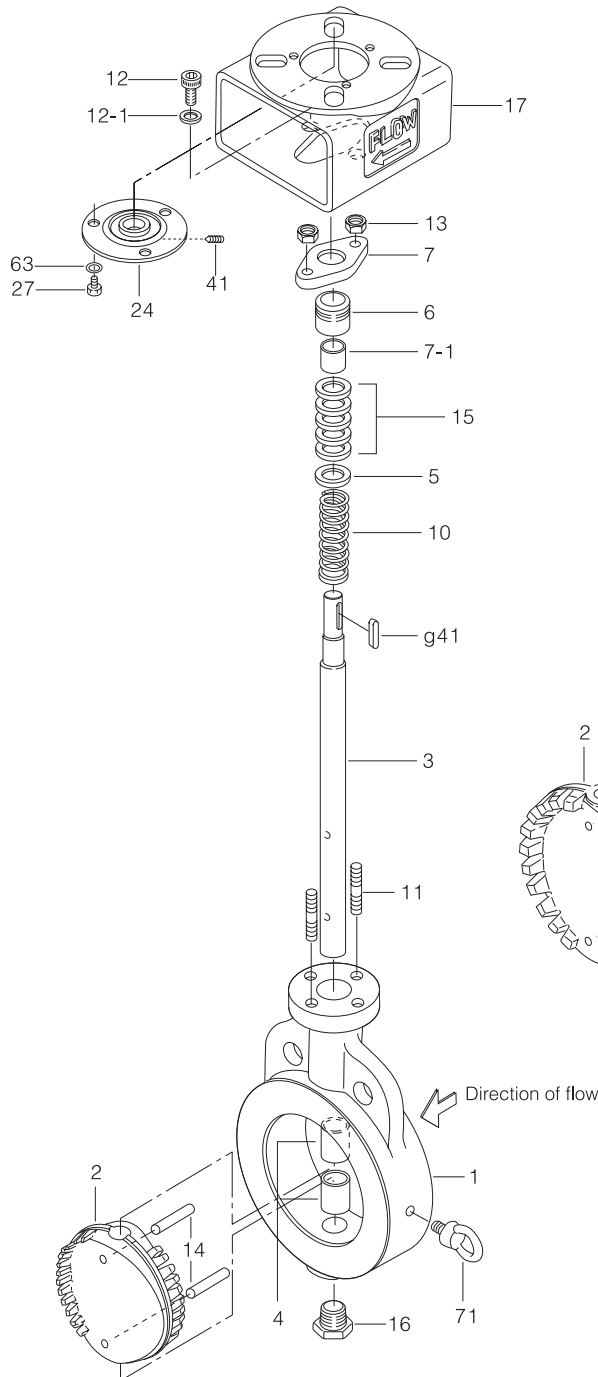
507V-03 (Body with drive member other than diaphragm) Parts list (50 mm to 400 mm)

No.	Description	Q'ty	Remarks
1	Body	1	
2	Disc	1	
3	Stem	1	
4	Bearing	2	
5	Packing retainer	1	
6	Gland bushing	1	
7	Gland flange	1	
7-1	Sub-bearing	1	
10	Spring	1	
11	Gland bolt	2	
12	Hexagon hole bolt	2	
12-1	Spring washer	2	
13	Gland nut	2	
14	Taper pin	2	
15	Gland packing	5	
16	Bottom cover plug	1	
17	Bracket	1	
24	Ball bearing unit	1	
27	Hexagon bolt	3	
41	Hexagon hole set screw	1	
63	Spring washer	3	
71	Eye bolts	2	200mm to 400mm
g41	Stem key	1	

250mm to 400mm



50mm to 200mm



508V

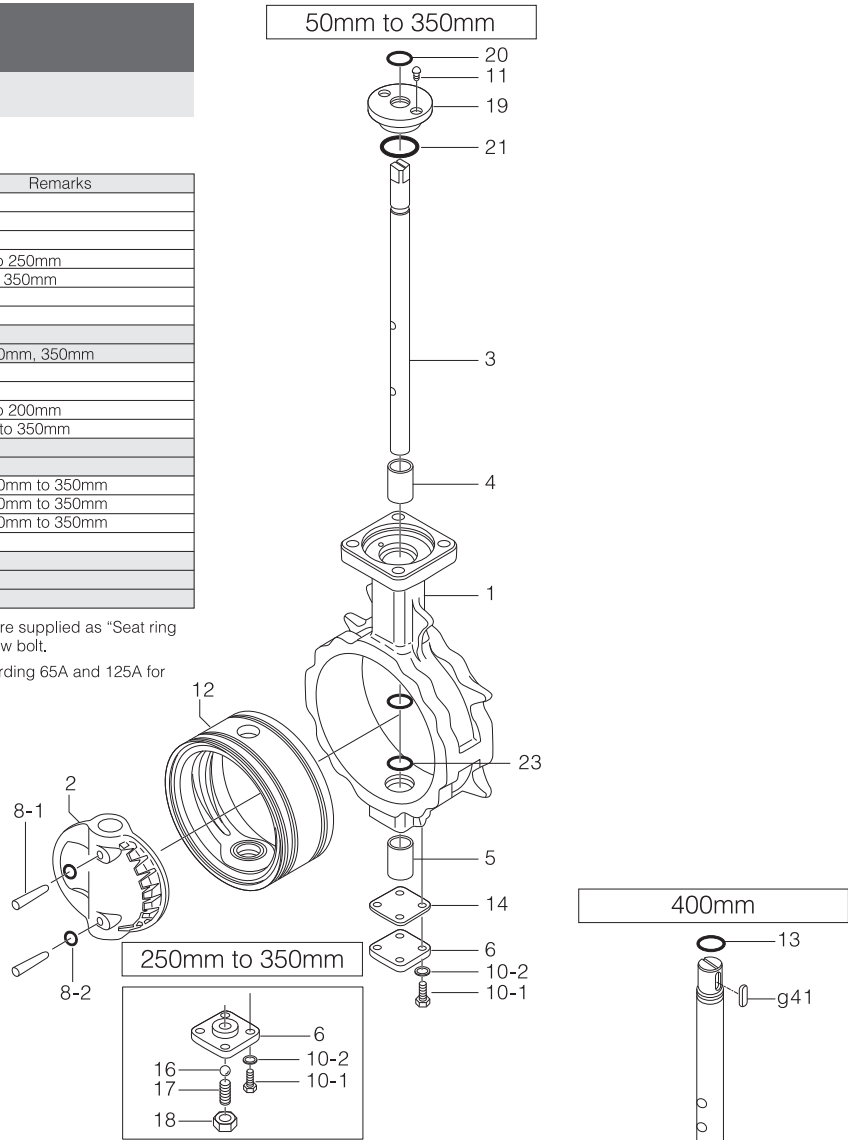
Expanded View

508V Parts list (50mm to 350mm)

No.	Description	Q'ty	Remarks
1	Body	1	
2	Disc	1	
3	Stem	1	
4	Bearing	1	50mm to 250mm
		2	300mm, 350mm
5	Bearing	1	
6	Bottom cover	1	
★ 8-1	Taper pin	2	
★ 8-2	"O"ring	4	Only 300mm, 350mm
10-1	Hexagon bolt	4	
10-2	Spring washer	4	
11	Machine screw	2	50mm to 200mm
		4	250mm to 350mm
★ 12	Seat ring	1	
★ 14	Gasket	1	
16	Ball	1	Only 250mm to 350mm
17	Hollow bolt	1	Only 250mm to 350mm
18	Lock nut	1	Only 250mm to 350mm
19	Dust seal	1	
★ 20	"O"ring	1	
★ 21	"O"ring	1	
★ 23	"O"ring	2	

Remark 1: The ★ indicates recommended spare parts. They are supplied as "Seat ring set" with a small hexagonal spanner to remove hollow bolt.

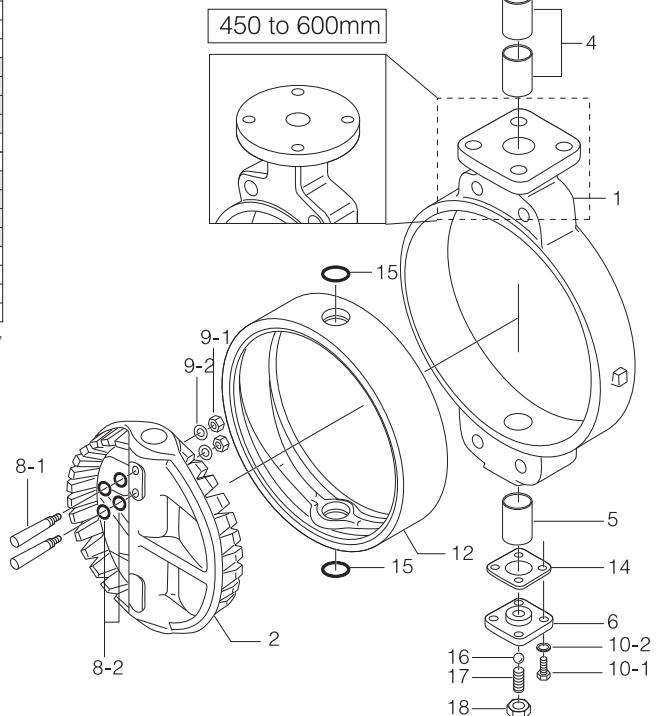
Remark 2: Please contact our sales dept. any information regarding 65A and 125A for 508V.



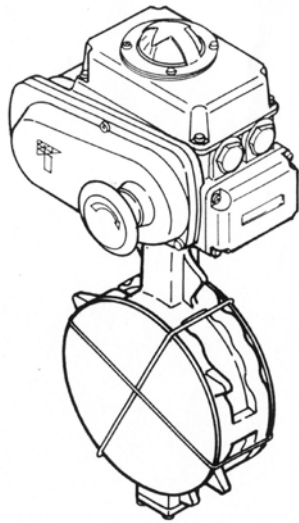
508V Parts list (400mm to 600mm)

No.	Description	Q'ty	Remarks
1	Body	1	
2	Disc	1	
3	Stem	1	
4	Bearing	2	400mm, 500mm
		3	450mm, 600mm
5	Bearing	1	400mm
		2	450mm to 600mm
6	Bottom cover	1	
★ 8-1	Taper bolt	2	
★ 8-2	"O"ring	4	
★ 9-1	Hexagon bolt	2	
★ 9-2	Spring washer	2	
10-1	Hexagon bolt	4	
10-2	Spring washer	4	
★ 12	Seat ring	1	
★ 13	"O"ring	1	
★ 14	Gasket	1	
★ 15	"O"ring	2	
16	Ball	1	
17	Hollow bolt	1	
18	Lock nut	1	
g41	Key	1	

Remark: The ★ indicates recommended spare parts. They are supplied as "Seat ring set" with a small hexagonal spanner to remove hollow bolt.



PACKAGING



(Fig. 1)

- (1) A vinyl protective plate is attached to the flange face on the valve body (piping flange contact surface) in order to protect the seat ring. (Fig. 1)
- (2) The disc is shipped in the fully (or almost fully) closed position.
- (3) The valve has a nameplate with which you can verify information such as the nominal size and material. (Fig. 1)

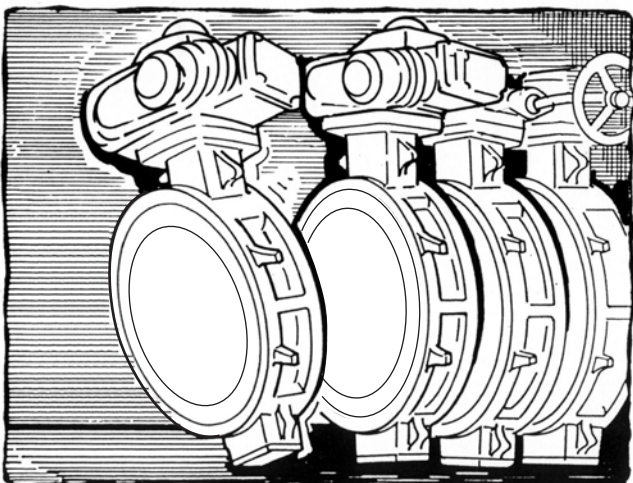
For model 508V

- (4) The sheet face of the disc has been coated with a slight amount of silicon grease.

TRANSPORT

- (1) Use containers for ocean transport.
- (2) Use a covered vehicle for inland transport. If an uncovered vehicle is used, be sure to cover the valves with a protective tarp.

STORAGE



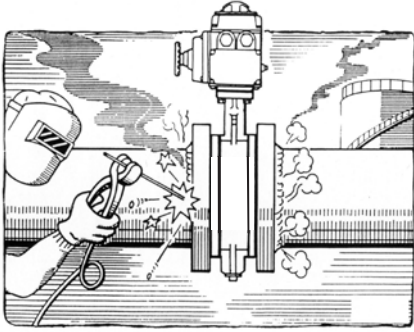
(Fig. 2)

- (1) When storing valves, keep them indoors in as cool and dark a place as possible (temperature: -10 to +60 degrees C, humidity: 70% or less) without removing the protective plate attached to the valve.
- (2) For long periods of storage, apply Ferroguard (use designated product) once per year to the plated parts (bolts, nuts, handle shaft, etc.). (Do not apply silicon grease to a rubber seat ring.)
- (3) Operate the valve once every three months.
- (4) When storing unpackaged butterfly valves, make sure that no unreasonable load is being applied to the valve body and drive member. (Fig. 2)

UNPACKING

- (1) Unpack the valve immediately before installing it into the piping. Do not leave the valve unpacked for long periods of time.

