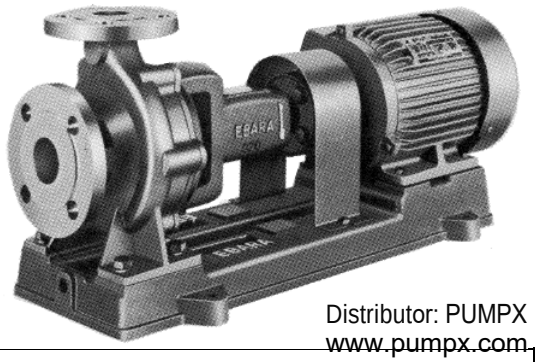
Be sure to issue the customer's pump operation personnel with copies of this manual

EBARA Stainless Pump

Model FSSC

Instruction Manual



CAUTION

Thank you for choosing the EBARA Model FSSC Stainless Steel Pump. EBARA takes every caution in manufacturing the product for safe use by the customer. However, handling this pump in an inappropriate manner may reduce its functional capacity and result in an accident.
This operation manual explains the proper procedures concerning the installation, operation, and maintenance of the product. This manual should be read before conducting operation and maintenance and inspections on this pump.
Installation personnel must provide copies of this manual to the customer's pump operation, maintenance and inspection personnel. Keep this manual in a safe place where it can be consulted at any time.

To installation personnel:

Be sure to issue copies of this manual to the customer's pump operation, maintenance, and inspection personnel.

CONTENTS

1 Warnings

Warnings in this manual provide information needed for safe operation of the pump, and instructions for preventing danger or injury to you or other people. So that you will know the degree and imminence of danger that warnings signify, they are divided into two grades, WARNING and CAUTION, according to the seriousness of what will happen if their instructions are not heeded. Both grades of warning contain important safety information; carry out all the instructions that they give, without fail.

Warning grade	Meaning
⚠ **Warning**	Potentially hazardous situation. Failure to follow the instructions could result in death or serious injury.
⚠ **Caution**	Failure to follow the instructions given could result in minor injury, or damage to the pump.

Note	Used to emphasize important information.

Specific explanation of marks in the figure

⃠	Indicates prohibition (that something must NOT be done). Precisely what must not be done is indicated by pictures or words either inside the circle of the symbol or close to it.
❗	Indicates an imperative (that something MUST be done). Precisely what must be done is indicated by pictures or words close to the symbol.

2 Safety Cautions

⚠ Warning	Please cut off the power when stopping using, otherwise insulating and aging will occur and brings in leaking, fire and electric shock.	❗
	Don't put pump outdoor or place suffered from the rain, otherwise it could result in leaking, electric shock and fire,	⃠
	Install coupling's cover after aligning. Don't approach the revolving parts when the pump is running to avoid damage.	❗
	Do not touch the rotating parts such as the spindle, shaft couplings, V-pulleys, etc. while the pump is running. Since these parts rotate at high speed, doing so could result in injury.	⃠
	Don't place dangerous and inflammable goods near the pump and engine to avoid fire.	⃠
	Fasten the pump securely with anchor bolts to prevent it overturning.	❗
	Confirm the wiring part of motor, the connecting part of power parts and one side and two sides of controlling plate .Make sure that the wiring position is not loose and no messes. Loosing of wiring part will result in bad connection and mess will cause fire when temperature is high.	❗
	Do not operate the pump for more than 1 minute with the discharge valve left closed. The pressure within the pump will rise, and the casing or plugs may be damaged.	⃠
	Don't touch electric parts when the electricity is on to avoid electric shock.	⃠
	Don't burn plastic on spot to avoid harmful gas.	⃠

⚠ Warning	Change and install other company's products is forbidden for it will result in eclectic shock, fire, wearing, personal hurt and abnormal running of equipment.	⃠
	Usage is forbidden if working medium or power doesn't meet the regulation otherwise accidents like leaking or fire will occur.	⃠
	Please cut off the power when insulating resistance is lower than 1MΩ. The dealer or Ebara Mechanical Company (China) will check and repair to avoid such accidents as electric shock, motor damage or fire.	❗
	Please carry out earth operation to avoid electric accident when leaking or fault occurs.	❗
	Pease choose places with good ventilation, dust free, explosive or corrosive gas free, salt free, moist free, steam free, frost free, no rain and sun to put the products to avoid leaking or electric accident.	❗
	Put the pump in rooms with management or rooms which is not easy accessible to outside person and separate with fence to avoid personal accident. Touch the rotating parts, high temperature parts, may cause personal injury accidents.	❗
	When moving the pump, please operate carefully according to hanging requirements (nameplate) and avoid falling.	⃠
	Always turn the power switch OFF before inspecting or repairing the pump. Not doing so could result in the pump starting up suddenly in auto operation, exposing personnel to danger.	❗
	No water on motor to cause such accidents as electric shock, leaking or fire	⃠
	Please confirm the weight and form when engaging pump operation to avoid falling and physical accident.	❗
	Professional staffs operate the pump according to correct regulation and standard (electric technological standard, inner line regulation and construction basic laws) to avoid such accidents as electric shock, leaking or fire.	❗
	Professional staffs operate the wiring engineering according to correct regulation and standard to make sure that wiring end no loosing. Wrong operation of unqualified staff will violate regulation and result in electric shock and fire.	❗
	Nobody is allowed to dismantle the pump except professional staff to avoid such accidents as electric shock, leaking or fire	⃠
	Close input and output valve and clean water inside the pump when check and operate without pressure rising and minus pressure to avoid engine damage	❗
	Refer to such documents as material safe data speculation (MSDS) when using chemical medicine and find the attention items like using method, protection tools and throwing away. Abide by other items when operation with protection tools to avoid burning, fire and environmental harm.	❗
	Set up special leaking breaker to avoid such accidents as leaking or fire	❗
	Turn off the power when power failure occurs to avoid accident.	❗
⚠ Caution	In facilities with living matter (fish farms, fish preserves, aquariums, etc.), always prepare a spare pump, as oxygen deprivation may result due to pump failures.	❗
	When operation stopped please clean the water in pump and pipe to avoid stored water from mortifying to producing bacteria.	❗
	Engaging experimental operation according to the requirements when operation is started after stop to avoid unsmooth operation, engine burning and dry running	❗
	If air is entrained during pumping and is not discharged, the bearings and shaft seals may be damaged, and pumping may be impossible. Avoid this situation.	⃠
	Do not touch the pump when the liquid handled is warm water. Burns may result from high temperatures.	⃠

