NISHIGAKI PUMP OPERATION MANUAL
FOR "CASSETTE PUMP"

[FSD-20・25
FS -20・25]

- Thank you for your purchase of a Nishigaki Pump.
  Please read this manual thoroughly before using your pump.
- Please arrange for this manual to be readily available to the personnel operating this pump.
- Please keep this manual in a place where it is readily available.

The safety precautions included in this operation manual have been divided into two categories: [Warning] and [Caution]

⚠ Warning indicates that improper operation could result in the potential danger of severe personal injury or even death.

⚠ Caution indicates that improper operation could result in the potential danger of moderate to light personal injury, or damage to equipment.

⚠ Warning

[Unloading and Installation]

1. *Be sure to give careful consideration to the weight and center of gravity of the crate when unloading. Improper hoisting could cause the crate to fall, resulting in damage to equipment or personal injury.*
2. *The pump is to be wired by qualified personnel in a safe manner and in accordance with the appropriate electrical standards. Improper wiring can result in electrical shock or fire.*
3. *Install a ground and circuit breaker for protection against short circuits. Failure to do so could result in electrical shock, especially in the event of a malfunction or short circuit.*

[During Test Runs and Normal Operation]

1. *The coupling is to be fitted with a coupling guard. Operating the pump without a coupling guard could result in personal injury from contact with rotating parts.*
2. *During operation, do not open the priming plug or priming cock, or the air vent valve.*
   To do so could result in danger from the spraying of liquid from the pump interior. It is also necessary to be aware that the pump interior is pressurized even when the pump is stopped.
3. *Do not loosen any plugs, bolts or nuts during operation. To do so could result in danger from the spraying of liquid from the pump interior or the separation of pump components.*

[During Inspection and Maintenance]

1. *When performing maintenance on the pump, be sure to disconnect the electrical power source. Also, be sure to display the [Inspection in Progress—Do not Operate] indicator on the operation panel. Failure to do so could result in electrical shock or other personal injuries from unintended operation.*
2. *Only qualified maintenance personnel are to be allowed to dismantle or repair the pump. Unqualified personnel are likely to cause personal injury due to improper operation.*
3. *If the pump malfunctions, disconnect the electrical power source and contact either your sales agent or a manufacturer's designated service agent to arrange for inspection and repair. Continuing operation with a damaged pump could result in electrical shock, or in a fire from a short circuit.*

⚠ Caution

[Product Specifications]

1. *Do not operate the pump except under the conditions described in the product specifications. To do so could result in electrical shock, fire, or leakage.*
2. *Do not modify the pump configuration. To do so could result in accidents.*

[Unloading and Installation]

1. *Avoid installing the pump in places subject to moisture, such as baths or showers. Short circuits could result in electrical shock in such places.*
2. *Avoid installing the pump in places with poisonous substances such as acids, alkalines, organic solvents or paint, or substances that give off corrosive gas, or with large quantities of dust. To do so could result in shorts or fires, or in corrosion and malfunction.*
3. *After attaching the coupling, be sure to double-check the spindle alignment. Poor spindle alignment could result in damage to the pump.*

[During Test Operations and Normal Operation]

1. *Use only with the approved rated voltage. Failure to do so could result in fire or electric shock.*
2. *Do not allow sand or other foreign objects to enter the pump. To do so could result in malfunctions or damage to the pump.*
3. *Absolutely do not perform 'dry' operation (operation without liquid) or operate the pump with the sluice valve closed. To do so could result in damage to the pump.*
4. *Do not operate the pump in reverse. To do so could result in leaks, or in damage to the pump interior.*
5. *Do not touch the pump or electrical motor. In particular, if the liquid is of a high temperature, touching the pump or electrical motor could result in burns.*
6. *Do not stand on top of the pump, the coupling guard or the electric motor. To do so could result in the spindle coming out of alignment, or in damage to the pump, coupling guard or motor.*

[During Inspection and Repair]

1. *Always wear gloves when dismantling a pump, and be careful of sharp edges and corners which could cause lacerations.*
2. *In the event that warning labels or the manual become worn, hard-to-read, or lost, please contact the manufacturer.*

Preface

After removing the pump from its packaging, perform the following inspection:

(1) Check the name plate to verify that the contents of the delivery conform with the contents of your order.

