

# ***CROVER***

C O R type

## Instruction Manual

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# Introduction

Thank you very much for purchasing a Mitsuwa Cross over Pump. This instruction manual provides guidance on how to use a Cross over Pump (hereafter referred to as a pump).

The manual describes procedures for installing, operating, inspecting, and maintaining the pump and check items for the actual users of the pump. Be sure to read the manual before installing, operating, inspecting, and maintaining the pump and follow the instructions.

Since we are always making improvements to deliver better products, there may be some discrepancies between the product and the description in the instruction manual.

## 【Safety precautions】

The following symbols are used in this manual so that you can safely and properly use the product and prevent bodily injury upon you and other people and physical damage to property. After fully understanding the meaning of the symbols, read the instructions.

	Indicates a potential situation that could result in death or serious injury on the user if the product is handled improperly.
	Indicates a potential situation that could result in minor injury on the user or physical damage to the product with great frequency if the product is handled improperly.
	Indicates a potential situation that could result in injury on the user or physical damage to the product if the product is handled improperly.
	Indicates a potential situation that could result in physical damage to the product if the product is handled improperly.

## 【Cautions】

<ul style="list-style-type: none"> <li>● Before fitting the belt (coupling bolt), check the rotation direction of the electric motor. For the rotation direction, see the pump.</li> </ul>	
<ul style="list-style-type: none"> <li>● After installing and piping the product, be sure to align the pulley (coupling).</li> </ul>	
<ul style="list-style-type: none"> <li>● Before operating the pump, be sure to attach the safety cover. Never touch the safety cover carelessly during operation.</li> </ul>	
<ul style="list-style-type: none"> <li>● After a new belt is fit, the belt may stretch. Be sure to check the belt tension in 15 to 30 days and adjust the tension as necessary.</li> </ul>	
<ul style="list-style-type: none"> <li>● <b>Never operate with the valve closed!</b> (A long continuous operation of the pump with the valves on the discharge and suction pipes fully closed may cause an abnormal rise in the pump liquid temperature, resulting in damage to pump components. Also, avoid pipe blockage.)</li> </ul>	

## For safety work

<ul style="list-style-type: none"> <li>● Before starting work, check the safety precautions and work procedures with the person in charge of site work according to the work plan and perform work safely.</li> </ul>	 <span style="border: 1px solid black; padding: 2px;">Danger</span>
<ul style="list-style-type: none"> <li>● Before inspecting, maintaining, or overhauling the product, check whether the work site is dangerous and accessible.</li> </ul>	 <span style="border: 1px solid black; padding: 2px;">Warning</span>
<ul style="list-style-type: none"> <li>● Before disassembling or repairing the product, be sure to turn off the electric motor.</li> </ul>	 <span style="border: 1px solid black; padding: 2px;">Danger</span>
<ul style="list-style-type: none"> <li>● Keep unauthorized people away from the work site.</li> </ul>	 <span style="border: 1px solid black; padding: 2px;">Warning</span>
<ul style="list-style-type: none"> <li>● When performing work, wear well-fitting work clothes to keep them from getting caught on protrusions or in moving parts. Also, wear your protectors such as a hard hat and safety shoes and use your goggles, gloves, and safety belt as necessary.</li> </ul>	 <span style="border: 1px solid black; padding: 2px;">Danger</span>
<ul style="list-style-type: none"> <li>● Designate a storage area for fire extinguisher and hydrant boxes and familiarize yourself with fire extinguishing procedures.</li> </ul>	 <span style="border: 1px solid black; padding: 2px;">Danger</span>
<ul style="list-style-type: none"> <li>● <b>Never modify the product!</b> When you want modifications to the pump, contact your dealer to discuss new specifications.</li> </ul>	 <span style="border: 1px solid black; padding: 2px;">Caution</span>
<ul style="list-style-type: none"> <li>● Do not operate the pump with the safety cover (belt cover or coupling cover) removed.</li> </ul>	 <span style="border: 1px solid black; padding: 2px;">Danger</span>
<ul style="list-style-type: none"> <li>● Shaft seal parts and bearings may become hot. If you touch them with your bare hands, you may get burned or have an accident. Exercise utmost caution when inspecting them.</li> </ul>	 <span style="border: 1px solid black; padding: 2px;">Caution</span>
<ul style="list-style-type: none"> <li>● Be sure to use a waste oil catch can. Do not discharge waste oil directly onto the earth's surface. Be sure to comply with applicable laws and regulations with regard to waste disposal.</li> </ul>	
<ul style="list-style-type: none"> <li>● Be sure to perform periodical inspection for operational safety. Replace wetted parts as necessary. Wetted parts may be worn or corroded depending on the type and properties of the liquid. Regularly inspect the wetted parts to prevent accidents such as liquid leakage.</li> </ul>	 <span style="border: 1px solid black; padding: 2px;">Danger</span>

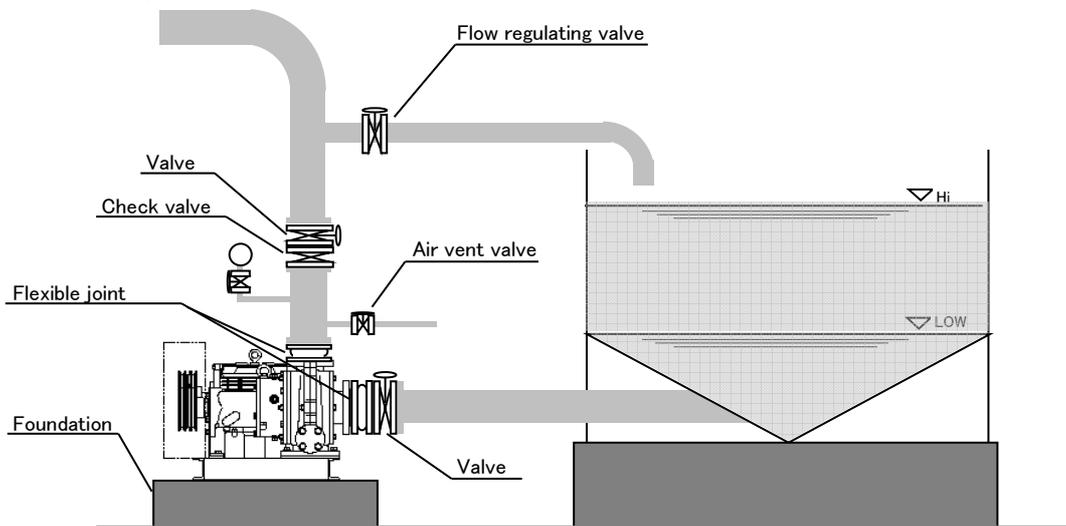
## Cautions at the time of product delivery

<ul style="list-style-type: none"> <li>● Check whether the product you ordered has been delivered.</li> </ul>	 <span style="border: 1px solid black; padding: 2px;">Warning</span>
<ul style="list-style-type: none"> <li>● When carrying in the product, take its center of gravity and weight into consideration. When hoisting heavy equipment, never get under it.</li> </ul>	 <span style="border: 1px solid black; padding: 2px;">Danger</span>