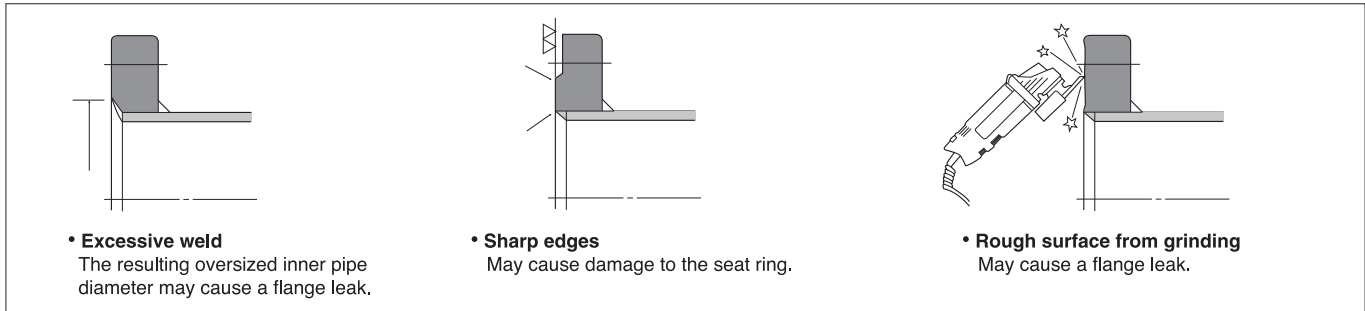
INSTALLATION PRECAUTIONS



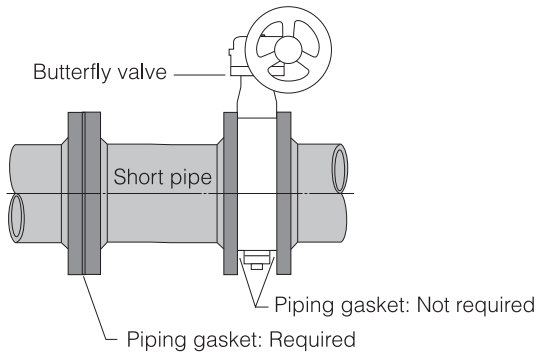
(Fig. 3)

(1) Installation of the valve immediately after welding the pipe flange will lead to adverse consequences, such as damage to the seat ring. Make sure that the temperature has cooled sufficiently and that you have removed weld spatter before installing the valve. Never weld when the valve is in the piping. (Fig. 3)

(2) The seat ring might become damaged or the flange may leak if the flange face that contacts the valve seat ring is as shown in Fig. 4. Also, please confirm that there is no distortion to the flange or that there is no damage, such as scratches, to the flange face.



(Fig. 4)

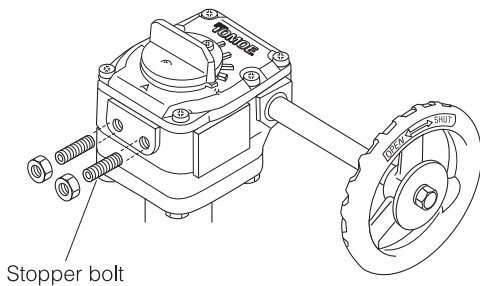


(Fig. 5)

(3) The 508V does not require a piping gasket. Do not use one. Please note, however, that when using a short pipe, a piping gasket may be required for the connection surface that is not the butterfly valve. A piping gasket must always be used on the 507V (Fig. 5).

(4) Do not apply strong shock such as by throwing the valve and do not put objects or put your weight on the lever or handwheel.

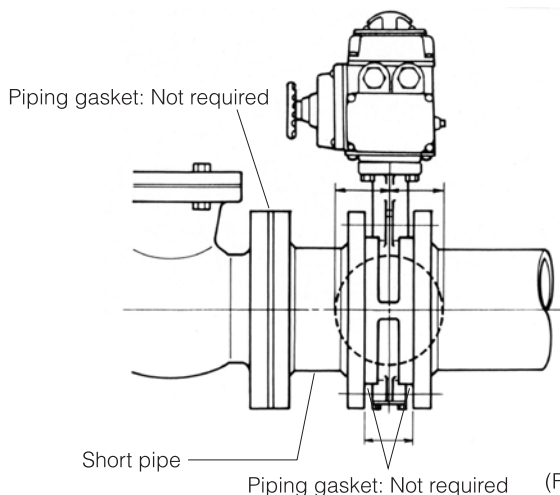
(5) Do not touch the stopper bolts on the gear box. Changing the valve close position will cause valve seat leakage. (Fig. 6)



(Fig. 6)

(6) Alignment of the valve to the flange should be done accurately.

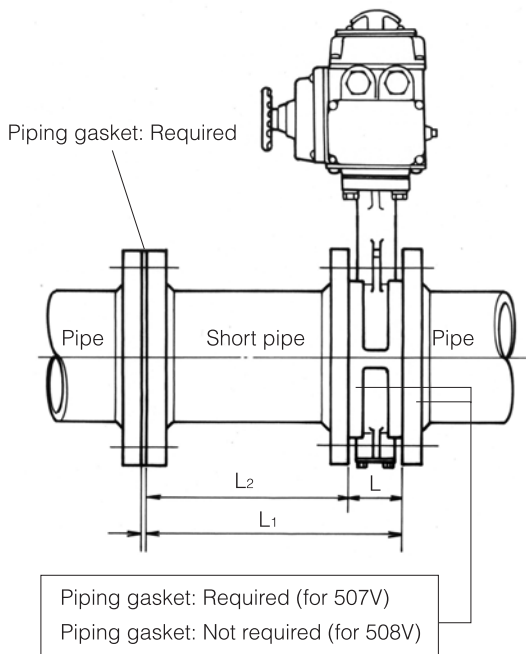
(7) Before tightening the piping bolts, check that the disc does not touch the inside of the flange when the valve is open.



(Fig. 7)

(8) When installing a non-return valve, pump and butterfly valve, always insert a short pipe in between. Not doing so will cause the disc to hit during operation and lead to faulty operation. (Fig. 7)

(9) If a Fail Open valve is installed, make sure that the disc is in the fully closed position. This is accomplished by temporarily applying pneumatic pressure to the drive member. If a manual handle has been incorporated as an option, use the manual handle to completely close the valve. "OPEN-SHUT" is indicated on the handwheel.



(Fig. 8)

(10) On models 507V and 508V, permissible differential pressures have been established for each valve opening. When performing a hydraulic test on the piping, take care not to exceed the permissible differential pressures. For details, see the table of permissible differential pressures (pages 3 and 4).

(11) On model 508V, make sure no solvent gets onto the seat ring. Also, except for those made of NBR and fluorocarbon rubber (FKM), always keep the seat ring away from any machine oil.

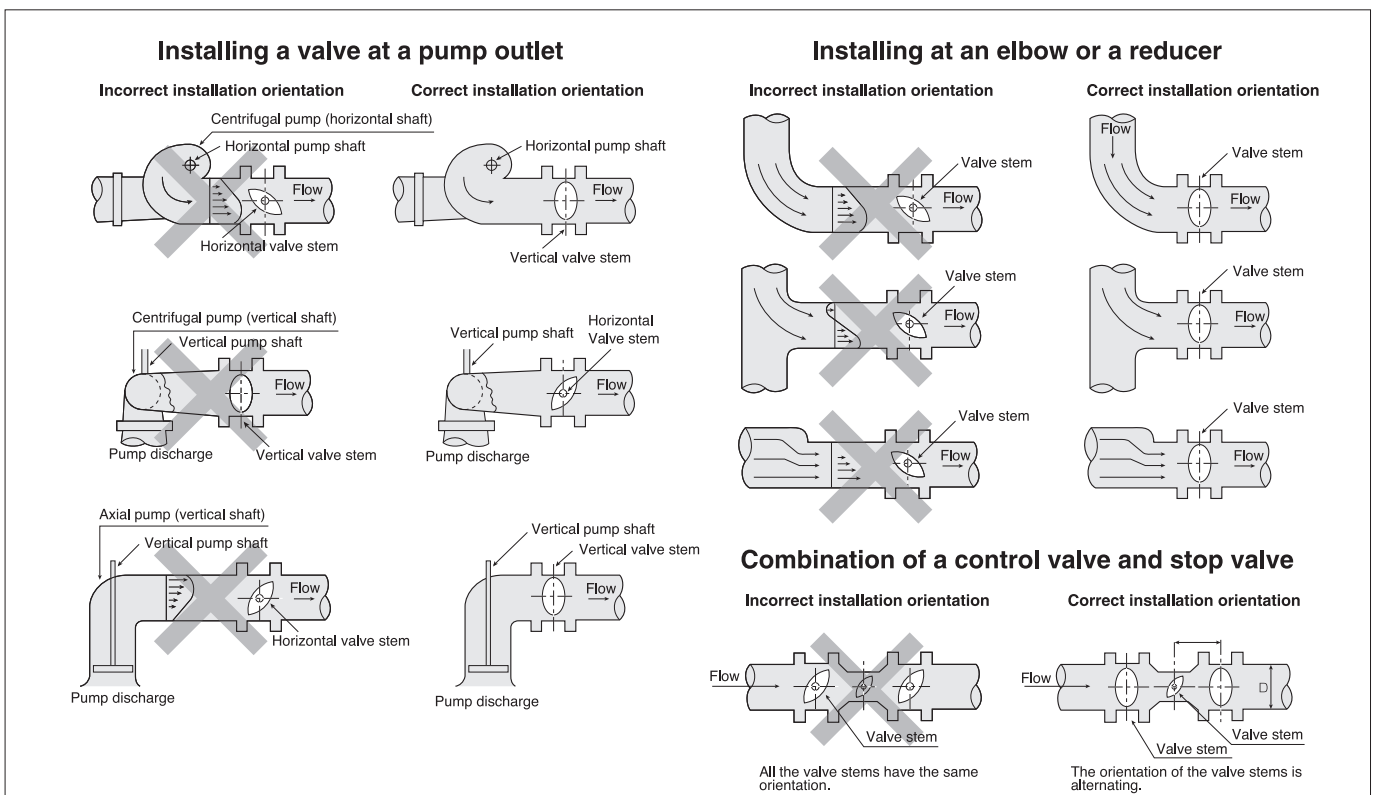
(12) When replacing a previously installed regular valve with a butterfly valve, since the face-to-face dimension of the previously installed valve will be greater, you must insert a short pipe and adjust to the face-to-face dimension of the original valve pipe flange. Use the equation below when making the short pipe. (Fig. 8)

Length of short pipe

$L_2 = L_1 - L$	mm
L_2 : Length of short pipe	mm
L_1 : Face-to-face dimension of existing valve	mm
L : Face-to-face dimension of TOMOE butterfly valve	mm

(13) Although it is okay to install a valve in the direction that makes installation easy, please take caution in the following conditions.

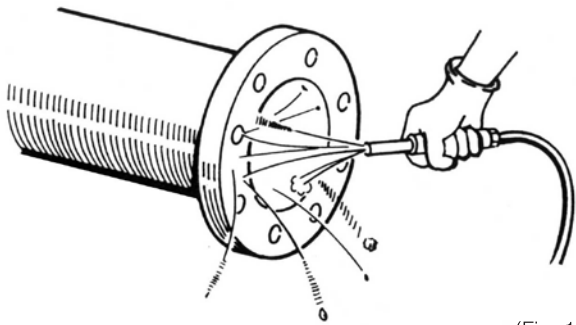
- 1 On model 508V with nominal diameters 250 mm and above have steel balls at the lower end of the stems; therefore, make sure that the actuator does not face downward (relative to horizontal).
- 2 When the drive member is a diaphragm, always keep the stem horizontal and the diaphragm facing up.
- 3 Be careful of the stem direction when piping conditions are as shown in Fig. 9



(Fig. 9)

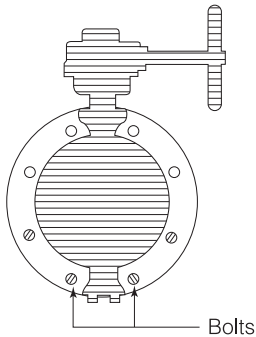
INSTALLATION PROCEDURE

When installing a non-return valve, pump or flexible rubber joint with a butterfly valve, always insert a short pipe in between. Otherwise the disc may hit the other device, resulting in faulty operation.



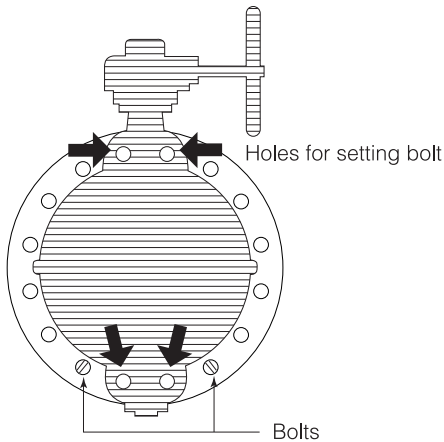
(Fig. 10)

Without setting bolts holes



(Fig. 11)

With setting bolt holes



(Fig. 12)

(1) Use air purging to clean the flange faces that will contact the valve. If there is rust or some other foreign material sticking to a flange face, clean it with a suitable cleaning fluid (alcohol or neutral detergent, etc.). (Fig. 10)

If possible, install in the piping a short pipe with a face-to-face dimension identical to the butterfly valve and blow into the pipe to completely remove foreign substances.

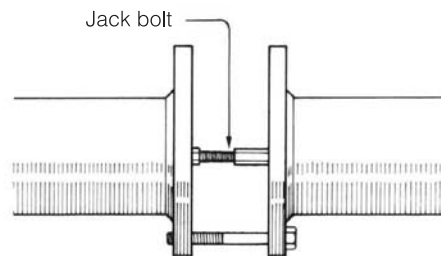
(2) Check the valve number and the material of the main component on the nameplate to verify applicability.

(3) Close the disc completely.

