

TRITEC (TT2) Instruction Manual

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Appendix 1: Structural Sectional Drawing

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1. Introduction

This instruction manual describes general handling of TRITEC (TT2) Triple Offset Valve.

TRITEC (TT2) is a rotary process valve whose seal/seat structure adopts a new mechanism unique to TOMOE VALVE CO., LTD. Read this instruction manual thoroughly to ensure proper use of the product. For detailed information on the actuator, see its separate instruction manual.

2. Features of Triple Offset Valve (Torque Sealing)

Due to its wedge-shaped sealing structure, TRITEC Triple Offset Valve suffers less wearing and slide scoring; its body seat comes in contact with the disc seal only when the valve is fully closed. The valve also has a torque sealing structure to retain the valve seat seal by a specified shut-off torque when the body seat makes even contact with the disc seal when the valve is fully closed.

3. Standard Specifications

Note) This table shows standard specifications of this product. For actual specifications, see the specifications of your product.

Valve type		Triple Offset Valve TOMOE TRITEC (TT2)									
Rating		API609 Class 300 Category B (ASME B16.34 Class300, JPI300Lb)					API609 Class 150 Category B (ASME B16.34 Class150, JPI150Lb)				
Model number		TT2BWR	TT2BLR	TT2BFR	TT2BGR	TT2BDR *3	TT2AWR	TT2ALR	TT2AFR	TT2AGR	TT2ADR *3
Connection type		Wafer	Lug	Double flange		*4	Wafer	Lug	Double flange		*4
Nominal diameter		80,100,150,200,250,300,350,400,450,500,600									
Face-to-face dimension		API 609 Class300			*4	API 609 Class150			*4		
		Wafer Short		DFSP		DFLP <th colspan="2">Wafer Short</th> <td>DFSP</td> <td>DFLP</td>	Wafer Short			DFSP	DFLP
Applicable fluid		Gas (exhaust gas, hot air), liquid (water, chemical solvent), and vapor									
Maximum operating pressure		5.1 MPa					2.0 MPa				
Operating temperature range		-29°C to 600°C (400°C or less in oxidized atmosphere)									
Flow direction		Bi-directional (However, the recommended pressure direction is for high pressure at the shaft side. Actuator selection will differ depending on the pressure direction.)									
Sealing structure		Torque seating									
Connection flange		*1	ASME B16.5 Class300(API300)				*2	ASME B16.5 Class150(API150)			
Standard material	Body		A216-WCB (-29 to 538°C), A351-CF8M (-29 to 600°C)								
	Disc	80-150 mm	A351-CF8M (-29 to 600°C)								
		200-600 mm	A216-WCB (-29 to 538°C), A351-CF8M (-29 to 600°C)								
	Disc seal		316SS, (Option: 316SS + hardening treatment with titanium nitride, 316SS + Stellite welding (or coating))								
	Shaft/Shaft pin		A564-TYPE630 H1150 double tempering (-29 to 400°C), Inconel 718 (400 to 600°C)								
	Seat ring		316SS + graphite laminate								
	Bearing		Stellite or carbon								
Gland packing		Graphite packing, five pieces in total									

*1 Connectable flanges to 300Lb wafer type: ASME B16.5 Class300(API300), JPI300, JIS16K/20K/30K, DIN16/25/40

*2 Connectable flanges to 150Lb wafer type: ASME B16.5 Class150(API150), JPI150, JIS10K/16K/20K, DIN10/16

*3 Double block and bleed valve

*4 See outline drawing.

4. Handling Procedure

4.1 Packaging

- (1) Before this product is shipped, the valve disc is set to a slightly open position from its fully closed position, and protection is provided to the flange seal surfaces and the body interior.
- (2) Surfaces of machined ferrous parts are protected with recommended anticorrosive.
- (3) It is recommended that this product remains stored in packed condition until the valve is ready to be installed in the piping system.

4.2 Transportation Conditions

- (1) For sea transportation, use wooden packaging (container).
- (2) For land transportation, use a roofed vehicle.
If using an unroofed vehicle, cover the valve with a waterproof sheet.