## Cautions for installation

<ul style="list-style-type: none"> <li>● The pump foundation must be constructed on soils with an adequate bearing capacity and must be strong enough to withstand equipment vibration and weight. There must be no pools of water on the pump foundation. Firmly secure the pump with anchor bolts. (At this moment, be careful not to twist the base.)</li> </ul>	 <b>Important</b>
<ul style="list-style-type: none"> <li>● Make the suction pipe as short as possible and minimize the number of bends.</li> <li>● Perform piping in such a way that air does not collect in the suction pipe and the pipe declines toward the pump.</li> </ul>	 <b>Important</b>
<ul style="list-style-type: none"> <li>● The suction pipe diameter must be equivalent to or greater than the pump suction opening diameter.</li> </ul>	 <b>Important</b>
<ul style="list-style-type: none"> <li>● Securely install supports for both discharge and suction pipes so that piping load is not applied to the pump.</li> </ul>	 <b>Caution</b>
<ul style="list-style-type: none"> <li>● Be sure to install an air vent valve on the discharge pipe.</li> </ul>	 <b>Important</b>
<ul style="list-style-type: none"> <li>● Remove foreign objects from the water tank. Keep foreign objects from entering the pump.</li> </ul>	 <b>Important</b>
<ul style="list-style-type: none"> <li>● When performing batch operation, be careful of the water stop level. Keep air from entering the pump.</li> </ul>	 <b>Important</b>
<ul style="list-style-type: none"> <li>● Install a valve on each of the discharge and suction pipes for easy inspection and repair. Also, secure adequate space for inspection and repair.</li> </ul>	
<ul style="list-style-type: none"> <li>● <u>Before fitting the belt (coupling bolt), check the rotation direction of the electric motor.</u> For the rotation direction, see the pump.)</li> </ul>	 <b>Caution</b>
<ul style="list-style-type: none"> <li>● After installing and piping the pump, be sure to align the pulley (coupling).</li> </ul>	 <b>Important</b>

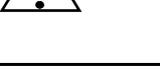
### 【Installation example】



## Pump startup procedures

- (1) Make sure that the main power supply to the electric motor is off.
  - (2) Check for loose pipe connections and pump bolts.
  - (3) Turn the pulley (coupling) by hand to check whether it turns smoothly.
  - (4) Before fitting the belt (coupling bolt), check the rotation direction of the electric motor.  
(For the rotation direction, see the pump.)
  - (5) After checking the rotation direction, turn off the main power supply again.
  - (6) Fit the belt (coupling bolt) and align the pulley (coupling).
  - (7) Attach the safety covers (belt and coupling covers).
  - (8) Fully open the discharge and suction pipe valves.
  - (9) Fill the pump and suction pipe with water or liquid (prime the pump), while opening the air vent valve to allow air to escape. When the pump is filled with water or liquid, fully close the air vent valve.
  - (10) Turn on the power and check that water is pumped up.
  - (11) Control the amount of flow with the discharge valve and maintain it at the proper level.
  - (12) Check for vibration and noise and make sure that the electric current is normal. With this, the work is completed.
- ※ The machine chamber (bearing chamber) is charged with factory-supplied oil. For an external water injection type, avoid a dry running of the mechanical seal.

## Cautions in startup and operation

<ul style="list-style-type: none"> <li>● Before operating the pump, be sure to attach the safety cover. Do not touch the safety cover carelessly during operation.</li> </ul>	
<ul style="list-style-type: none"> <li>● Be sure to fully open the suction pipe valve during pump operation. Friction (pressure loss) on the suction pipe may cause cavitation.</li> </ul>	
<ul style="list-style-type: none"> <li>● Do not use the pump within an under-discharge or over-discharge range. Otherwise, the pump may fail at an early stage.</li> </ul>	
<ul style="list-style-type: none"> <li>● <b><u>Do not rotate the motor backward!</u></b> (Even a slight backward rotation may cause the screw impeller to come off, resulting in damage to the pump.)</li> </ul>	
<ul style="list-style-type: none"> <li>● <b><u>Do not idle the pump!</u></b> (Operation without water or liquid in the pump may damage the mechanical seals or other pump components.)</li> </ul>	
<ul style="list-style-type: none"> <li>● <b><u>Do not operate the pump with the valve closed!</u></b> (A long continuous operation of the pump with the valves on the discharge and suction pipes fully closed may cause an abnormal rise in the pump liquid temperature, resulting in damage to the pump components. Also, avoid pipe blockage.)</li> </ul>	
<ul style="list-style-type: none"> <li>● <b><u>Keep foreign objects from entering the pump!</u></b> (Foreign objects in the pump may damage pump components. If foreign objects are likely to enter the pump, use strainers to prevent them.)</li> </ul>	

## Cautions during non-operation

<p>If no countermeasures against water hammer such as a check valve have been taken, fully close the discharge valve and then stop the pump. At this moment,</p> <ul style="list-style-type: none"> <li>● allow the internal pressure in the pump to escape with the air vent valve. (Be aware that liquid may splatter.)</li> <li>✕ Stop the pump immediately after the discharge valve is fully closed.</li> </ul>	
<ul style="list-style-type: none"> <li>● Back or negative pressure must not be created in the pump during non-operation. If back or negative pressure is likely to be created, fully close the discharge and suction valves.</li> </ul>	
<ul style="list-style-type: none"> <li>● If liquid is likely to coagulate during non-operation, pass water through the pump to clean the interior of the pump.</li> </ul>	
<ul style="list-style-type: none"> <li>● If the pump is likely to freeze in winter, remove liquid in the casing.</li> </ul>	

## Cautions during storage and long non-operation

<ul style="list-style-type: none"> <li>● Store metal parts under favorable conditions because they are prone to rust during storage.</li> </ul>	
<ul style="list-style-type: none"> <li>● Remove the belt and store it at room temperature, away from direct sunlight. Avoid hanging the belt on a shelf or wall with the belt tightly bent.</li> </ul>	
<ul style="list-style-type: none"> <li>● Cover the pump with a plastic sheet to prevent it from being exposed to splashing water and dust.</li> </ul>	
<ul style="list-style-type: none"> <li>● When placing the pump in storage, cover it to prevent foreign objects from entering through the flange.</li> </ul>	
<ul style="list-style-type: none"> <li>● If the pump is likely to freeze in winter, remove liquid in the casing.</li> </ul>	
<ul style="list-style-type: none"> <li>● Rotate the bearings by hand every one or two months to prevent rust.</li> </ul>	
<ul style="list-style-type: none"> <li>● Before starting the pump, turn the pulley by hand several times.</li> </ul>	
<ul style="list-style-type: none"> <li>● Before starting the pump, check the oil level. Add oil if necessary. Change oil if there are signs of degradation.</li> </ul>	