(4) After aligning the piping, insert a piping bolt into the position in the figure and secure the valve to prevent it from dropping.

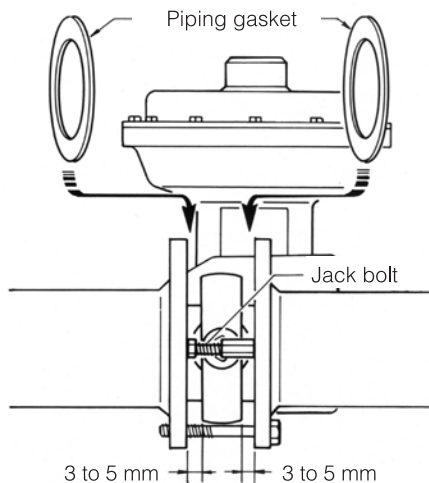
*The valves have two drilled setting bolt holes at both the top and bottom of the valve body. Insert piping bolts in the locations shown in the diagram to prevent falling. (Fig. 11) (Fig. 12)

(5) Place a jack bolt in the position shown in the figure to widen the face-to-face dimension. (If you require, we can supply jack bolts.) Push and widen to make the face-to-face dimension 3 to 5 mm greater than the valve width on each side. (Fig. 13)



(Fig. 13)

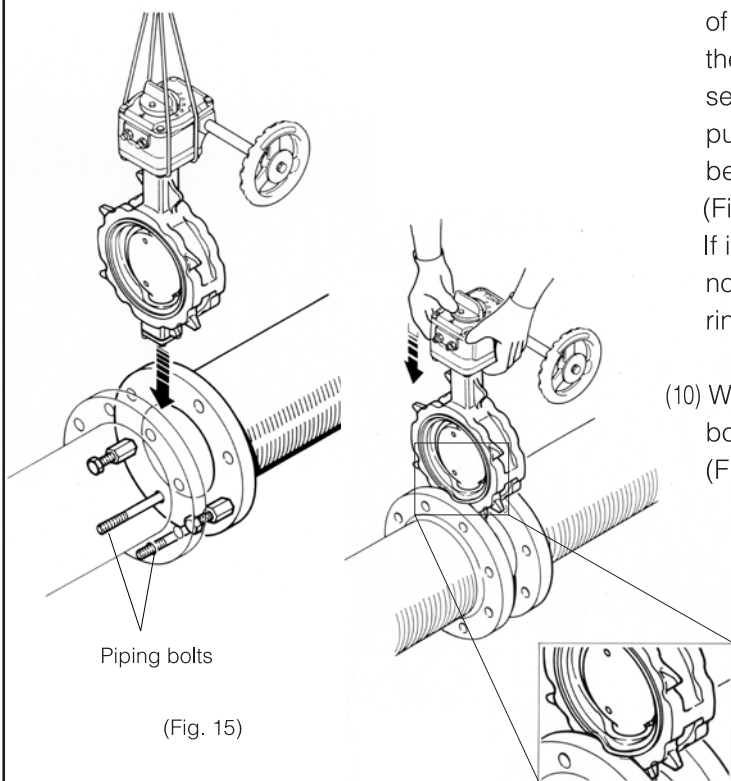
For model 507V



(Fig. 14)

- (6) Match the direction of valve pressure to the direction of the arrow indicated on the valve body, and insert the valve taking care not to damage the valve gasket face.
- (7) Insert piping gaskets between the pipe flange faces and the end faces of the valve.
- (8) Insert piping gaskets into the remaining flange bolt holes. After align the piping flanges with the valve and the piping gaskets, tighten the hexagon nuts.

For model 508V



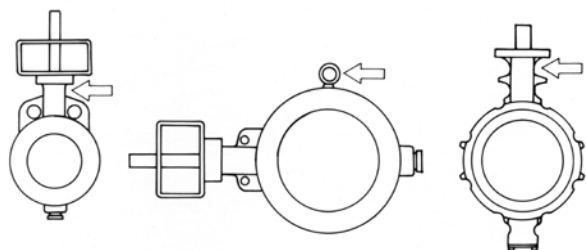
(Fig. 15)

- (9) Match the direction of valve pressure to the direction of the arrow indicated on the valve body, and insert the valve as shown taking care not to damage the seat ring face of the valve. If the valve is forcibly pushed between the piping edges, the seat rings will be damaged and leakage will result. (Fig. 15) (Fig. 16)
- If inserting a blind flange or similar device, take care not to forcibly insert the flange as damage to the seat ring and leakage will result.

- (10) When the valve is completely inserted, insert piping bolts so that the bolts support the alignment ribs. (Fig. 17)

(Fig. 16)

(Fig. 17)

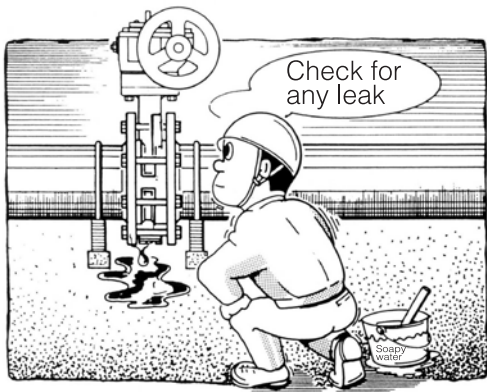


(Fig. 18)

- (11) To facilitate installation, suspend the valve with a crane or similar while working. When suspending the valve, use nylon string and suspend it from its "neck section" if the valve has no eye bolts. (Fig. 18)
- (12) When tightening the hexagon nuts, alternate diagonally, applying equal strength as you gradually tighten each nut. Be careful not to tighten the nuts on one side too much or too little in order to prevent lopsided tightening.

- (13) After installing, open and close the valve to verify that the disc does not hit the piping or piping gaskets.

HANDLING PRECAUTIONS AFTER INSTALLATION



(Fig. 19)

- (1) Before beginning operation, air-purge the outside of the piping and clean the inside of the piping by running water through the piping.
- (2) Prior to operating, increase the internal pressure of the piping and check for possible leakage from the flange gaskets, glands, and bottom cover by employing soapy water or similar.
When doing so, make sure the internal pressure does not exceed the permissible differential pressure (See page 3 and 4.) of the valve. (Fig. 19)
- (3) If leakage is observed from the bottom cover, immediately retighten the bottom cover installation bolts. Alternate and tighten gradually with equal strength to avoid lopsided tightening. If leakage is observed from the flanges or glands, release the internal pressure and remove the valve from the piping. Check that there is nothing wrong with the seat rings and piping gaskets.

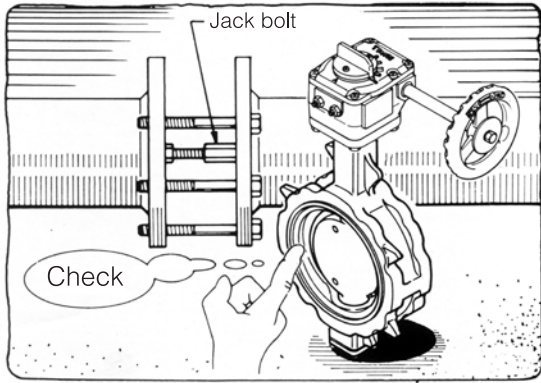
(4) Opening and closing operation of the worm gear type must be done by hand. Do not use a Wilky key on the gear handle. Doing so can damage the handle and break the valve.

(5) When performing a pressure test, completely open the valve (if using a pressure higher than the rated pressure). Never use a fully closed valve in place of a blind flange. If inserting a blind flange or similar device, take care not to forcibly insert the flange as the seat ring may tear off on the 508V or the flange face may be damaged on the 507V, causing leakage.

(6) If the system will be not be operated for a prolonged period of time after the piping work is finished, exercise the valve by opening and closing it about once every two weeks.

(7) Please consult us if the valve is to be used at an opening of 30° or less.

INSPECTION AND MAINTENANCE



(Fig. 20)

(1) Periodic inspection

Perform an inspection once per year and check for disc corrosion and wear of the seat ring. The gear box have been designed to be maintenance-free.

(2) Abnormal operation

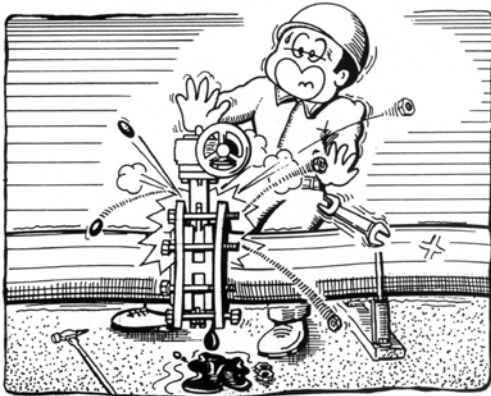
Abnormal operation is usually caused by accumulation of foreign material or damage to the seat ring. If foreign material has accumulated and the disc is in the fully open position, it can be removed by maintaining the fully open position and flushing it out. If that does not work and if the seat ring is damaged, remove the valve from the piping and inspect it. (Fig. 20)

(3) Lubricants

Use Lithium-base grease to lubricate the cylinder. Use silicon oil to lubricate the disc edge. (Use only the specified greases.)

Rust preventive agents and Lubricants	Product name (manufacturers)	To be applied to:
FELLOW GUARD	FELLOW GUARD #1009	Plated parts (bolts, nuts and handle shaft)
Lithium-base grease	Multinoc grease No.2 (Nippon Oil Corporation)	Pneumatic Actuator T-matic
Grease	M ystik JI-6 (Kyodo yushi)	Gear box
Silicon oil	Shin-Etsu Silicon KF96H (Shin-Etsu Chemical Co., Ltd.)	Disc edge (for 508V only)

VALVE REMOVAL PROCEDURE

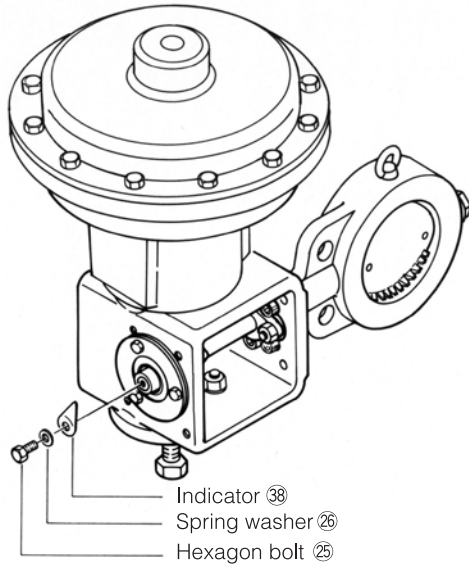


(Fig. 21)

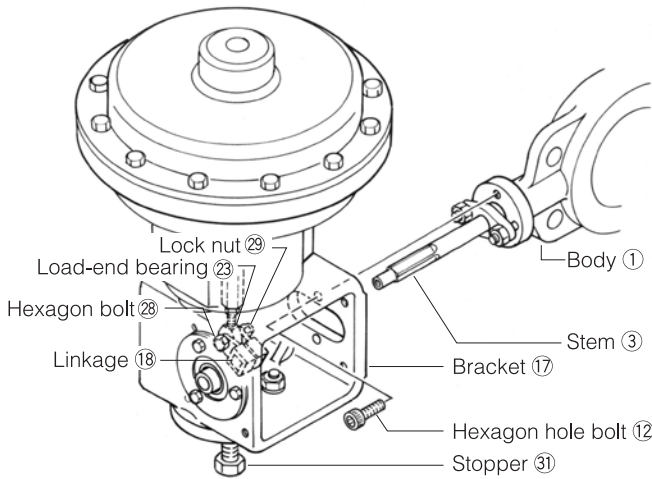
(1) When removing the valve from the piping, make sure that the pressure inside the piping or the temperature have dropped completely.

It is very dangerous to loosen any piping bolts while the piping is under pressure. Be very careful. Also, drain off any residual fluid from the piping. (Fig. 21)

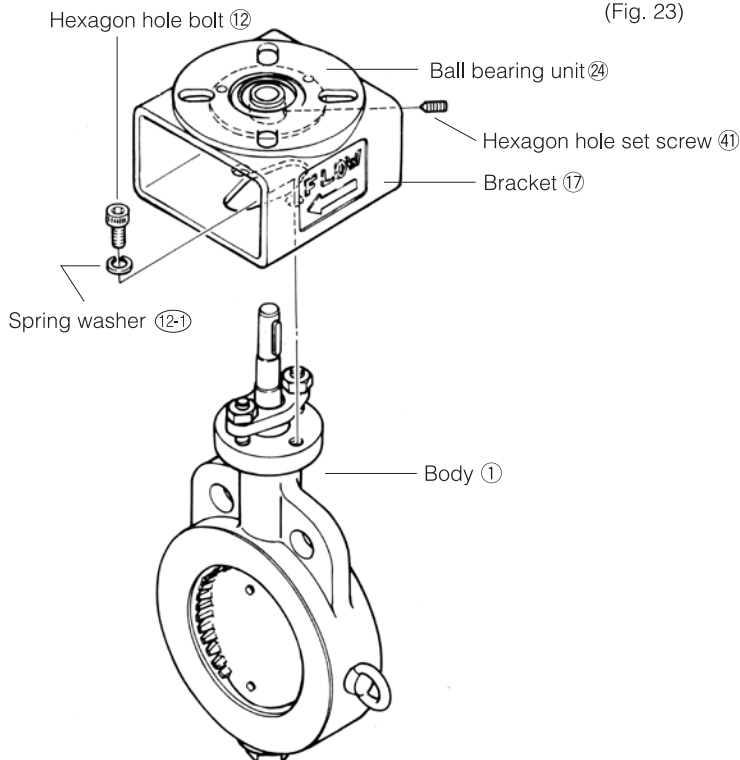
(2) With the disc closed, loosen the piping bolts and nuts. Remove them all except those on the lower side. Remove the valve. Use of a jack bolt in between the flanges will assist in removing the valve more easily.