4.3 Storage

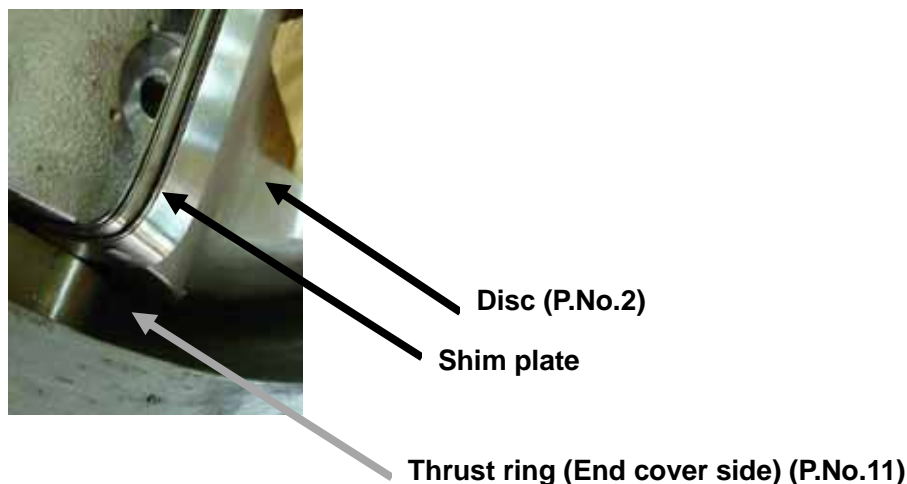
- (1) Store the valve in a well-ventilated indoor area (temperature: -5 to 60°C; humidity: 70% or less) without removing the protective plate from the valve body.
- (2) Do not store this product in a corrosive atmosphere.
- (3) For long-term storage, apply anticorrosive to ferrous or plated parts once a year.
- (4) If storing the valve in unpacked condition, avoid excessive loads on the valve body and the actuator.

4.4 Unpacking Conditions

- (1) Do not leave the valve unpacked for an extended period of time. You can unpack it just before starting the piping work.

4.5 Precautions for Bareshaft

- (1) To avoid seat damage of the body seat when assembling the actuator, the shim plate is inserted between bottom area of the disc and the thrust ring of end cover side.
- (2) Remove the shim plate before opening the valve when finish assembling the actuator.



5. Precautions for Piping Work

- (1) Clean the flange surfaces that make contact with the valve, by air purging, to avoid damage to the valve during operation. If rust or other foreign objects are present, remove them and clean the valve.
- (2) Before installing or removing the valve in/from the piping system, shut the valve disc to avoid damage to the sealing surfaces.
- (3) If hanging the valve, use the hang holes or the neck of the valve body.
(Do not suspend the valve by its actuator parts such as the valve wheel.)
- (4) Install the valve in the piping system only after all welding work around the valve has been completed.
- (5) Before installing the valve, attach a short pipe to the piping system, with the same face-to-face dimensions as the valve's dimensions, and blow air into the piping system to thoroughly eliminate any foreign objects.
- (6) Use gasket packing on both sides of the valve.
- (7) Accurately center the valve, flanges and gaskets.
- (8) If the check valve or the pump is connected directly to the valve, it may interfere with the valve disc. Therefore, attach a short pipe between the valve and the check valve or the pump. Otherwise, avoid direct connection to the check valve or the pump.

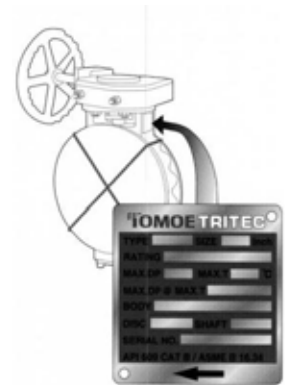
6. Piping Procedure

TRITEC is designed with sealing capability in both flow directions. However, the actuator size may vary since the required torque differs depending on the flow direction. Therefore, when installing the valve, align the flow direction with the arrow described in the nameplate on the valve body or in your product's specifications.

For the piping of TRITEC for both flow directions, such as the double block and bleed valve, see your product's specifications.

When installing the valve, set the valve shaft as horizontal as possible. For other restrictions on installation, see Appendix 3.

- (1) Make sure that the flange surfaces are parallel to each other, with no misalignment, and that the sealing surfaces are free of scratches and foreign objects.
- (2) Before installation, make sure that the pressure and temperature in the piping system are respectively the normal atmospheric pressure and temperature.
- (3) Make sure that you have selected the correct valve type by checking the valve model number and the main material stated in the nameplate on the side of valve body.
- (4) Insert a new gasket between the valve ends and the flange face. During maintenance or reinstallation, always use a new gasket. Use a proper gasket that matches the flange to be connected.
- (5) Tighten the pipe bolts evenly and progressively, in a diagonal sequence.
Tighten the bolts securely to the torque recommended by the gasket manufacturer to ensure the sealing performance of the flange face. However, note that the tightening torque for these pipe bolts does not affect the sealing performance of the valve seat or torque of the valve.
- (6) After installation, open and close the valve slowly to check and confirm that the valve disc makes no contact with the pipe or the gasket.