(2) Verify that there has been no in-transit damage to the unit, and that no nuts or bolts have come loose.

(3) Verify that any accessories have been delivered as ordered. In the event that a problem is discovered during the above inspection, please contact your sales agent, or the manufacturer right away, and be prepared to inform them of the pump model, serial number and construction symbol.

Installation of the Pump and Piping

1. Location

(1) This pump is intended to be used indoors. In the event that it is installed outdoors, be sure to install a cowling or otherwise protect it from the wind and rain.

⚠ Caution

- *Avoid installing the pump in places subject to moisture, such as bath rooms. Short circuits could result in electrical shock in such places.*

(2) Select a location in which maintenance can be performed easily.

(3) The pump is to be installed as close as possible to the liquid, and the vertical differential between the center of the pump and the lowest liquid level is to be kept smaller than 5meters. In cases where special liquids, liquids at high temperatures, or extra long suction lines are in use, it may be necessary to raise the liquid level.

⚠ Caution

- *When installing FSD model pumps, be sure to install the electrical motor either above or to the side of the pump. Absolutely do not install the motor in a configuration where it is beneath the pump. In cases where the motor is installed beneath the pump, even the slightest leakage can result in liquid entering the motor interior and cause accidents.*

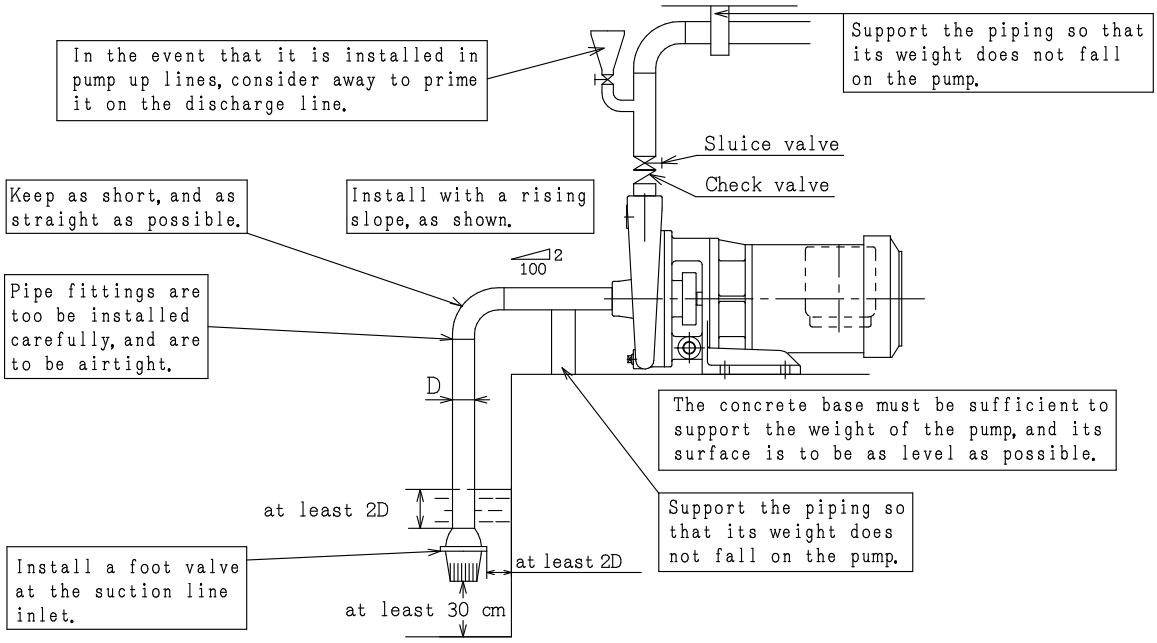
2. Piping

(1) The suction line is to be kept as short and as straight as possible, so that no air pockets can form.