(Fig. 22)



(Fig. 23)



(Fig. 24)

When performing periodic inspection or when trouble has occurred due to a worn or damaged seat ring, refer to the expanded view and follow the steps below to disassemble the valve.

Removing the Diaphragm

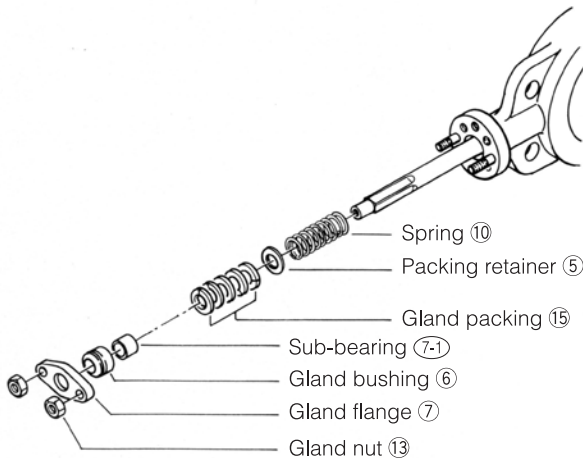
- (1) First disconnect the air pipe from the drive member or positioner.
- (2) Remove the entire valve from the piping. This work can be facilitated by inserting jack bolts between the flanges. If the valve is a Fail Open, apply pneumatic pressure to the actuator or turn the manual handle to close the valve and then remove it from the piping.
- (3) Remove the hexagon bolt 25, spring washer 26, and indicator 38 from the upper end of the stem. If a positioner is installed, remove the positioner and all installation parts.(Fig. 22)
- (4) To loosen the linkage 18 for the stem 3, loosen the hexagon bolt 28 and lock nut 29. (Do not remove these parts.)
- (5) Remove the hexagon hole bolt 12 and spring washer 12-1 that secures the bracket 17 to the valve body 1, and then pull the bracket 17 together with the drive member off of the stem 3 and separate from the valve body 1. (Fig. 23)

Removing a Drive Member Other Than a Diaphragm

- (1) Put the disc 2 into the fully closed position. Prior to disassembly, make an alignment mark using an oil based pen or chisel on the bonnet (bracket) that connects the actuator and body in order to clarify the position and direction in which the actuator and body are assembled.
- (2) Remove the actuator, bracket, and joint. Before removing the bracket 17, first loosen the hexagon hole set screw 41 that secures the ball bearing unit 24 and stem 3. (Fig. 24)

507V Removing the Gland Packing

- (1) Remove the gland nut ⑬, gland flange ⑦, and gland bushing ⑥. This allows the gland packing ⑮ to be removed. Take care not to lose the sub-bearing ⑦-1 that is inside the gland bush ⑥. (Fig. 25) (A special tool is required to remove the gland packing ⑮ from the valve body ①.)

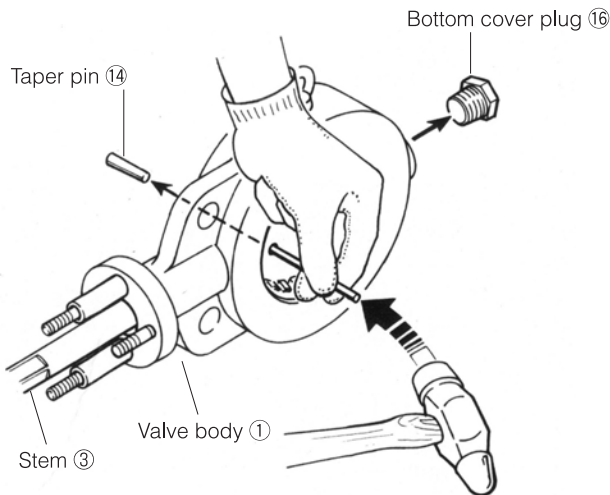


(Fig. 25)

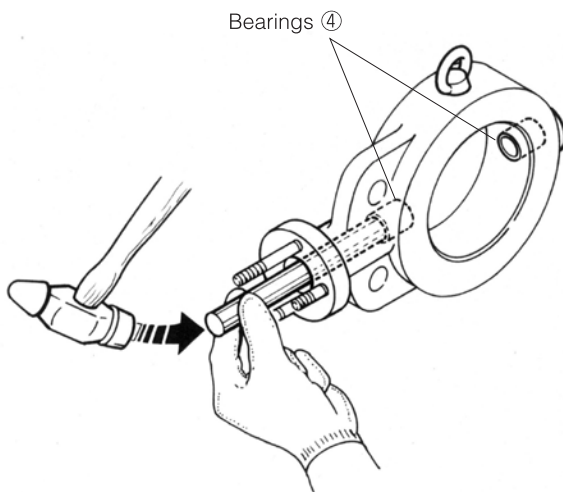
507V Removing the Bearing

Only remove the bearing to replace it.

- (1) Remove the bottom cover plug ⑯ from the bottom of the valve body.
- (2) Insert a round rod (4 mm diameter round rod for 50 to 200 mm valve bore diameters or 7.5 mm diameter round rod for 200 to 400 mm valve bore diameters) into the pin hole on the downstream side (flat side) of the valve body ②, and gently tap with a hammer to remove the taper pin ⑭. Before removing the taper pin ⑭, make an alignment mark on the stem ③ and flange face of the valve body ①. (Fig. 26)
- (3) Remove the stem ③ from the valve body ① and disc ②, and remove the valve body ②.
- (4) Insert a round rod of diameter approximately 1 mm larger than the stem into each stem hole and tap gently with a hammer to push the upper and lower bearings ④ out into the inner periphery of the disc ②. (Fig. 27)



(Fig. 26)



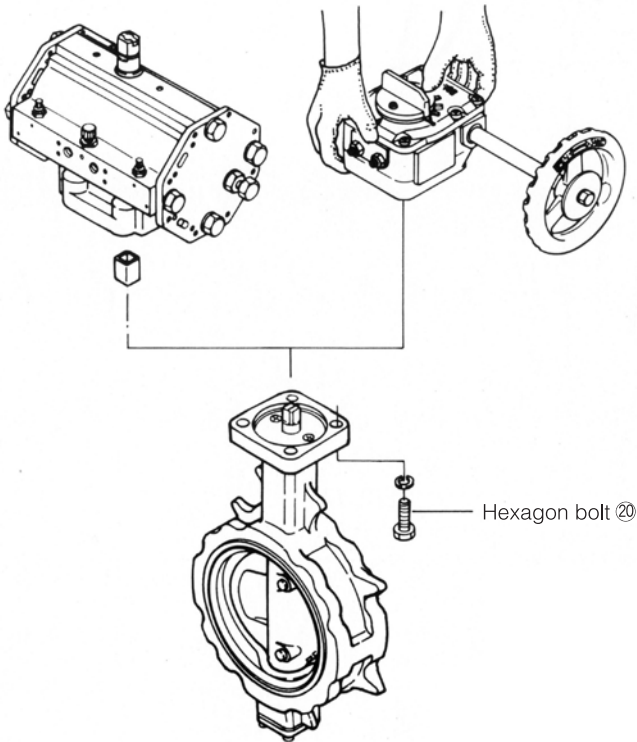
(Fig. 27)

Note: If the valve is specified for fluid temperatures in excess of 200 degrees C, exercise caution when removing the bearing as it is made of carbon and easily damaged. In addition, if there is a possibility that bearing ④ fragments remain in the stem hole of the valve body ①, air-purge the hole or clean it with a suitable cleaning fluid.

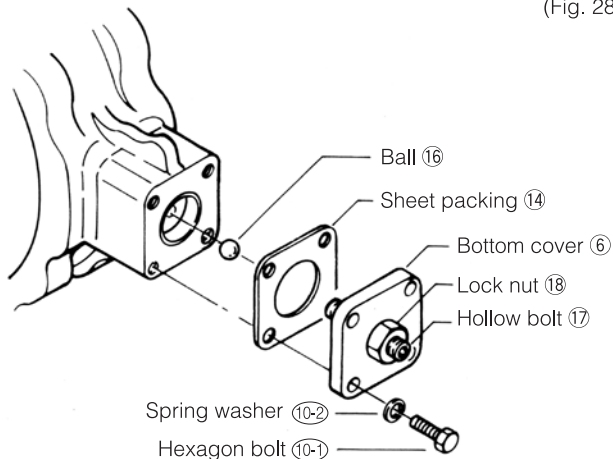
Disassembling Model 508V

50 mm to 350 mm

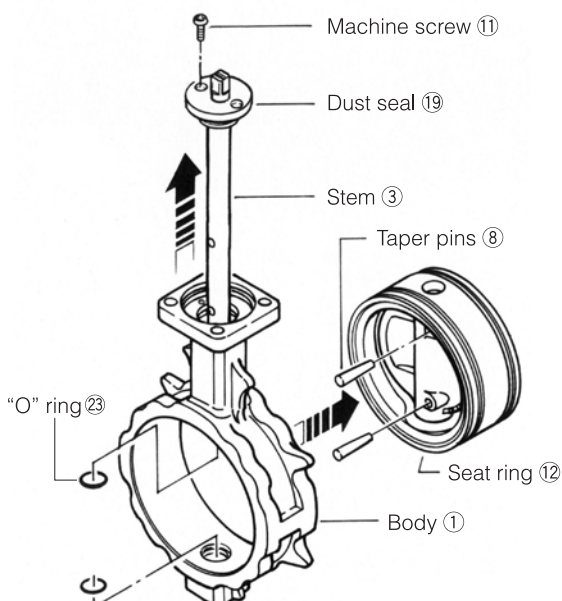
Remark : Please contact our sales dept. any information regarding 65A and 125A for 508V.



(Fig. 28)



(Fig. 29)



(Fig. 30)

(1) Put the disc (2) into the fully closed position. Prior to disassembly, make an alignment mark using an oil based pen or chisel on the bonnet (bracket) that connects the actuator and body in order to clarify the position and direction in which the actuator and body are assembled.

(2) Remove the actuator, bracket and joint. (Fig. 28)

(3) Remove the hexagon bolts (10-1) and spring washers (10-2) that secure the bottom cover (6), and remove the bottom cover (6) and sheet packing (14). (Fig. 29)

On 250 mm to 350 mm types, do not remove the hollow bolt (17) and lock nut (18); leave them attached to the bottom cover (6). In addition, a ball (16) is seated in the assembly. Take care not to lose the ball.

(4) Remove the machine screw (11).

(5) Remove the taper pins (8) that join the disc (2) and the stem (3).

(6) Pull the stem (3) up together with the dust seal (19). If it is difficult to remove the stem, insert a rod through the stem hole in the bottom of the valve bottom and gently tap the rod against the bottom of the stem with a hammer. (Fig. 30)

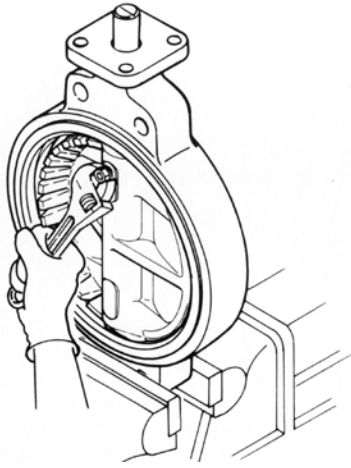
(7) Pull the seat ring (12) together with the disc (2) out of the valve body (1).

(8) Remove the disc (2) from the seat ring (12).

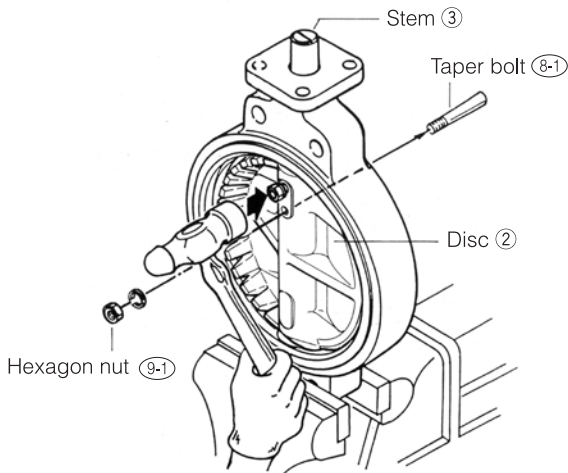
(9) Remove the "O" ring (23) from the valve body and the "O" rings (20) (21) from the dust seal (19).