## Daily checks and maintenance

Frequency	Check items	Check and action						
Every week	Check the oil condition.	Check the oil condition through the sight glass. Change oil if it is contaminated or add oil if there is not enough. The following week, if you have the same problem, you need to replace the mechanical seal.						
Every month	(Pump/electric motor) check the drive.	<p>Belt-driven type: Check the belt for looseness and wear. If anything is wrong with the belt, adjust or replace it.</p> <p>Direct-driven type: Check the coupling rubber for wear. If anything is wrong with the rubber, adjust or replace it.</p>						
Every three months	Change oil in the machine chamber.	<p>Change all of the oil in the machine chamber.</p> <ul style="list-style-type: none"> <li>* Recommended oil: ISO VG 10 or equivalent</li> <li>* Oil level: See the specified amount below.</li> </ul> <p><b>【Oil level】</b></p> <table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th>Model</th> <th>Oil level</th> </tr> </thead> <tbody> <tr> <td>1CO</td> <td>600 cc</td> </tr> <tr> <td>2COR</td> <td>1250 cc</td> </tr> </tbody> </table>	Model	Oil level	1CO	600 cc	2COR	1250 cc
	Model	Oil level						
1CO	600 cc							
2COR	1250 cc							
	<p>Change oil in the bearing chamber.</p> <p>(<b>【Special specifications】</b> Oil bath bearings only)</p>	<p>Change all of the oil in the bearing chamber.</p> <ul style="list-style-type: none"> <li>* Recommended oil: ISO VG 32 or equivalent</li> <li>* Oil level: Adjust the amount of oil so that the oil level is near the middle of the sight glass.</li> </ul> <p><b>【Guide for oil level】</b></p> <table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th>Model</th> <th>Oil level</th> </tr> </thead> <tbody> <tr> <td>1CO</td> <td>cc</td> </tr> <tr> <td>2COR</td> <td>300 cc</td> </tr> </tbody> </table>	Model	Oil level	1CO	cc	2COR	300 cc
Model	Oil level							
1CO	cc							
2COR	300 cc							
Every six months	Check for abnormal noise and vibration.	<ul style="list-style-type: none"> <li>* Retighten bolts and nuts.</li> <li>* When a bearing makes abnormal or high-pitched noise, it needs to be replaced.</li> </ul>						
Every year	Overhaul/inspection and maintenance	<ul style="list-style-type: none"> <li>* Replace parts if there are signs of wear or damage.</li> <li>* Check pipes and repair them if anything is wrong.</li> </ul>						

### 【Cautions】

<ul style="list-style-type: none"> <li>● After a new belt is fit, the belt may stretch. Check the belt tension in 15 to 30 days and adjust the tension if necessary.</li> </ul>	 <b>Important</b>
<ul style="list-style-type: none"> <li>● Before checking the oil level or changing oil, stop the pump. Air bubbles may form in the oil during operation; this is not unusual.</li> </ul>	
<ul style="list-style-type: none"> <li>● Overhaul the pump once a year and check the interior of the pump, pipes, and instruments. All the components have different life expectancies depending on liquid or slurry properties. Check the components for wear and tear and replace them in an appropriate manner.</li> </ul>	

## Pump troubleshooting (at startup)

Problem	Main causes																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
The pump does not work.	⊙	○	⊙	○																			
Water is not pumped up.			○	⊙	○	○	○	⊙		○	○	○				○	○	○					
The discharge rate is low.				⊙	○	⊙	⊙	○	○	○	○					○	○	○					
The discharge pressure is low.				⊙		⊙	○	○	○	○	○					○		○					
Abnormal noise is generated.				○	○	○	○	⊙	⊙	⊙	○	○	○	○	○	○		○		⊙	⊙		
Abnormal vibration is generated.				○	○	○	○	○	○	○	○	○	○	⊙	○	○		○		⊙	⊙		
The motor is overloaded.				○												○		⊙	⊙	⊙			

	Causes	Remedies
1	Faulty wiring in the electric motor	Carry out correct wiring.
2	Electric motor failure	Contact your dealer for repair.
3	Impeller removed by reverse rotation	Check the rotation direction and overhaul the pump.
4	Blocked pump (including freezing)	Overhaul the pump and eliminate the cause.
5	Blocked suction pipe (including freezing)	Overhaul the suction pipe and eliminate the cause.
6	Blocked discharge pipe (including freezing)	Overhaul the discharge pipe and eliminate the cause.
7	Improper priming or air bleeding	Bleed air from the pump and suction pipe and fill them with water.
8	Sucking air	Change the suction position to prevent air from being sucked.
9	Air trapped along the suction pipe	Improve the suction pipe.
10	Insufficient NPSH	Check the water level, liquid temperature, and suction piping resistance in the suction tank and maintain sufficient NPSH.
11	Loose bolts and nuts	Tighten the bolts and nuts.
12	Closed valve	Open the valve.
13	Insufficient pipe supports	Reinforce the pipe supports.
14	Improperly secured pump	Firmly secure the pump with anchor bolts.
15	Improper pulley (coupling) alignment	Align the pulley (coupling).
16	Undertensioned or overtensioned drive belt	Adjust the drive belt tension.
17	Total pump head too small or too large	Review the specifications with consideration given to the total head.
18	Liquid viscosity too high	Maintain the viscosity as per specifications. Review the specifications.
19	Liquid specific gravity too high	Maintain the specific gravity as per specifications. Review the specifications.
20	Overdischarge	Control the amount of flow with valves as per specifications.
21	Underdischarge	Control the amount of flow with valves as per specifications.

## Pump troubleshooting (during operation)

Problems	Main causes																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Pumping water is inefficient.	○	◎	◎	◎	○	○	○			○	○	○	○			◎	○						○
The discharge rate is low.		◎	◎	◎	○	○	○			○	○	○				◎	○						○
The discharge pressure is low.		◎	○		○	○	○			○		○				◎	○						○
The oil in the machine chamber is contaminated or decreases quickly.		○	◎	○	○	○	○	○	◎	◎				○	○				◎	○	○	○	
The pump generates excessive heat.		○	○	◎					○	○					◎			◎			○	○	○
Abnormal noise is generated.		○	○	○	○	○	○	○	◎	◎				◎	○			◎	○				○
Abnormal vibration is generated.		○	○	○	○	○	○	○	◎	◎				◎	◎			◎	○				○
The electric motor is overloaded.	○	◎											○	○	○			○					◎

	Causes	Remedies
1	Electric motor failure	Contact your dealer for repair.
2	Blocked pump (including freezing)	Overhaul the pump and eliminate the cause.
3	Blocked suction pipe (including freezing)	Overhaul the suction pipe and eliminate the cause.
4	Blocked discharge pipe (including freezing)	Overhaul the discharge pipe and eliminate the cause.
5	Sucking air	Change the air suction position to prevent air from being sucked.
6	Air trapped along the suction pipe	Improve the suction pipe.
7	Insufficient NPSH	Check the water level, liquid temperature, and suction piping resistance in the suction tank and maintain sufficient NPSH.
8	Loose bolts and nuts	Tighten the bolts and nuts.
9	Improper pulley (coupling) alignment	Align the pulley (coupling).
10	Undertensioned drive belt	Adjust the drive belt tension.
11	Total pump head too small or too large	Review the specifications with consideration given to the total head.
12	Change in liquid viscosity	Maintain the viscosity as per specifications. Review the specifications.
13	Change in liquid specific gravity	Maintain the specific gravity as per specifications. Review the specifications.
14	Overdischarge	Control the amount of flow with valves as per specifications.
15	Underdischarge	Control the amount of flow with valves as per specifications.
16	Wear of the impeller	Replace the impeller.
17	Wear of the volute liner and lining parts	Replace the volute liner and lining parts.
18	Wear and tear of the bearings	Replace the bearings.
19	Wear and tear of the mechanical seals	Replace the mechanical seals.
20	Wear of the sleeve	Replace the sleeve.
21	Too much oil	Put in the proper amount of oil.
22	Too little oil	Put in the proper amount of oil.
23	Contact with the impeller	Replace necessary parts.