⚠ *Caution*

● *Do not install the pump in a location where it is higher than the piping. If an air pocket forms inside the pump, the pump interior could be damaged.*

(2) Be sure to sufficiently support both the suction line and the discharge line so that none of their weight falls on the pump.
(3) In cases where liquids of a high temperature are to be pumped, be sure to install expansion joints, so that no stress from heat expansion falls on the pump.
(4) Be sure to install a sluice valve on the discharge line to be used in adjusting the discharge flow, and in preventing overloads on the electrical motor.
(5) In cases where the piping is long, the actual head is large, two or more pumps are operating in parallel, or the liquid is being discharged into a pressure tank, install a check valve between the pump and the sluice valve.
(6) This pump have no priming plug and priming funnel. In the event that it is installed in pump up lines, consider a way to prime it on the discharge line.

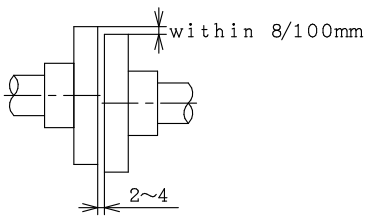


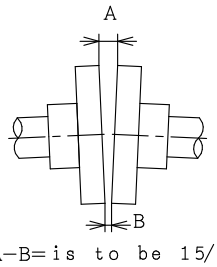
※ For gravity feed inlet lines:

(1) For ease of operation when breaking down or inspecting the pump, install a sluice valve on the suction line.
(2) To insure that no air pockets form in the suction line, install the suction line with a descending slope toward the pump.

Installing the pump [For FS-20・25]

① Place the common base, pump and electrical motor on a well cured base of concrete.
② Shim the common base as necessary to level the pump and motor.
③ Apply mortar, and let cure. Once well cured, tighten the foundation bolts evenly.
④ Spindle alignment
The spindle may come out of alignment during transport, etc. Please check the alignment when installing the pump.





A−B= is to be 15/100mm or less

Use the figures shown above to adjust the alignment.

⑤ After installing the piping, re−check the alignment once again.

⚠ Caution

- *After installing the piping, be sure to double-check the spindle alignment. Poor spindle alignment could result in damage to the pump.*

⑥ Be sure to securely tighten the coupling screws.
⑦ Attach the coupling guard.

⚠ Warning

- *The coupling is to be fitted with a guard. Operating the pump without a coupling guard could result in personal injury from contact with rotating parts.*

Pre-Operation Preparation

(1) Prime the pump.
① This pump have no priming plug and priming funnel. In the event that it is used in gravity feed inlet lines, open the sluice valve on the suction line for priming.
② In the event that it is used in pump up lines, fill the pump and suction line interior with liquid from the priming funnel and many otherways on the discharge line.

⚠ Caution

- *Absolutely do not perform 'dry' operation (operation without liquid). To do so could result in damage to the pump interior.*

(4) Start the flow of liquid at the necessary quantity and pressure, whether it be an external source, for water cooling, or any other type of application.

Name	Flow quantity (ℓ/min)	Pressure (MPa)
External source	as desired	Sealed spindle pressure + 0.05
Water cooling with cooler	5 to 20	0.2MPa or less

【Reference】 1 MPa = 10.197kgf/cm^2·G

※ For methods other than those shown above, refer to the appropriate operation manual.

⚠ Caution

- *Always start the flow of liquid before operating the pump. Failure to do so could cause damage to the pump interior and result in leakage.*
- *Avoid as much as possible the use of small sized piping on coolant outlets. To do so could result in coolant leakage.*
- *When siphoning water directly from an industrial water supply, always install check valves on the piping. Failure to do so could allow liquid from the pump interior to back-flow into the water supply, and result in unexpected accidents.*

(5) Fully open the suction line sluice valve.
(6) Close, either fully or partially, the discharge line sluice valve.

Operation

(1) Push the switch once or twice to verify that the pump rotates in the proper direction. If the pump should rotate in reverse, switch two of the 3-phase connections.
(The proper direction of rotation is indicated on the metal casing or on the pump casing.)