Disassembling Model 508V

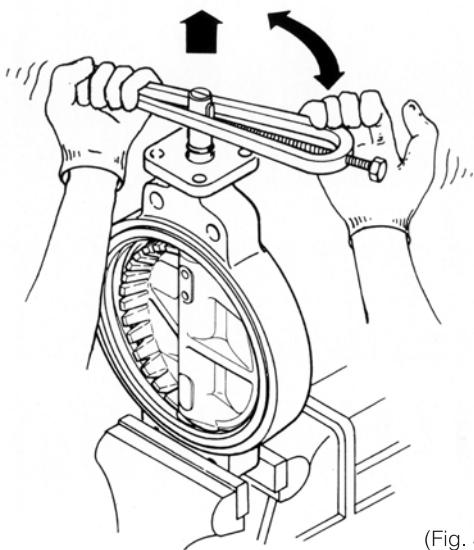
400 mm to 600 mm



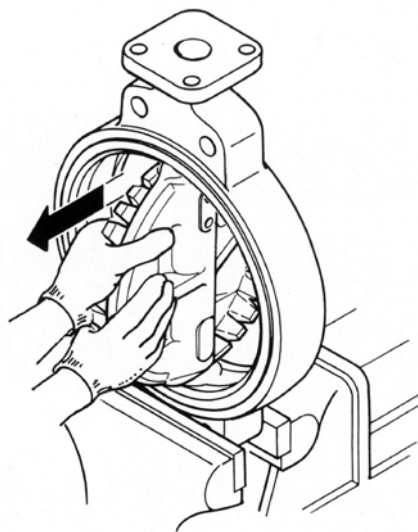
(Fig. 31)



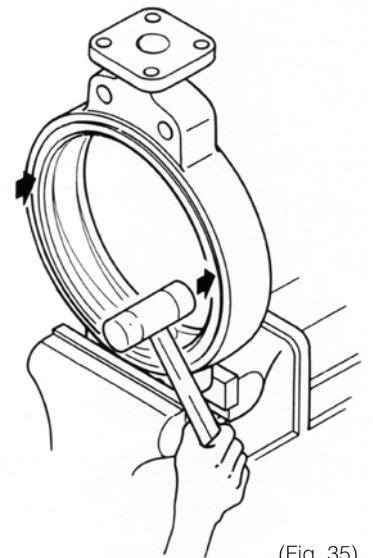
(Fig. 32)



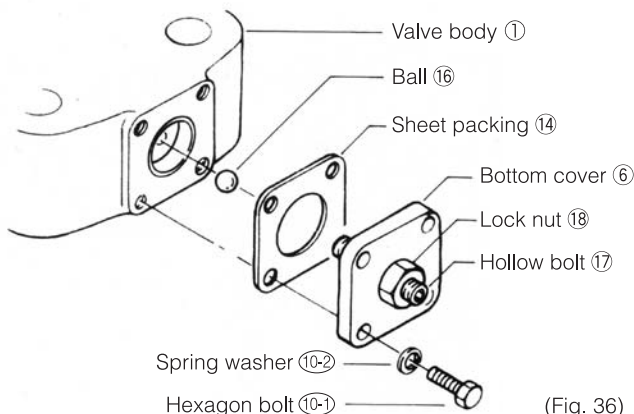
(Fig. 33)



(Fig. 34)



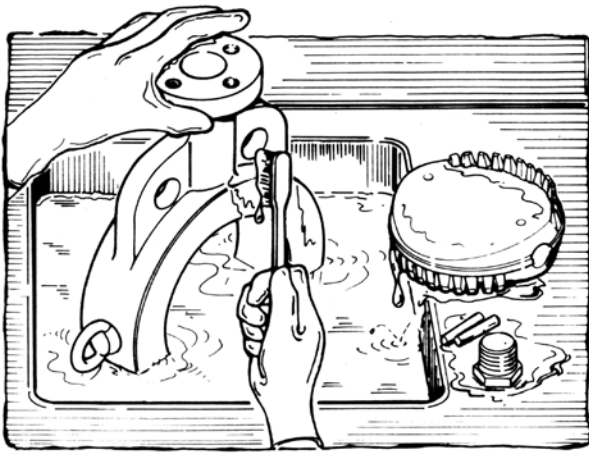
(Fig. 35)



(Fig. 36)

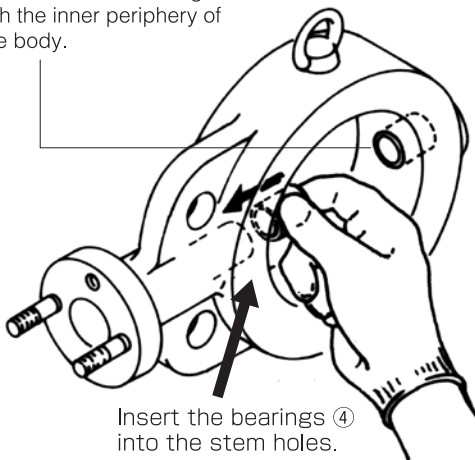
- (1) Hold the valve body ① firmly in a vise.
- (2) Loosen the hexagon nut ⑨-① on each taper bolt ⑧-① that secures the stem ③ and disc ② until it is flush with the threaded end of the taper bolt ⑧-①. (This is to protect the threads when the bolt is tapped by a hammer.) (Fig. 31)
- (3) Tap the hexagon nut ⑨-① straight with a hammer straight to remove the taper bolt ⑧-①. (Fig. 32)
- (4) Grip the end of the stem ③ with a gripping tool and rotate it back and forth to pull it out. (Fig. 33)
- (5) Rotate the disc ② 90° so that it is fully open and pull it out with both hands. (Fig. 34)
- (6) Gently tap around the edge of the seat ring ⑫ with a plastic hammer or similar tool to remove it. (Fig. 35)

- (7) Remove the "O" ring ⑧-② from the seat ring ⑫ using a scriber or similar implement.
- (8) Remove the valve body ① from the vise and remove the bottom cover ⑥ and sheet packing ⑭ that are secured with the hexagon bolt ⑩-① and spring washer ⑩-②. When removing the bottom cover, keep the hollow bolt ⑰ and lock nut ⑱ on the bottom cover ⑥. Take care not to lose the ball ⑯. (Fig. 36)



(Fig. 37)

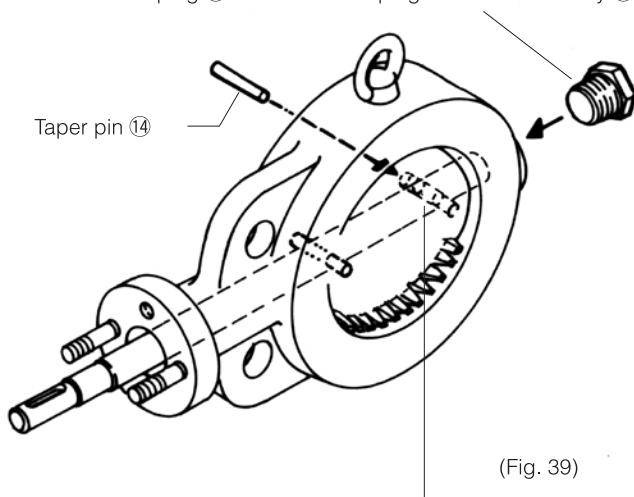
Each bearing ④ should be inserted so that the end of the bearing is flush with the inner periphery of the valve body.



Insert the bearings ④ into the stem holes.

(Fig. 38)

Apply liquid gasket to the threads of the bottom cover plug ⑯ and screw the plug into the valve body ①.



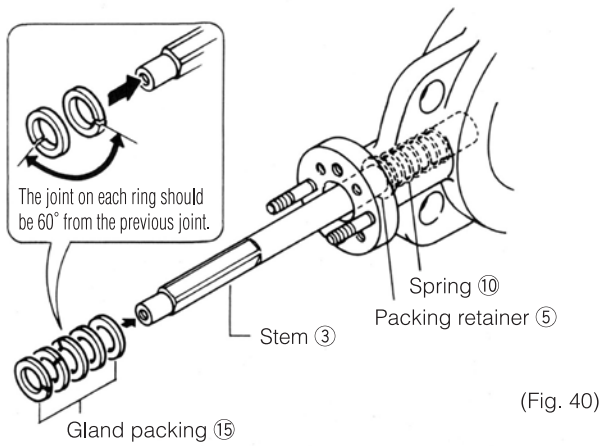
(Fig. 39)

Align the taper pin holes in the disc ② and stem ③.

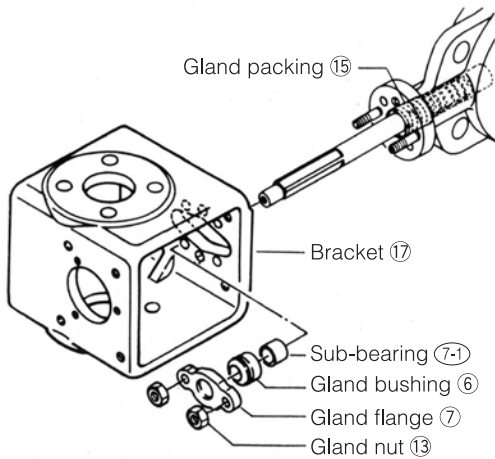
Assembly Procedure

- (1) Before assembly, clean all parts well using a cleaning fluid such as alcohol or a neutral detergent and make sure that none are damaged or abnormal. (Fig. 37)
- (2) Any parts judged unusable or “O” rings that have deteriorated due to the passage of time (even if not showing signs of wear) should be replaced with new parts.
- (3) Insert one bearing ④ each into the top and bottom stem holes in the valve body ① so that the end of each bearing ④ is flush with the inner periphery of the valve body (where the disc ② will be inserted). (Fig. 38)
- (4) Insert the disc ② into the valve body ①, and then insert the stem ③ supporting it with your hand. While inserting the stem, make sure that the disc ② is oriented correctly.
- (5) Align the taper pin holes in the disc ② with the holes in the stem ③, and insert the taper pins ⑭ by tapping them gently with a hammer. (Fig. 39) To align the holes, use the alignment marks that you made on the valve body ① and stem ③ during disassembly.
- (6) Apply liquid gasket to the threads of the bottom cover plug ⑯ and screw the plug into the valve body ①.

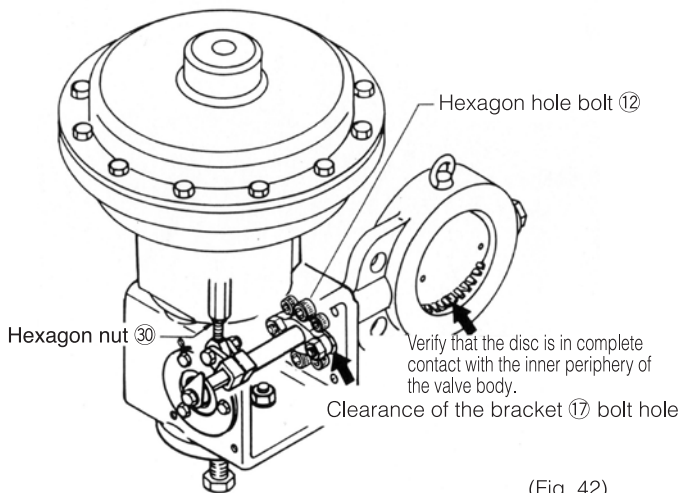
Assembling Model 507V



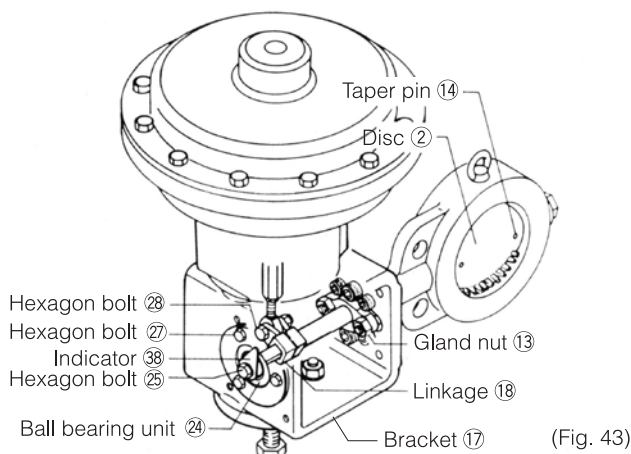
(Fig. 40)



(Fig. 41)

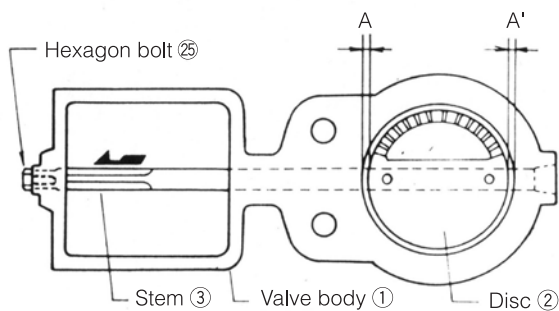


(Fig. 42)

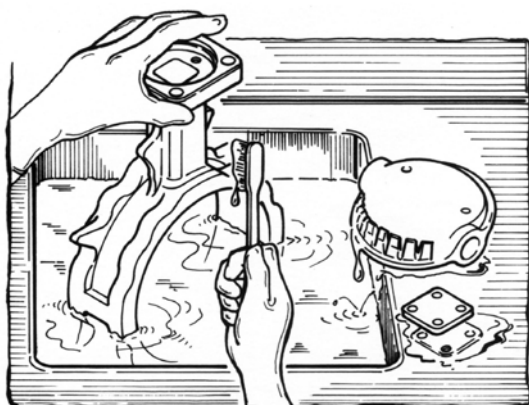


(Fig. 43)

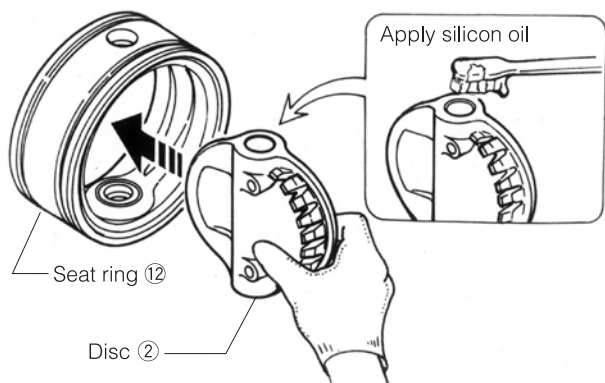
- (1) Slide the spring ⑩ and packing retainer ⑤ onto the stem ③ and into the valve body bonnet. (Fig. 40)
- (2) Slide the gland packing ⑮ onto the stem ③, pushing each ring in with a cylindrical pipe. As you slide each ring on, make sure that its joint is rotated 60° from the joint on the previous ring.
- (3) Insert the sub-bearing ⑦-1 into the gland bushing ⑥, temporarily secure the bracket ⑰ with the hexagon hole bolt ⑫, and attach the gland flange ⑦ with the gland nuts ⑬. After tightening the gland nuts ⑬ sufficiently by hand, use a wrench to tighten the nuts an additional half to full turn (enough so that two threads of each bolt protrude equally from the nuts). (Fig. 41)
- (4) If the valve is a Fail Open valve, rotate the drive member and bracket together an amount equal to the clearance of the bracket ⑰ bolt hole with the diaphragm pressurized. Verify that the disc ② is completely in contact with the inner periphery of the valve body ① and tighten the hexagon hole bolt ⑫. This creates a slight overload on the actuator spring. If the valve is a Fail Open valve with a manual handle, manually close the valve completely and tighten the hexagon hole bolt ⑫ in the same way. (Fig. 42)
- (5) Tighten the hexagon bolt ⑳ in the overload state.
- (6) Always tighten the hexagon bolt ㉘ of the linkage ⑱ at the zero point of the actuator stroke. Note: The disc of a Fail Open valve can be closed by rotating the valve shaft to the left. If the disc is in the piping, rotate the disc to the shut position to place the valve shaft in the correct position.
- (7) At this time, verify that the indication of the indicator ㉚ is correct.