⚠ Caution	Cut off the power and ask the dealer or Ebara Mechanical Company (China) to check and repair to avoid accidents when fault occurs.	❗
	Prepare spare pump for using when the pump stops to avoid device nonmoving when water supply is stopped.	❗
	Prepare spare pump to avoid device non-operation when the pump is used for important devices like computer cooling device or refrigerator cooling device.	❗
	Do not operate the pump with 50 Hz specifications at 60 Hz. Doing so will overload the pump, causing the motor to burn. Do not operate the pump with 60 Hz specifications at 50 Hz. Doing so will cause the pump to perform poorly.	⊘
	Replace consumable parts timely to avoid aging and wearing and cause big fault like leaking and burning. Trust dealer or Ebara Mechanical Company (China) to engage in replacement.	❗
	Please don't use it for food processing and transportation for easily suffering of bacteria and mess.	⊘
	People is not allowed to be near input mouth of pump pipe to avoid accident.	⊘
	Remove the wire from controlling plate when doing engine insulating test during assembling and use insulating ohmmeter which is in accordance with power pressure and engage wiring operation after confirming the resistance between engine lead and ground wire is over 5 MΩ to avoid engine burning.	❗
	Confirm that the setting up of engine terminals is not loose and engine will be burned if even one terminal is loose.	❗
	Don't touch spare to avoid high temperature scald.	⊘
	Don't cover motor with carpet or cloth to avoid fire.	⊘
	Such measures as temperature maintenance, heating and dewatering should be carried out in water to prevent freezing.	❗
	Connecting wire pole should be fastened to avoid overheating and engine burning.	❗
	Don't turn on power after the discharging of pipe water to avoid dry running and pump damage.	⊘
	Adopt appropriate filter on the exit to avoid the entering of cutting oil, rubber and other masses to ensure fully filtering.	❗
	Waterproof and drainage measure should be taken in locating place to avoid the leaking of pump, valve and pipe.	❗
	Confirm protection relay's operation condition timely to avoid device fault and electric shock accident.	❗
	Operate the pump in the scale of regulation. Avoid operating lower than minimum water yield(amounting to water yield of input diameter of pump, for example, if the input diameter is 50mm then minimum water yield is 50L/min)when used in situations of flow rate changing.	❗
	Refer to such documents as material safe data speculation (MSDS) when dealing with and decomposing rubbish of chemical medicine and ask professional company to deal with it and abide by laws and local regulations.	❗

3 Delivery checks

Check the following points as soon as the pump is delivered:

1. Pump and accessories

(1) Check that no parts were damaged due to accidents during transport, and that bolts and nuts have not become loose.

(2) Check that all accessories ordered have been provided

2. Nameplate

The pump's basic specifications are inscribed on the nameplate. Check the nameplate to ensure that the equipment is as ordered.

Confirm motor output power, phase number, voltage, frequency and type, pay special attention to using frequency is 50Hz or 60Hz.

⚠ Caution	Do not operate 50 Hz pumps at 60 Hz. The pump will overload, and the motor will burnout. Do not operate 60 Hz pumps at 50 Hz. Pump performance will suffer.	⃠

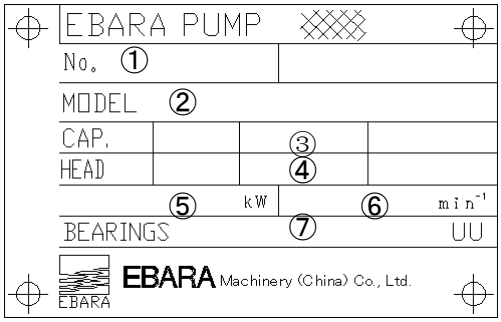


Fig. 1 content on pump nameplate

①. Serial No ②.Model ③.Capacity ④.Head ⑤.Rated output ⑥.Speed ⑦.Bearing type

4 Specifications

Confirm the nameplate according to such functions as head, CAP and rotating speed of the pump and other specifications are as followed and the following graph showed standard specification.

Client who buys standard products will refer to standard list. There are special occasions that process with client's need for special speculation but please don't use outside specification scale.

⚠ warning	Usage is forbidden if working medium or power doesn't meet the regulation otherwise accidents like leaking or fire will occur.	⃠
	Set up special leaking breaker to avoid such accidents as leaking or fire	❗
⚠ Caution	Please don't use it for food processing and transportation for easily suffering of bacteria and mess.	⃠
	When used in places with living creatures (like fish farm or aquarium), please prepare spare pump to avoid operation fault.	❗
	Prepare spare pump to avoid device non-operation when the pump is used for important devices like computer cooling device or refrigerator cooling device.	❗
	Adopt appropriate filter on the exit to avoid the entering of cutting oil, rubber and other masses to ensure fully filtering.	❗
	Please prepare spare pump to avoid device stop when pump fault occurs.	❗
	Waterproof and drainage measure should be taken in locating place to avoid the leaking of pump, valve and pipe.	❗

Standard specifications

		2P	4P
Liquid handled ※1	temperature density specific gravity	Water, oil and chemical liquid 0～100℃ Mechanic seal temperature：0～90℃ self wash Below 10cST 0.7～1.0	Water, oil and chemical liquid 0～100℃ Mechanic seal temperature：0～90℃ self wash Below 10cST 0.7～1.0
Maximum working pressure		10bar	
Installation location		Indoor, ambient temperature: 0 - 40℃ Relative humidity: 90% or less (no condensation) Altitude 1000m or less No corrosive/explosive gas and s team	Indoor, ambient temperature: 0 - 40℃ Relative humidity: 90% or less (no condensation) Altitude 1000m or less No corrosive/explosive gas and steam
Construction	Impeller Shaft seal Shaft liner Bearing	Closed type Mechanic seal non sealed ball bearing	Closed type Mechanic seal ⩽100×80 non ⩾125×100 yes sealed ball bearing
Flange		JIS 10K（standard）	JIS 10K（standard）
Material	Casing Impeller Shaft Gasket	304 304 304 PTFE（O- ring）	304 304 304 PTFE（O- ring）
Motor ※2 ※3	Phase·/pole Type Voltage	3 phase·/2pole TEFC 50Hz-380V/ 400V	3 phase·/4pole TEFC 50Hz-380V/ 400V

Note: For customers purchasing standard goods refer to the standard specifications column. There may also be specifications changes in the form of optional specifications, on request of the customer. Do not use the equipment beyond the scope of the specifications.

※1. Fresh water refers to tap water, industrial water or well water, with a temperature of 0 to 80 C, a pH of 5.8 to 8.6 , a chlorine ion concentration of 200 mg/L or less, and floating colorations density of 10mg ／L or less.

※2. In the case of inverter drive, be careful of the following points, and discuss the situation with the manufacturer of the inverter used.

(1) Ensure that the motor's operating output is 90% or less of the rated output.
(2) Set the output frequency range at 60 to 95% of the mains power frequency.
(3) With inverter drive, electromagnetic noise is produced by the motor, which may sound quite harsh in comparison with mains power drive.
(4) Avoid a rotational speed range in which the pump and motor resonate during normal operation.