⚠ Caution

- *Do not operate the pump in reverse. To do so could result in leaks, or in damage to the pump interior.*

(2) After verifying that there are no unusual vibrations, sounds or other malfunctions, allow the pump to operate.
(3) After the pump has reached its rated rpm, gradually open the discharge line sluice valve until the proper operating pressure is attained.

⚠ Caution

- *Do not use the suction line sluice valve to adjust the flow. To do so could cause unusual vibrations or noise, and result in damage to the pump interior.*
- *Do not operate the pump at less than the rated pressure. Operation at less than rated pressure could place an overload on the electrical motor.*

(4) Check the pressure, voltage, discharge flow, vibration and noise to be sure that there are no malfunctions. When not making measurements, however, be sure that the pressure gauge and vacuum gauge cocks are closed. Leaving them open could cause damage.
(5) When ceasing operation, close the discharge line sluice valve slowly, and stop the electrical motor. Afterwards, stop the flow of liquids.

Maintenance

⚠ Warning

- *When performing maintenance on the pump, be sure to disconnect the electrical power source. Also, be sure to display the [Inspection in Progress —Do not Operate] indicator on the operation panel. Failure to do so could result in electrical shock or other personal injuries from unintended operation.*

(1) Inspect the following items daily:

① Verify that there are no extreme changes in pressure, discharge flow, voltage, vibration or noise.
② For FS-20·25 verify that the bearing temperature is no more that 40℃ above the room temperature, and less than 75℃ overall. (If cool enough to be touched, then there is no problem.)
③ For pumps with mechanical seals, verify that there is no more than 10ml/hour leakage.
If the leakage exceeds that amount, prepare a replacement seal.

⚠ Caution

- *Do not perform any 'dry' operation with mechanical seals. To do so could result in damage to the pump interior or leakage.*

(2) In addition to the daily inspections, inspect the following items monthly:
① Verify that the pump and electric motor coupler is attached securely. If not, refer to the section on installation, and redo accordingly.

⚠ Caution

- *Do not operate the pump with the spindle out of alignment. To do so could result in unusual vibrations and noise, or damage to the pump.*

(3) Inspect the following items once a year:
① Dismantle the pump, and inspect the coupling, shaft, balance ring, liner ring and other rotating parts for wear and proper alignment, and replace as necessary.
② Inspect the pump interior for wear.
③ Replace expendable parts, such as packing.
(4) Always follow the precautions shown below during operation:

① **⚠ Caution**

- *Do not operate the pump for long periods of time while the discharge line sluice valve is closed, or at extremely low flow levels. To do so could result in the pump interior over-heating, and cause unexpected accidents.*

② Repeated starting and stopping of operation will reduce the life of the pump. The pump should be operated as much as possible 6times/hour or less

⚠ Warning

- *In the event of a power outage, be sure to turn off the power switch. Sudden operation of the pump when power is restored could result in personal injury or unexpected accidents.*

(5) Follow the precautions shown below when ceasing operation for long period of time, or storing the pump:

① **⚠ Caution**

- *Whether ceasing operation for long or short periods of time, always remove the drain plug and release any waste water. Frozen water could cause damage to the pump.*