## Procedures for aligning the shaft coupling

The pump is provided with a factory-aligned shaft coupling. The shaft coupling may be misaligned during pump installation or piping. When pump installation or piping is completed, check the alignment and realign it if necessary. If you continue to operate the pump with the shaft coupling misaligned, the pump may fail at an early stage. Also, before fitting the belt and coupling bolts, be sure to check the rotation direction of the electric motor. Reverse rotation may take the impeller off, resulting in damage to the pump.

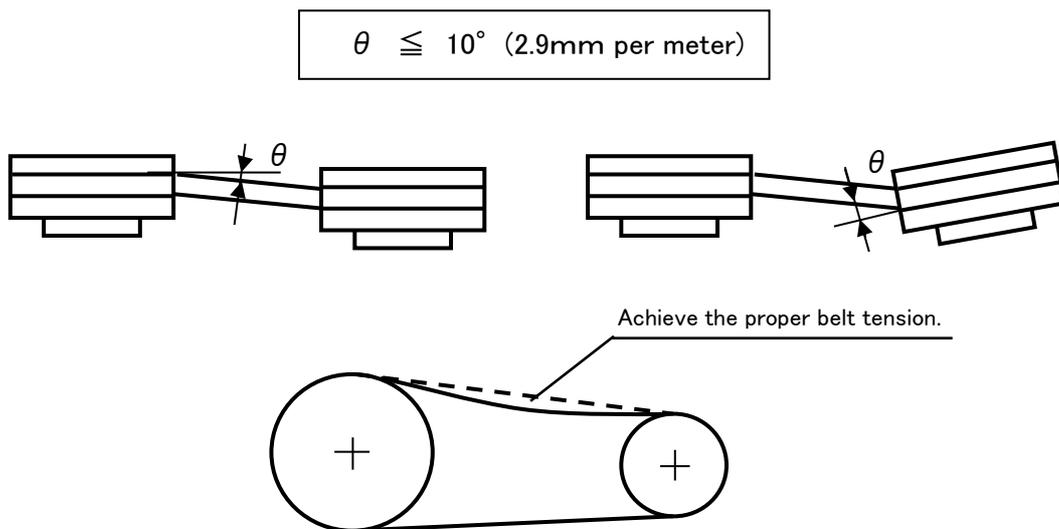
### 【Belt-driven type】

Before fitting the belt, check the pulley groove for contamination. Move the electric motor from side to side and fit the belt so that the belt is not overloaded.

Use a straight edge or leveling string to avoid misalignment. Adjust the belt to the proper tension with the adjusting bolt on the electric motor. Avoid overtension and undertension.

After a new belt is fitted, the belt may slightly stretch. Be sure to check the belt tension and adjust it as necessary.

Be sure to replace all the belts at a time instead of the worn belt only.

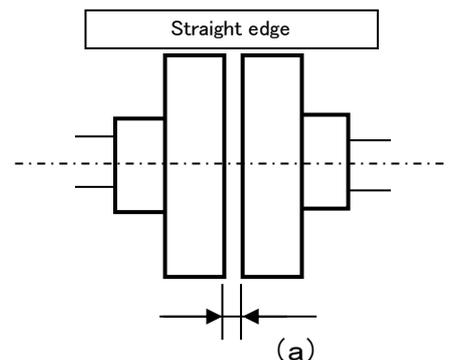


※ For the proper belt tension, contact your dealer or the product manufacturer.

### 【Direct-driven type】

Loosen the motor mounting bolts. Make an adjustment with a straight edge so that the circumference of the right coupling aligns with that of the left and clearance (a) is uniform on the left, right, top, and bottom.

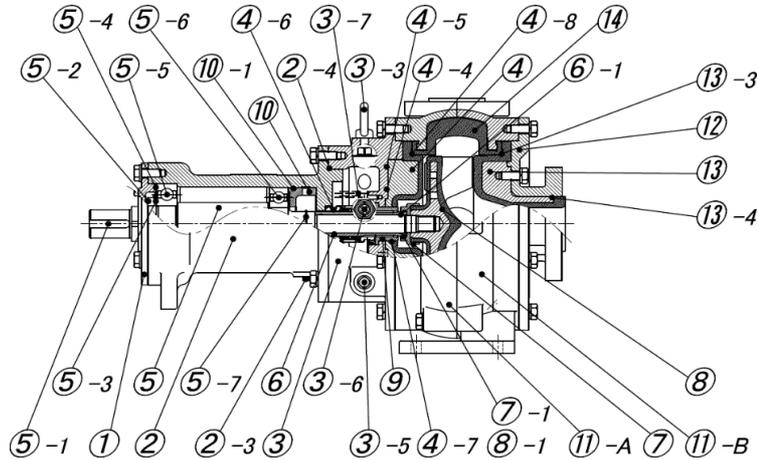
After the adjustment, tighten the mounting bolts and check the alignment again. Then, put the coupling bolts.



# 1CO Assembling (disassembling) procedures

The procedures for assembling the pump are as shown below. Disassembly is the reverse of assembly. The procedures for assembling the standard type are described. For special specifications, contact your dealer or the product manufacturer.

## 【Schematic diagram of the pump】



No.	Parts	Q'ty	No.	Parts	Q'ty	No.	Parts	Q'ty
1	Bearing case cover	1	5	Shaft	1	10	Bearing plate	1
2	Bearing case	1	5-1	Key	1	10-1	O ring	1
2-3	Plug	1	5-2	Bearing nut	1	11-A	Outer casing A	1
2-4	O ring	1	5-3	Lock washer	1	11-B	Outer casing B	1
3	Mechanical seal case	1	5-4	Bearings wave washer	1	12	Suction cover	1
3-3	Lifting eye	1	5-5	Ball bearing	1	13	Suction plate	1
3-5	Oil supply and drain plugs	4	5-6	Ball bearing	1	13-3	O ring (COM type)	1
3-6	Oil gauge	2	5-7	O ring	1	13-4	O ring (COM type)	1
3-7	Oil	600cc	6	Shaft sleeve	1	14	Inner volute	1
4	Back plate	1	6-1	O ring	2			
4-4	O ring	1	7	Boss cover (COR type)	1			
4-5	O ring	1	7-1	O ring (COR type)	1			
4-6	Double mechanical seal	1	8	Impeller	1			
4-7	O ring (COM type)	1	8-1	O ring (COM type)	1			
4-8	O ring (COM type)	1	9	R-ring (COR) / M-ring (COM)	1			

## 【注意事項】

- Before assembling or disassembling the pump, be sure to power off the electric motor.



- When placing an order or requesting a quote for parts, be sure to contact your dealer and tell the model and manufacturer's serial number.