※3. The tolerance value for voltage fluctuations is 5% or less, and the tolerance value for frequency fluctuations is 2% or less. For simultaneous fluctuations of voltage and frequency, the sum of their absolute values is within 5%. However in either case, the motor's characteristics, temperature rise, etc. are not in accordance with the rated values.

5	Installation	

⚠ warning	Professional staffs operate the pump according to correct regulation and standard (electric technological standard, inner line regulation and construction basic laws) to avoid such accidents as electric shock, leaking or fire.	
	Please confirm the weight and form when engaging pump operation to avoid falling and physical accident.	
	When moving the pump, please operate carefully according to hanging requirements (nameplate) and avoid falling.	
	Don't put the products outside the room or places suffered from rain Bad insulating and aging is the result of leaking and fire.	
	Fasten the pump securely with anchor bolts to prevent it overturning.	
	Pease choose places with good ventilation, dust free, explosive or corrosive gas free, salt free, moist free, steam free, frost free, no rain and sun to put the products to avoid leaking or electric accident.	
	Put the pump in rooms with management or rooms which is inaccessible to outside person and separate with fence to avoid personal accident.	
	No water on motor to cause such accidents as electric shock, leaking or fire	
⚠ Caution	Don't cover engine with carpet or cloth to avoid fire.	
	Such measures as temperature maintenance, heating and dewatering should be carried out in water to prevent freezing.	
	Adopt appropriate filter on the exit to avoid the entering of cutting oil, rubber and other masses to ensure fully filtering.	
	Waterproof and drainage measure should be taken in locating place to avoid the leaking of pump, valve and pipe.	

Note	Packing material which is needless after installation and waste of maintenance, lubricating oil and accessory should be trusted to professional staff to deal with according to local regulation.

1. Installation location

(1) Pump must be installed indoor room. Giving considerations to equipment wear, install a roof, etc., and select a site where it will not be exposed to wind and rain or direct sunlight.

(2) Select a place that is convenient for pump maintenance.

(3) Take measures such as enclosing the pump to keep unqualified personnel away from the equipment.

(4) Install the pump in a location as close as possible to the water source, with a low static suction head (height from the intake liquid surface to the pump center) and a short length of suction pipe.

(5) The suction head value should be within that described in the standard specification table at total suction head. However, it may not be possible to raise the water level depending on water temperature, etc.

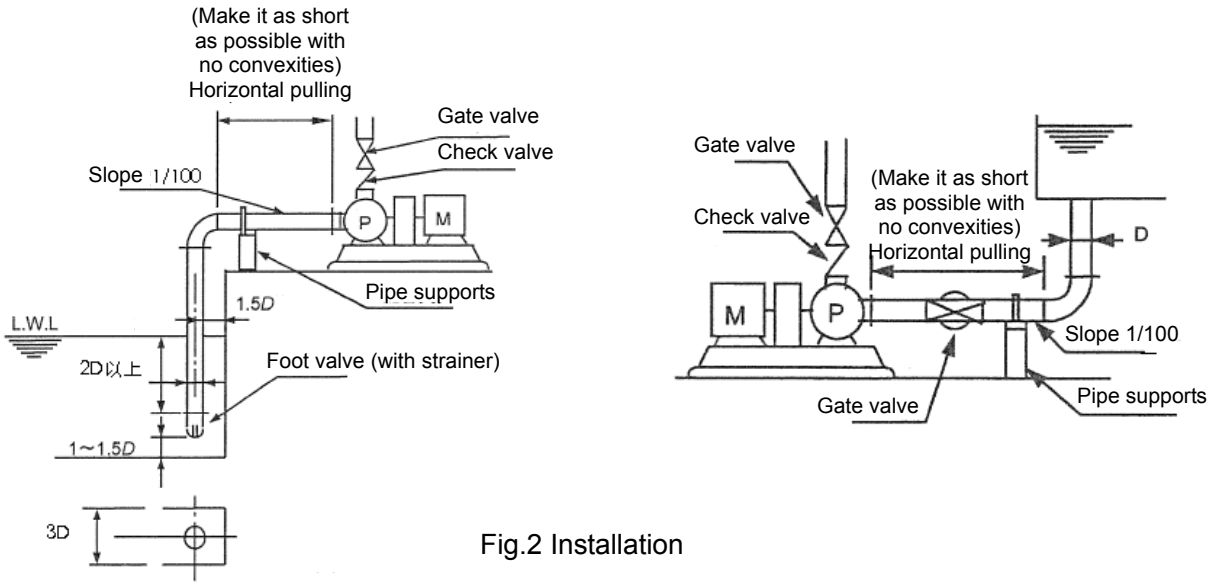


Fig.2 Installation

2. Piping

(1) Provide sufficient pipe supports so that there is no load on the pump from the suction pipe and discharge piping.

(2) Install a check valve when the pipe is long, the actual pump head is high, in automatic operation, when water is delivered to a pressure tank, or when 2 or more pumps are operated in parallel. Install the check valve between the pump and the discharge valve.

(3) Install air vent valves at locations on the device where accumulation of air cannot be avoided. However, do not install in the suction pipes or other locations where there will be negative pressure. Conversely, air will be sucked in.

(4) When there is a danger of water hammer, take measures such as the installation of emergency check valves

(5) When sucking

(a) Place the suction pipe end at a depth of at least twice the pipe diameter (D), at least 1 to 1.5 D away from the bottom.

(b) Foot valve (with strainer) must be fit at the suction pipe end. Size is referred Table.1.

(c) As shown in Fig.2, the suction pipe should be as short as possible, with minimal bend. Set a rising gradient towards the pump, and do not install a gate valve. There should be sufficient seals to ensure that air is not sucked in from suction pipe connectors.

(d) As shown in Fig.3, avoid convex parts along the stretch of suction pipe as this is where air would accumulate. An accumulation of air may make pumping impossible, or lead to dry operation, resulting in seizing of sliding parts.

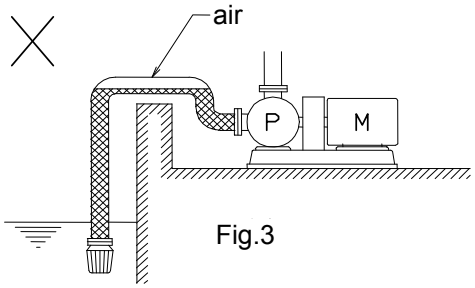


Fig.3

Tabele.1 Size of foot valve

Pump	Foot valve	Reducer
32x32	32	-
40x32	40	
50x40	50	
65x50	65	
80x65	100	100x80
100x80	125	125x100
125x100	150	150x125
150x125	200	200x150

(6) Flooding or positive suction

For the flooding system, install a gate valve on the suction pipe as shown in the figure. If there is no gate valve, all water in the tank and pipes must be removed during inspections and repairs.

