NISHIGAKI PUMP OPERATION MANUAL
FOR REGENERATIVE TURBINE PUMPS

- 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.

This contents of this operation manual are applicable to the following pump series:

Regenerative Turbine Pumps: WS

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. Some of the pump components, such as metal casings or electrical motors, have eye-bolts attached to them.
   These eye-bolts are for use in hoisting the individual components during maintenance.
   Do not use these eye-bolts to hoist the entire pump as a single unit. The eye-bolts could break, causing the pump to fall, and resulting in damage to equipment or personal injury.
3. 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.
4. 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 specificaton. 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. Poorspindle 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 damage to the pump.
3. Do not use the pump for bubbly liquid sucha soap water. To do so could result in malfunctions or damage to the pump.
4. Absolutey 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.
5. Do not operate the pump in reverse. To do so could result in leaks, or in damage to the pump interior.
6. 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.
7. 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 quard 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, 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 orderd, 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 as small as possible. 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

- Install the discharge flange of the casing upward. To do not so could result in malfunctions of self-priming.

2. Piping

⚠ Caution

- *Remove the label from the suction flange, the discharge flange and the center of the flange packings perfectly.*
  It could result in malfunctions of the pump.

(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.

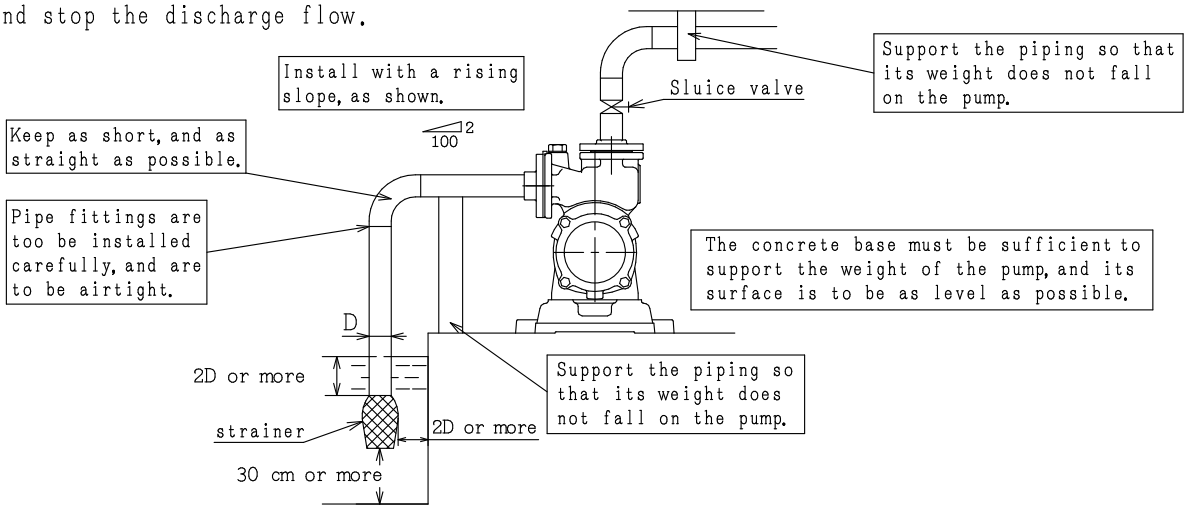
(3) In cases where liquids of a hight temperature are to be pumped, be sure to install expansion joints, so that no stress from heat expansion falls on the pump.

(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 principle, check valves are not to be installed on the discharge line.

(6) 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. In such cases, however, because air pockets will sometimes form between the pump and the check valve causing the pump to don't discharge install an air relief valve directly beneath the check valves. (Because a considerable quantity of liquid will flow out of the air relief valve once the pump deliver fluid, it is best to connect this valve to the source tank with a small pipe.)

(7) Be sure that there are no low points in the discharge line where the liquid could accumulate, and stop the discharge flow.



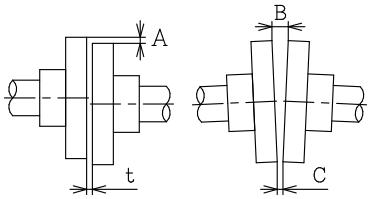
※ For gravity feed inlet lines:

(1) For ease of operation when breaking down or inspecting the pump, install a sluice valve on the suction line.