### 【When disassembling】

- When disassembling the pump, close the discharge and suction valves and drain off the liquid from the pump through the drain cover. Note that the liquid may splatter. Special attention should be given to chemical liquid.

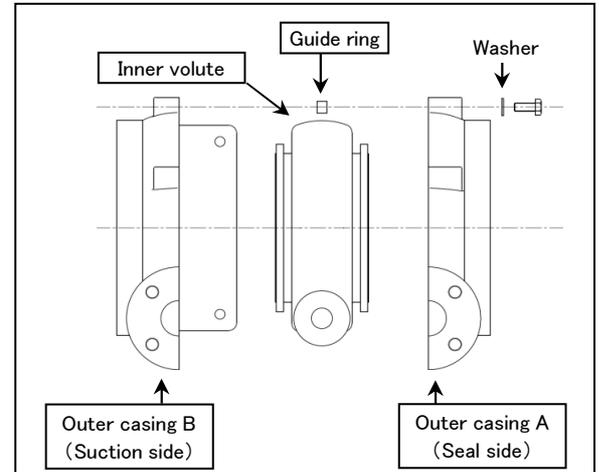
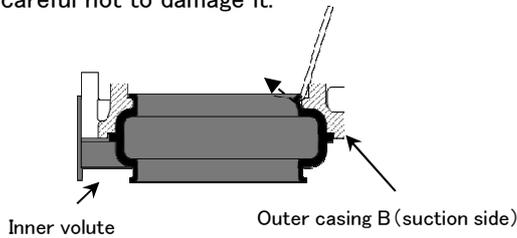


## 1、 Assembling the casing 【Assembly on the casing side】

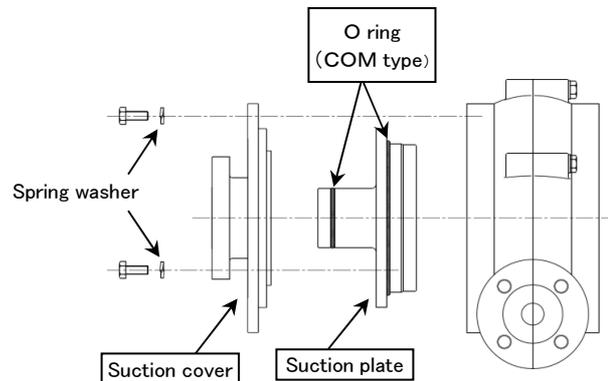
- ① Align the outer casing B (suction side) with the inner volute and fit the inner volute flange into the outer casing B. Pull out the inner volute flange with a flat-tipped rod and firmly fit the flange into the casing by hand. ( COM type has no flange, just have to insert.)

※ Inner volute is made of rubber.

Be careful not to damage it.



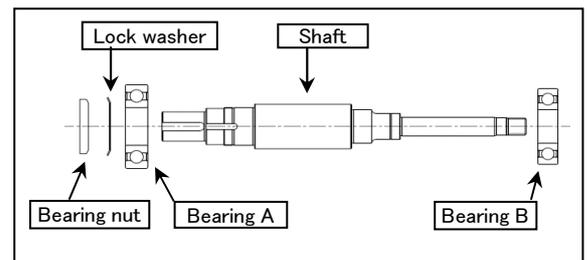
- ② After inserting guide rings(2pcs), Fit the inner volute into the outer casing A (seal side), too.
- ③ Fasten the casings (outer casing A and B) with bolts(6pcs).
- ④ Attach the O ring to the suction plate (COM type), Fit the Suction plate into the suction cover. Fasten with bolts(4pcs)



- ⑤ Attach the suction cover to the outer casing B with bolts(8pcs)

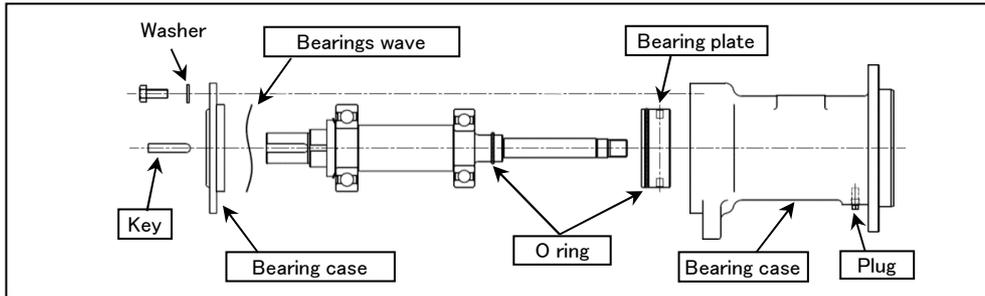
## 2、 Assembling the bearing 【Bearing assembly】

- ① Insert bearings A and B each into the shaft with a pressure of about 10 MPa. When inserting a bearing, apply force on the inner race of the bearing. Do not strain the bearing.
- ※ When using a hammer to insert a bearing, be careful not to directly hit the shaft or bearing.
- Fasten the bearing A with lock washer and bearing nut.



- ② Attach the O ring to the bearing plate, Fit the bearing plate into the bearing case.

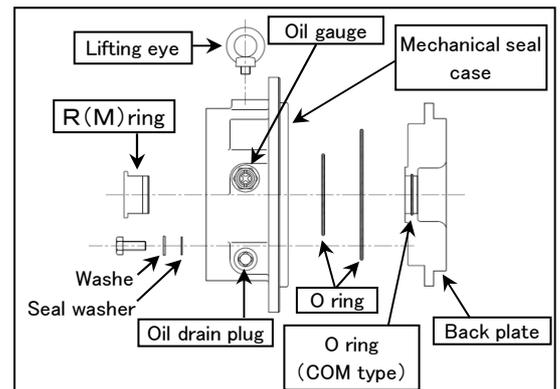
Pay attention to adjust the positions of the bearing plate hole and the bearing case plug hole as aligned.



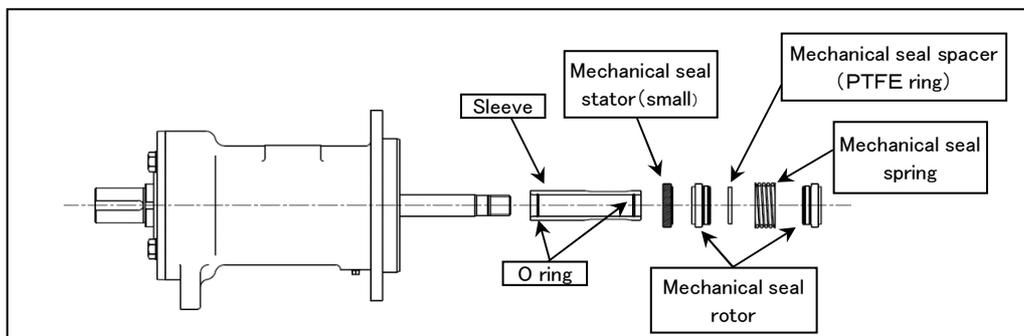
- ③ Attach the O ring to the shaft and fit the shaft, bearing and the bearings wave washer into the bearing case. Fit the bearing case cover with bolts(4pcs). Attach the plug to the bearing case, the key to the shaft.
- ④ After finishing assembling all the parts, turn the shaft by hand to check whether the shaft moves stiffly or jerkily. Gently shake the shaft tip right, left, up, and down to check the shaft for looseness.

