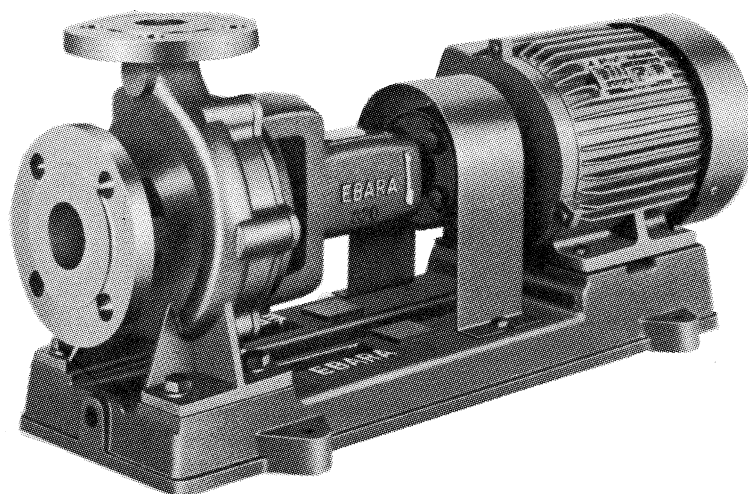


Instruction Manual

EBARA Stainless steel Volute Pumps

MODEL FSS



Introduction

Check the following points upon receipt of your pump:

- (1) Is the pump exactly what you ordered? Check the nameplate. **It is especially important that you check whether the pump is to be used with 50 or 60 Hz.**
- (2) Has any damage occurred during shipment? Are any bolts or nuts loose?

- (3) Have all necessary accessories been supplied? (For a list of standard accessories see **Construction.**)

We recommend that you keep a spare pump on hand in case of emergencies. Keep this instruction manual in a safe place for future reference.

Specifications

Check the nameplate for your pump's head (HEAD), discharge volume (QUANT.), and speed (SPEED). Other specifications are listed in the chart below.

	Standard	Optional
Liquid	Water, sea water, oil, liquid chemicals etc.	
Temperature	0 ~ 100°C (32 ~ 212°F)	
Viscosity	below 10 cSt	
Specific gravity	0.7 ~ 1.03	
Max. suction pressure	Please refer to "Dimensions"	
Re. NPSH	4m at 20°C (13 feet at 68°F) excepting... 100 × 80 50Hz...below 5m at 20°C (16.5 feet at 68°F) 60Hz...below 7m at 20°C (23 feet at 68°F)	
Installation	Indoors	
Materials		
Casing	18Cr.-8Ni. stainless steel castings (JIS Standard SCS13)	
Impeller	18Cr.-8Ni. stainless steel castings (JIS Standard SCS13)	
Shaft	304 Stainless steel (JIS Standard SUS304)	
Mechanical seal	—	Silicon carbide-carbon Silicon carbide-silicon carbide
Flange	JIS 10kgf/cm ² GR.F.	
Construction		
Nozzle position	End-suction, top-discharge	
Impeller type	Enclosed	
Stuffing box	Packing	Mechanical seal for temperature below 90°C (194°F)
Bearing	Self flushing Sealed ball bearings	External flushing oil bath

Note: Refer to the Standard Specifications if you have purchased a standard model. We also offer pumps with optional features according to customer demand.

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

Installation

1. Location

- (1) This pump should be installed indoors. If it is to be used outdoors, some type of roof or covering will be required to protect the pump from the weather.
- (2) Install where inspection and maintenance can be easily performed.
- (3) Provide suitable enclosure to prevent entry of unauthorized persons.

