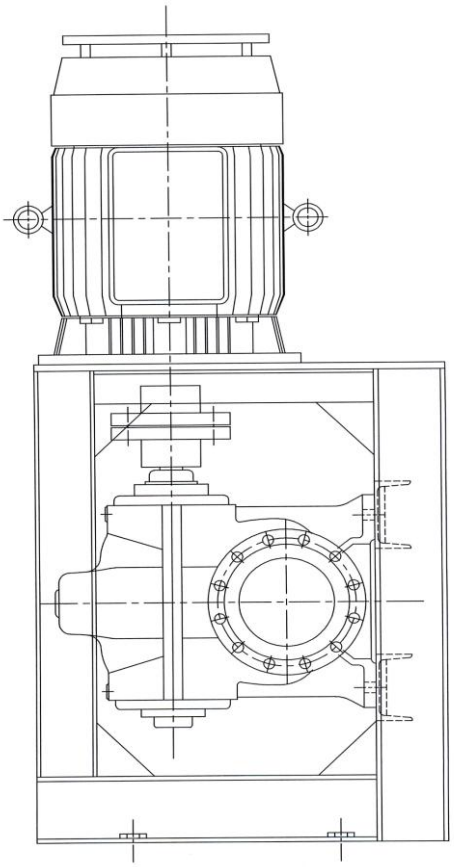
CN 9003V-R4EC

Instruction Manual

EBARA HORIZONTAL SPLIT CASING
Centrifugal Pump
Vertical mounted version

MODEL CSA & CNA



Contents

Safety Information and Introduction

WARNING

Before handling this pump, always disconnect the power first. No open flame or use sparkable electrical devices or flames in a septic (gaseous) or possible septic sump.

Do not work under heavy Suspended object unless there is a positive support under it to stop its fall in event of sling or, hoist failure. Disregard of this warning could result in personal injury.

This pump should only be serviced by a qualified person or a factory trained person

CAUTION

This instruction manual includes necessary items for installation, operation and maintenance. Read this manual carefully to ensure correct installation, operation and maintenance.

Be sure to keep this instruction manual on hand for future reference.

CAUTION

Be careful not to exceed the given specifications in the use of your products.

Introduction

Thanks you for purchase of this EBARA Model CSA/CNA Horizontal Split Casing Vertical Mounted Pump.
EBARA has manufactured this pump with due care so that it can be operated with case.
However, if it is not property operated, unexpected accident may result.
Accordingly, you are requested to operate this pump according to this instruction manual and to keep this manual for reference.

Installation

If the pump is installed properly and maintained with due care, it can be operated quietly and safely for long time. Install the pump and connect piping with reference to following items:

1. Unpacking

Upon arrival of the pump at site, check the following:

(1) Check that the pump is as ordered by referring to the nameplate.
(2) Check for possible shipping damage and loosed nuts or bolts.
(3) Check for missing accessories. If defects are found, contact your nearest service representative, referencing the items listed on nameplate.
(4) Handle carefully without damage to the units as bellows:
   1. To lift the pump, suspend with cable as shown In Fig. 1, so that loading in even. Please do not use excessive large size cable.
   2. Handle with care so that piping, valves, Instrument, etc, are not broken.
3. Lifting hook bolts attached to upper casing are used for their removal only. They must not be used for lifting the entire pump unit.

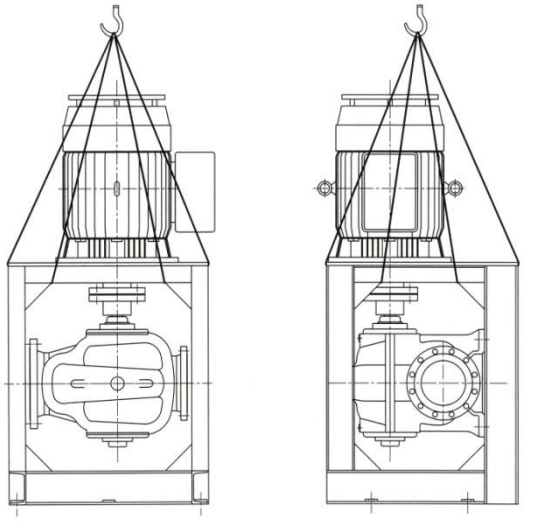


Fig. 1

(5) If storage is required after unpacking, place the pump indoors without fail. Before pump shipment, the coupling, flanges, shaft, and other external machined pump surface have usually been coated with rust preventative oil (NOX-RUST 366).
Internal components have also been coated with rust preventative oil (RUST-VET 377).
When the pump is stored for extended periods, hermetically seal all openings after inserting, dry agent (silica gel) or rust-proof agent (Dyana). Use thinner to remove the internal coating before

2. Installation Site

(1) Select a pump site, easy for maintenance and inspection.
(2) Provide a suitable barrier to prevent entry of an-authorized persons around pump.
(3) Install the pump as close to the water supply as possible. As high suction head may cause vibration, noise and pump failure, the suction head should be re-checked. Since the suction head should be reduced if liquid temperature is high, install the pump in reference to Re NSPH (Required Net Positive Suction Head) so that average net positive suction head (Av NPSH) is larger than the Required NPSH.