3. Alignment（centering）

⚠ warning	Coupling cover should be installed after its centering. Besides, don't approach the revolving parts when the pump is running to avoid damage.	❗

The aligning of pump should be finished before goods delivery, but the base may be bent when ground bolt is installed and non-aligning of pump shaft and motor shaft may occur

During the running of pump, such problems like vibration, noise and unusual wearing of bearing may occur if non-aligning of pump shaft and motor shaft exists.

Please engage aligning according to the following way during installation:

Fig 4 non-aligning of pump shaft and motor shaft during installation

(1). Aligning precision

The aligning precision should be in the following scope measured according to 4 points on the outer circle of coupling and the space between each point:

[Scope of aligning precision]

Level difference： 0.05mm or less

Difference of the face to face distances： 0.1mm or less

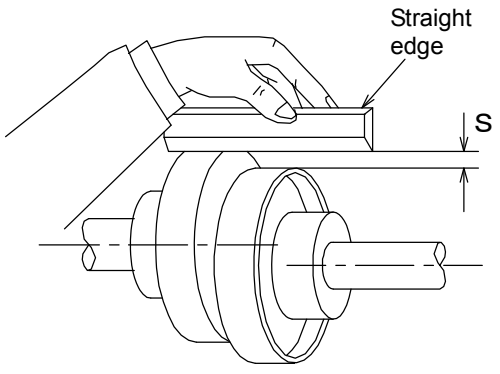


Fig 5 Level difference

Measure space S on the 4 points of outer periphery of coupling. T

The difference S should be less than 0.05mm.

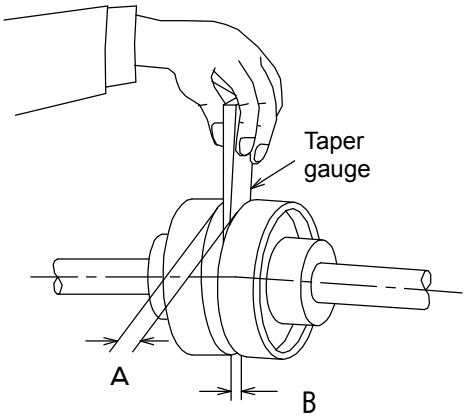


Fig.6 Difference of the face to face distances

Measure the distance A and B by feeler gauge or taper gauge.

Adjust the distance between 2 to 4mm.

The difference of distances should be less than 0.1 mm.

(2) Aligning adjustment

Add wedge block under base to engage aligning adjustment.

(a) Wedge inserting position

Insert the wedges on both side of anchor bolt and on the position that the base has bent (middle point of ground bolt) if necessary.

Note	There exists some space between base and floor when fastened .Deforming and destroy of the base will occur if fastening anchor bolt by force, so add correct wedge on pump side(shown as Fig.7) between base and floor.

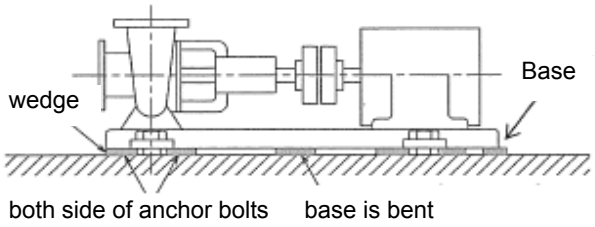


Fig.7 Inserting position of wedge

(b) Centering adjustment

Adjust coupling's concentricity by push the block and see the coupling's condition.

Later adjustment should be finished by inserting liner under motor for the position of block will be buried by grouting after installation. Use similar way when install motor on the base on spot.

Dismantle coupling's cover when aligning but install protection cover before running.

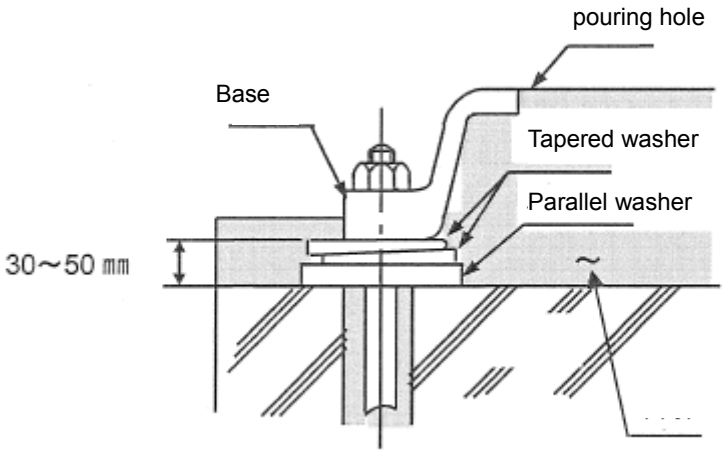
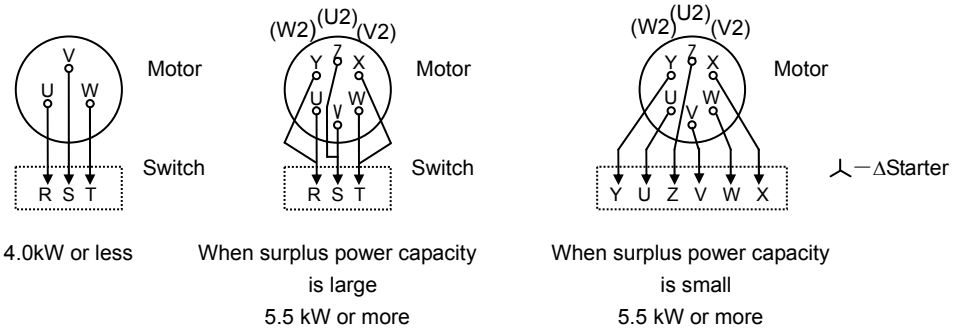


Fig.8 Aligning adjustment

4. Electrical wiring

⚠ warning	Carry out wiring work correctly, in accordance with electrical equipment technical standards and interior wiring regulations. Electric shocks or fires may result from incorrect wiring.	❗
	Install the ground wire securely, and make sure to carry out grounding. Shocks may result when there is a malfunction or fault current.	❗
	To prevent shocks, install a dedicated earth leakage breaker.	❗
	Confirm that the installation of motor terminals is not loose. Motor will be burned if even one terminal is loose.	❗
	Confirm the wiring part of motor the connecting part of power parts and one side and two sides of controlling plate .Make sure that the wiring position is not loose and no messes. Loosing of wiring part will result in bad connection and mess will cause fire when temperature is high.	❗
	Before wiring the motor, measure the insulation resistance using an insulation tester (DC 500 V megger). Confirm that there is a value of 1 MΩ or more between the motor lead wire and the ground.	❗
⚠ Caution	With 3-phase motors, check that none of the 3 motor terminals is loose or has become separated. Phase interrupted operation will result when the equipment is operated with 2 terminals, and the motor will burnout.	❗

(1) Carry out the wiring as per Fig.9.