2. Piping

- (1) Use adequate support for suction and discharge piping to prevent pump and motor from being off-center.
- (2) A check valve must be installed between the pump and the discharge valve in the following cases: when suction piping is long; when actual head is high; when pump is automatic; when water is being pumped to pressure tank; and when two or more pumps are in parallel operation.
- (3) Install an air-release valve in piping to prevent the formation of air pockets due to construction. Note, however, that an air-release valve must not be installed where pressure may drop below atmospheric pressure since the valve may suck in air instead of expelling it.
- (4) To reduce effect of water hammer install such a device as a quick-closing check valve.
- (5) Suction system:
 - 1 The end of the suction piping should be submerged to a depth of **at least twice the diameter (D) of the piping**, and should be at a distance between 1 to 1.5 times the diameter of the piping from the bottom of the pit.
 - 2 Install a foot valve at the end of the suction piping to block the entrance of foreign matter.
 - 3 Suction piping should be inclined upward (over 1/100) in relation to the pump to prevent formation of air pockets. Pipe joints must be tight so that there will be no possibility of air suction.
 - 4 Keep suction piping as short and straight as possible. Do not attach a sluice valve.
 - 5 Suction pipe size suction reducer sizes should be as indicated in **Table 1**. Install the suction reducer as shown in **Fig. 1** to prevent the formation of air pockets. The suction reducer is available as an optional accessory.
- (6) For the influx system, we recommend that you install a cutoff valve on the suction piping to facilitate disassembly and inspection.

- (4) Install pump as close to water source as possible. Suction height (height from surface of liquid to center of pump) should be as low as possible, and suction piping should be short.
- (5) Suction head should be less than 6 meters (50Hz: 5m, 60Hz: 3m for 100 × 80mm diameter). In certain cases, such as with hot water, suction head must be lower. To minimize suction piping loss, excessive use of elbows and valves should be avoided.

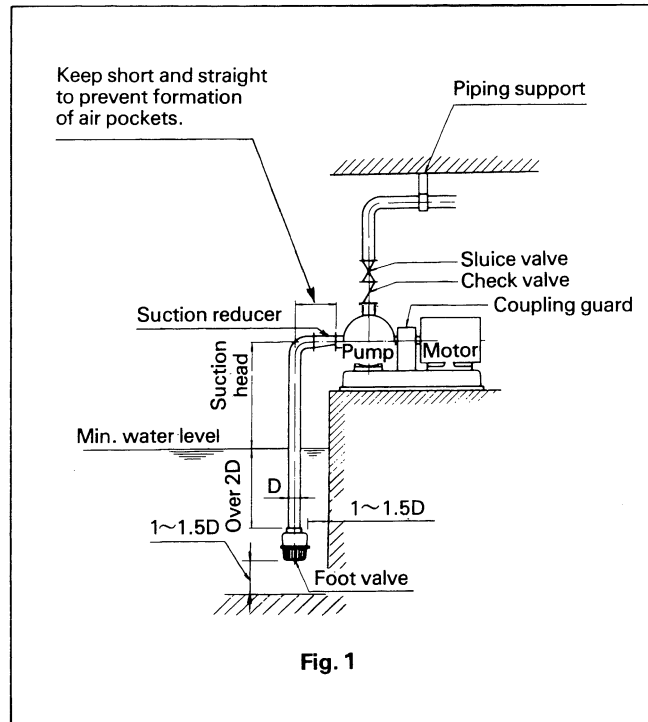


Fig. 1

Pump size	Foot valve suction pipe size	Suction reducer size
40 × 32	40	—
50 × 40	50	—
65 × 50	65	—
80 × 65	100	100 × 80
100 × 80	125	125 × 100

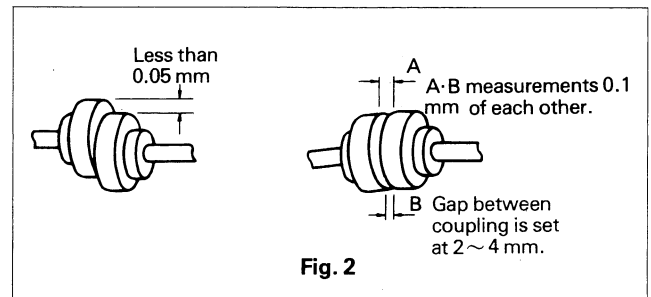
Table 1.

