



INSTRUCTION MANUAL

EBARA END SUCTION VOLUTE PUMP

Model FSA



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Safety Information and Introduction

WARNING



Before handling this pump, always disconnect the power first. No open flame or use spark able 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.

Design of this EBARA pump is based on superior engineering and long experience. To prevent trouble and provide satisfactory operation and long life, it is important to understand the EBARA pump thoroughly by careful study of this manual. If any questions arise regarding this manual, please direct them to your local EBARA representative.

Specification

CAUTION

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

Check the following points upon receipt of your pump:

- (1) 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 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.

Description		Standard		Optional			
		2 poles model	4 poles model	2 poles model	4 poles model		
Liquid	Name	Clean water					
	Temperature	0 to 100 °C (32 to 212 °F)					
Max. Working Pressure		10 bar (10.2 kgf/cm ²) for standard flange JIS 10K RF 16 bar (16.3 kgf/cm ²) for standard flange JIS 16K RF		16 bar (16.3 kgf/cm ²)			
Synchronous Speed		3000 min ⁻¹	1500 min ⁻¹				
Installation		Indoors		Outdoors			
Construction	Impeller	Enclosed					
	Shaft seal	Mechanical seal		Gland Packing			
	Sealing	Self flushing		External flushing			
	Bearing	Sealed ball bearing		Oil bath (some models only)			
Flange	Suction & Discharge	Suction < φ 150 mm, except 100x65 FSKA : JIS 10K RF 100x65 FSKA : JIS 16K RF		16 bar : JIS 16K RF; DIN PN-16 DIN PN-16			
		Suction = φ 150 mm, except below models : JIS 10K RF 150x100 FSKA; 150x100 FSNA : JIS 16K RF		16 bar : JIS 16K RF; DIN PN-16 DIN PN-16			
		Suction = φ 200 mm, except below models : JIS 10K RF 200x150 FSLA; 200x150 FSNA : JIS 16K RF		16 bar : JIS 16K RF; DIN PN-16 DIN PN-16			
		Suction = φ 250 : JIS 16K RF		DIN PN-16			
		Casing		Cast Iron		Ductile Cast Iron (FCD)	
		Material	Impeller	Bronze Casting (CAC406/BC6)		Cast iron; Ductile Cast Iron (FCD)	
Shaft	403 Stainless steel		304; 316 Stainless steel				
Seal	Mechanical Seal: Ceramic/Carbon/NBR		Gland Packing : Teflon (PTFE) impregnated				
			Mechanical Seal : SiC/SiC				
Accessories	Bare shaft			Priming funnel ; valve; Companion Flange			
	With motor	Common base, Coupling, Coupling guard		Priming funnel ; valve; Companion Flange			

Note : Refer to the Standard Specification 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 specification on the use of your pump.

Installation

Check the following before beginning installation:



WARNING

Before insulation resistance measurement, always disconnect the power first.

All electric work should be performed by a qualified electrician and all national and local electrical codes must be observed.

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.
- (4) Install pump as close to water source as possible. Suction head (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 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.

2. Piping

- (1) Use adequate support for suction and discharge piping to prevent pump and motor from becoming 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 unavoidable 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 effects 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 diameters 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 1/1000 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 sizes and 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 a separate special accessory.

- (6) For the influx system, we recommend that you install a cutoff valve on the suction piping to facilitate disassembly and inspection.