3. Cautions on Piping

(1) As suction discharge pipe load applied to the pump causes eccentricity, both pipes should be provided with adequate support.
(2) Minimum number of suction elbows with bend radius as large as possible may be installed at some distance from pump inlet (Fig. 2)

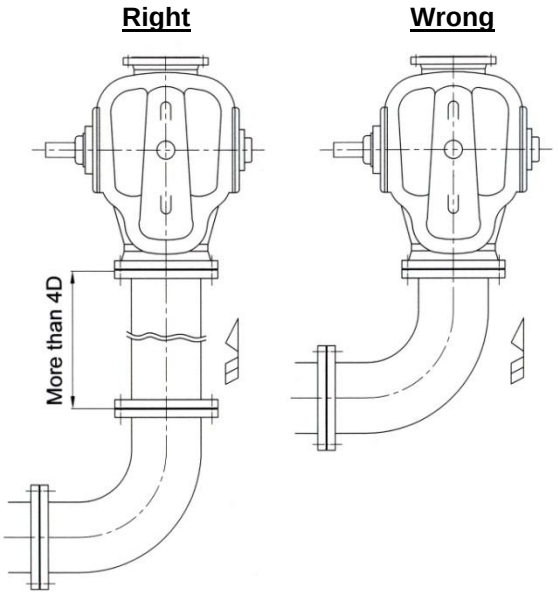


Fig. 2

(3) Install a check valve for reverse flow prevention when the discharge pipe is too long, actual head is high, water is fed pressure tank, or when two or more pumps are operated in parallel. Install the check valve between the pump and the sluice valve.
(4) If there is danger of water hammer, a quick closing check valve should be installed on the discharge side.
(5) If a pipe of different diameter than pump flange is used, an eccentric type reducer should be installed so as not produce any air pocket. (Fig. 3)

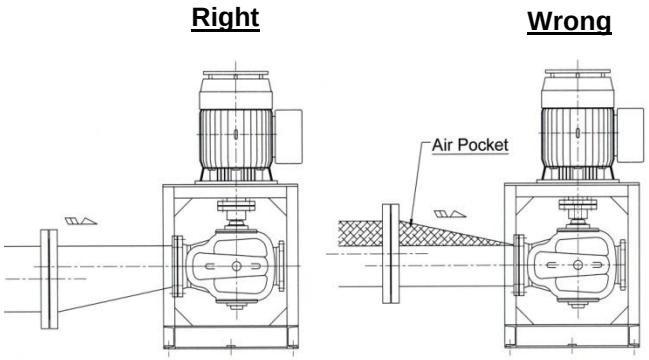


Fig. 3

Suction pipe for positive suction

(1) Install a foot valve at the end of suction pipe and connect the pipe as shown in Fig. 4. The foot valve must be ordered separately.
(2) Connect horizontal portion of pipe with a gradient of more than 1/100 toward pump, as shown in Fig.4.
(3) Ensure that flange does not permit air intake.

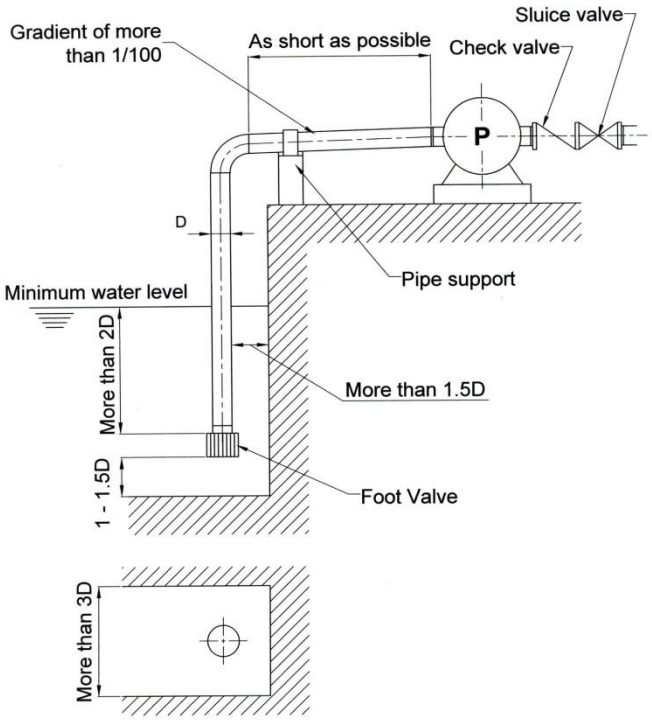


Fig. 4

Suction pipe for influx or force feed

(1) Install a sluice valve on suction pipe between the pump and tank as shown in Fig. 5. Sluice valve should be installed with their handles facing sideways so as not to produce any air pocket Fig. 6.