3. Centering

Though the pump and driver have been centered in the factory, the common bed may be distorted when the foundation bolts are inserted during installation. Adjust by placing tapered liners underneath the bed, and **center so that the shaft coupling is within the range indicated in Fig. 2.**

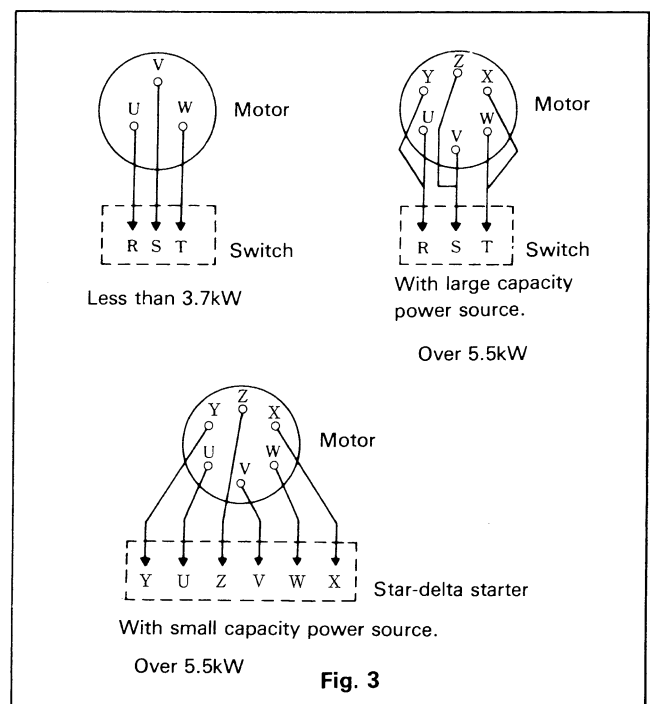
To center a pump which has been purchased without a driver and which is to be directly driven, insert liners under the driver, and **center so that the shaft coupling is within the range indicated in Fig. 2.**

The coupling guard must be removed to make centering adjustments. Be sure to replace before beginning operation.



4. Electrical Wiring

- (1) Refer to **Fig. 3** for correct wiring. It is important that wiring be correct and that motor is properly grounded.
- (2) Check the following points before turning on operation switch.
 - 1 Is the fuse the right type?
 - 2 Is the wiring correct?
 - 3 Has motor been grounded?
 - 4 With a three-phase motor, check for a loose or completely detached connection. Operating on only two terminals will result in phase omission, causing motor burn out.
- (3) Terminal voltage in motors bearing the EBARA nameplate may be within $\pm 10\%$ of the rated voltage. Exceeding this range will lead to breakdown.
- (4) Overloading the motor beyond the prescribed limit will reduce its efficiency, is not economical and will eventually lead to motor malfunction. We recommend that a protective motor relay be installed to prevent burnout caused by overloading.



Operation

1. Before starting

To rotate by hand, remove the motor end cap and turn slot on shaft end with a screwdriver.

- (1) Ensure lubricating oil is to the specified level on the oil level gauge. Use ISO VG46(JIS K2213 turbine oil). **[OIL BATH TYPE]**
- (2) Turn pump by hand to check for smooth rotation. If movement is sluggish or uneven, components inside the pump may be rusted or the gland packing may be too tight.
- (3) Remove the coupling bolts and briefly operate the motor alone to check rotation direction. The pump should rotate in a clockwise direction when seen from the motor side.
Replace coupling bolts after inspection is completed.
- (4) Prime the pump. Operating the pump without prime will cause breakdown.
Open air-release valve and prime pump. If the piping is already full of water the pump can be supposed to be filled up to the discharge outlet, open the suction valve, discharge valve and air-release valve to prime.
- (5) Rotate the pump by hand when priming to remove internal air from casing.

2. Operation

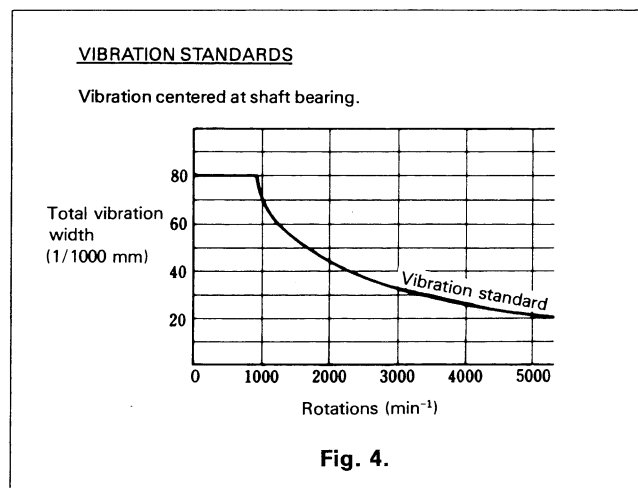
- (1) Close the air-release valve and discharge valve after priming has been completed. If there is a suction valve, open completely.
- (2) Turn operation switch on and off two or three times to check operating condition. Attach shaft coupling guard after operation check has been completed.
- (3) Begin continuous operation and gradually open discharge valve.
- (4) Check that pressure, current, vibration and noise (refer to Maintenance) are at normal levels. Both the pressure gauge and compound gauge cocks should be kept closed except at specified times. Leaving them open may lead to malfunction.
- (5) If there is no check valve on the discharge piping, close the discharge sluice valve slowly when stopping pump operation. Turn off operation switch after the sluice valve has been completely closed.
- (6) Subsequent operation can proceed without checks, if all conditions are normal.