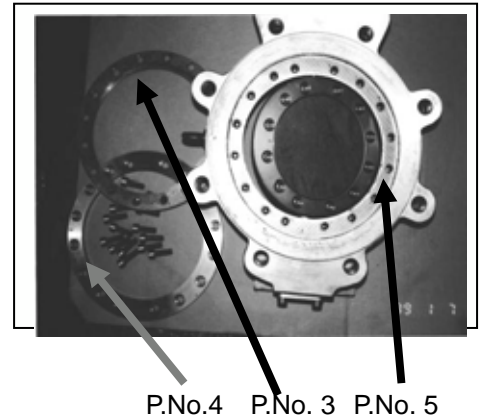


7. Disassembly (For part numbers, see structural drawing in Appendix 1)

When replacing the body seat or the disc seal, replace the valve that was removed from the piping system according to the following procedure.

7.1 Removal of Body Seat (Tools needed: Hex key)

- ① Open the valve to 10 to 20°.
- ② Remove the body seat screws (P.No.24) using the Hex key.
- ③ Remove the retainer (P.No.4), the body seat (P.No.3), and the body seat gasket (P.No.5).



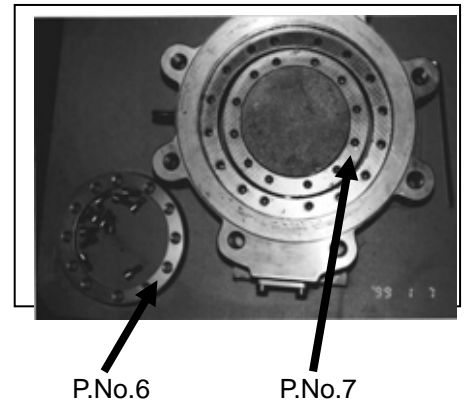
7.2 Removal of Disc Seal (Tools needed: Hex key)

If only replacing the body seat, this process is not necessary

- ① Fully close the valve.
- ② Remove the disc seal screws (P.No.22) using the Allen wrench.
- ③ Successively remove the disc seal (P.No.6) and the disc seal gasket (P.No.7).

Note 1) Retain the removed screws for reuse after cleaning.

Note 2) Replace the removed gaskets with new ones.
(P.No.5: body seat gasket; P.No.7: disc seal gasket;
P.No.14: End cover gasket)



8. Assembly (For P.No., see structural drawing in Appendix 1)

8.1 Adjustment of Valve Disc Position (Tools needed: Hex key)

To allow for thermal expansion at high temperature, thrust rings with gaps have been provided between the valve body and the valve disc. While assembling the valve, the valve shaft must be pushed upward from the end cover to clear the gap on the actuator side.

As shown in Figure 2, remove the end cover and insert a spacer, such as a bolt, between the end cover and the valve shaft. Use longer bolts and gently tighten them (torque approx. 1 to 4 Nm) to push up the valve shaft

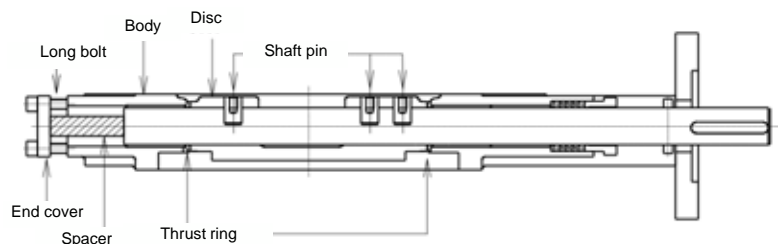


Figure 2

This work is to be carried out when assembling the actuator.