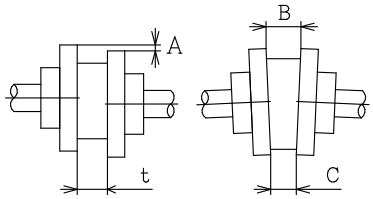
(2) To insure that no air pockets form in the suction line, install the suction line with a descending slope toward the pump.

Installing the pump

① Be sure to place a common base, pump and electric motor on a rigid base (made of completely cured concrete, etc.).
The common base placed upon an unstable base may be distorted or warped since it is not a complete rigid body.
If the common base is installed on a steel structure, such as a structural channel or angle, ensure that the bottom of the common base is in a full contact with the structure. Do not fix the common base to the structure only with foundation bolts. Do not use foundation bolt holes for purposes other than fixing the common base. Doing so may deform the common bese or cause misalignment of shaft couplings.
② Insert a metal wedge or the like between the common base and the base to keep the level.
③ Fill foundation bolt holes with mortar and tighten the foundation bolts uniformly after the mortar is completely cured.
④ Mount piping and be sure to perform coupling alignment before operating the pump.



≪Flexible flanged shaft coupling≫



≪Rubber shaft coupling≫

Couplings shall be adjusted as follows: (Unit: mm)

Shaft coupling	A	B–C	t
Flexible flanged shaft coupling	8/100 or less	15/100 or less	2～4
Rubber shaft coupling (0.2kW)	12/100 or less	15/100 or less	Approx. 10
Rubber shaft coupling (0.4kW)	25/100 or less	30/100 or less	Approx. 10
Rubber shaft coupling (0.75・1.5kW)	25/100 or less	40/100 or less	Approx. 17

⚠ *Caution*

- *Although we perform a simple coupling alignment using a scale immediately before the shipment, a coupling misalignment may occur during transfer or installation (due to the load of piping) or due to distortion or warp of the common base caused by tightening of the foundation bolts. Be sure to perform coupling alignment before operating the pump.*
  Coupling misalignment reduces the life of shaft couplings or ball bearings. In the worst case scenario, abnormal vibrations may damage the pump or motor.

⑤ Be sure to tighten the setscrew of a shaft coupling.
⑥ Mount the shaft coupling guard.

⚠ *Warning*

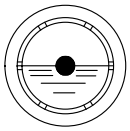
- *For a pump equipped with a shaft coupling, be sure to fix a shaft coupling guard in place. Operating the pump without the shaft coupling guard may cause an operator to be caught in a rotary section and get injured.*

Pre-Operation Preparation

(1) Check the lubrication.

① For sealed grease ball bearings (units with no grease cup or oil cap) :No need to lubricate.

② For oil lubricated ball bearings (units with an oil cap) :Verify that there is a sufficient quantity of oil contained in the metal casing.



The oil should reach the center of the oil level gauge.

OIL,GREASE / MANUF.	BEARING OILS		ROLLER BEARING GREASE
	ISO VG 32	ISO VG 68	1-2 (NLG1-2)
IDEMITSU	DAPHNE MECHANIC OIL 32	DAPHNE MECHANIC OIL 68	EPONEX 2
JX Nippon Oil & Energy	FBK OIL RO 32	FBK OIL RO 68	MALTINOC GREASE 2
SHOWA-SHELL	SHELL TELLUS S2M 32	SHELL TELLUS S2M 68	STAMINA EP2
ESSO-STANDARD	TELESSO 32	TELESSO 68	BEACON 2
MOBIL	DTE OIL LIGHT	DTE OIL HEAVY-MEDIUM	MOBILUXE EP2
COSMO OIL	COSMO ALLPUS 32	COSMO ALLPUS 68	COSMO GREASE DYNAMAX 2
JAPAN ENERGY (JOMO)	JOMO RARTUS 32	JOMO RARTUS 68	JOMO REZONIC GREASE 2

※1. Choose a type of bearing oil that maintains a viscosity of 30mm²/s at normal operating temperatures. As a rule of thumb, for operating temperatures of 80℃ or less, use ISO VG 32, and for operating temperatures of more than 80℃, use ISO VG68.