(2) Connect horizontal portion of pipe with a gradient of more than 1/100 toward pump, as shown in Fig. 5.

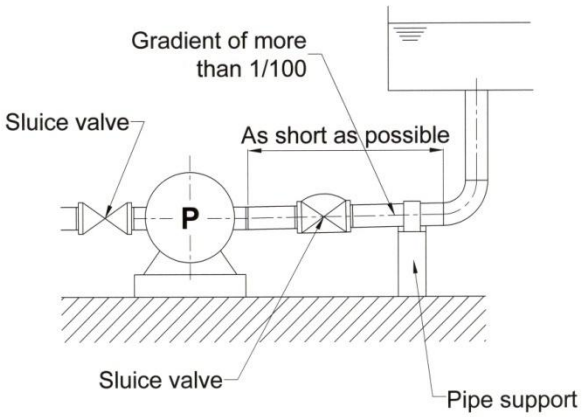


Fig. 5

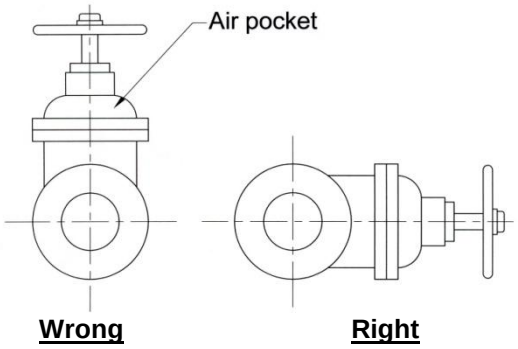


Fig. 6

4. Installation

The pump has been aligned with driver before shipment. However, adjustment for alignment is necessary at the site.

Install and center according to the following procedure:

(1) After chipping the foundation, arrange one parallel liner and two taper liners on both side of the anchor bolt hole of the base as shown in Fig. 7.

(2) Place the pump plus common bed on these liners and install the anchor bolt in the anchor bolt hole.

(3) Determine the position and height of the pump level by using the casing machined surface, to obtain a horizontally of 0.1 mm/m as the reference value. The pump height can be easily adjusted with taper liners.

(4) After installing anchor bolt, pour mortar into the anchor bolts holes and allow to be harden Mortar will harden in about 4 days, although this period more or less differs according to the open air temperature, humidity and the compound ratio.

(5) After the mortar has hardened, arrange the liners used in paragraph (1) as close to and on either side of the anchor bolt. If the distance between anchor bolts exceeds 1m, install additional liners between these anchor bolts.

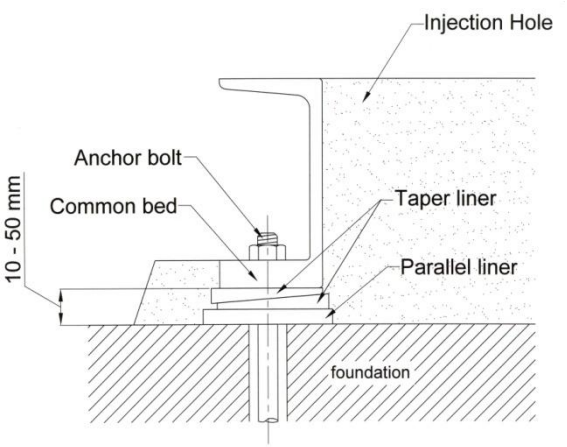


Fig. 7

(6) First Centering
Perform centering while adjusting the taper liners. Axial center offset and surface deflection of coupling must be within the allowance shown in Fig. 9, while using a flat gauge, taper gauge, thickness gauge or dial gauge as shown in Fig. 9. Measure these values with anchor tightened. Be careful since these values very considerably according to whether anchor bolts are tight or loose. Install the driver on the base by placing several liners, so that driver is mostly 1 to 2 mm higher than base surface.

(7) After completion of centering, securely tighten anchor bolts and pour mortar around the pump. Pour mortar into the space of the bed seat.

(8) After mortar has been harden, tighten anchor bolts securely again and connect pump suction and discharge piping. If shaft coupling offset exceeds 0.2 mm as a result of pipe connections, disconnect pipe connection and adjust pipe support. Repeat this adjustment until piping is correct.