8.2 Installation of Disc Seal (Tools needed: Hex key, Torque wrench)

If only replacing the body seat, this process is not necessary

- ① Clean the mating surface to ensure that no foreign particles or gasket residue are present.
- ② Note that the disc seal gasket for bore size 200 mm or less is in a ring shape without bolt holes and has no distinction between front and back or top and bottom. However, the disc seal gasket for bore size 250 mm and over has bolt holes that need to be aligned with the bolt holes in the valve disc. Apply graphite paste (e.g. ThreeBond1107) to both sides of disc seal gasket (P.No.7) and place it on the valve disc as necessary.
- ③ Install the disc seal by following the positioning arrow marked on it. Align the arrow with the 9 o'clock direction. (Direction toward actuator is 12 o'clock; see Figure 4.) Check to ensure that the outside diameter of the valve disc (P.No.2) does not stick out beyond the outside diameter of the disc seal (P.No.6) when viewed from the front of the disc seal (P.No.6). Otherwise, grind the outside diameter with an angle grinder so that the valve disc (P.No.2) does not make contact with the body seat (P.No.3) when the valve is opened or closed.
- ④ Apply molybdenum disulfide grease to the disc seal screws (P.No.22) before installation.
- ⑤ Tighten all bolts to 25% of the torque specified in Appendix 2, in a diagonal sequence.
- ⑥ Tighten all bolts in a diagonal sequence to 50, 75, and 100% of the specified torque. Repeat tightening to 100% of the specified torque, two or three times, until the screws do not turn any more.
- ⑦ Retighten the bolts to 100% of the specified torque two hours after previous tightening

8.3 Installation of Body Seat (Tools needed: Hex key)

- ① Clean the mating surface to ensure that no foreign particles or gasket residue are present.
- ② Place the body seat gasket (P.No.5) on the valve body. Align the bolt holes with those in the valve body. The gasket has no distinction between its front and back sides. Apply graphite paste (e.g. ThreeBond1107) to both sides of body seat gasket (P.No.5) as necessary. (A notch is marked on the outer circumference at the 9 o'clock position as reference.)
- ③ Attach the body seat (P.No.3), which has distinct front and back sides, to the valve body with the 9 o'clock arrow facing you. Use the 0.5 mm thickness gauge to ensure that there is a gap between the outside diameter of the body seat (P.No.3) and the inside diameter of the valve body.
- ④ Attach the retainer (Part number 4) with its non-step side facing the 9 o'clock direction (Figure 3). Align the bolt holes in the valve body with those in the retainer.
- ⑤ Apply molybdenum disulfide graphite grease to the body seat screws (P.No.24) before installation.

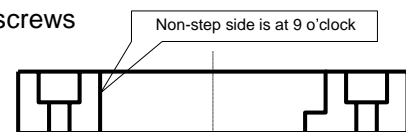


Figure 3

8.4 Tightening Adjustment of Body Seat (Tools needed: Hex key, Torque wrench)

- ① Turn out the body seat screws (P.No.24) by 1 to 2 turns, from the point where you feel resistance.
- ② Temporarily open the valve disc to about 20° and then close it slowly. During this operation, visually and manually check the movement of the retainer (P.No.4) at the 3 o'clock position. Stop the actuator immediately before the retainer is lifted up by the valve disc. If you try to identify the stop position again, do so after returning the body seat to its initial position, as the body seat (P.No.3) will overshoot once retainer is lifted up.
- ③ Adjust the position of the retainer so that the body seat hangs evenly over the retainer, and make sure that the retainer does not make contact with the disc seal. Then, tighten the body seat screws (P.No.24) lightly until the retainer does not move.
- ④ Successively tighten two screws at the 3 o'clock position (Figure 4 ①②), two screws at 6 and 12 o'clock (Figure 4 ③④), and the remaining screws (Figure 4 ⑤ to ⑯) from 9 o'clock, to 25% of the torque specified in Appendix 2.
- ⑤ Successively tighten the bolts to 50, 75, and 100% of the torque specified in Appendix 2.
- ⑥ Repeat tightening of all bolts from ① to ⑯ to 100% of the specified torque, two or three times, until they do not turn.
- ⑦ Open the valve disc to approximately 20° again. To apply closing torque to the valve, loosen the stopper of the actuator on the closing side so that the actuator is set to its fully closed position.
- ⑧ Fully open and close the valve slowly to make sure that the valve disc, disc seal and body seat move smoothly and that no deformation of metal laminate is present at the edge of the body seat in the fully open position. Especially when checking the edges of the body seat in the upper and lower cutouts, use a flashlight to get a clear view, as the disc seal is close to the body seat (P.No.3).
- ⑨ By shining light on the fully closed valve from the valve stem side while applying closing torque, ensure that no light can be seen between the body seat and the disc seal. If any light is visible, redo the procedure from Section 8.4 Tightening Adjustment of the body seat (P.No.3).
- ⑩ Retighten the bolts to 100% of the specified torque after two hours after the previous tightening.