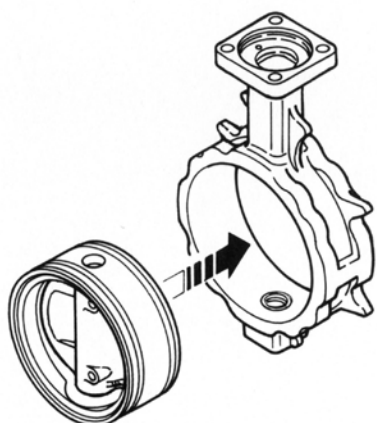
(Fig. 44)



(Fig. 45)



(Fig. 46)



(Fig. 47)

- (8) If necessary, reset the indicator 38 to the correct position and tighten with the hexagon bolt 25. Before tightening the indicator, loosen the gland nut 13 of step (3). (Fig. 44)

Note: The hexagon bolt 25 acts to pull in the stem 3 in order to make clearances A and A' between the disc 2 and valve body 1 equal.(Fig. 44)

- (9) Rotate the disc 70° from the closed position and verify that it rotates smoothly.

Assembling Model 508V

50 mm to 350 mm

Remark : Please contact our sales dept. any information regarding 65A and 125A for 508V.

- (1) Before assembly, clean all parts well using a cleaning fluid such as alcohol or a neutral detergent and make sure that none are damaged or abnormal. (Fig. 45)

- (2) Any parts judged unusable or "O" rings that have deteriorated due to the passage of time (even if not showing signs of wear) should be replaced with new parts.

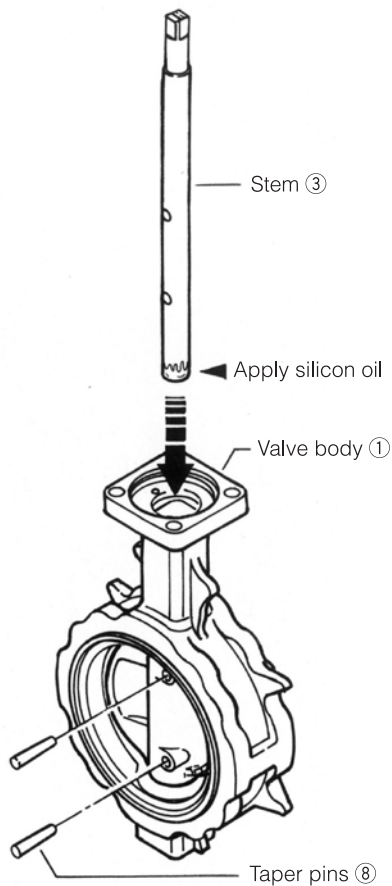
Note: If the seat ring material is other than NBR (EPDM or other material), use only silicon grease for the grease that is applied to the shaft, disc and other parts. Regular grease will cause swelling and corrosion.

- (3) Apply a thin coating of silicon oil to the outer edge of the disc 2.

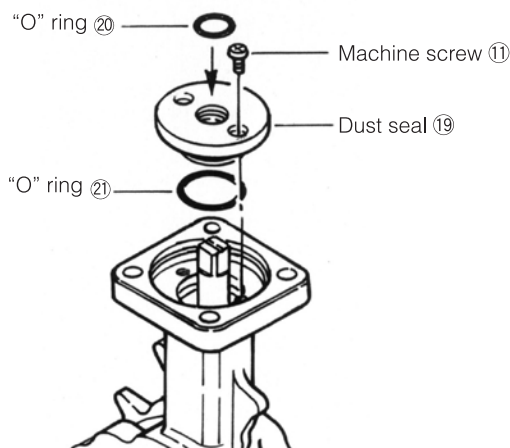
- (4) Insert the disc 2 into the seat ring 12. When inserting the disc 2, adjust its position by inserting a rod through the stem hole in the seat ring to align the stem holes in the seat ring 12 and disc 2. (Fig. 46)

- (5) Place the "O" ring 23 in the valve body 1.

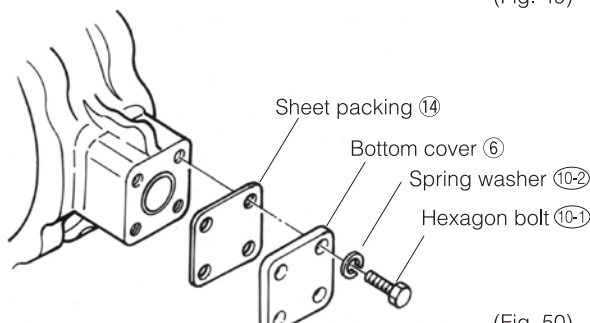
- (6) Apply a thin coating of silicon oil to the metal core surface on the outside of the seat ring 12 and then insert the seat ring with the disc into the valve body 1. When inserting the seat ring, position it so that the stem holes in the seat ring 12 and disc 2 are aligned with the stem holes in the valve body 1. (Fig. 47)



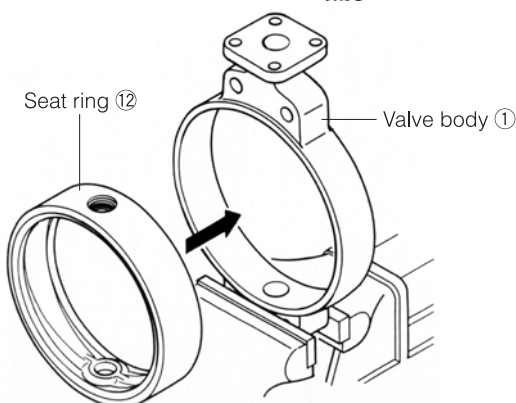
(Fig. 48)



(Fig. 49)



(Fig. 50)



(Fig. 51)

(7) Apply a thin coating of silicon oil to the bottom end of the stem ③ and insert this end of the stem through the upper stem hole in the valve body. Position the stem so that its taper pin holes are aligned with the taper pin holes in the valve body. (Fig. 48)

(8) Use a hammer to tap the taper pins ⑧ through the pin holes in the valve body ② and join the disc ② to the stem ③. (Fig. 48) (For 350 mm or less types, caulk with a punch after tapping in the taper pin to prevent the pin from slipping out.)

(9) Place the "O" rings ⑳ ㉑ in the dust seal ⑲ and slide onto the top end of the stem. Secure to the valve body with the machine screw ⑪. (Fig. 49)

(10) Attach the sheet packing ⑭ and bottom cover ⑥ to the bottom of the valve body in that order using the hexagon bolt ⑩. (Fig. 50)

(For 250 mm or larger types, apply grease to the tip of the hollow bolt ⑰ and use the grease to hold the ball ⑱ in the tip of the hollow bolt ⑰. Secure the sheet packing ⑭ and bottom cover ⑥ with the hexagon bolt ⑩-1 and spring washer ⑩-2.)

(11) Put the disc ② into the fully closed position.

(12) Install the bracket, joint, and actuator. When assembling, align and position each part using the alignment mark you made prior to disassembly.

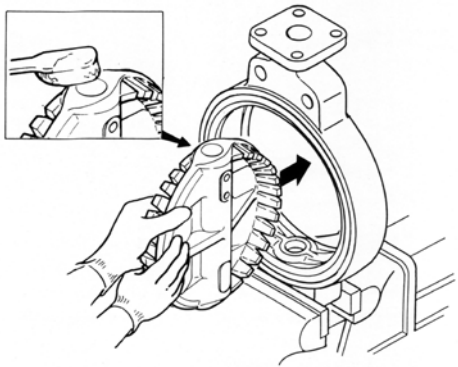
(13) Open and close the valve to verify that operation is smooth.

Assembling Model 508V

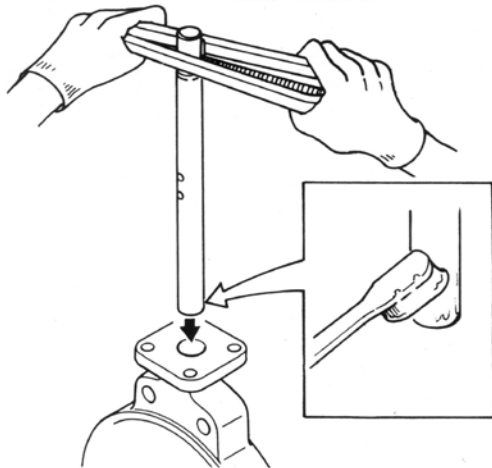
400 mm to 600 mm

(1) Insert "O" ring ⑮ in the upper and lower stem holes in the seat ring ⑫.

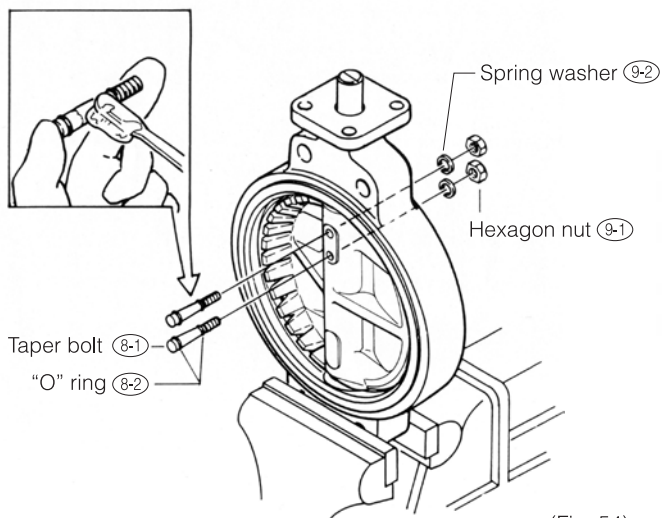
(2) Apply silicon oil to the outer periphery of the seat ring ⑫ and tap it gently and evenly with a plastic hammer to insert it into the valve body ①. At this time, verify that the stem holes at the top and bottom of the seat ring ⑫ and valve body ① are correctly aligned. (Fig. 51)



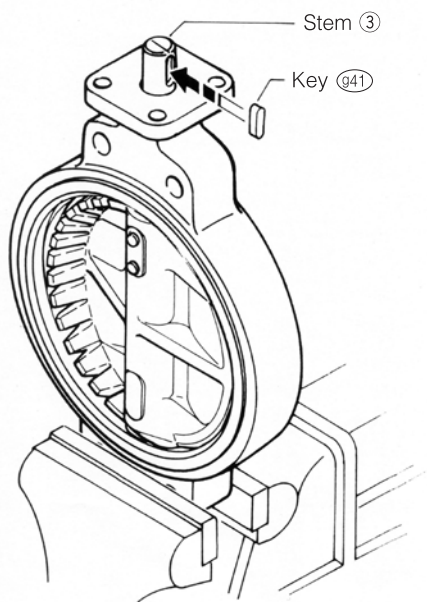
(Fig. 52)



(Fig. 53)



(Fig. 54)



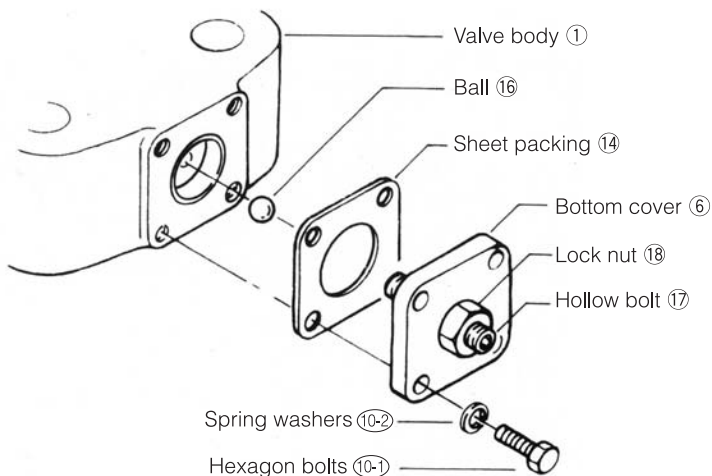
(Fig. 56)

(3) Apply silicon oil or similar lubricant to the top and bottom of the disc (2) and insert it into the seat ring (12). (Fig. 52)

(4) Insert the stem (3). When inserting the stem, apply silicon grease to the tip of the stem (3) and insert carefully to prevent damage to the hole in the seat ring (12) (Fig. 53)

(5) Rotate the stem (3) and verify that the taper bolt holes in the disc (2) and stem (3) are aligned. Place a new "O" ring (8-2) on the taper bolt (8-1), apply grease to the bolt, and insert it in the taper bolt hole in the disc (2). Next, tap the taper bolt (8-1) in with a hammer and tighten the taper bolt firmly with the hexagon nut (9-1) and spring washer (9-2). (Fig. 54)

(6) Apply grease to the tip of the hollow bolt (17) and use the grease to hold the ball (16) in the tip of the hollow bolt (17). Secure the sheet packing (14) and bottom cover (6) with the hexagon bolt (10-1) and spring washer (10-2). (Fig. 55)



(Fig. 55)

(7) Attach the key (941) to the stem (3). (Fig. 56)

This completes the assembly of the valve body. Verify that no parts were forgotten or assembled incorrectly.