(9) Second centering
After piping has been completed correctly, set the axial center offset of the shaft coupling of the pump and driver to less than the value shown in Fig. 8. Adjust this value by exchanging shims between the driver and common bed as required.

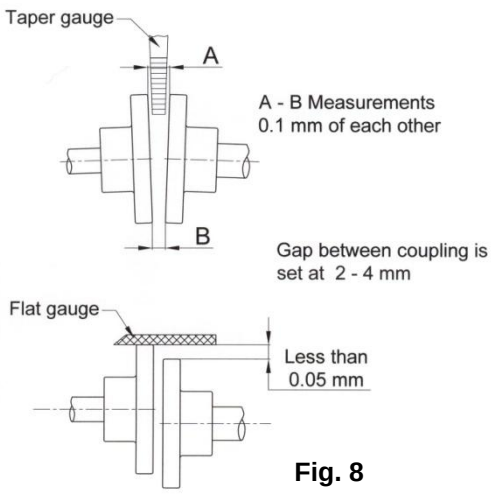


Fig. 8

4. Electrical Wiring

WARNING

Check that the power is locked off and disconnected before working on pump.
All electric work should be performed by a qualified electrician and all national and local electrical codes must be observed

CAUTION

Measure the insulation resistance. The value should be more than 1 mega ohm. While making The measurement, keep the power supply cable off the ground.

CAUTION

Before installation check rotation. The standard rotation is clockwise when viewed from motor side. Read ELECTRICAL WIRING.

Power supply equipment and wiring for the motor must be in accordance with the instruction manual for the motor, electrical equipment technical standard and existing regulation. Incomplete wiring and grounding by an unqualified persons is against the law and very dangerous.

In order to prevent electric shocks, install a short circuit breaker according to local regulations. This breaker must be supplied by costumer. A motor protective device, to prevent damage to the motor due to overload, etc., should be installed

Operation

CAUTION

Check rotation. Pump should be started with gate valve closed, than the operator should open the valve gradually.

1. Cautions Before Starting Operation

(1) Turn the pump by hand and check for smooth rotation. If pump rotation is difficult or uneven, it may be caused by internal rust etc. Locate cause and eliminate.
(2) Operate the driver only by inching operation so as to confirm direction of rotation. Then, connect the shaft coupling and install shaft coupling guard.
(3) Prime the pump. Never operate the pump without prime. Open the air vent plug or valve mounted on the pump discharge side. So as to exhaust air or other gas completely and confirm the pump is fully primed. Turn the pump shaft manually to discharge air and gas.
(4) After priming has been completed, close the discharge valve.

2. Start Operation and Stop

(1) Ensure that suction valve is fully open and the discharge valve is fully closed.
(2) Turn the start switch off and on once or twice to ensure the pump is operating normally. If there are no malfunctions, the pump may be placed in continuous operation since pump shut-off operation causes rapid liquid temperature rise inside pump, with resultant damage, shut-off operation should be confined to short periods.
(4) Check each part of the pump and driver for current voltage, lubrication of each part, rotation noise, vibration, discharge and suction pressure, etc. If there is a possibility that foreign substances may be introduced into the pump, during the initial stage of operation, provide a temporary strainer on the suction side just before the pump. Provide a pressure gauge between the strainer and the pump to monitor pressure drop due to strainer. Increased pressure drop indicate strainer clog, so pump must be stopped and strainer cleaned. If suction pressure becomes low due to excessive pressure drop there is danger of pump burn-out. Do not remove strainer until all foreign substance are completely removed from the system and piping.
(5) Re-check pump and driver 30 to 60 minutes after start.
(6) During stop operation, gradually close the discharge valve before turning off the prime mover.

3. Shut-down and Emergency Shut-down

(1) When the pump stops due to power failure, turn of the switch and closed discharge valve. (This prevents sudden start of pump when power is restored).
(2) Power emergency shut-down, switch off electric power and close discharge valve.

4. Standby Pump

For standby pump operation, fully open the suction and discharge valve. Fill the pump with the liquid so that suction pressure is applied. Stop reverse pressure with check valve only and start the pump is when restarting.

Maintenance

CAUTION

Disconnect power cable from power source before servicing unit.
Normal maintenance should be done by qualified personnel.

In order to maintain best operating conditions for the pump the following maintenance and checks should be provided, pressure gauge and compound gauge cocks should be closed except when taking readings. This will prevent instrument damage.