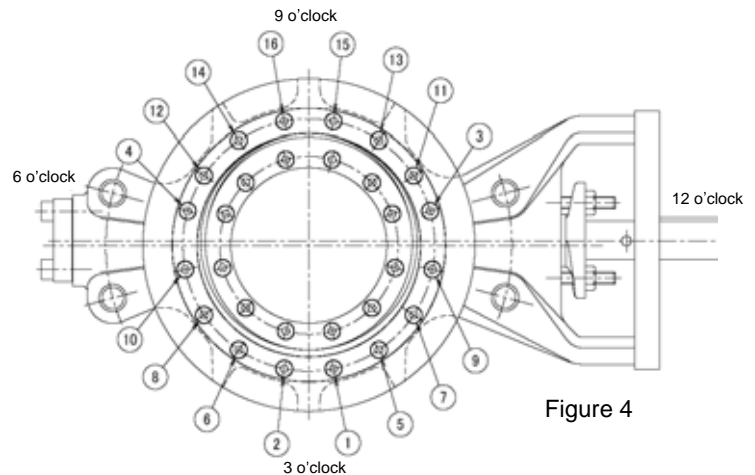


Figure 4

8.5 Installation of End cover (Tools needed: Hex key, Torque wrench)

- ① Remove the spacer inserted under the end cover in Section 8.1. Apply graphite paste (e.g. ThreeBond 1107) to the contact surface of the valve body and set the new end cover gasket (P.No.14). Put back the end cover (P.No.13).
- ② Tighten the end cover screws (P.No.26) in a diagonal sequence to 25, 50, 75 and 100% of the torque specified in Appendix 2. Repeat tightening to 100% of the specified torque, two or three times, until the bolts do not turn any more.
- ③ Wipe off any excess paste squeezed out of the lid.

8.6 Tightening Confirmation of Body Seat

- ① Fully open and close the valve slowly to ensure that the valve disc, disc seal and body seat move smoothly and that no deformation of metal laminate is present at the edge of the body seat in the fully open position. Especially when checking the edges of the body seat in the upper and lower cutouts, use a flashlight to get a clear view, as the disc seal is close to the body seat.
- ② Make sure that the disc seal does not make contact with the retainer when applying closing torque.
- ③ Make sure to provide sufficient clearance to the stopper (stroke-limiting device) of the actuator so that the valve disc does not make contact with the retainer even if the disc overruns by about 3° in the fully closed position. (For the fully open position, adjust the stopper so that the valve stops in the fully open position of the indicator.)

Caution: Be careful not to get your fingers caught in the valve disc during opening/closing operation. In case of automatic valves, double-check before using them, as a preventive measure against danger.

This is the end of instructions on assembly and disassembly for replacing the body seat and the disc seal. The above procedure applies to individual valves (except bleed valve) in the double block and bleed valve.

9. Maintenance of Gland Packing

If gland leakage occurs during use, the gland nuts (P.No.29) need retightening. For information on the retightening torque, see Appendix 2.

When retightening, make sure to allow the internal fluid pressure to respectively reach normal atmospheric pressure and temperature. If the pressure and temperature remain high, sealing performance recovery may be insufficient and internal fluid could blow out due to breakage of the bolts, which is extremely dangerous.

If leakage continues despite retightening of the gland nuts, replace the gland packing according to the following procedure.

9.1 Disassembly

- ① Remove the actuator.
- ② Remove the mounting plate (or bracket, P.No.17)
- ③ Remove the key (P.No.35) and the anti-blowout pin (P.No.38) in the upper part of the valve shaft.
- ④ Undo the gland nuts (P.No.29) and remove the gland plate spigot (P.No.16) from the upper part of the valve shaft.
- ⑤ Remove the two types of gland packing (P.No.33 and 34) using a packing removal tool.
- ⑥ Discard the removed gland packing.