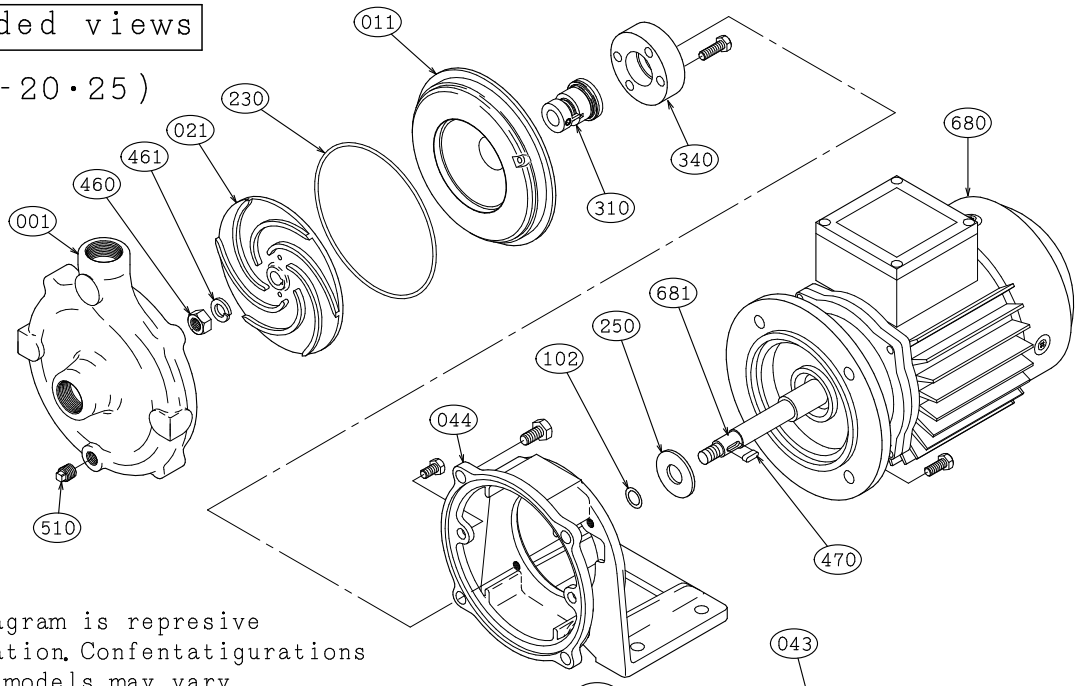
② If a spare pump is kept on hand, operate it occasionally to be sure that it is operable.

Troubleshooting

Problem	Cause	Remedy
Does not start.	○ Electrical motor malfunction ○ Electrical power source malfunction ○ Pump malfunction (corrosion, burnout or foreign object)	○ Repair electrical motor. ○ Inspect and repair. ○ Break down, clean and repair.
Starts, but does not pump.	○ Insufficiently primed ○ Closed sluice valve ○ Large discharge head (heavy resistance) ○ Large suction head (heavy resistance) ○ Primer does not remain inside pump ○ Low RPM ○ High liquid temperature ○ Liquid is too heavy or viscous	○ Prime the pump and suction line. ○ Open the sluice valve. ○ Replace the pump, or repair the piping. ○ Lower the head. ○ Inspect the foot valve. ○ Consult with the motor manufacturer. ○ Ensure proper steam pressure for the suction resistance. ○ Replace pump, or mix liquid at intake.
Does not perform to the rated flow or head.	○ Foreign object in strainer or foot valve ○ Insufficient liquid at the suction line intake. ○ Air in the line. ○ Foreign object in the pump impeller. ○ Pump is operating in reverse. ○ The semi-open pump impeller are worn. ○ The pump impeller are corroded.	○ Break down and clean. Install a screen. ○ Add enough liquid so that there is no intake of air. ○ Retighten all components. Inspect sealed parts. ○ Break down and clean. ○ Re-connect the electrical wiring properly. ○ Adjust alignment of parts, replace worn parts. ○ Replace worn parts.
Occurrence of overloads	○ Small head. (Flow quantity is large) ○ Liquid is heavy or viscous. ○ The pump and electrical motor are in poor alignment. [For FS-20·25] ○ Too many RPM. ○ The grand packing has been over tightened. ○ The shaft is deformed. ○ Rotating parts are rubbing against each other.	○ Trim the discharge line sluice valve to reduce the flow. ○ Change the pump. Use a larger electrical motor. ○ Realign and tighten the bolt. ○ Check the voltage. ○ Adjust so that a proper amount of leakage occurs. ○ Repair or replace parts. ○ Break down and repair.
Bearings overheat or are noisy.	○ The pump and electrical motor are in poor alignment. [For FS-20·25] ○ The ball bearing is damaged. [For FS-20·25] ○ The shaft is deformed. ○ The inappropriate type of lubricant. ○ The coupling key has moved. [For FS-20·25]	○ Realign and tighten the bolt. ○ Replace worn parts. ○ Repair, replace worn parts. ○ Replace with specified type. ○ Tighten set bolt.
Unusual vibrations or noise from the pump.	○ Pump base is incomplete. ○ Foundation bolts or shims are loose. ○ Coupling rubber is worn. [For FS-20·25] ○ The pump and electrical motor are in poor alignment. [For FS-20·25] ○ Occurrence of cavitation surges. ○ Flow of the liquid is causing noise. ○ The entire unit is resonating.	○ Rebuild the base. ○ Tighten or replace. ○ Replace worn parts. ○ Realign and tighten the bolt. ○ Consult manufacturer. ○ Build discharge line with as few bends as possible. Use a shock-absorbing valve. ○ Use flexible pipe, or anti-resonating rubber.