(1) Supply and replacement of bearing lubricant. To supply grease, fill from the upper nipple with the amount and at the intervals shown in table 1. Excessive grease will cause overheat. Applicable grease should be "Shell Albania No. 3" or equivalent.
Insert the mouth hose of grease gun into the nipple of bearing properly and then pumping. Please do fill without offset, rotating the shaft.
(2) Temperature on the bearing casing should not exceed room temperature plus 40 ^{0}C or 80 ^{0}C. If this temperature is exceeded, stop operation immediately and check.
(3) Do not start the pump frequently otherwise the pump may be damage. Suppress the starting frequency as follows:

Motor output	Starting frequency
Lower than 7.5 kW	Less than 6 times per hour
11 kW – 22 kW	Less than 6 times per hour
Higher than 26 kW	Less than 6 times per hour

(4) Pressure, current, vibration, noises etc. which differ greatly from normal values are a symptom of trouble. Take counter measure immediately. For this purposed, it is recommended that records be kept.
Check the following items:
- Suction and discharge pressures
- Current value and deviation
- Bearing temperature (max. 80 ^{0}C on bearing casing)
- Vibration (on bearings and pump casing)
- Noises

(5) Turn off the switch without fail before checking pump.
(6) Turn the pump shaft by hand once every week if the pump is stopped for long time.
(7) To prevent freeze and subsequent damage to pump during cold weather operation, drain pump or provide insulation.
(8) Consumable parts.
Replace parts under the following conditions as shown in table 2.

INTAKE PUMP ⟵ TRANSMISION PUMP ⟵

Table 1.

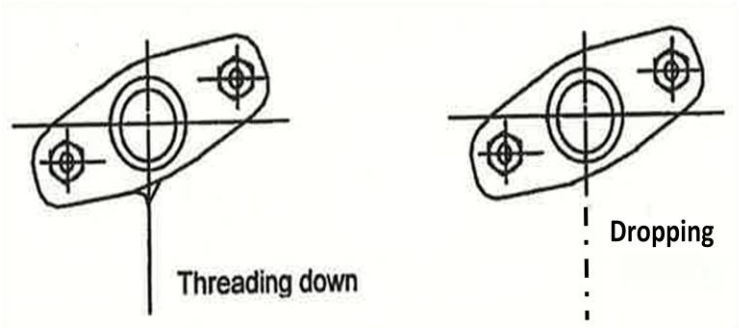
Nominal Bearing		CUCFC 206C UCFC 206E	CUCFC 208C UCFC 208E	CUCFC 210C UCFC 210E	CUCFC 212C UCFC 212E	CUCFC 214C	CUCFC 216C	CUCFC 218C
Supplied	Grease charge leak (2 points)	2.2 gr	3.9 gr	5.4 gr	10 gr	13.6 gr	18.8 gr	28 gr
	Interval	3000 - 4000 hrs	3000 - 4000 hrs	3000 - 4000 hrs	3000 - 4000 hrs	3000 - 4000 hrs	3000 - 4000 hrs	3000 - 4000 hrs

Table 2.

Part	Reason for change	Change Frequency
Mechanical seal	If leak cannot be stopped	Every 1 – 2 years
Gland packing	Too much water leakages at maximum fastening gland	Annually
Shaft Sleeve	Scratch or worn	Every 1 – 2 years
Shaft coupling rubber	Worm, deteriorated, worm on one side	Annually
Bearing unit	Noticeable noise, abnormal noise	Every 2 – 3 years
Oil Seal	Water leakage	Every 1 – 2 years
Gaskets	Each disassembly	-

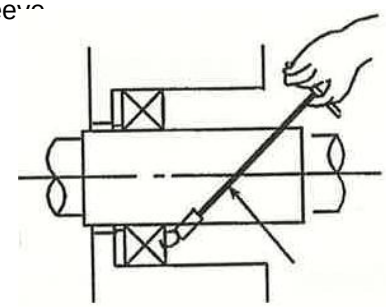
The above change frequency indicates standard values when the pump is operated normally.

9. Check stuffing box portion (Gland packing type only)
   (1) Check of leakage amount from gland. Adjust the leakage from the gland packing as shown below. When leakage is excessive, tighten the gland gradually and evenly. When the temperature is too high, loosen the gland to allow more leakage. After running the pump for a while to fit the shaft, tighten the gland again.

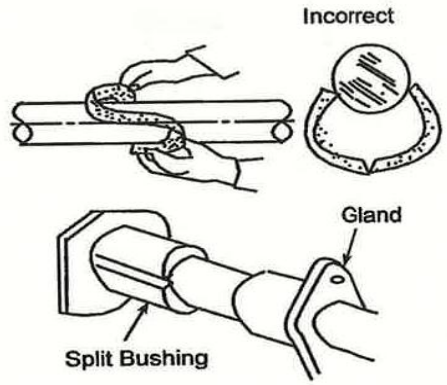


   If excessive leakage occurs and cannot be adjusted even by tightening the gland bolt units, replace the packing. Take care during replacement, as packing incorrectly installed will cause continuous leakage or partial abrasion of the sleeve.