9.2 Assembly

- ① Clean the gland packing installation holes and the valve stem to remove foreign particles and dust.
- ② Carefully insert new gland packing so as not to damage the packing by the valve shaft keyway.
- ③ Insert five pieces of gland packing, one piece at a time, while compressing each piece, in the order of one piece of P.No.33, three pieces of P.No.34, and one piece of P.No.33. Set each cutout (bias cutout or straight cutout) about 90° apart from adjacent cutouts.
- ④ Install the gland plate spigot (P.No.16) and tighten the gland nuts (P.No.29) to the torque specified in Appendix 2.
Successively tighten the right and left nuts alternately to 25, 50, 75 and 100% of the specified torque. Repeat tightening to 100% of the specified torque, two or three times, until the nuts do not turn any more.
- ⑤ Install the anti-blowout pin (P.No.38), the key (P.No.35) and the mounting plate (or bracket, P.No.17).
- ⑥ Install the actuator and tighten the mounting bolts.
<Be careful not to misalign the valve disc seal while installing the actuator.>
- 1) Avoid placing additional load such as weight of the joint on the valve shaft. To support the joint, insert a collar under it so that the mounting plate (or bracket, P.No.17) sustains the weight of the joint.
- 2) Do not let the valve shaft drop when assembling. For example, ensure that the actuator or the joint do not hit the head of the valve shaft.
- ⑦ Retighten the bolts to 100% of the specified torque more than two hours after previous tightening.

10. Other Precautions

- 1) For the handling of the bleed valve in the double block and bleed valve, see the separately issued instruction manual.
- 2) For your safety, take additional measures to keep shut the secondary side of the bleed valve in the double block and bleed valve, such as by connecting a blind flange.

11. Closing Remarks

This is the end of instructions on the handling of TRITEC (TT2) main body.

Please follow the instructions in this manual to get the best performance from the valve.

Appendix 1: Structural Sectional Drawing	1 page
Appendix 2: Listing of Bolt Tightening Torque	1 page
Appendix 3: Listing of Installation Position in Piping	2 pages

List of Bolt Tightening Torque

1. TT2-150Lb

(Unit: Nm)