4.0kW or less

When surplus power capacity is large
5.5 kW or more

When surplus power capacity is small
5.5 kW or more

Fig.9 Wiring diagram

2) Check the following conditions before turning on the switch:
   a) Installation of appropriate fuses.
   b) Correct wiring.
   c) Correct grounding.

6	Operation	

⚠ warning	Do not touch the rotating parts such as the spindle, shaft couplings, V-pulleys, etc. while the pump is running. Since these parts rotate at high speed, doing so could result in injury.	
	Don't place dangerous and inflammable goods near the pump and engine to avoid fire.	
	Do not operate the pump for more than 1 minute with the discharge valve left closed. The pressure within the pump will rise, and the casing or plugs may be damaged.	
	Don't touch electric parts when the electricity is on to avoid electric shock.	
	No water on motor to cause such accidents as electric shock, leaking or fire	
⚠ Caution	If air is entrained during pumping and is not discharged, the bearings and shaft seals may be damaged, and pumping may be impossible. Avoid this situation.	
	Do not touch the pump when the liquid handled is warm water. Burns may result from high temperatures.	
	Never touch the motor. Burns may result from high temperatures.	
	Do not cover the motor with blankets, cloths, etc. Fires may result from overheating.	
	Don't contact the power when the water in the pipe is discharged to avoid free running to result in pipe broken and overheating damage.	
	Pump failures are possible when operated with less flow rate than appropriate for the pump size (nominal inlet bore diameter in mm) (e.g. 50 L/min for size of 50 mm). When operation may occur with a small flow rate, install relief pipes, etc. to ensure operation at or above this flow.	
	Refer to the documents as material safe data speculation (MSDS) when using chemical medicine and find the attention items like using method, protection tools and throwing away. Abide by other items when operation with protection tools to avoid burning, fire and environmental harm.	
	Refer to the documents as material safe data speculation (MSDS) when dealing with and decomposing rubbish of chemical medicine and ask professional company to deal with it and abide by laws and local regulations.	

1. Prior to start up

Note	Reconfirm the arignment of pump and motor after piping connecting and water priming.

(1) Check bearing lubricant and supply to regulated level by oil measure gauge and choose turbine oil ISO VG46(JIS K 2213 type2)（suitable for thin oil lubricating type）

(2) Ensure that the power switch is OFF. Rotate the pump manually, and check that it rotates easily. Inspect the pump if the movement is hard or non-uniform.

(3) Be sure to perform pump priming, as operation of the pump without priming could cause breakdown. Priming is to be done through the following methods.

(4) When priming, manually rotate the unit, completely removing air from inside the impeller.

(5) Remove the coupling's bolts and run the motor in short time to confirm its rotational direction (clock wise looking from motor fan), then reinstall the bolts and protection cover after confirming.

2. Operation

⚠ Warning	If there is a power failure, turn the power switch off. Otherwise, the pump may start-up suddenly when the power supply is resumed, exposing personnel to danger.	

Note	Confirm pump's rotational direction and change wire to make it running forward if the 3 phase power running reversely.
	Reverse rotation cause vibrating and loosing impeller's nut and bolt and result in accident.
	Avoid running in cavitations. Cavitations will occur if pump rate of flow is too much or the suction pressure is too low.

(1) Close the discharge valve when priming is complete. Completely open the suction valve for flooding or positive suction.
(2) Turn the switch OFF and ON several times, and check that there are no problems with rotation direction or operating conditions.
(3) When the specified speed is reached, gradually open the discharge valve, and begin continuous operation.
(4) Check that there are no problems with pressure, current, vibrations, noise, etc. (In addition, refer to 7 Maintenance.) Keep pressure gauges, compound pressure gauges and other valves closed except during measurement. Damage can easily result if they are left open.
(5) For the 2nd and subsequent operations of the pump, refer to 7 Maintenance, and if there are no problems start operation immediately.

Note	Operate at a capacity appropriate to the equipment. (Under- or over-operation may result in noise and vibrations. Further, unnecessary power consumption will result.)

3. Stopping

To stop operation if there is no check valve at the discharge side, gradually close the discharge valve and then stop the motor.

7 maintenance

⚠ Warning	Do not touch the rotating parts such as the spindle, shaft couplings, V-pulleys, etc. while the pump is running. Since these parts rotate at high speed, doing so could result in injury.	⃠
	Don't place dangerous and inflammable goods near the pump and engine to avoid fire.	⃠
	Confirm the wiring part of motor, the connecting part of power parts and one side and two sides of controlling plate .Make sure that the wiring position is not loose and no messes. Loosing of wiring part will result in bad connection and mess will cause fire when temperature is high.	❗
	Don't touch the parts with electricity when the electricity is on to avoid electric danger.	⃠
	Don't burn plastic products to produce harmful gas.	⃠
	Please cut off the power when insulating resistance is lower than 1MΩ. The dealer or Ebara Mechanical Company(China) will check and repair to avoid such accidents as electric shock, motor damage or fire.	❗
	When moving the pump, please operate carefully according to hanging requirements (nameplate) and avoid falling.	⃠
	Always turn the power switch OFF before inspecting or repairing the pump. Not doing so could result in the pump starting up suddenly in auto operation, exposing personnel to danger.	❗
	No water on motor to cause such accidents as electric shock, leaking or fire	❗
	Please confirm the weight and form when engaging pump operation to avoid falling and physical accident.	❗
	Disassembly and repair of the pump should only be performed by specialist maintenance technicians. Otherwise, error by personnel could result in electric shock, and the pump catching fire or operating abnormally and causing injury.	❗
	Close input and output valve and clean water inside the pump when check and operate without pressure rising and minus pressure to avoid engine damage	❗
⚠ Caution	Do not touch the pump when the liquid handled is hot water. Burns may result from high temperatures.	⃠
	To prevent an accident if the pump stops running or an abnormality occurs, immediately turn off the power switch. Contact the shop from where you ordered the pump, or EBARA to perform an inspection and maintenance on the pump.	❗
	A person is not allowed to be near inlet mouth of suction pipe to avoid accident.	❗
	Confirm that the setting up of engine terminals is not loose and engine will be burned if even one terminal is loose.	⃠
	Do not touch the motor. The motor's surfaces will be hot, and you could get burned if you touch them.	❗
	Do not cover the motor with blankets, cloths, etc. Fires may result from overheating.	❗
	Such measures as temperature maintenance, heating, and dewatering should be carried out in winter to prevent freezing.	⃠
	Wiring Connecting pole should be fastened to avoid overheating and engine burning.	⃠
	Don't turn on power without priming to avoid dry running and pump damage.	⃠
	Confirm protection relay's operation condition timely to avoid device fault and electric shock accident.	❗

Close switch when checking pump for starting pump suddenly in auto running condition is very dangerous.