Maintenance

Ensure that pump operation switch is off before making inspections; the pump may suddenly start if it is an automatic operation type.

1. Daily inspection

- (1) Pressure or current variations, abnormal vibration or noise are signs of malfunction. Refer to **Troubleshooting** and make necessary repairs as soon as possible. We recommend that you keep a record of daily operating conditions so that you will be able to detect early signs of trouble.
- (2) Use ISO VG46(JIS K2213 turbine oil).
Replace lubricating oil 300 hours after trial operation. Replace lubricating oil once every 3 months, or as required, according to oil conditions hereafter. Monitor the bearing casing level gauge, and replenish lubricating oil if oil is at the lower limit of the gauge. (Remove the air vent cap on the top of the bearing casing and supply lubricating oil). **[OIL BATH TYPE]**
- (3) The maximum allowable bearing operating temperature should not exceed 80°C.
- (4) **For mechanical seal type:**
Normally, there is almost no water leakage. If small water leakage is perceived during start operation, it will be reduced after operation has continued for a while.
If leakage does not end, stop operation and check.



For packing type:

Make sure that water drops appropriately (20ml/min). If water leakage increases during operation, re-tighten packing press. Gland packing should not be excessively or onesidedly tightened.

- (5) **Fig. 4.** indicates the normal level of vibration when installation and piping are correct. Excessive vibration may be due to such conditions as incorrect centering, defective piping or loose foundation bolts. Inspect carefully.

2. Carefully observe the following points:

- (1) Operating the pump for an extended period of time with the discharge valve closed will eventually cause pump components to be damaged. Care should, therefore, be taken.
- (2) Too frequent starting and stopping of the pump will eventually cause damage. Keep pump starting frequency to a minimum.
- (3) Be sure to turn off operation switch in event of power failure. It is dangerous to leave the switch on as the pump will suddenly start when power is restored.

3. Carefully observe the following when the pump is to be stored or remains idle for any length of time.

- (1) Water remaining inside an idle pump will freeze in cold weather and cause the pump casing to burst. **Be sure to insulate pump or drain water completely.**
- (2) Operate any auxiliary pumps occasionally to maintain best usable condition.

4. Replaceable parts

- (1) Replace parts indicated in following chart as necessary.

Replaceable part	Packing	Mechanical seal	Coupling rubber	ball bearings	"O" ring
Replacement guide	When no longer able to control leakage.	When there is leakage	When rubber is no longer effective When rubber shows sign of wear When wear is uneven	When there is an abnormally loud sound	Whenever disassembling for inspection
Average replacement frequency	Annually	Annually	Annually	Once every 2 to 3 years	—

Replaceable part	Shaft sleeve	Oil seal
Replacement guide	When sleeve surface is worn	When lubricating oil leaks
Average replacement frequency	Once every year	Once every year

(SHAFT SLEEVE TYPE) (OIL BATH TYPE)

The above average replacement frequency is for normal operating conditions.

- (2) The replaceable parts for this pump are as follows: (STANDARD)