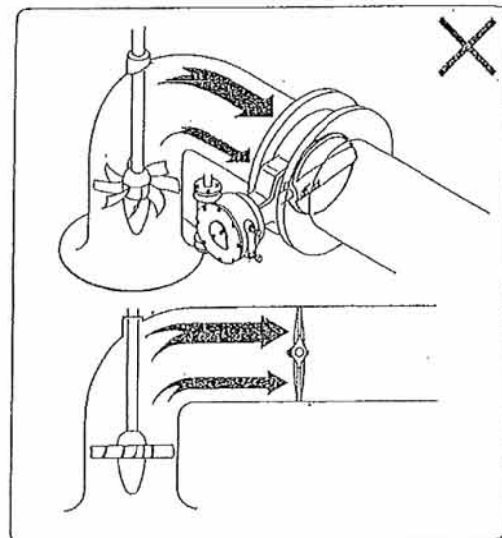
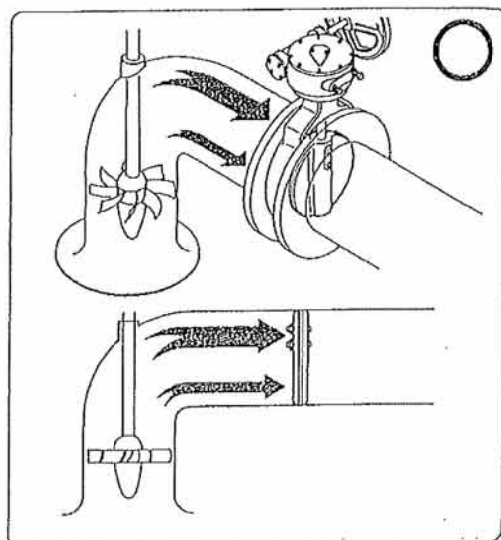
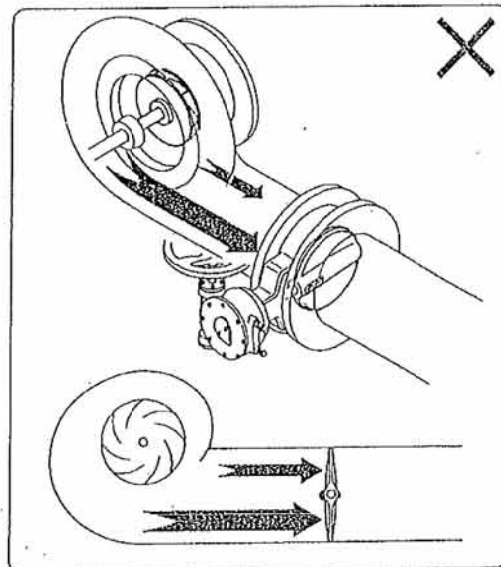
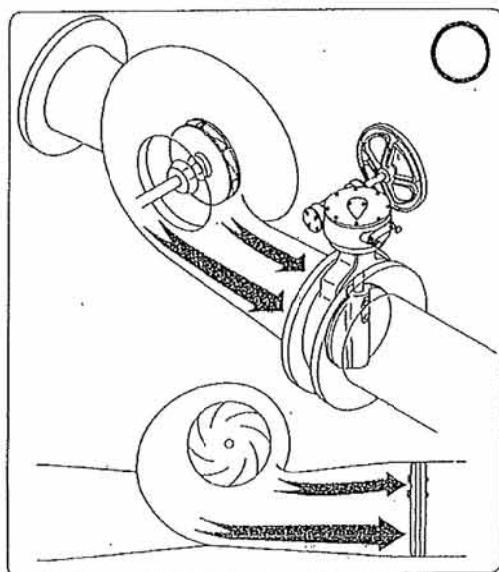
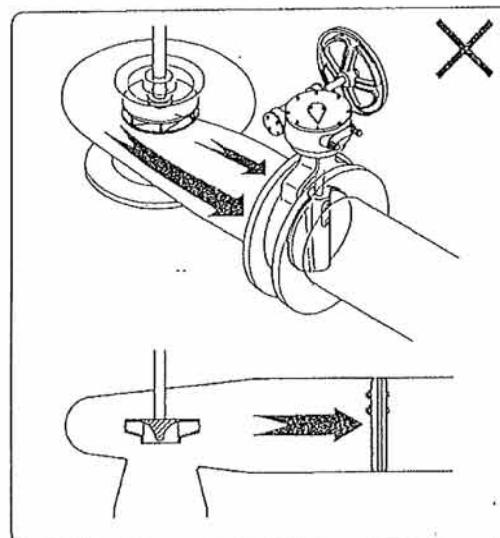
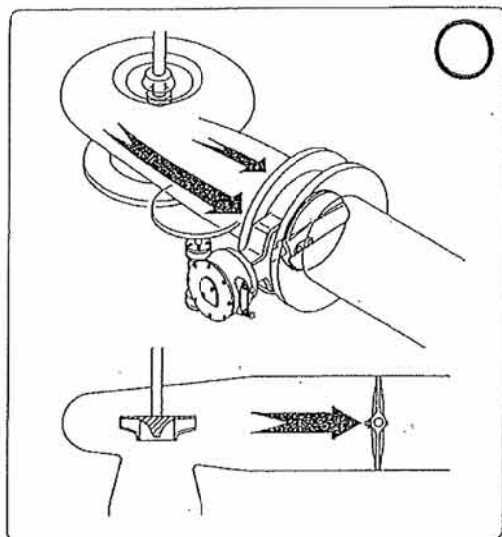
Size		No.22 Disc seal screw		No.24 Body seat screw		No.25 M/T plate and Bracket screw		No.26 End cover screw		No.29 Gland nut	
mm	inch	Torque value	M size	Torque value	M size	Torque value	M size	Torque value	M size	Torque value	M size
80	3	12	M6	14	M6	8.3	M6	8.3	M6	8.3	M6
100	4	12	M6	12	M6	20	M8	20	M8	20	M8
150	6	19	M8	27	M8	20	M8	20	M8	20	M8
200	8	19	M8	33	M8	20	M8	20	M8	20	M8
250	10	52	M10	52	M10	20	M8	40	M10	40	M10
300	12	48	M10	58	M10	40	M10	70	M12	70	M12
350	14	50	M10	50	M10	40	M10	70	M12	70	M12
400	16	50	M10	63	M10	70	M12	173	M16	173	M16
450	18	150	M16	210	M16	70	M12	173	M16	173	M16
500	20	150	M16	260	M16	70	M12	173	M16	173	M16
600	24	150	M16	260	M16	583	M24	173	M16	173	M16