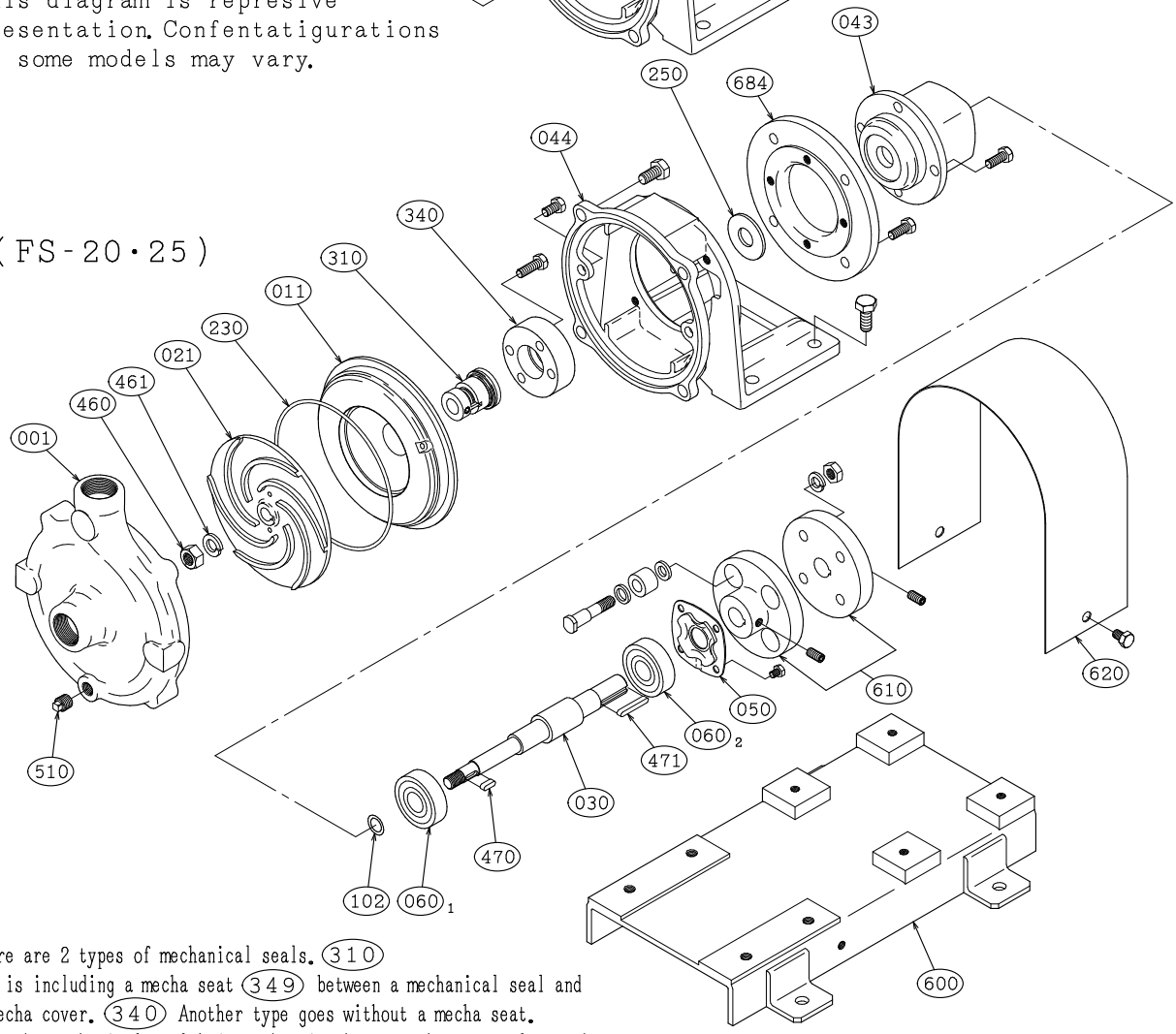
Exploded views

(FSD-20・25)



This diagram is represive presentation. Confentatigurations on some models may vary.

(FS-20・25)



There are 2 types of mechanical seals. (310)
One is including a mecha seat (349) between a mechanical seal and a mecha cover. (340) Another type goes without a mecha seat.
When the mechanical seal before changing has a mecha seat, please change a new mechanical seal with a mecha seat. If not, change a mechanical seal without a mecha seat.

NO.	NAME OF PART	NO.	NAME OF PART	NO.	NAME OF PART	NO.	NAME OF PART
001	Casing	050	Bearing Cover	340	Mecha Cover	600	Common Base
011	Casing Cover	060½	Ball Bearing	460	Impeller Nut	610	Coupling
021	Impeller	102	Adjust Ring	461	Lock Washer	620	Coupling Guard
030	Shaft	230	Cover Packing	470	Impeller Key	680	Motor
043	Bearing Box	250	Deflector	471	Coupling Key	681	Motor Shaft
044	Pedestal	310	Mechanical Seal	510	Drain Plug	684	Adapter

Breaking Down the Pump

① Close both the suction line and discharge line sluice valves. Remove the drain plug (510), and drain any residual liquid.
② Remove any auxiliary piping, such as from blow off valves, etc.
③ Disconnect the pump from the suction and discharge lines, and remove the casing (001) from the pedestal (044). The pump interior can now be inspected. Check to be sure that there is no conspicuous wear or damage.