1. Daily inspections
Please pay attention to the following items:

(1) As abnormalities with pressure, current, capacity, vibration, sound, etc. are signs of a failure, it is important to refer to 8 Troubleshooting and take steps as soon as possible. For this reason, please keep an operations log.

Note	Engage paint repair in some period and following using condition. Rust will occur if screw with anti-rust oil, craft parts and parts with anti-rust paint are placed under high-humidity, dewing and humid condition.
	Please follow indication when one see nameplate showing forbidden and attention items, warning signs and attention signs.
	The life of ball bearing and oil sealing will be shortened if lubricant is changed slowly and by particles caused of bearing early wearing .Oil leaking will occur if oil seal of main shaft is wearied.

(2) Use lubricant with turbine oil ISO VG46 (JIS K 2213 two kinds).The first change should be engaged after 300 hour's running and after that changing lubricant every six month. Check it each day and supply when lowering than oil position（suitable for thin oil lubricating type.

The life of ball bearing and oil sealing will be shortened if lubricant is changed slowly and by articles caused of bearing early wearing .Oil leaking will occur if oil seal of main shaft is wearied.

(3) Bearing temperature should not be over 80℃--higher 40℃ than room temperature. It is normal if hand is permitted to touch the bearing but if not so, please stop running and check for the temperature is too high.

(4) Shaft seal is a mechanical seal, therefore there is almost no leakage when it is operating normally. Even when a little leak is accepted at the time of an operation start, if operation is kept for a while in the state, a leak will decrease. When a leak still does not stop, please stop operation and check.

(5) Standard values of vibration for when the pump and piping have been installed correctly are shown in the figure at right. If vibration exceeds these standard values, inspect the pump and piping to determine the cause. Probable causes are strains in the piping and loose anchor bolts.

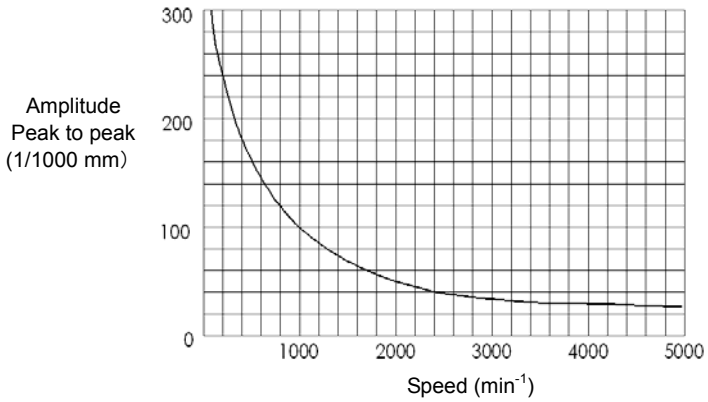


Fig.10 Standard value of vibration

2. Pump operation

⚠ Warning	Do not operate the pump for more than 1 minute with the discharge valve left closed. The pressure within the pump will rise, and the casing or plugs may be damaged.	⃠
⚠ Caution	If air is entrained during pumping and is not discharged, the bearings and shaft seals may be damaged, and pumping may be impossible. Avoid this situation.	⃠

Note	Reverse rotation cause vibrating and loosing impeller's nut and bolt and result in accident.
	Avoid running in cavitations. Cavitations will occur if pump rate of flow is too much or the suction pressure is too low.

Frequent starting and stopping will make the pump wear out quickly. Limit start-ups to the frequency shown below.

Motor output	7.5 kW or less	11 to 22 kW	30 kW or more
Frequency of start-ups	No more than 6 per hour	No more than 4 per hour	No more than 3 per hour

3. Long-term pump stoppage and storage

⚠ Warning	Cut the power when stop to avoid insulating, aging ,electric shock, leaking and fire.	❗
⚠ Caution	Discharge water inside pump and piping when operation is stopped. Stored water will decay and produce bacteria if not doing so.	❗
	Engage test run according to demands of installation and operation when restarting pump to avoid pump restriction, engine burning and dry running of pump.	❗

(1) If you have installed a spare pump, run it from time to time and keep it in good condition so that it is ready for use at any time. (checking each week is recommended)

(2) Clean inner mechanical seal chamber and water if the pump is not running for long time (over 3 months).

(3) Use preventive oil for machined surface of bearing and coupling if pump is stopped for long time (over 3 months).
Rotate the pump manually to prevent rusting every one or two weeks. Use lubricating the bearing if not doing so. Change lubricant when restarting.

(4) If a pump is left out of use for prolonged periods in the wintertime or in cold climates, water inside the pump could freeze, causing damage to the pump. Accordingly, in such situations provide thermal insulation for the pump, or drain the water from its interior.

(5) Please cut off power if the pump is stopped for long time (over 3 months).

(6) Proceed with prepared step (check and test) of installing if the pump is stopped for long time (over 3 months).

4. Consumable parts

⚠ Warning	Don't install or change other parts which are not our standard parts. Damage may be caused for electric shock, firing or wearing. Meanwhile normal function of machine can't be exerted.	⃠
⚠ Caution	Replace consumable parts timely to avoid aging and wearing and cause big fault like leaking and burning. Trust dealer or Ebara Mechanical Company (China) to engage in replacement.	❗

(1) Replace the parts according to the conditions shown in the table below

Consumable part	Mechanical seal	Coupling's rubber	Ball bearing	Gasket and O-shape ring	Oil seal
Replacement condition	Large amount of leakage	Rubber aging, wearing and single side wearing.	If noise or vibration becomes severe	Every time pump is disassembled	Lubricant flowing
Replacement interval	Once per year	Once per year	Once every 2 - 3 years	–	Once per year

The replacement intervals shown above are as guide line for normal operation.