### 3、Assembling the rotating parts 【rotating parts】

- ① Attach the lifting eye, oil gauge(2pcs) and oil drain plug(2pcs) to the mechanical seal case. Attach the O ring(2pcs) to the mechanical seal case, fit the back plate into the mechanical seal case, and fasten with bolts(3pcs) Attach the O ring to inside of the back plate (COM type), insert the R(M) ring into the back plate.



- ② Attach the O ring to inside of the shaft sleeve, insert to the shaft.
- ※ Insert the sleeve as thin part comes impeller side.
  - ※ Before inserting the sleeve, properly remove dust and dirt from the shaft and sleeve.



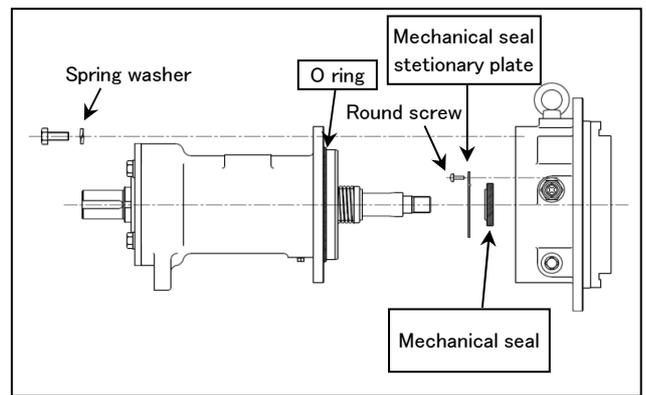
- ③ Attach the mechanical seal in the order shown in the figure on the above.
- ※ Prevent dust and dirt from adhering to the sliding surface of the mechanical seal.
  - ※ Be careful with the sliding surface of the mechanical seal; it is very fragile.
  - ※ Put oil on the sliding surface to avoid seizing.

- ④ Insert the mechanical seal stator(large) into the mechanical seal case and fasten it with the mechanical seal stationary plate and round screw(3pcs).

- ⑤ Attach the O ring to the bearing case and assemble the bearing case and mechanical seal case with bolts(5pcs).

※At this moment, be careful that the sliding surface of the mechanical seal does not come in contact with the shaft and other parts.

※Put oil on the sliding surface to avoid seizing.



- ⑦ Turn the shaft by hand to check whether there is anything wrong with the shaft.

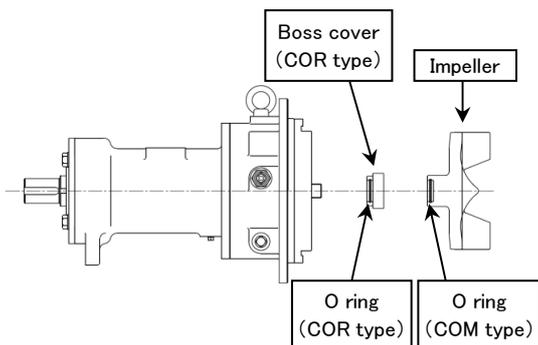
Conduct air tightness tests as necessary.

An air tightness test shows whether the mechanical seal has been assembled properly.

Air tightness test: After attach the one side oil supply plug, leave the mechanical seal for 10 minutes with a pressure of 0.3 MPa applied to air at room temperature from the threaded hole of the other side plug.

- ⑧ Pour oil through the oil supply plug and attach the oil supply plug.

※Pour the specified amount of oil. Too much or too little oil may cause early failure.



- ⑨ COR···Attach the O ring to inside of the Boss cover and fit on the impeller.

Attach the impeller to the shaft.

COM···Attach the O ring to inside of Impeller.

Attach the impeller to the shaft.

The impeller is of screw type. Secure the shaft and screw the impeller squarely into the shaft clockwise.

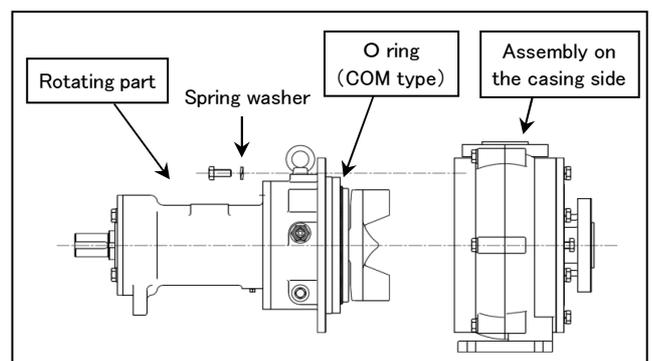
※ The impeller is a rubber lined product. Be careful not to damage it. Do no hit it with a hammer.

- ⑪ Turn the shaft by hand to check whether the impeller comes in contact with the suction cover.

#### 4、Assembling the pump (pump)

- ① Attach the O ring to the rotating part(COM type), assemble to the casing side with bolts(8pcs).

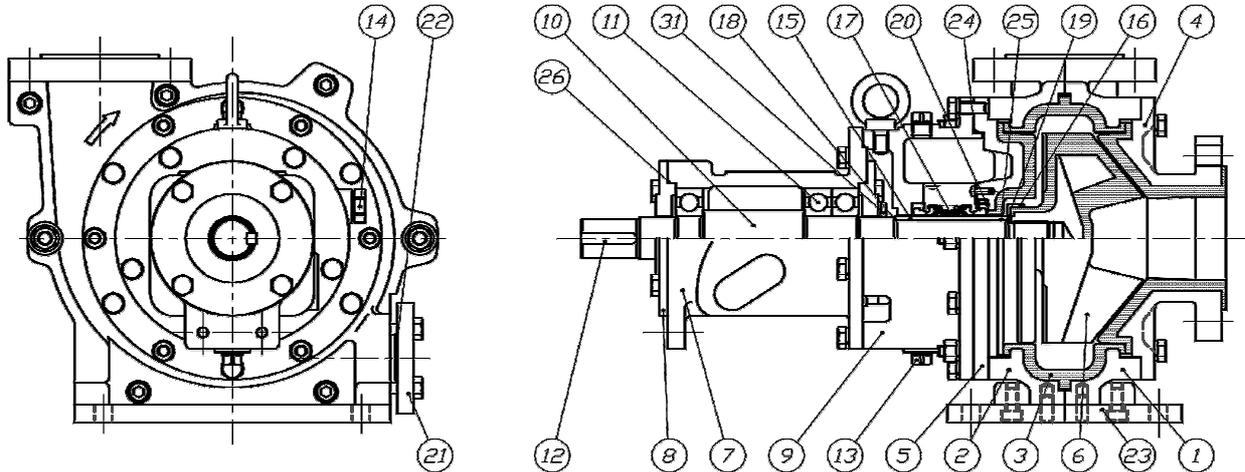
- ② Turn the shaft by hand to check whether the impeller comes in contact with the suction plate.



## 2COR Assembling (disassembling) procedures

The procedures for assembling the pump are as shown below. Disassembly is the reverse of assembly. The procedures for assembling the standard type are described. For special specifications, contact your dealer or the product manufacturer.