④ Remove the impeller nut (460) and the lock washer (461), and then remove the impeller (021), and the impeller key (470).
⑤ Remove the mecha cover (340) from the casing cover (011).
⑥ Remove the casing cover (011) from the pedestal (044).
⑦ Loosen the set screw, and remove the mechanical seal (310) from the shaft (030) or the motor shaft (681).
※1 For FSD-20·25
⑧ Remove the motor (680) from the pedestal (044).
※2 For FS-20·25
⑧ Remove the coupling (610) and the coupling key (471) from the shaft (030).
⑨ Remove the deflector (250) from the shaft (030).
⑩ Remove the bearing cover (050) and the shaft (030) from the bearing box (043).

Reassembling the Pump

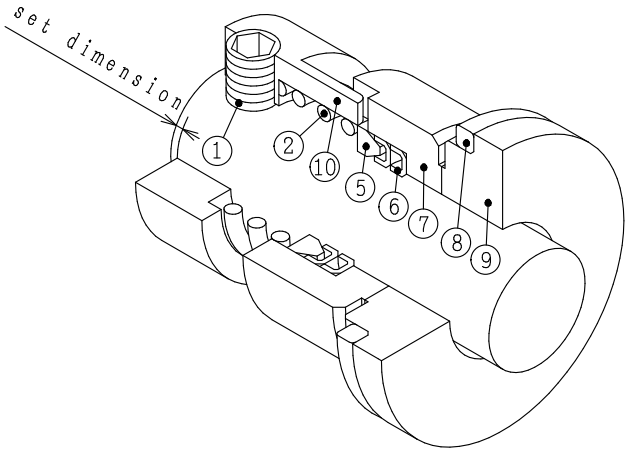
Reassemble the pump following the breakdown procedure in reverse order. At that time, follow the precautions shown below:
(1) Adjust the gap between the semi-open impeller (021) and the casing (001) to be between 0.5 and 0.7mm. If necessary, insert an adjust ring (sold separately) between the back of the impeller (021) and the ridge on the motor shaft (681) or shaft (030).
(2) Replace all old packing with new ones.
(3) Replace all worn or damaged parts.
(4) Clean all parts.