Model	"O" ring	Packing × 4	Mechanical seal	Sealed ball bearings × 2
40 × 32FSSF	φ3 × φ155	20 × 36 × 8 [□]	φ20	6304ZZ
40 × 32FSSG	φ3 × φ185	20 × 36 × 8 [□]	φ20	6304ZZ
50 × 40FSSE	φ3 × φ155	20 × 36 × 8 [□]	φ20	6304ZZ
50 × 40FSSF	φ3 × φ155	20 × 36 × 8 [□]	φ20	6304ZZ
50 × 40FSSG	φ3 × φ185	20 × 36 × 8 [□]	φ20	6304ZZ
50 × 40FSSH	φ3 × φ225	25 × 41 × 8 [□]	φ25	6305ZZ
65 × 50FSSE	φ3 × φ155	20 × 36 × 8 [□]	φ20	6304ZZ
65 × 50FSSF	φ3 × φ165	20 × 36 × 8 [□]	φ20	6305ZZ
65 × 50FSSG	φ3 × φ185	20 × 36 × 8 [□]	φ20	6305ZZ
65 × 50FSSH	φ3 × φ225	25 × 41 × 8 [□]	φ25	6305ZZ
65 × 50FSSJ	φ3 × φ275	25 × 41 × 8 [□]	φ25	6305ZZ
80 × 65FSSF	φ3 × φ165	25 × 41 × 8 [□]	φ25	6305ZZ
80 × 65FSSG	φ3 × φ185	25 × 41 × 8 [□]	φ25	6305ZZ
80 × 65FSSH	φ3 × φ225	25 × 41 × 8 [□]	φ25	6305ZZ
100 × 80FSSF	φ3 × φ165	25 × 41 × 8 [□]	φ25	6305ZZ
100 × 80FSSG	φ3 × φ185	25 × 41 × 8 [□]	φ25	6305ZZ

Coupling bolts

Coupling dia.	100	112	125	140	160	180	200	224	250	280
CLAB-()	10	10	14	14	14	14	20	20	25	28
Number	4	4	4	6	8	8	8	8	8	8