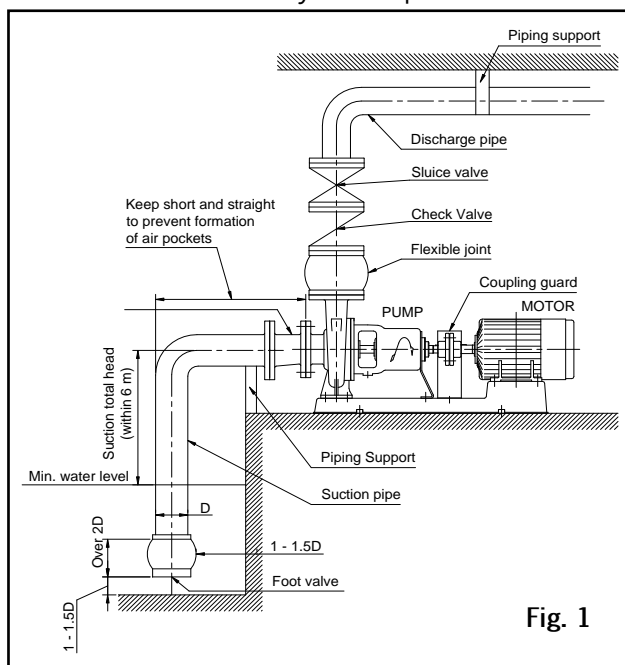


Fig. 1

Model	Foot valve, suction pipe size	Suction reducer size
50 x 40 FSA	50	-
65 x 50 FSA	65	-
80 x 65 FSA	100	100 x 80
100 x 80 FSA	125	125 x 100
100 x 65 FSA		
125 x 100 FSA	150	150 x 125
150 x 125 FSA	200	200 x 150
150 x 100 FSA		
200 x 150 FSA	300	300 x 200
250 x 200 FSA		

Table 1.

Installation

3. Centering

Though the pump and driver have been centered in the factory, the common base 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 that has been purchased without a driver and which is to be directly driven, insert liners under the drive, and center so that the shaft coupling is within the range indicated in Fig. 2.

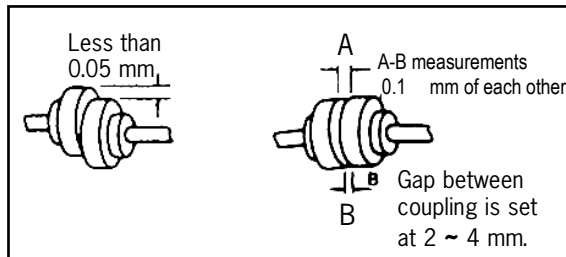


Fig. 2

! CAUTION

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

! 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. Correct rotation is clockwise when viewed from motor side. Read ELECTRICAL WIRING.

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 notional and local electrical codes must be observed.

- (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 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.

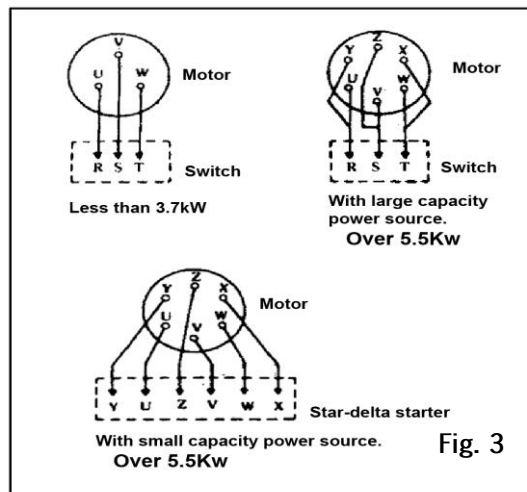


Fig. 3

Operation

1. Before starting

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

- (1) 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.
- (2) 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.

- (3) 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.
- (4) Rotate the pump by hand when priming to remove internal air from casing.

2. Operation :



Check rotation. Correct rotation is clockwise when viewed from top of motor.
Pump should be started with gate valve closed, then the operator should open the valve gradually.

- (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 and service**) are at normal levels. Both the pressure gauge
- (5) 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 and Service



WARNING

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

Check pressure, output, voltage, current, vibration, and other specifications. Unusual readings may indicate a problem requiring immediate service. Contact your local EBARA representative as soon as possible.

Ensure that pump operation switch is off before making inspections; the pump may suddenly start if it is 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) The maximum allowable bearing operating temperature should not exceed 80 °C.
- (3) There should be no leakage if shaft sealing mechanical seal is normal. Replace entire seal if there is leakage. Gland packing leakage should be kept down to a steady drip or trickle (approx. 20 ml/min.) Do not tighten excessively or unevenly, or when pump is stopped.
- (4) Fig. 4 indicates the normal level of vibration when installation and piping are correct. Excessive vibration may be due to conditions such as *15 (incorrect centering,) defective piping or loose foundation bolts. Inspect carefully.