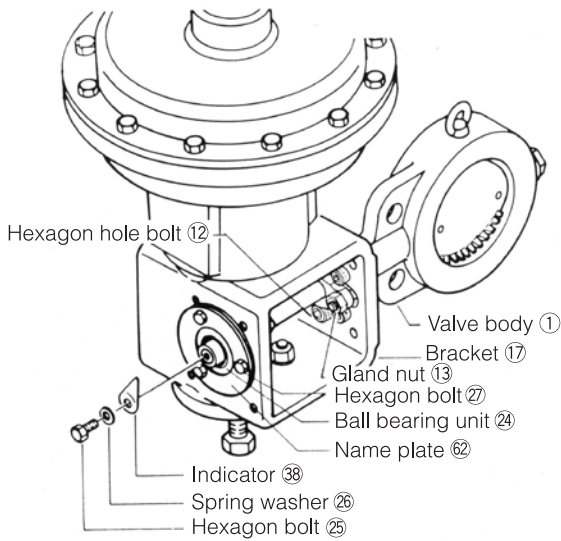
*To assemble the drive member on the valve, reverse the disassembly procedure.

ACTUATOR MAINTENANCE

DISASSEMBLING AND INSPECTING THE SPRING DIAPHRAGM

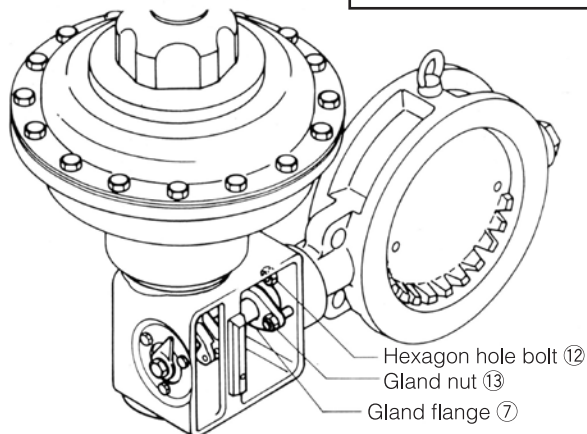
Remark : Please contact our sales dept. any information regarding 65A and 125A for 508V.

50 mm to 200 mm

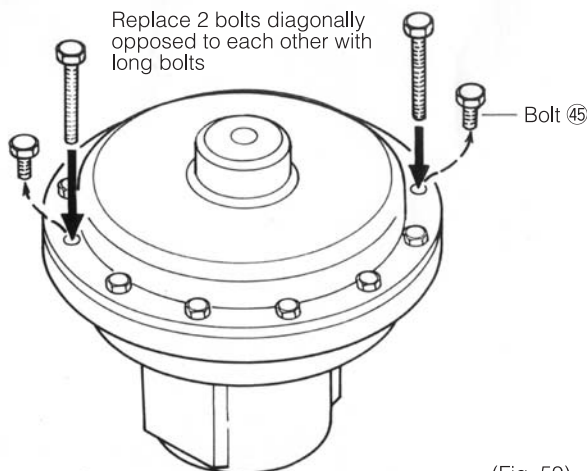


(Fig. 57)

250mm to 400mm



(Fig. 58)



(Fig. 59)

(1) Disconnect the air piping.

(2) Loosen hexagon bolt ②⑤ and remove together with the indicator ③⑧. Next, loosen the hexagon bolt ②⑦ that secures the ball bearing unit ②④ and name plate ②⑥.

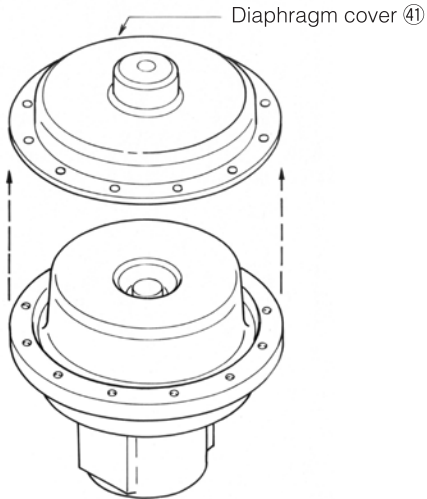
(3) Remove the hexagon hole bolt ①② that secures the bracket ①⑦ and the valve body ①. (Fig. 57)
Remove the gland nut ①③ that secures the gland flange ①⑦.

(4) Loosen the hexagon bolt ②⑧ and lock nut ②⑨ and slide the actuator together with the bracket ①⑦ and linkage ①⑧ off the stem ①③.
(See Fig. 23 on page 15.)

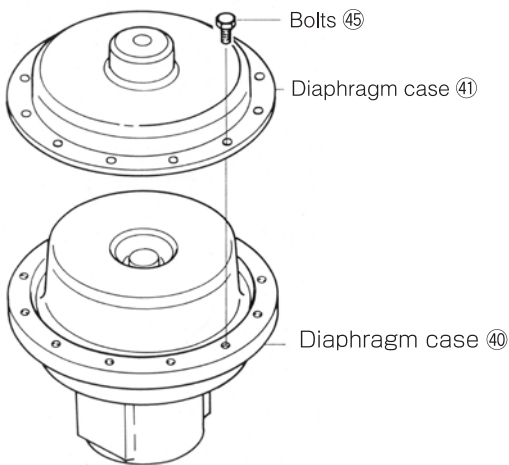
(5) Remove the load end bearing ②③.

(6) Loosen all diaphragm fastening bolts ④⑤ about two turns. The repulsive force of the spring ④⑦ acts on the diaphragm cover ④①, thus obtain two long bolts and replace two diaphragm fastening bolts ④⑤ diagonally opposed to each other with the long bolts. Remove all of the other bolts.

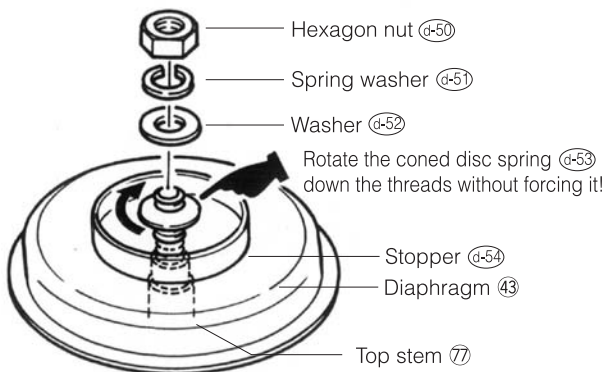
(Fig. 59)



(Fig. 60)



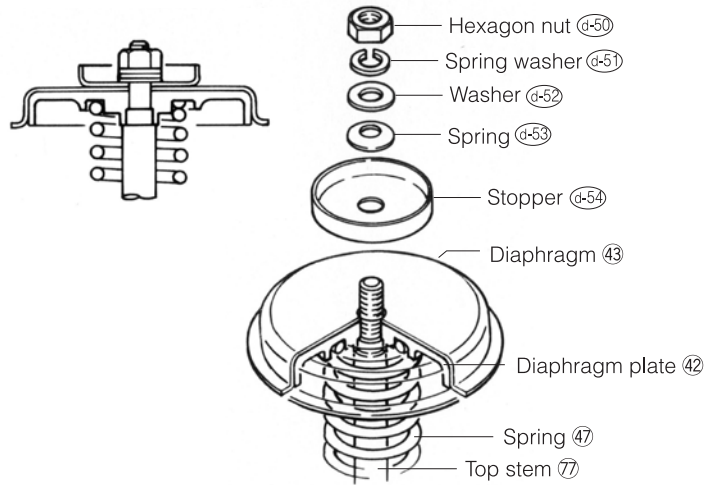
(Fig. 62)



(Fig. 63)

(7) While paying attention to the repulsive force of the spring, alternately loosen the two remaining long bolts and remove the diaphragm cover ④①.

(8) Remove the hexagon nut ④-50, spring washer ④-51, washer ④-52, spring ④-53, and stopper ④-54. (Fig. 61)



(Fig. 61)

(9) Remove the diaphragm ④③ and check for cracks.

(10) Check the top stem ⑦⑦, spring ④⑦, and other parts for damage or other problems.

(11) Replace parts judged to be no longer useable. It is also recommended that parts such as the “O” ring and spring ④-53 that deteriorate with the passage of time be replaced even if there are no signs of wear.

Reassembling the Actuator

The actuator is reassembled by reversing the disassembly procedure.

(1) Replace the top diaphragm case ④①. When replacing the top diaphragm case, make sure that the bolt holes are aligned with the bolt holes in the bottom diaphragm case ④① of the diaphragm ④③.

(2) Tighten the fastening bolts ④⑤ evenly, alternating diagonally.

(Fig. 62)

(3) When replacing the spring ④-53 on the top stem ⑦⑦, rotate the spring to the right so that it moves down the threads. Do not force the coned disc spring down, as this will damage the seal and allow air to leak.

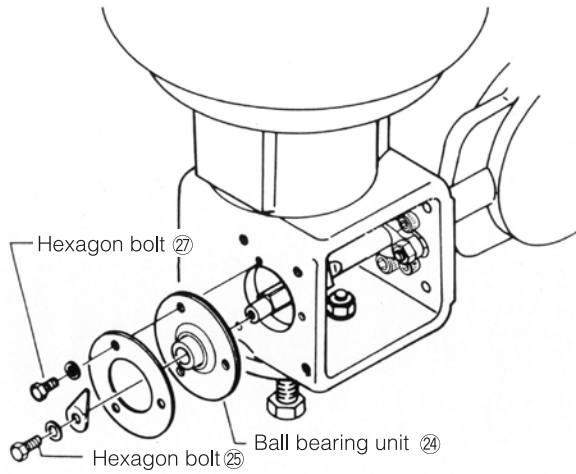
(4) When tightening the hexagon nut ④-50, take care not to tighten it to the point that the diaphragm ④③ and stopper ④-54 are deformed. (Fig. 63)

ADJUSTING THE ACTUATOR STEM LENGTH

When an actuator is replaced on an already installed valve, the actuator stem length must be adjusted to correctly close the disc. To adjust the actuator stem length, follow the steps below.

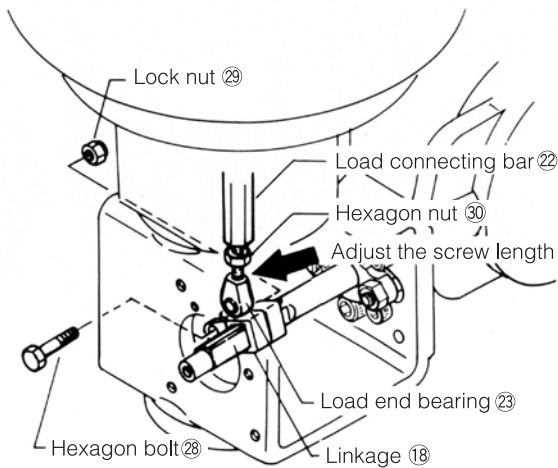
50 mm to 200 mm

Remark : Please contact our sales dept. any information regarding 65A and 125A for 508V.



(Fig. 64)

(1) Remove hexagon bolts 25 and 27 and then remove the ball bearing unit 24 from the stem. (Fig. 64)



(Fig. 65)

(2) Loosen the lock nut 29 and remove the hexagon bolt 28 from the linkage 18.

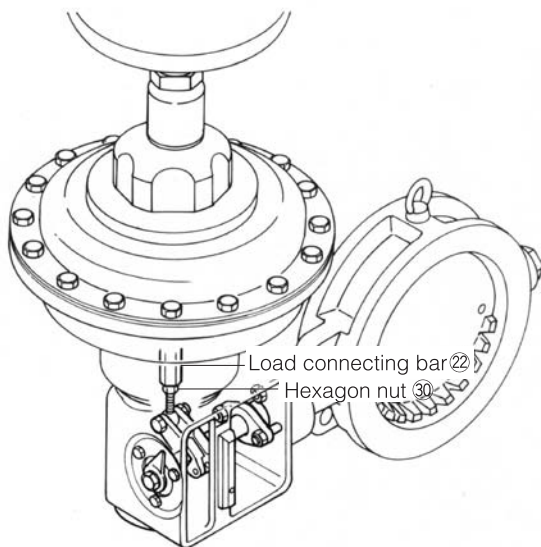
(3) Move the actuator slightly and loosen the hexagon nut 30. Rotate the load end bearing 23 to attain a desirable linkage position and adjust the screw length in the load connecting bar 22. (If the disc does not close completely, lengthen the load connecting bar 22 screw length.) (Fig. 65)

(4) Make sure that the load end bearing 23 is parallel to the linkage 18 and then tighten the hexagon nut 30.

(5) Attach the linkage 18 to the load-end bearing 23 with the hexagon bolt 28 and lock nut 29.

(6) Attach the ball bearing unit 24 to the stem 3 and bracket 17 with the hexagon bolts 25 27.

250 mm to 400mm



(Fig. 66)

(1) Loosen the hexagon bolt 30.

(2) Rotate the load connecting bar 22 to adjust the screw length. When doing so, rotate the load connecting bar 22 so that it descends slightly.