10. Replacement of gland packing
   (1) Stop pumping
   (2) Remove the nut from the gland bolts and remove the gland.
   (3) Used packing should be removed and discarded. Use the wire rod to take the packing, care to avoid damage To the stuffing box and sleeve



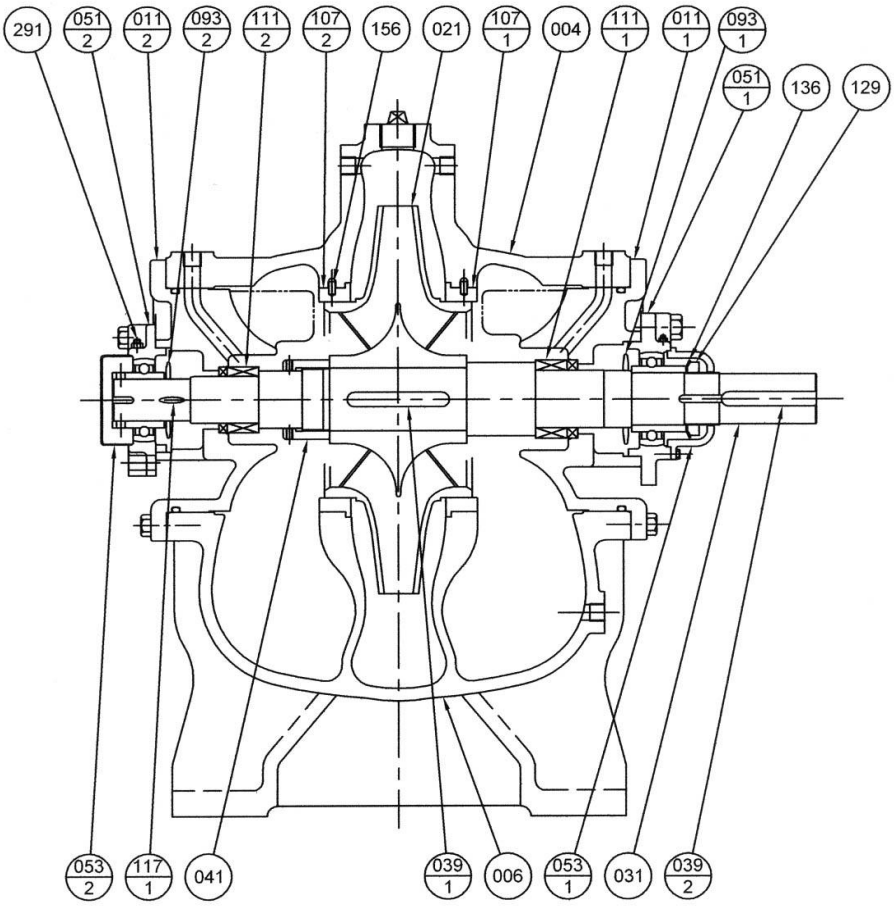
   (4) Replace the shaft sleeve if it is worn damaged.
   (5) Spread lubricant on the stuffing box inner surface Twist the packing rings open and wind around the shaft sleeve. Push the packing rings, one by one, into the stuffing box. Cut ends of the packing must always be staggered by 90–180.Install 3 packing, lantern ring and 2 packing in this order.



   (6) Tighten the gland bolt nuts by installing the gland in symmetrical Order alternately

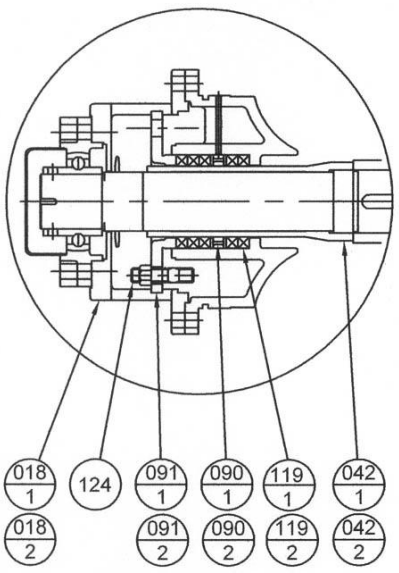
Disassembly and Assembly

1. Description of Structure



291	Grease Nipple
156	Lock Pin
136	Bearing Washer
129	Bearing Nut
117-1	Gasket (Casing)
111-2	Mechanical Seal
111-1	Mechanical Seal
107	Casing Wear Ring
093-2	Deflector (CCP Side)
093-1	Deflector (CP Side)
053-2	Bearing Cover
053-1	Bearing Cover
051-2	Bearing Unit
051-1	Bearing Unit
041	Impeller Nut
039-2	Coupling Key
039-1	Impeller Key
031	Shaft
021	Impeller
011-2	Side Cover
011-1	Side Cover
006	Casing Lower Half
004	Casing Upper Half
No.	**Part Name**