In the event that special vibration control measures are necessary, EBARA has the following available upon request: (the EBARA vibration absorber) the EBARA Flex (a flexible joint) and the EBARA pipe silencer (pressure pulsation absorber).

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 remain 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.

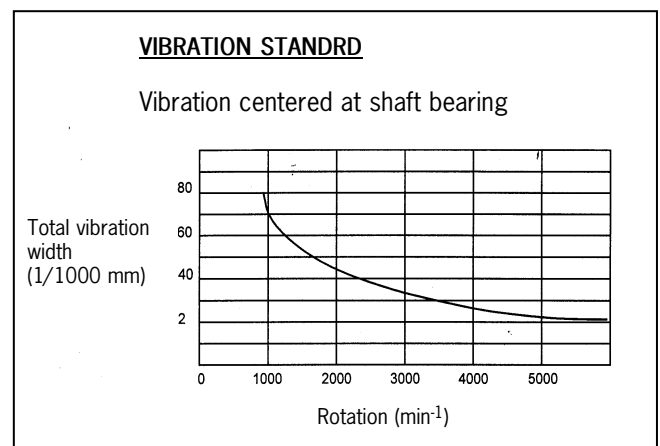


Fig. 4

4. Replaceable parts

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

Replaceable part	Packing	Mechanical Seal	Coupling rubber	Sealed ball bearing	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 or grease flow.	Whenever disassembling for inspection.
Average replacement frequency	Annually	Annually	Annually	Once every 2 to 3 years	-

The above average replacement frequency is for normal operating conditions.

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

Packing, mechanical seal, and O-ring

Model	Mechanical Seal	O-Ring/ Gasket	Gland Packing Size mm	Qty of Gland Packing	Ball Bearing
50x40 FSHA	EA-262-25	Gs-225	41x25x8	4	6305 ZZ
65x50 FSHA	EA-262-25	Gs-225	41x25x8	4	6305 ZZ
65x50 FSJA		Gs-275			
80x65 FSGA	EA-262-25	Gs-180	41x25x8	4	6305 ZZ
80x65 FSHA		Gs-225			
80x65 FSJA	EA-262-35	Gs-275	51x35x8		6307 ZZ
80x65 FSKA		Gs-335			
100x65 FSKA	EA-262-40	Gs-335	56x40x8	4	6208 ZZ
100x80 FSGA	EA-262-25	Gs-275	41x25x8	4	6305 ZZ
100x80 FSHA	EA-262-35	Gs-225	51x35x8		6307 ZZ
100x80 FSJA		Gs-275			
100x80 FSGCA	EA-262-35	Gs-185			
100x80 FSHCA		Gs-225			
125x100 FSJCA	EA-262-40	Gs-275		56x40x8	
125x100 FSKA	EA-262-35	Gs-335	51x35x8	4	6307 ZZ
125x100 FSLA	EA-262-45	Gs-425	65x45x10	5	6309 ZZ
150x100 FSKA	EA-262-50	370x320x0.8T	70x50x10	4	6310 ZZ
150x100 FSNA	EA-262-55	560x515x0.8T	75x55x10	5	6312 ZZ
150x125 FSHA	EA-262-35	Gs-225	51x35x8	4	6307 ZZ
150x125 FSJA		Gs-275			
150x125 FSKA	EA-262-45	Gs-335	65x45x10	5	6309 ZZ
150x125 FSLA		Gs-425			
200x150 FSHA	EA-262-35	Gs-225	51x35x8	4	6307 ZZ
200x150 FSJA	EA-262-45	Gs-275	65x45x10	5	6309 ZZ
200x150 FSKA	EA-262-55	Gs-335	75x55x10		6312 ZZ
200x150 FSLA		450x415x0.8T			
200x150 FSNA	EA-262-65	560x515x0.8T	90x65x12.5	5	6313 ZZ
250x200 FSLA	EA-262-65	480x440x0.8T	90x65x12.5	5	6313 ZZ
250x200 FSNA	EA-262-75	615x550x0.8T	104x75x14.5		6315 ZZ