(3) When you have finished adjusting the length, tighten the hexagon bolt 30. (Fig. 66)

REQUIRED NUMBER AND SIZE OF PIPING BOLTS

507V Piping bolts and nuts sizes

Nominal size		JIS 10K	JIS 20K	ANSI 150Lb	ANSI 300Lb
mm	inch	Long bolts and nuts		Long bolts and nuts	
50	2	4-M16×130	8-M16×130	4-U 5/8×140	8-U 5/8×140
80	3	8-M16×130	8-M20×170	4-U 5/8×150	8-U 3/4×175
100	4	8-M16×130	8-M20×170	8-U 5/8×150	8-U 3/4×175
150	6	8-M20×170	12-M22×190	8-U 3/4×175	12-U 3/4×190
200	8	12-M20×170	12-M22×210	8-U 3/4×190	12-U 7/8×230
250	10	12-M22×210	—	12-U 7/8×230	—
300	12	16-M22×210	—	12-U 7/8×230	—
350	14	16-M22×210	—	12-U 1 ×260	—
400	16	16-M24×240	—	16-U 1 ×260	—

Material Long bolt: SNB7
Nut: S45C

508V Piping bolts and nuts sizes

Nominal size		JIS5K		JIS10K		JIS16K		ANSI 150Lb	
mm	inch	Long bolts and nuts	Setting bolts	Long bolts and nuts	Setting bolts	Long bolts and nuts	Hexagon bolts	Long bolts and nuts	Setting bolts
50	2	4-M12×105	—	4-M16×120	—	8-M16×125	—	4-U5/8-11UNC×130	—
80	3	4-M16×120	—	8-M16×125	—	8-M20×135	—	4-U5/8-11UNC×145	—
100	4	8-M16×130	—	8-M16×130	—	8-M20×150	—	8-U5/8-11UNC×150	—
150	6	8-M16×130	—	8-M20×155	—	12-M22×165	—	8-U3/4-10UNC×165	—
200	8	8-M20×150	—	12-M20×155	—	12-M22×170	—	8-U3/4-10UNC×180	—
250	10	—	—	12-M22×175	—	12-M24×190	—	12-U7/8-9UNC×195	—
300	12	—	—	16-M22×185	—	16-M24×210	—	12-U7/8-9UNC×210	—
350	14	—	—	16-M22×195	—	16-M30(P3)×225	—	12-U1 -8UNC×240	—
400	16	—	—	16-M24×220	—	—	—	16-U1 -8UNC×255	—
450	18	—	—	20-M24×230	—	—	—	16-U1 1/8-8UN×280	—
500	20	—	—	20-M24×245	—	—	—	20-U1 1/8-8UN×295	—
600	24	—	—	20-M30×290	8-M30×65	—	—	16-U1 1/4-8UN×340	8-U1 1/4-8UN×85

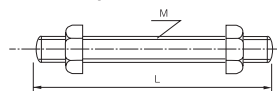
Remarks: Bold and nut material: SS400/SS400 and SUS 304/SUS04.
Long bolt uses full threaded bolt.
Use thin hexagon nut. (Use heavy hexagon nut for ANSI150Lb.)
A unified screw should have 8 threads per inch if its nominal diameter exceeds 1 inch.
Please contact our sales dept. any information regarding 65A and 125A for 508V.

Example

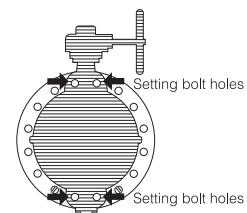
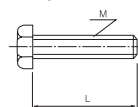
Long bolts: 4 - M12 × 105
 Quantity Nominal size (M) Length of bolt (L)

Setting bolts: 4 - M16 × 120
 (Hexagon bolts) Quantity Nominal size (M) Length of bolt (L)

Long bolts and nuts (full thread)



Setting bolts (Hexagon bolts)



APPLICABLE PIPE AND MINIMUM INTERNAL DIAMETERS

■ Applicable pipe list in case of A

Nominal size		SGP	STPY	Sch20	Sch40	Sch10S	Sch20S	Min. internal diameters of piping (mm)	
mm	inch							507V	508V
50	2	○	—	○	○	○	○	36	34
80	3	○	—	○	○	○	○	71	70
100	4	○	—	○	○	○	○	98	91
150	6	○	—	○	○	○	○	148	144
200	8	○	—	○	○	○	○	199	194
250	10	○	—	○	○	○	○	241	246
300	12	○	—	○	○	○	○	293	294
350	14	○	○	○	○	—	—	321	327
400	16	○	○	○	×	—	—	367	387
450	18	○	○	○	×	—	—	—	434
500	20	○	○	○	×	—	—	—	484
600	24	—	○	○	×	—	—	—	581

Remark : Please contact our sales dept. any information regarding 65A and 125A for 508V.

■ Applicable pipe list in case of B

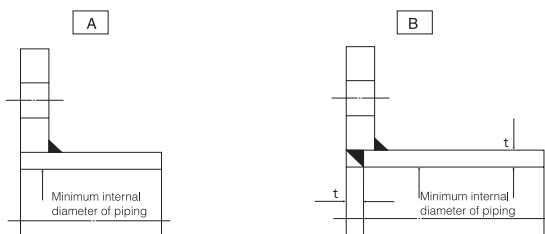
Nominal size		SGP	STPY	Sch20	Sch40	Sch10S	Sch20S
mm	inch						
50	2	○	—	○	○	○	○
80	3	○	—	○	○	○	○
100	4	○	—	○	○	○	○
150	6	○	—	○	○	○	○
200	8	○	—	○	○	○	○
250	10	○	—	○	○	○	○
300	12	○	—	○	○	○	○
350	14	○	○	○	○	—	—
400	16	○	○	○	○	—	—
450	18	○	○	○	○	—	—
500	20	○	○	○	○	—	—
600	24	—	○	○	○	—	—

Remark1: ○: Installation possible, ×: Installation not possible, —: No standard

Remark2: Butterfly valves are inserted into a pipe that was fitted with the disc when fully open.

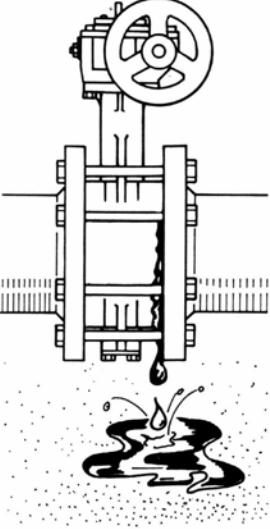
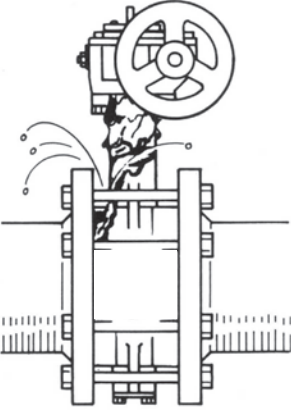
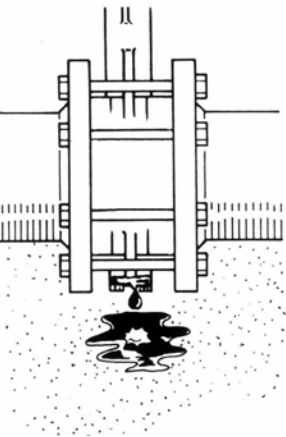
In cases where you are using a pipe or flange that is less than the minimum inner pipe diameter, use is still possible if means are taken such as inserting a spacer between the valve and flange. For details, please consult us.

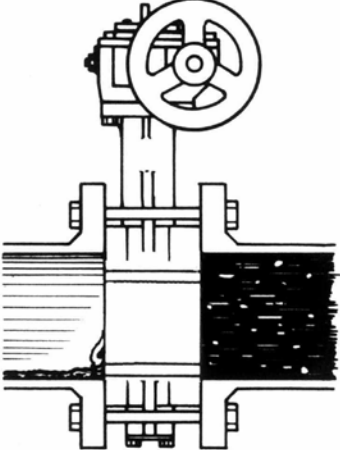
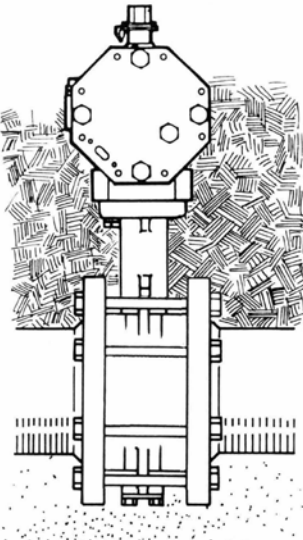
Remark3: Please contact our sales dept. any information regarding 65A and 125A for 508V.



TROUBLESHOOTING

Please refer to the following when there is a problem with a valve.

Problem	Cause	Countermeasure
<p data-bbox="108 360 512 454">There is leakage from the gasket between the valve body and pipe flange faces.</p> 	<p data-bbox="563 360 963 421">The piping bolts are loose or they were not tightened evenly.</p>	<p data-bbox="1018 360 1334 421">Loosen the bolts and then retighten them.</p>
	<p data-bbox="563 465 850 495">The valve is misaligned.</p>	<p data-bbox="1018 465 1406 526">Loosen the bolts and realign the valve correctly.</p>
	<p data-bbox="563 577 879 607">Torn or damaged seat ring</p>	<p data-bbox="1018 577 1422 734">Remove the valve body and check the seat ring for signs of tearing or other damage. If any damage is observed, replace the seat ring.</p>
	<p data-bbox="563 757 943 786">Seat ring deterioration. (508V only)</p>	<p data-bbox="1018 757 1283 786">Replace the seat ring.</p>
	<p data-bbox="563 824 963 913">Internal fluid leak due to damage to the seat ring shaft seal. (508V only)</p> <p data-bbox="563 925 963 1003">(In this case the bottom cover can be removed to verify the existence of the leak.)</p>	<p data-bbox="1018 824 1283 853">Replace the seat ring.</p>
<p data-bbox="108 1030 469 1059">There is a leak from the gland.</p> 	<p data-bbox="563 1025 963 1086">Worn or damaged seat ring shaft seal.</p>	<p data-bbox="1018 1025 1283 1086">Replace the seat ring. (508V only)</p> <p data-bbox="1018 1167 1401 1256">Re-tighten the gland packing or replace the gland packing. (507V only)</p>
<p data-bbox="108 1590 480 1650">There is a leak from the bottom cover.</p> 	<p data-bbox="563 1585 963 1776">For 508 V The primary seal between the seat ring and disc is damaged. In addition, the secondary seal between the seat ring and disc is damaged.</p>	<p data-bbox="1018 1585 1283 1615">Replace the seat ring.</p>
	<p data-bbox="563 1809 943 1870">For 507V The bottom cover plug is loose.</p>	<p data-bbox="1018 1809 1257 1839">Re-tighten the plug.</p>

Problem	Cause	Countermeasure
<p data-bbox="185 152 592 241">There is leakage from the valve seat and the amount of leakage increases.</p> 	<p data-bbox="639 152 1038 241">The wrong material was selected for the fluid application. (Parts are being corroded.)</p>	<p data-bbox="1094 152 1437 241">Change the material. Please inquire with us regarding selection.</p>
	<p data-bbox="639 286 1038 412">There is damage to the disc seal or seat ring due to the presence of foreign matter inside the piping.</p>	<p data-bbox="1094 286 1477 344">Replace the disc seal wrapping and the seat ring.</p>
	<p data-bbox="639 434 983 492">Movement of disc in the fully closed position</p>	<p data-bbox="1094 434 1493 492">Adjust the fully closed position of the disc.</p>
	<p data-bbox="639 546 1038 636">Fluid specification is not compatible with valve specification. (Specifications have been exceeded.)</p>	<p data-bbox="1094 546 1430 568">Re-check the specifications.</p>
	<p data-bbox="639 658 1038 748">There is torsion of stem due to an unusual increase in opening/ closing torque.</p>	<p data-bbox="1094 658 1501 680">Replace the disc and valve body.</p>
	<p data-bbox="639 770 1023 860">Movement of disc in fully closed position due to loose actuator installation bolts.</p>	<p data-bbox="1094 770 1461 860">Re-adjust the fully closed disc position by re-tightening the installation bolts.</p>
	<p data-bbox="639 916 1023 974">Wearing of seat ring due to long period of use (508V only)</p>	<p data-bbox="1094 916 1358 938">Replace the seat ring.</p>
<p data-bbox="185 1032 592 1090">Faulty operation (The valve does not work.)</p> 	<p data-bbox="639 1032 1023 1090">Prescribed actuator air pressure or voltage not being supplied.</p>	<p data-bbox="1094 1032 1422 1090">Check by using a pressure gauge, tester, or similar.</p>
	<p data-bbox="639 1144 1023 1270">For pneumatic pressure cylinder types, diaphragm of speed controller is stuck in the fully closed position.</p>	<p data-bbox="1094 1144 1422 1202">Open the diaphragm of the speed controller.</p>
	<p data-bbox="639 1290 975 1348">By-pass valve is in the open position.</p>	<p data-bbox="1094 1290 1390 1312">Close the by-pass valve.</p>
	<p data-bbox="639 1368 935 1426">Insufficient output due to damaged cylinder parts.</p>	<p data-bbox="1094 1368 1461 1494">Apply the prescribed pressure and observe functioning. If defective parts are suspected, replace them with new parts.</p>
	<p data-bbox="639 1514 1023 1603">Increased torque due to presence of foreign matter in the piping.</p>	<p data-bbox="1094 1514 1493 1603">Keep valve in the fully opened position and flush out the foreign material.</p>
	<p data-bbox="639 1626 1007 1751">The valve has been installed in reverse orientation to the direction of flow (direction of pressure).</p>	<p data-bbox="1094 1626 1453 1684">Install the valve in the correct orientation relative to the flow.</p>
	<p data-bbox="639 1783 1007 1841">Twisted or damaged stem and joints.</p>	<p data-bbox="1094 1783 1382 1841">Replace the valve body assembly.</p>

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