Ex. for coupling dia. 140 use CLAB-14 × 6

Troubleshooting

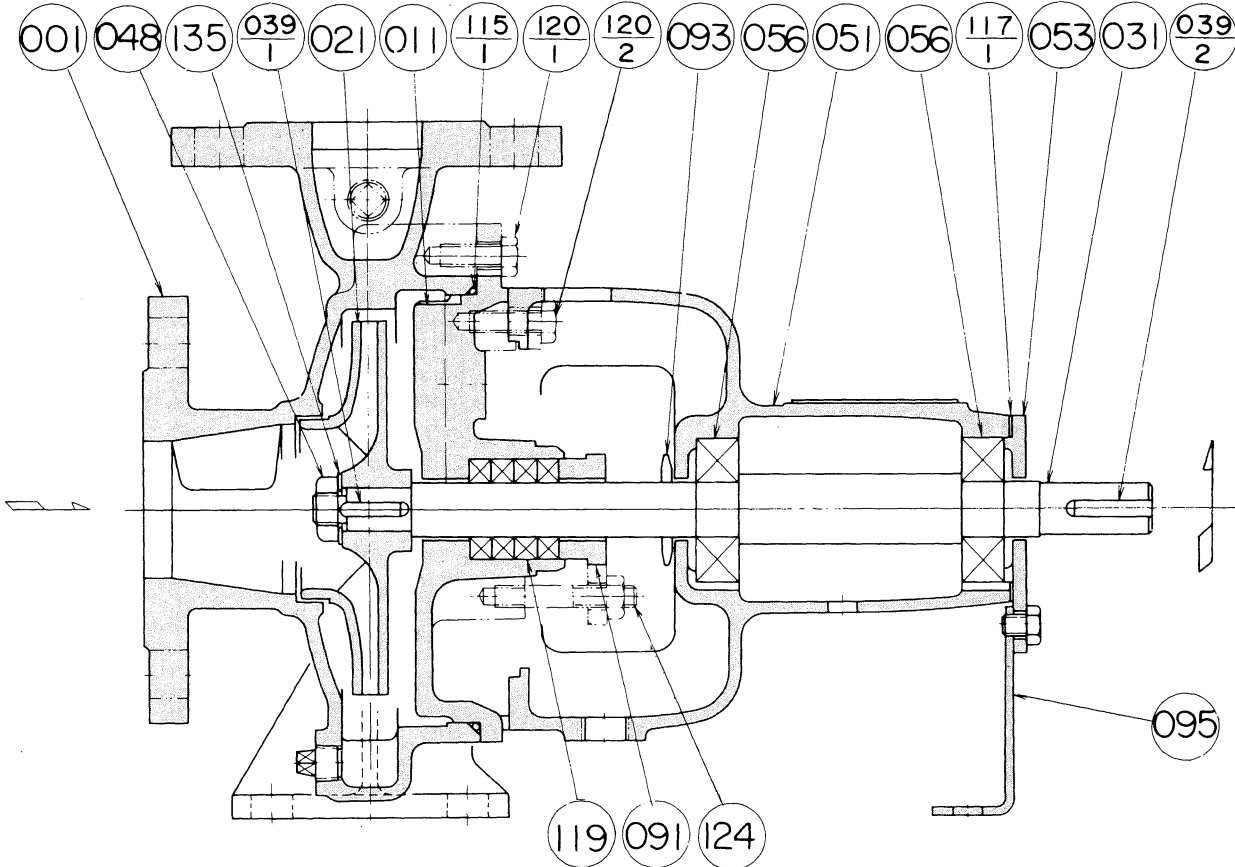
Trouble	Cause	Remedy
Motor does not start.	(1) Motor malfunction. (2) Power source malfunction. (3) Rotating parts in contact, rusted, burnt out. (4) Foreign matter clogging contacting parts	(1) Repair motor. (2) Inspect, repair, or consult power company. (3) Manually rotate. Reassemble. Have repaired in specialist shop. (4) Remove foreign matter
Pump is operating but there is no water discharge. Does not obtain specified discharge volume.	(1) Pump not primed. (2) Valve closed, insufficiently open. (3) Excessive piping loss. (4) Suction height too high for pump. (5) Cavitation. (6) Rotation direction reversed. (7) Rotation speed low. • Wrong number of poles in motor. • 60Hz pump being used in 50Hz area. • Voltage drop. (8) Impeller clogged. (9) Piping clogged. (10) Air suction. (11) Foot valve or suction piping end not submerged sufficiently. (12) Discharge piping leakage. (13) Impeller corroded. (14) Impeller worn. (15) Casing ring worn. (16) Liquid temperature too high. Volatile liquid.	(1) Prime. (2) Open valve. (3) Re-examine original plan. (4) Re-examine original plan. (5) Consult specialist. (6) Correct rotation direction. (7) Check with tachometer. • Check nameplate and change. • Check nameplate and change. • Check power source and remedy. (8) Remove foreign matter. (9) Remove foreign matter. (10) Inspect, repair suction piping, shaft sealing. (11) Extend suction piping and submerge end to sufficient depth. (12) Inspect, repair. (13) Check quality of liquid and consult specialist. (14) Replace impeller. (15) Replace casing ring. (16) Re-examine original plan.
Water discharges but soon stops	(1) Head low. Excessive volume flow. (2) Air suction. (3) Air pockets in suction piping. (4) Suction height too high for pump.	(1) Prime sufficiently. (2) Inspect, repair suction piping, shaft sealing. (3) Reinstall piping. (4) Re-examine original plan.
Overloads(overcurrent).	(1) Head low. Excessive volume flow. (2) Rotation speed low. • Wrong number of poles in motor. • 50Hz pump being use in 60Hz area. (3) Rotation parts in contact. Shaft bent. (4) Liquid density, viscosity too high.	(1) Partially close discharge valve. (2) Check with tachometer. • Check nameplate and change. • Check nameplate and change. (3) Have repaired in specialist shop. (4) Re-examine original plan.
Bearing overheats.	(1) Bearing damaged. (2) Excessive pump operation with discharge valve insufficiently opened.	(1) Replace bearing. (2) Open sufficiently.
Pump vibrates. Excessive noise.	(1) Piping vibration. (2) Rotation direction reversed. (3) Coupling rubber worn. (4) Rotating parts in contact. Shaft bent. (5) Cavitation. (6) Excessive discharge volume. (7) Insufficient discharge volume. (8) Excessive pump operation with discharge valve insufficiently open.	(1) Reinforce piping support. (2) Check with arrow and rewire. (3) Replace coupling rubber. (4) Have repaired in specialist shop. (5) Consult specialist. (6) Partially close discharge valve. (7) Operate at specified flow level. (8) Open sufficiently
Excessive leakage from from shaft seal.	(1) Damaged mechanical seal. (2) Excessive influx pressure. (3) Incorrect installation of packing. (4) Damaged packing. (5) Shaft or sleeve worn. (6) Excessive influx pressure. (7) Shaft bent. (8) Excessive water flushing pressure.	(1) Replace mechanical seal. (2) Re-examine original plan. (3) Reinstall. (4) Replace packing. (5) Replace with new parts. (6) Re-examine original plan. (7) Have repaired in specialist shop. (8) Adjust to appropriate pressure.
Shaft sealing overheats.	(1) Packing too tight. (2) Paking tightened unevenly. (3) Inappropriate water flushing pressure, volume. (4) Shaft sleeve worn. (5) Lantern ring positioned incorrectly. (6) Excessive influx pressure.	(1) Adjust. (2) Adjust. (3) Adjust to correct pressure and flow. (4) Replace with new part. (5) Correct position. (6) Re-examine original plan.