### 【Schematic diagram of the pump】



No.	Parts	Q'ty	No.	Parts	Q'ty	No.	Parts	Q'ty
1	Casing (on the suction side)	1	12	Key	1	23	Base plate	1
2	Casing (on the seal side)	1	13	Oil feed/drain plug	2	24	O ring	1
3	Volute liner	1	14	Sight glass	1	25	O ring	1
4	Suction cover	1	15	Shaft sleeve	1	26	O ring	2
5	Casing cover	1	16	Boss cover	1	27		
6	Impeller	1	17	Double mechanical seal	1	28		
7	Bearing case	1	18	Seal washer	1	29		
8	Bearing case cover	2	19	Seal washer	1	30		
9	Seal case	1	20	Seal washer	1	31	Deflector	1
10	Shaft	1	21	Drain cover	1	32		
11	Ball bearing	3	22	Drain cover gasket	1	33		

### 【Cautions】

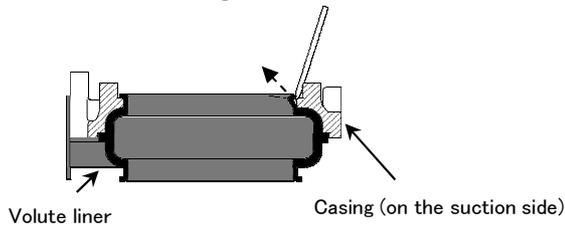
<ul style="list-style-type: none"> <li>Before assembling or disassembling the pump, be sure to power off the electric motor.</li> </ul>	 <span style="border: 1px solid black; padding: 2px;">Danger</span>
<ul style="list-style-type: none"> <li>When placing an order or requesting a quote for parts, be sure to contact your dealer and tell the model and manufacturer's serial number.</li> </ul>	
<p>【When disassembling】</p> <ul style="list-style-type: none"> <li>When disassembling the pump, close the discharge and suction valves and drain off the liquid from the pump through the drain cover. Note that the liquid may splatter. Special attention should be given to chemical liquid.</li> </ul>	 <span style="border: 1px solid black; padding: 2px;">Danger</span>
<p>【When disassembling】</p> <ul style="list-style-type: none"> <li>After loosening the casing cover nut, remove the rotating part from the assembly on the casing side. If you remove the bolt, the oil in the machine chamber will leak.</li> </ul>	 <span style="border: 1px solid black; padding: 2px;">Important</span>

## 1. Assembling the casing 【Assembly on the casing side】

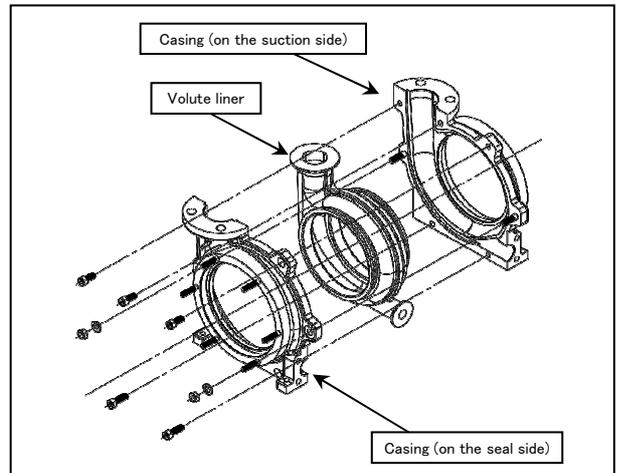
- ① Align the casing (on the suction side) with the volute liner and fit the volute liner flange into the casing. Pull out the volute liner flange with a flat-tipped rod and firmly fit the flange into the casing by hand.

※ The volute liner is made of rubber.

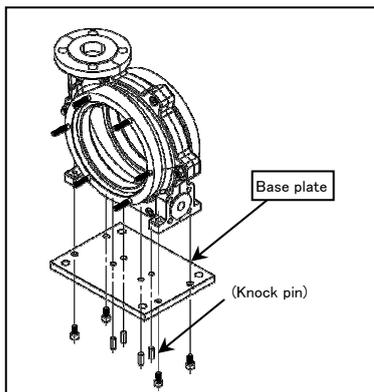
Be careful not to damage it.



- ② Fit the volute liner into the casing (on the seal side), too.



- ③ Temporarily fasten the casings (on the suction and seal sides) with the nuts and hexagon socket head cap screws.



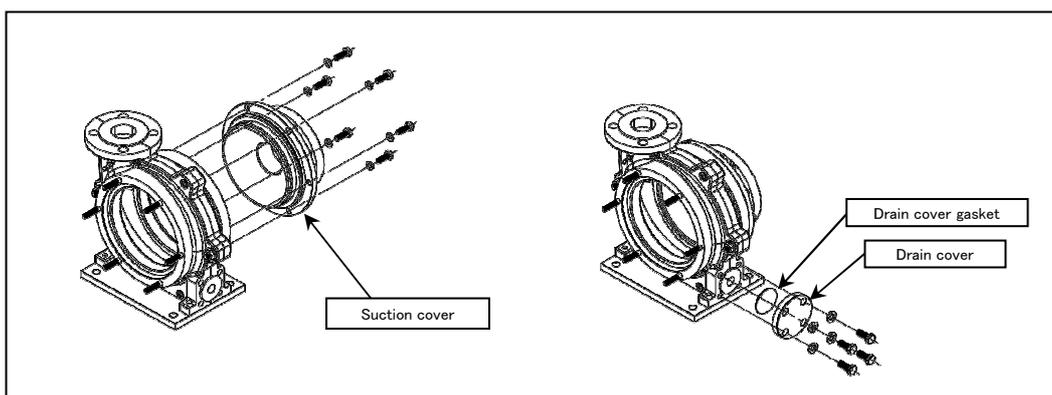
- ④ Hammer the knock pin into the casing from the direction shown in the figure on the left below so that it protrudes about 3 mm above the base plate and temporarily fasten the casing and base plate with the hexagon socket head cap screws. Hammer the knock pin again so that it does not protrude from the base plate. Then, firmly tighten the screws.

※ Use a copper hammer to prevent the knock pin from deforming.

※ Pay attention to the orientation so that the internal thread comes to the bottom of the pump. Thus, you can remove the knock pin later.

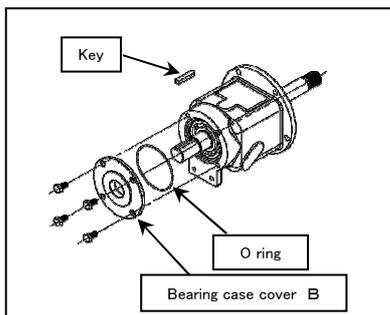
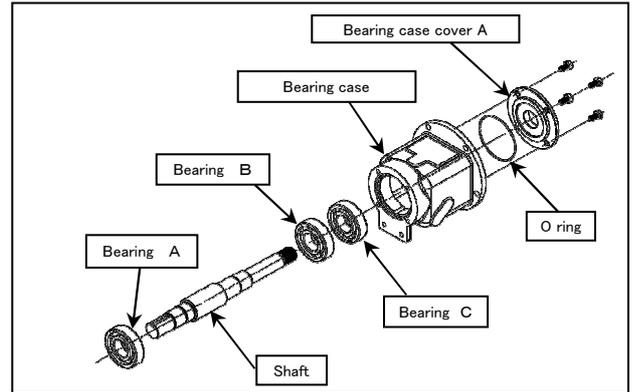
- ⑤ Firmly tighten the nuts and hexagon socket head cap screws that have been temporarily tightened in step ③.