Coupling bolts

Coupling dia.	100	112	125	140	160	180	200	224	250	280	315
CLAB()	10	10	14	14	14	14	20	20	25	25	28
Number	4	4	4	6	8	8	8	8	8	8	10

Example for coupling dia. 140 use CLAB-14x6

Troubleshooting



CAUTION

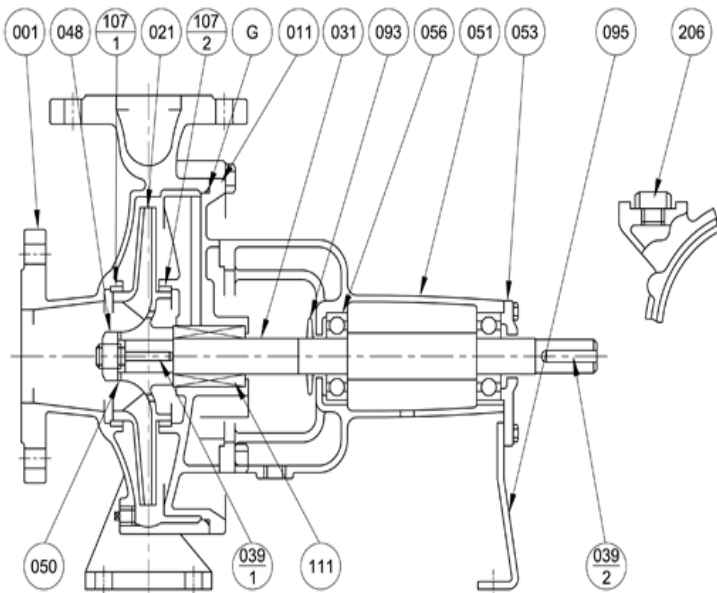
All service should be done by factory trained or qualified personnel only.

Trouble	Cause	Remedy
Motor does not start	<ol style="list-style-type: none"> (1) Motor malfunction. (2) Power source malfunction. (3) Rotating parts in contact, rusted, burnt out. (4) Foreign matter clogging contacting parts. 	<ol style="list-style-type: none"> (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	<ol style="list-style-type: none"> (1) Pump not primed. (2) Valve closed, insufficiency open. (3) Excessive piping loss. (4) Suction height too high for pump. (5) Cavitations. (6) Rotation direction reserved. (7) Rotation speed low. <ul style="list-style-type: none"> • Wrong number of poles in motor. • 60 Hz pump being used in 50 Hz 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. 	<ol style="list-style-type: none"> (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. <ul style="list-style-type: none"> • 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 Discharge but soon stops	<ol style="list-style-type: none"> (1) Insufficient priming. (2) Air suction. (3) Air pocket in suction piping. (4) Suction height too high for pump. 	<ol style="list-style-type: none"> (1) Prime sufficiently. (2) Inspect, repair suction piping, shaft sealing. (3) Reinstall piping. (4) Re-examine original plan.
Overloads (over current)	<ol style="list-style-type: none"> (1) Head low. Excessive volume flow. (2) Rotation speed low. <ul style="list-style-type: none"> • Wrong number of poles in motor. • 50 Hz pump being used in 60 Hz area. (3) Rotating parts in contact. Shaft bent. (4) Liquid density, viscosity too high. 	<ol style="list-style-type: none"> (1) Partially close discharge valve. (2) Check with tachometer. <ul style="list-style-type: none"> • Check nameplate and change. • Check nameplate and change. (3) Have repaired in specialist shop. (4) Re-examine original plant.
Pump vibrates Excessive noise.	<ol style="list-style-type: none"> (1) Piping vibration. (2) Rotation direction reserved. (3) Rotating parts in contact. Shaft bent. (4) Cavitations. (5) Excessive discharge volume. (6) Insufficient discharge volume. (7) Excessive pump operation with discharge valves insufficiently open. 	<ol style="list-style-type: none"> (1) Reinforce piping support. (2) Check with arrow and rewire. (3) Have repaired in specialist shop. (4) Consult specialist. (5) Partially close discharge valve. (6) Operate at specified flow level. (7) Open sufficiently.
Excessive leakage from shaft seal.	<ol style="list-style-type: none"> (1) Damage 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. 	<ol style="list-style-type: none"> (1) Replace piping support. (2) Re-examine original plan. (3) Reinstall. (4) Replace packing. (5) Replace with new parts. (6) Re-examine original plan. (7) Have repaired in special shop. (8) Adjust to appropriate pressure.
Shaft sealing overheats	<ol style="list-style-type: none"> (1) Packing too tight. (2) Packing tightened unevenly. (3) Inappropriate water flushing pressure, volume. (4) Shaft sleeve worn. (5) Lantern ring positioned incorrectly. (6) Excessive influx pressure. 	<ol style="list-style-type: none"> (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