Replacing Mechanical Seals

(1) Break down the pump as described previously.
(2) Verify the mechanical seal set dimensions beforehand.
(3) During reassembly, apply a coat of detergent oil (spindle oil, etc.) or the liquid to be pumped, to the motor shaft or the shaft, and sliding parts of the mechanical seal. (Use a detergent oil compatible with the liquid to be pumped.)

⚠ *Caution*

- *Be careful not to damage the motor shaft or shaft. To do so could result in leakage.*
- *Be careful not to damage the packing, or any sliding surfaces. To do so could result in leakage.*



NO.	NAME OF PART	NO.	NAME OF PART
1	Set screws	7	Seal ring
2	Springs	8	Insert packings
5	Adapter	9	Insert
6	Shaft packings	10	Coller

Repairs

(1) Repairs to damage and correction of malfunctions due to any one of the causes shown below, as well as the replacement of expendable parts, will be performed on a remuneratory basis.
① Damage and malfunctions that are caused by improper use, or as a result of storage.
② Damage and malfunctions that occur while using parts or components other than those approved by the manufacturer.
③ Damage and malfunctions that are caused by modifications or repairs other than those approved by the manufacturer.
④ Damage and malfunctions caused by fire, earthquake or other types of natural disasters.
⑤ Damage and malfunctions, or corrosion and wear, caused by the physical characteristics of the liquid that is pumped.
⑥ Damage and malfunctions caused by the use of parts that have exceeded their normal life expectancy.

(2) The determination of the applicability of items ①, ②, ③, ④, ⑤ and ⑥ shown above will be done on a case by case basis, in cooperation with the customer.

(3) The manufacturer accepts no responsibility for damage to other equipment, loss of production time, or personal injury caused by malfunctions occurring in the pump.

※ The expression 'expendable parts' refers here to lubricants, rubber coupling bushes, packing, mechanical seals, oil seals, sleeves, and any other parts which can be expected to deteriorate with normal use.

(4) When requesting repairs
Before requesting inspection and repair, read the manual carefully, and reinspect the pump. In the even of a malfunctions contact your sales agent.

(5) Precautions when returning a pump for repair
In order to protect the personal safety of maintenance personnel, as well as the environment, always follow the precautions shown below:

⚠ *Caution*

- *Always clean the pump thoroughly, and include a repair request form when returning a pump.*
- *Pumps returned without a repair request form may be refused.*
- *Regardless of whether or not a repair request form has been included, pumps that are evaluated as being dangerous to repair will be refused.*

※ *Repair request forms may be obtained at the locations shown below.*

(6) Minimum period of inventory for replacement parts
Replacement parts are kept in inventory for a minimum of 10 years after the discontinuation of the manufacture of a pump model. The expression 'replacement parts' refers to all parts necessary to maintain the performance of the pump.

Consultations

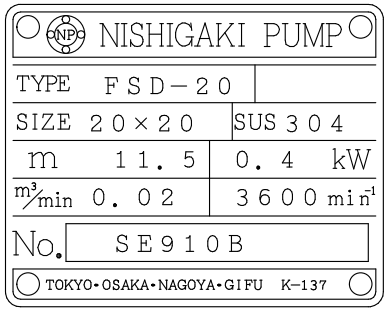
If you have any questions regarding repairs covered. or other after-sales-services, please consult your sales agent, or the Nishigaki office nearest you.

When Ordering Parts

(1) When ordering parts, or requesting a consultation, be sure to have on hand the following informations, which can be found on the name plate.

(2) Name plate
① TYPE ———— pump model
② SIZE ———— inlet/outlet size
③ SUS ———— pump material
④ m·m^3/min ———— pump specifications
⑤ kW ———— electrical motor output
⑥ min^{-1} ———— synchcronous revoling speed
⑦ No. ———— pump serial number

Example (FSD-20 0.4kW 60Hz)



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