(2) A table of dimensions for consumable parts is shown below.
＜standard specification＞mechanic seal　ball bearing chart

4P

type	diameter						
	40×32	50×40	65×50	80×65	100×80	125×100	150×125
FSS4K	—	—	—	D	D	E	F
FSS4J	—	C	D	D	D	E	E
FSS4H	C	C	C	D	D	—	E
FSS4G	B	B	C	C	D	—	—

2P

type	diameter					
	32×32	40×32	50×40	65×50	80×65	100×80
FSSJ	—	—	—	C	—	—
FSSH	—	—	C	C	C	—
FSSG	A	A	B	B	C	C
FSSF	A	A	A	B	C	C
FSSE	—	—	A	A	—	—

	mechanic seal	O-ring for mechanic seal	bearing
A	Φ20	G-45	6304UU-2
B	Φ20	G-45	6305UU-2
C	Φ25	G-50	6305UU-2
D	Φ35	G-55	6307UU-2
E	Φ45	G-70	6307UU-2
F	Φ55	G-80	6309UU-2

O-shape ring	
type	specification
FSSE	Φ3×155
FSSF※1	Φ3×165
FSSH※2 4G	Φ3×185
FSSJ·4H	Φ3×225
FSSJ·4J	Φ3×275
FSS·4K	Φ3×335

※1　32×32FSSF、40×32FSSF、50×40FSSF,Φ3×185

※2　100×80FSS4G,Φ3×195

Coupling bolt									
Specification of coupling	80	100	112	125	140	160	180	200	224
CLAB()M	8	10	10	14	14	14	14	20	20
quantity	3	4	4	4	6	8	8	8	8

（example）diameter of coupling is140　CLAB-14M,6.

＜standard specification（shaft liner and thin lubricant form）＞mechanic seal　ball bearing chart

4P

type	diameter						
	40×32	50×40	65×50	80×65	100×80	125×100	150×125
FSS4K	—	—	—	E	E	E	F
FSS4J	—	D	E	E	E	E	E
FSS4H	D	D	D	E	E	—	E
FSS4G	C	C	D	D	E	—	—

2P

type	diameter					
	32×32	40×32	50×40	65×50	80×65	100×80
FSSJ	—	—	—	B	—	—
FSSH	—	—	B	B	B	—
FSSG	A	A	A	A	B	B
FSSF	A	A	A	A	B	B
FSSE	—	—	A	A	—	—

	Gasket used for shaft liner	Mechanic seal	O-shape ring for mechanic seal cover	Ball bearing	Oil seal
A	16×20×0.5	Φ25	G50	6305-2	SB-25408
B	22×25×0.5	Φ30	G55	6305-2	SB-25408
C	16×20×0.5	Φ25	G50	6305-2	SC-25387
D	22×25×0.5	Φ30	G55	6305-2	SC-25387
E	32×35×0.5	Φ45	G70	6307-2	SC-35507
F	42×45×0.5	Φ55	G80	6309-2	SC-45629

8 Troubleshooting

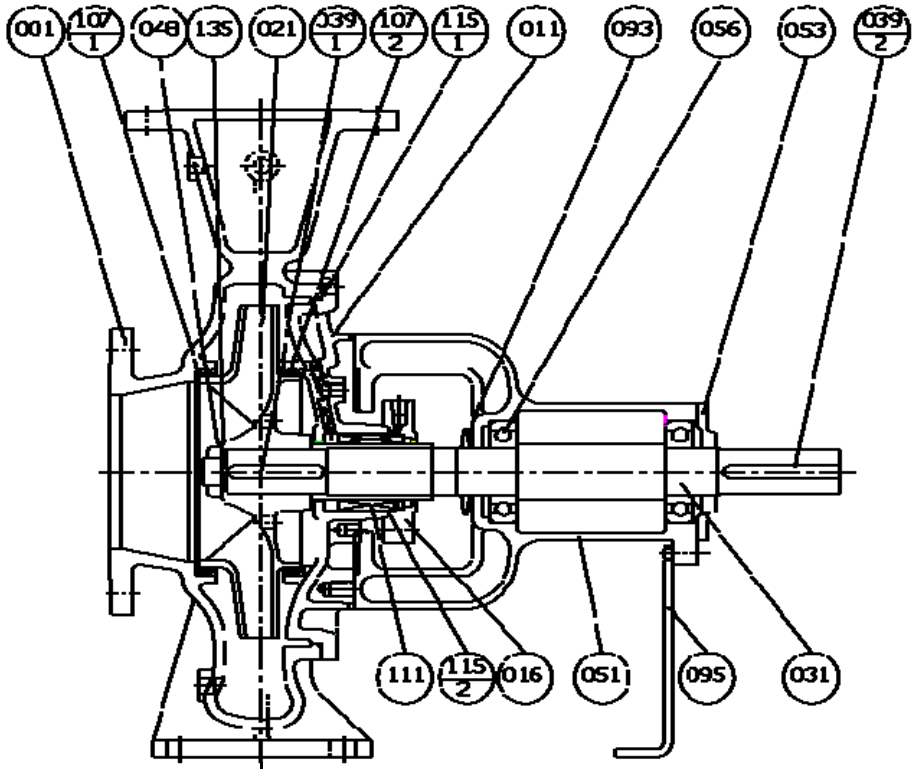
Trouble	Cause	Remedy
Motor won't turn. Motor growls and won't turn	- The motor is damaged. - Power supply abnormality. - Rotating parts in contact. Rust. Burning. - Foreign material caught in the contacting surfaces.	- Repair the motor. - Inspect and repair - Manually rotate. Re-assemble. Have repaired by a specialist workshop. - Remove the foreign material.
Pump operates, but no water is discharged. Water is not discharged at the rated capacity.	- Pump not primed. - Gate valve is closed or half open. - Reverse rotation direction. - Pump speed too low. * Motor has wrong number of poles * 60 Hz pump used in 50 Hz power supply area. * Voltage drop has occurred. - Impeller is clogged with foreign matter. - Piping is clogged with foreign matter. - Foot valve and/or strainer are clogged with foreign matter. - Air is being sucked in. - Foot valve or end of suction piping is not properly submerged in the water. - Leakage from discharge piping. - Impeller is corroded. - Impeller is worn. - Wear ring is worn. - Large loss in the piping. - Suction head is too high for the pump. Discharge head is too high for the pump. - High fluid temperature or volatile fluid. - Cavitations.	- Prime the pump. - Open the gate valve. - Check the rotation arrow, and correct the wiring. * Consult nameplate data and replace motor with correct one. * Consult nameplate data and replace correct pump. * Check the power supply. - Remove the foreign material. - Remove the foreign material. - Remove the foreign material. - Inspect, repair suction piping and shaft seal - Extend suction piping so that foot valve / end of piping to be submerged at least 2 times deeper than the diameter of the piping. - Inspect, repair. - Check the fluid, change material. - Replace the impeller. - Replace wear ring. - Review the plan. - Review the plan. - Review the plan. - Consult with a specialist.
Water is discharged, but stops.	- Not primed sufficiently. - Air is being sucked in. - Air is trapped inside the suction piping. - Suction head is too high for the pump.	- Sufficiently prime the pump. - Inspect, repair suction piping and shaft seal. - Refit the piping. - Review the plan.
Overload (over current) occurs.	- Rotating speed is too high * Motor has wrong number of poles * 50 Hz pump used in 60 Hz power supply area. - Head is too low. Discharge capacity is too high. - Bearing is damaged. - Rotating parts in contact. Shaft is bent. - Fluid specific gravity, viscosity is too great.	* Consult nameplate data and replace motor with correct one. * Consult nameplate data and replace correct pump. - Turn down discharge valve to adjust to prescribed capacity. - Replace bearing. - Have repaired by a specialist workshop. - Review the plan.
Bearing heats up	- Bearing is damaged. - Pump is operated for prolonged period at shut-off pressure.	- Replace bearing. - Stop shut-off pressure operation.
Pump vibrates. Loud operation noise.	- Bearing is damaged. - Discharge capacity is too high. - Impeller is clogged with foreign matter. - Reverse rotation direction. -Pump is operated for prolonged period at shut-off pressure. - Rotating parts in contact. Shaft is bent. - Cavitation. - Piping vibrates.	- Replace bearing. - Turn down discharge valve to adjust to prescribed capacity. - Remove the foreign material. - Check the rotation arrow, and correct the wiring. - Stop shut-off pressure operation. - Have repaired by a specialist workshop. - Consult with a specialist. - Rectify the piping.
More leakage from the shaft seal.	- Mechanical seal is damaged. - Suction pressure is too high.	- Replace mechanical seal. - Review the plan.