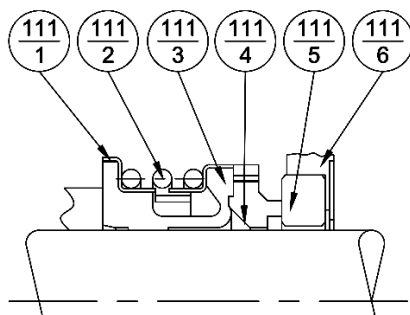
1. Sectional View

This drawing represents standard model FS. There may be some variations according to model.



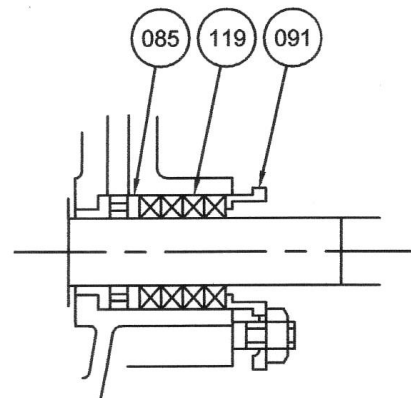
G	O-Ring	Rubber	1	
206	Plug	Steel		
111	Mechanical Seal	-		
107-2	Casing Ring	Bronze		
107-1	Casing Ring			
095	Bearing Support	Steel		
093	Deflector	Rubber		
056	Ball Bearing	-		2
053	Bearing Cover	Cast Iron		
051	Bearing Housing			
050	Impeller Nut Washer	Brass		
048	Impeller Nut			
039-2	Coupling Key	Stainless Steel		
039-1	Impeller Key			
031	Shaft			
021	Impeller	Bronze		
011	Casing Cover	Cast Iron		
001	Casing			
No.	Part Name		Material	Qty

Mechanical Seal Type (Standard)



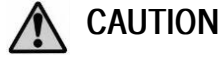
111-6	Cup Gasket	NBR	1
111-5	Mating Ring	Ceramic	
111-4	Seal Ring	Carbon	
111-3	Bellows	NBR	
111-2	Coil Spring	Stainless Steel	
111-1	Spring Holder		
No.	Part Name	Material	Qty

Gland Packing Type (Option)



119	Gland Packing	-	4 or 5
091	Lantern Ring	Bronze	
085	Lantern Ring Bushing		
No.	Part Name	Material	Qty

Disassembly and Assembly



All Service should be done by factory trained or qualified personnel only.
Be sure to cut off power source before beginning disassembly.

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 cannot 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.
- (2) Remove the motor from the common base. Inspect shaft coupling rubber and replace if excessively worn.

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.

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: At this point in

disassembly, the fixed portion of the mechanical seal is attached to the casing cover and the rotating portion to the main shaft. The fixed portion of the mechanical seal can be removed by pushing it out of the shaft hole in the casing cover with a screw driver of similar tool.