1. TT2-300Lb

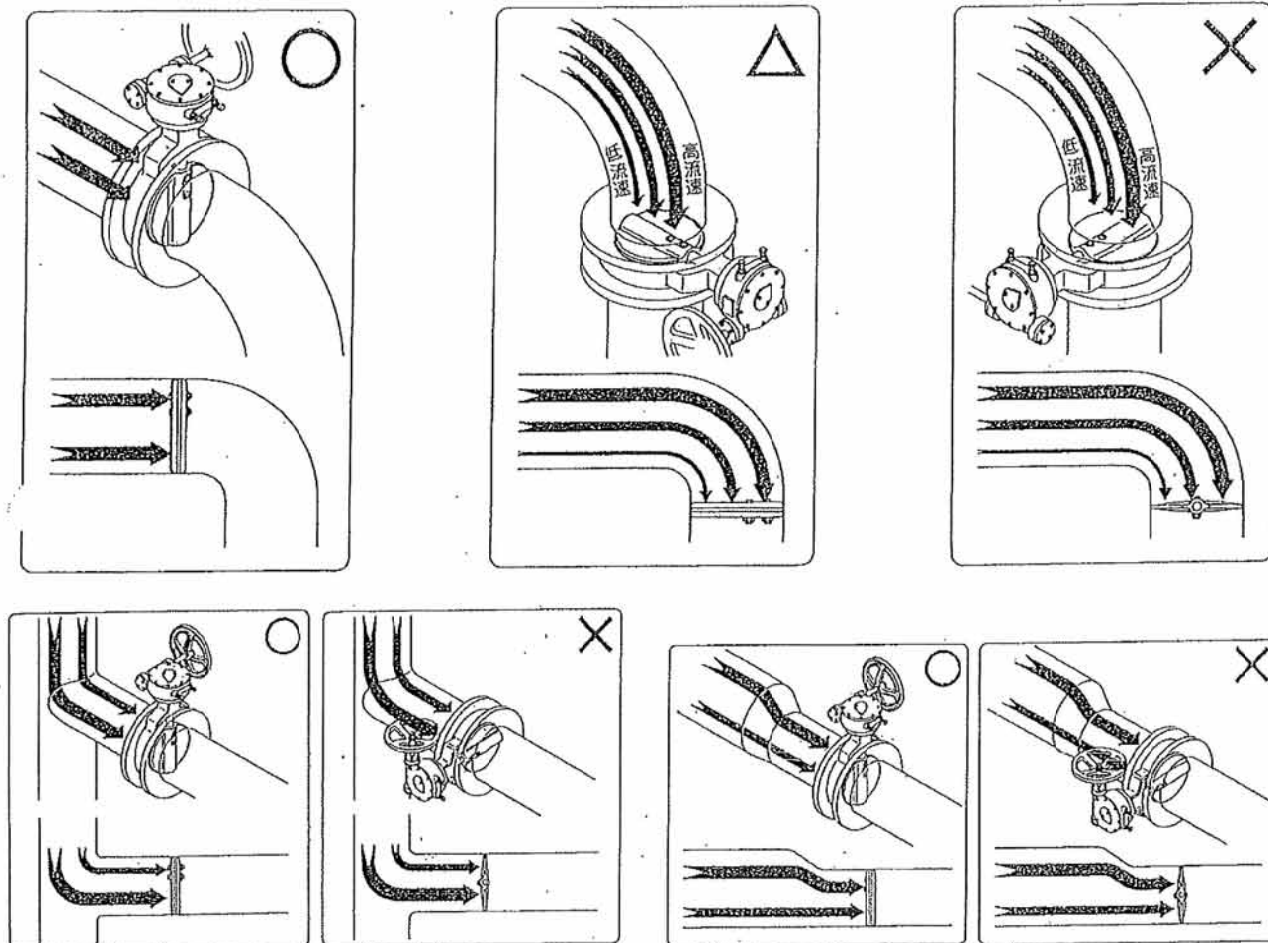
(Unit: Nm)

Size		No.22 Disc seal screw		No.24 Body seat screw		No.25 M/T plate or Bracket screw		No.26 End cover screw		No.29 Gland nut	
mm	inch	Torque value	M size	Torque value	M size	Torque value	M size	Torque value	M size	Torque value	M size
80	3	12	M6	14	M6	8.3	M6	8.3	M6	8.3	M6
100	4	12	M6	12	M6	20	M8	20	M8	20	M8
150	6	19	M8	27	M8	20	M8	20	M8	20	M8
200	8	19	M8	33	M8	40	M10	40	M10	40	M10
250	10	52	M10	52	M10	40	M10	70	M12	70	M12
300	12	48	M10	58	M10	70	M12	173	M16	173	M16
350	14	50	M10	50	M10	70	M12	173	M16	173	M16
400	16	50	M10	63	M10	173	M16	173	M16	173	M16
450	18	150	M16	210	M16	583	M24	173	M16	338	M20
500	20	150	M16	260	M16	583	M24	338	M20	338	M20
600	24	150	M16	260	M16	583	M24	338	M20	338	M20

Example : Installation of the Valve for Pump outlet



Example : Installation of the Valve for Bend pipe and Reducer pipe



Example : Combinational Installation of the Control valve and On-Off valve