9	Construction

1. **Sectional view**

This figure shows a typical model FSSC pump; there may be some differences from this figure depending on its model size.

〈standard：mechanic sealing type〉



Number	Part name	Quantity
056	Bearing	2
053	Bearing cover	1
051	Bearing housing	1
048	Impeller nut	1
039-2	Key	1
039-1	Key	1
031	Shaft	1
021	Impeller	1
016	Mechanical seal cover	1
011	Casing cover	1
001	Casing	1

Number	Part name	Quantity
135	Impeller washer	1
115-2	O-ring	1
115-1	O-ring	1
111	Mechanic seal	1
107-2	Sealing ring	2
107-1	Casing ring	1
095	Stay	1
093	Deflector	1

2. Accessory
Standard accessory
Common base……1
coupling……1 set
coupling protection cover……1

10	Disassembly & Reassembly	

⚠ Warning	Don't burn plastic parts on spot for burning may produce harmful gas	⃠
	Don't install or change other parts which are not our standard parts. Damage may be caused for electric shock, firing or wearing. Meanwhile normal function of machine can't be exerted.	⃠
	Don't disassemble or repair the pump except professional engineer for damage may be caused for electric shock, firing or wearing.	⃠
	For disassembly and inspections, close the suction and discharge valves, drain the casing drain valve, and ensure that the pump pressure is not abnormal or negative. The pump may undergo abnormal rotation while the work is incomplete, resulting in damage to the casing.	❗
	Refer to the documents as material safe data speculation (MSDS) when using chemical medicine and find the attention items like using method, protection tools and throwing away. Abide by other items when operation with protection tools to avoid burning, fire and environmental harm.	❗
	Refer to the documents as material safe data speculation (MSDS) when dealing with and decomposing rubbish of chemical medicine and ask professional company to deal with it and abide by laws and local regulations.	❗

1. Disassembly

When disassembling the pump, refer to 9 Sectional view, and the following procedure:

(1) Remove motor from common base and check coupling rubber parts.
(2) Drain lubricant from bearing housing if it is oil lubricating type.
(3) Remove bolts from casing cover, casing cover and bearing housing from casing to check inner situation. Check wearing and other unusual condition and change parts in time when wear volume of casing ring reaches 1mm.
(4) Remove impeller nut and impeller washer, then remove impeller.
(5) Remove key for impeller from shaft.
(6) Remove two-head stud which fastens mechanical seal cover and slide the cover to bearing side. Remove casing cover from bearing housing, loose screw on shaft, then remove mechanical seal carefully from shaft.
(7) Remove deflector from shaft. Remove bearing cover from bearing housing, then pull out shaft finally. Check rotating condition of bearing and replace it if not rotating normally.

2. Reassembly

Assemble the parts in reverse order of disassembly. Observe the following information during assembly.

(1) Replace the coupling rubber it is worn.
(2) Replace the O-rings and seat gaskets.
(3) Replace any worn or damaged parts with new ones. If the casing ring or bushings are worn approximately 1 mm in the diameter, replace with new parts.
(4) tighten the bolts symmetrically and gradually so that they are not tightened unevenly.
(5) After the assembly, turn the pump by hand, to check that it rotates easily and smoothly.
(6) Consumable parts should be obtained from the same dealer where the pump was purchased.

11 Limited Warranty

Our liability under this warranty is limited to bear cost for repairing pump parts, and it shall not be extended to any other cost beyond this.

(1) This warranty is valid for eighteen (18) months after EX-factory EBARA CORPORATION. But if products will be delivered within six (6) months after Ex-factory, it shall be valid for twelve (12) months after delivery date to customer.

(2) Under warranty term, EBARA will supply new replacing pump or parts free of charge in conditions that the cause of trouble is obviously recognized due to our design/ manufacture error, and the user operates pumps properly. Our free supply will cover until FOB China port (Ocean/Air freight fee, Customs duty and tax in destination are not included.) And we don't take responsibility to compensate any of secondary loss caused by our pump trouble.

(3) In following cases, replacement and repairing cost will be charged:
   (a) The trouble occurs after warranty expired.
   (b) The trouble caused by wrong operation, and/or caused during storage.
   (c) The trouble caused by fire, flood, earthquake or other disasters beyond human control.
   (d) The trouble caused by using non-genuine parts.
   (e) The trouble caused by repairing or modifying by workers who is not our staff or not authorized staff by us.

(4) There is case that it is impossible to supply repairing pump part by reason for model change etc.

(5) The responsibility of Ebara machinery China Co.,Ltd is limited on the above guarantee scale and no other cost and loss not belonged to the scale.

(6) Goods supplying period of repairing parts is: consecutive 5 years after repairing parts stops being produced.

Note

EBARA are not liable for any compensation for damage or injury caused by pump breakdown. When you find anything abnormal under operation, stop operating immediately and check the trouble.

"Consumable items" refers to bearings, bearing sleeves, O-rings etc that replacement eventually required.

In case of trouble, please contact EBARA Corporation, EBARA group company or authorized distributors/dealers to request repaire or maintenance. Please make sure to tell us the information on the identification plate (serial No. & model No. etc.) and details of a trouble.

12 Repair and maintenance

When you request for repair or maintenance, please contact the distributor/dealer you purchased, or EBARA Machinery (China) Co. Ltd.

Please stop pump's operation immediately when any abnormal situation appears and check if faults occur (please refer to Chapter 8 Troubleshooting).

If you have any enquiries, please feel free to contact us

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