Standard Model



119-2	Gland Packing (CCP Side)
119-1	Gland Packing (CP Side)
090-2	Lantern Ring (CCP Side)
090-1	Lantern Ring (CP Side)
091-2	Gland (CCP Side)
091-1	Gland (CP Side)
042-2	Shaft Sleeve (CCP Side)
042-1	Shaft Sleeve (CP Side)
018-2	Bearing Support (CCP Side)
018-1	Bearing Support (CP Side)
124	Gland Bolt
No.	**Part Name**

Gland Packing type (Option)

2. Disassembly

Prior to disassembly prepare cardboard or plywood sheet upon which to place disassembled parts on top each other, since casing gaskets and side cover gaskets cannot be re-used after disassembly, prepare replacement in advance. Observe the following procedure for disassembly. Before disassembly, it is necessary to turn off all power, close discharge and suction valves, (close valves in minimum flow piping) and open casing drains to completely drain pump.

Disassembly pump upper casing

(1) Remove 4 long bolts near side cover. Install four guide rods as fig.9a previously.
(2) Remove bolts of side cover on the upper side casing only and loose bolt on the other side.
(3) Use vertically hoist and connect to hook bolts attached to upper casing.
(4) Remove all bolts holding upper and lower casing.
(5) Lift off upper casing with dowel bolt and slide upper casing along the guide rods smoothly.

Disassembly the entire pump

(1) Remove coupling connections.
(2) Remove side cover bolt and lift off the entire pump shaft smoothly by using vertically hoist as fig. 9b.
(3) Place rotating parts on wooden support and remove shaft coupling.
(4) Remove bolts for bearing unit and remove bearing unit from the shaft.
(5) Remove oil seal and housing.
(6) For gland packing type, remove bearing support, gland bolt and gland.
(7) Remove side cover smoothly to prevent mechanical seal damage.
(8) Remove mechanical seal or gland packing.
(9) Remove impeller nut or shaft sleeve.
(10) Remove impeller and liner ring.

Disassembly is now complete.

3. Check

(1) Check liner ring for contact, galling and water.
(2) Check for bent shaft (if liner ring contacts).
(3) Check impeller for corrosion, wear and cracks.
(4) Replace bearing unit if they show excessive wear.
(5) Check shaft sleeves if scratched or worn.
(6) It is recommended mechanical seal and oil seals be replaced once every year.

4. Assembly

(1) Assembly is in the reverse order of disassembly. Clean all parts with solvent and assemble after through checks for corrosion or scratches.
(2) During assembly replace all used gaskets.
(3) Securely tighten impeller nut set screw bolts and bearing nut.
(4) At mechanical seal assembly, special tool which provided by maker, should be used.