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 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 packing and other parts from pump dealer. The table of dimensions is given in "**Maintenance**".

Disposal

 Warning	<p>When handling chemicals, consult material safety data sheets (MSDSs) and other data to study the handling method, protective equipment to be used, precautions for disposal and so on, wear appropriate protective equipment and carry out work in a safe manner while observing other precaution instructions. Otherwise, there is a risk of burns, fire, and environmental impact.</p>	
 Warning	<p>When chemical waste is generated during the disassembly or cleaning of the pump, consult material safety data sheets (MSDSs) to study the method of disposal, and dispose of it in accordance with laws and local regulations, for example by employing a contractor specialized in chemical waste disposal.</p>	
Note	<p>After installation, have unneeded packaging disposed of by a specialist disposal company.</p>	

When the pump will be permanently stopped and dismantled, the various materials composing it should be properly disposed of. It is important to make sure that no residual polluting liquids and lubrication (grease or oil) are trapped within the pump. The materials used in pump construction are:

- Steel, stainless steel and cast iron.
- Rubber and plastic.
- Bronze and brass.
- Grease or oil (lubrication).
- Electronic waste.

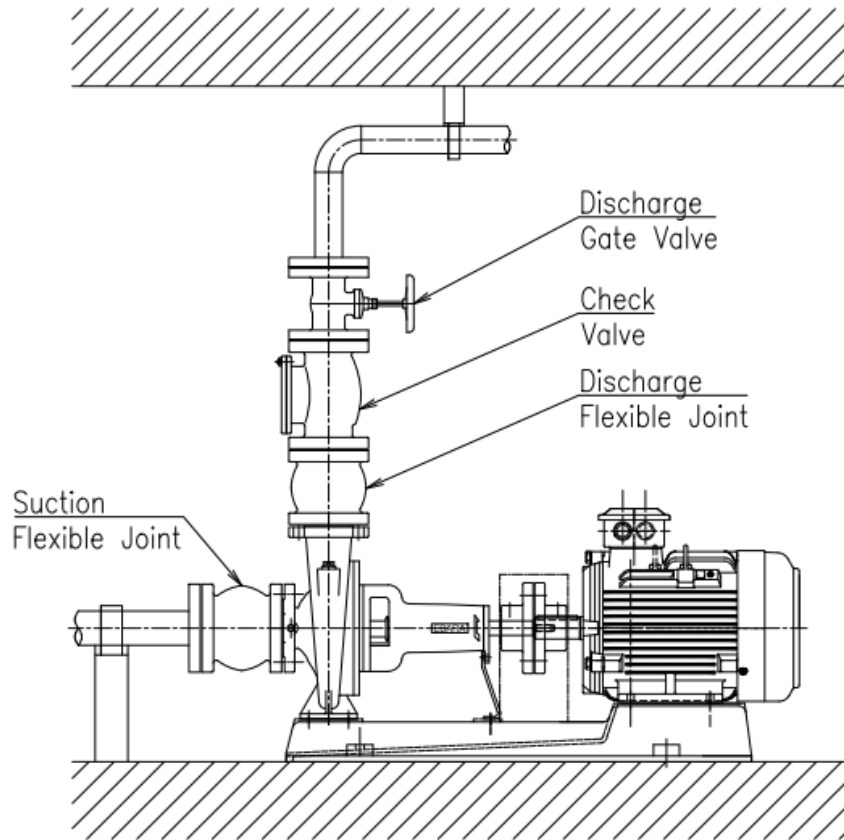
The disposal of polluting liquids and materials should follow current environmental regulations. Environment protection is an increasingly pressing problem.

Read the instructions carefully before using the appliance for the first time. It is recommended that you do not use this product for any purpose other than that for which it was intended; there is danger of electric shock if used improperly.

MEMO :

Additional Information

Recommended installation pipe for positive suction pressure.



Install a flexible pipe joint to absorb noise, vibration and almost all of the reaction force in piping system.

MEMO :

All specifications are subject to change without notice