Construction

1. Sectional view

This drawing represents one of the standard model FSS.
There may be some variations according to model.

Packing type (standard)

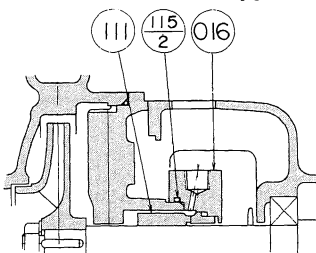


PART NO.	PART NAME	PART NO.	PART NAME
001	CASING	056	BALL BEARING
011	CASING COVER	093	DEFLECTOR
021	IMPELLER	095	STAY
031	SHAFT	115-1	"O" RING
039-1	KEY	117-1	GASKET
039-2	KEY	120-1	BOLT
048	IMPELLER NUT	120-2	BOLT
051	BEARING CASING	135	WASHER
053	BEARING COVER		

Packing type (standard)

PART NO.	PART NAME
091	GLAND
119	PACKING
124	GLAND BOLT

Mechanical seal type (optional)



PART NO.	PART NAME
016	MECHANICAL SEAL COVER
111	MECHANICAL SEAL
115-2	"O" RING

2. Standard accessories

- [Bare shaft pump]
- Casing drain plug 1
- [With motor]
- Common base 1
- Coupling 1set
- Coupling guard 1

Disassembly and Assembly

1. Disassembly

When disassembling pump, have a piece of cardboard or plywood ready to place the parts on as you work. Do not pile parts on top of each other. They should be laid out neatly in rows the "O" ring and gasket can not be used again once they are removed. Have replacement parts ready.

Disassemble in the following order, referring to the sectional view.

Be sure to cut off power source before beginning disassembly.

- (1) Drain all water from casing and drain oil from bearing housing.
- (2) Remove the motor from the common base. Inspect shaft coupling rubber and replace if excessively worn.
- (3) Remove the casing cover bolts, and remove casing cover and shaft bearing frame from casing. You will now be able to inspect the inside of the pump. Check for wear and other abnormal signs. Replace casing ring when wear approaches 1 mm.
- (4) Remove impeller nut (right hand thread) and impeller washer (some models do not have one), and remove impeller from casing. If the impeller is rusted and will not come loose, tap its end lightly with a wooden hammer to release.
- (5) Remove the impeller key from the main shaft (some models do not have a key), the casing cover from the shaft bearing frame, and the deflector from the main shaft.

Mechanical seal type:

Remove the nuts securing the mechanical seal cover.

Raise the cover and move to the end of the bearing casing side.

Remove the casing cover from the bearing casing, and the set screws of the rotating ring on the main shaft. Slowly draw the mechanical seal off the main shaft, together with the fixed ring inside.

Gland packing type: Remove the packing gland from the casing cover and take out the packing and lantern ring bushing. (Some models do not have a lantern ring bushing).

- (6) Remove the shaft bearing cover from the shaft bearing frame and take out the main shaft. Inspect condition of the shaft bearing and replace if it does not rotate smoothly.

2. Assembly

Re-assemble in reverse order of disassembly.

Re-assemble of the following points.

- (1) Gland packing type: Replace gland packing with new packing, shifting joints 180° until last joint is on the bottom.
Mechanical seal type: Wipe contacting part of mechanical seal with a dry cloth.
- (2) Replace "O" ring with a new one.
- (3) Replace all parts that are excessively worn or damaged.
- (4) Tighten all bolts evenly.

Please obtain "O" rings, gland packings and other parts from pump dealer. The table of dimensions is given in "Maintenance".

* All specifications subject to change without notice.

In this catalog, the particulars in { } are in accordance with the International System of Units (SI) and given for reference only.

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