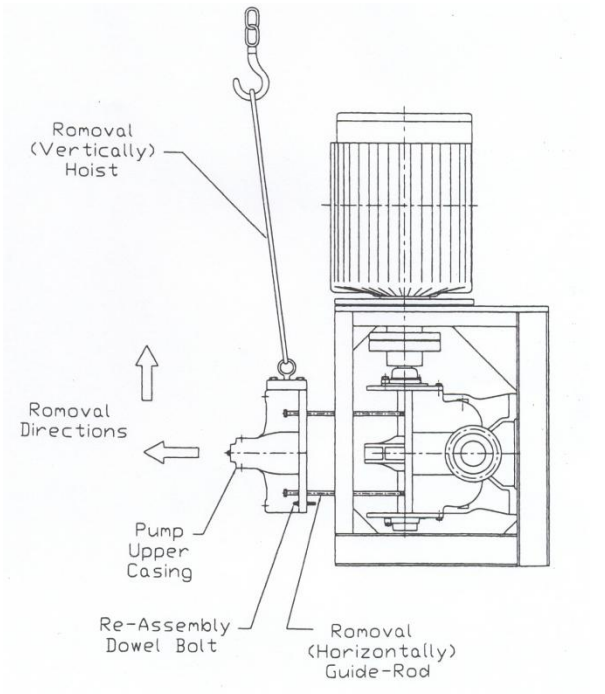


Fig. 9a

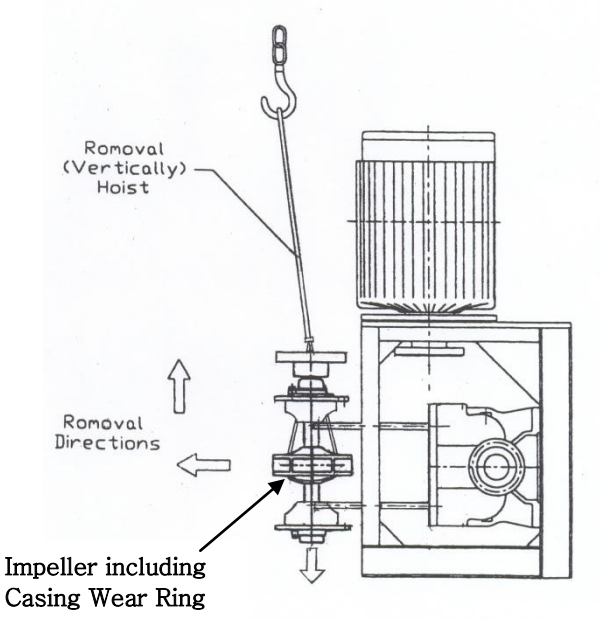


Fig. 9b

Troubleshooting

CAUTION

All service should be done by factory trained or qualified personal only.

Trouble	Causes	Countermeasures
Prime mover does not rotate or rotates with hum	• Defective prime mover • Defective power supply • Contacts, rust or seizure of rotating parts. • Foreign matter in motor	• Repair or replace • Check and repair • Manually rotate pump, disassemble clean, reassemble • Remove and clean or repair in specialist shop.
Pump is operating but there is no water discharge. Does not obtain specified discharge volume	• Incomplete, no prime. • Sluice valve closed, half open. • Actual head is higher than total head pump. • Excessive suction head.	• Prime. • Open sluice Valve. • Re-check plan. • Re-check plan.
Specified displacement not obtained	• Reverse rotation direction. • Low rotation speed. • No. of poles of motor differs. • Low voltage. • Foot valve or strainer clog. • Impeller clog. • Pipe clog. • Air lock in suction pipe. • Air suction. • Discharge pipe leak. • Impeller corrosion. • Excessive impeller wear. • Excessive liner ring wear. • Excessive pipe loss • Excessive liquid temperature. • Cavitation.	• Correct connections, referring to arrow indications. • Check with tachometer • Check nameplate. • Check power supply. • Remove foreign matter. • Remove foreign matter. • Remove foreign matter. • Remove air. • Check and repair suction pipe and shaft seal. • Check submersion depth at end of foot valve and suction pipe. • Check and repair. • Check liquid quality and repair. • Replace. • Replace. • Re-check plan. • Re-check plan. • Contact specialist.
Water pumped, but soon stops.	• Insufficient prime. • Air suction. • Air lock suction height. • Excessive suction head.	• Prime. • Check and repair suction pipe and shaft seal. • Re-connect piping. • Re-check plan.
Overload.	• Excessive rotation. • No. of poles of motor differs. • Voltage drop and considerable unbalance between phases. • Low head or excessive water flow. • Centering misalignment. • Foreign matter in pump • Liner ring wear. • Bearing damage. • Contact of rotating parts or bent shaft.	• Check with tachometer. • Check nameplate. • Contact company. • Reduce opening of discharge valve. • Center again. • Remove foreign matter. • Replace. • Replace. • Repair in specialist shop.

Bearing over heat.	• Insufficient lube oil. • Excessive lube oil. • Improper lube oil. • Deteriorated lube oil. • Contaminated lube oil. • Centering misalignment. • Bearing damage. • Excessive time cut-off operation.	• Replenish. • Reduce oil supply. • Replace bearing unit. • Replace bearing unit. • Replace bearing unit. • Center again. • Replace bearing unit. • Stop cut-off operation.
Pump vibrates. Excessive operating noises.	• Inadequate foundation. • Installation and centering failure. • Bearing damage. • Excessive water flow. • Discharge volume too small. • Impeller clog. • Reverse rotation. • Rotary part touches or bent shaft. • Cavitation. • Vibrating piping.	• Repair foundation. • Check installation and centering condition. • Replace bearing. • Reduce discharge valve opening. • Operate pump with specified flow. • Remove foreign matter. • Correct, referring to arrow. • Repair in specialist. • Contact specialist. • Modify piping.
Water leak from shaft seal	• Mechanical seal assemble failure. • Mechanical seal damage. • Shaft and mechanical seal damage. • Bent shaft.	• Mount mechanical seal correctly. • Replace. • Replace. • Repair in specialist shop.
Shaft coupling – rubber wear.	• Defective installation and centering. • Shaft coupling - rubber damage.	• Check and correct discrepancies. • Replace.