- ⑥ Attach the suction and drain covers.



## 2. Assembling the bearing 【Bearing assembly】

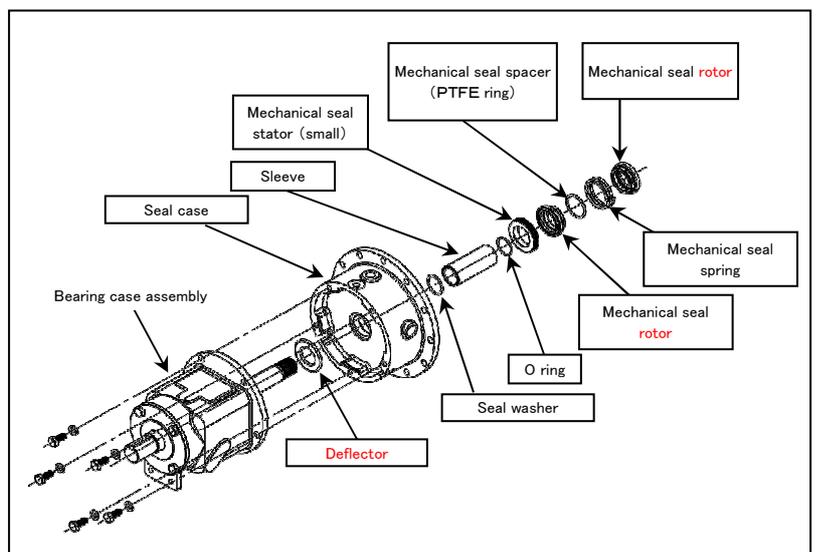
- ① Put the bearing case and bearing case cover A together.
- ② Insert bearings A, B, and C each into the shaft with a pressure of about 10 MPa. When inserting a bearing, apply force on the inner race of the bearing. Do not strain the bearing.
  - ※ When using a hammer to insert a bearing, be careful not to directly hit the shaft or bearing.



- ③ Assemble bearing case cover B.
- ④ Attach the key to the shaft.
- ⑤ After finishing assembling all the parts, turn the shaft by hand to check whether the shaft moves stiffly or jerkily. Gently shake the shaft tip right, left, up, and down to check the shaft for looseness.

## 3. Assembling the rotating parts 【rotating parts】

- ① Insert the deflector into the shaft and attach the seal case to the bearing assembly. At this moment, apply liquid gasket to the contact surface between bearing assembly and seal case.
- ② Insert the seal washer and sleeve (attach the O ring to its inside) into the shaft in this order.
  - ※ Before inserting the sleeve, properly remove dust and dirt from the shaft and sleeve.
- ③ Attach the mechanical seal in the order shown in the figure on the right.
  - ※ Prevent dust and dirt from adhering to the sliding surface of the mechanical seal.
  - ※ Be careful with the sliding surface of the mechanical seal; it is very fragile.



- ④ Attach the oil drain plug and sight glass to the seal case.
- ⑤ Insert the seal washer (with liquid gasket applied to both sides) and mechanical seal rotor (large) into the casing cover and fasten them with the mechanical seal stationary plate.

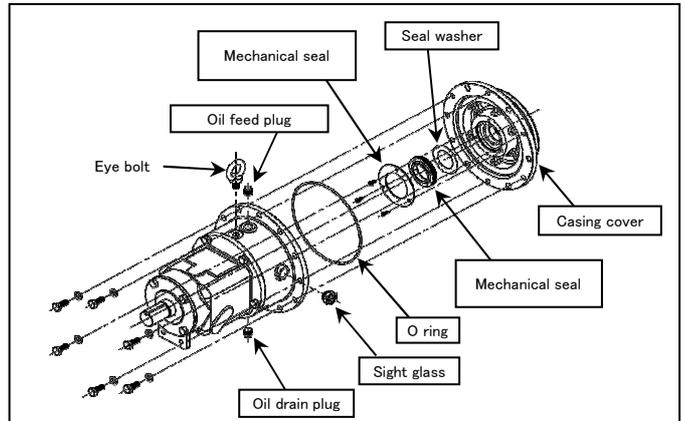
- ⑥ Attach the O ring and assemble the casing cover and seal case.  
 ※At this moment, be careful that the sliding surface of the mechanical seal does not come in contact with the shaft and other parts.

- ⑦ Turn the shaft by hand to check whether there is anything wrong with the shaft.

Conduct air tightness tests as necessary.

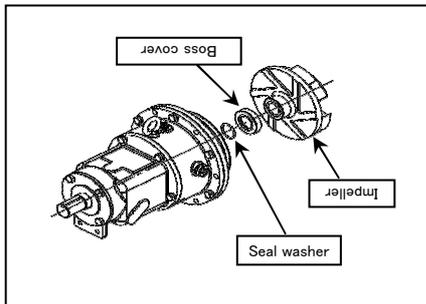
An air tightness test shows whether the mechanical seal has been assembled properly.

Air tightness test: Leave the mechanical seal for 10 minutes with a pressure of 0.3 MPa applied to air at room temperature from the threaded hole of the oil feed plug.



- ⑧ Pour oil through the oil feed plug and attach the oil feed plug and eye bolt.

※Pour the specified amount of oil. Too much or too little oil may cause early failure.



- ⑨ Attach the seal washer (with liquid gasket applied to both sides) and boss cover to the shaft.

- ⑩ Apply silicon grease to the thread and attach the impeller. The impeller is of screw type. Secure the shaft and screw the impeller squarely into the shaft clockwise.

※ The impeller is a rubber lined product. Be careful not to damage it. Do not hit it with a hammer.

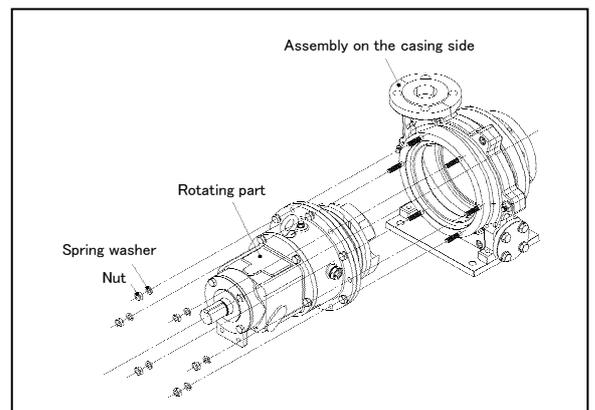
- ⑪ Turn the shaft by hand to check whether the impeller comes in contact with the suction cover.

#### 4、Assembling the pump (pump)

- ① Attach the rotating part to the assembly on the casing side.

- ② Turn the shaft by hand to check whether the impeller comes in contact with the suction cover.

※ **Take out the nut** to remove the rotating part from the assembly on the casing side. Never take out the bolt.





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