※2. As a rule of thumb, for operating temperatures between 0℃ and 80℃, use a lithium based grease equivalent to JIS roller bearing grease 1-2, or NLG1-2.

⚠ Caution

- *Do not operate the pump with the oil cap screw in place.*
  To do so could result in oil leaks from the metal casing.

(2) Prime the pump.

Fill the pump interior with liquid from the priming plug. Rotate the coupling manually to expel any remaining air from around the impeller.

⚠ Caution

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

(3) 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/cm²·G

(for both grand packing and mechanical seals)

※ 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.

⚠ Caution

- *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) Fully open 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 close 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 more than the rated pressure.*
  Operation at more 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, Fully open the discharge line sluice valve and stop the electrical motor. Afterwards, stop the flow of liquids. (In cases where the air cannot be allowed to enter the piping, continue the flow of liquid even after stopping the pump.)
(6) If the pump fails to deliver fluid for more than 10 minutes after starting operation, cease operation and inspect the pump and piping.

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 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 gland packing, verify that the liquid is flowing onto the packing at an appropriate rate. (3 to 30ml/minute)

⚠ Caution

- *Do not over-tighten the gland packing.*
  If over-tightened, the resultant heat could shorten the life of the packing, the shaft and its sleeve, or place an overload on the electrical motor.

④ 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.

⑤ Verify that there is no oil leakage from the bearing lubricant or oil seals.
(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.

② Verify that the bearing lubrication is clean, and replenish as necessary.
(3) In addition to the daily inspections, inspect the following items once every 6 months:
① Inspect the gland packing, shaft and sleeve for wear, and replace as necessary.
② Change the bearing lubricant.
※ The bearing lubricant is to be changed after the first 500 hours of operation, and after every 2000 hours of operation thereafter.
(4) 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 lubricants, grease and packing.
(5) 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 under the conditions shown below:

Electrical output	Start/Stop Frequency
7.5kW or less	6 times/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.

(6) 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.
③ The gland packing sometimes rusts if the pump is not operated for long periods of time. Remove the gland packing, and remove any traces of moisture from it if it is to be reused, or replace it with a new one. (For cast iron pumps)

List of Expendable Parts

The following list contains standard expendable parts. For custom or special parts, refer to the pump drawings, or consult your sales agent or the manufacturer.

MODEL and DIAMETER	GLAND PACKING	BALL BEARING		OIL SEAL		LUBRICANT QUANTITY (mℓ)
	(300)	(060)$_1$	(060)$_2$	(401)	(402)	
WS−20	□5-φ25-φ15-quan.4	6202ZZ	6202ZZ	(15307)	(15307)	(50)
25						
32	□6.5-φ30-φ17-quan.4	6203ZZ	6203ZZ	(17307)	(17307)	(65)
40	□6.5-φ33-φ20-quan.4	6204ZZ	6204ZZ	(20367)	(20367)	(140)

Note 1: Gland packing nominal size -outer diameter -inner diameter-quantity
Note 2: For oil seals and lubricant quantities shown in parenthesis, the number shown indicates a ZZ bearing unit that was converted to an oil bath bearing unit per standard specifications. (For oil bath or grease lubricated ball bearings, the ball bearing is an open type.)
[Example] 6304ZZ becomes 6304

Suction valve configuration

The suction valve configurations for our pumps are as shown below. Refer to this chart when ordering.

Suction valve configuration	

Gland packing

Reference–Use the following replacement parts for gland packings. (It is most trust worthy to use the genuine parts.)

MANUFACTURER	PRODUCT NAME TEFLON IMPREGNATED
NICHIAS	TOMBO No. 9038 (Pack of Resistance Edible Graphite PTFE Fiber packing)
VALQUA	VALQUA No. 7202 (PTFE Mixed Graphite packing)
NIPPON PILLAR	PILLAR No. 4527L (Special Pilaflon packing)

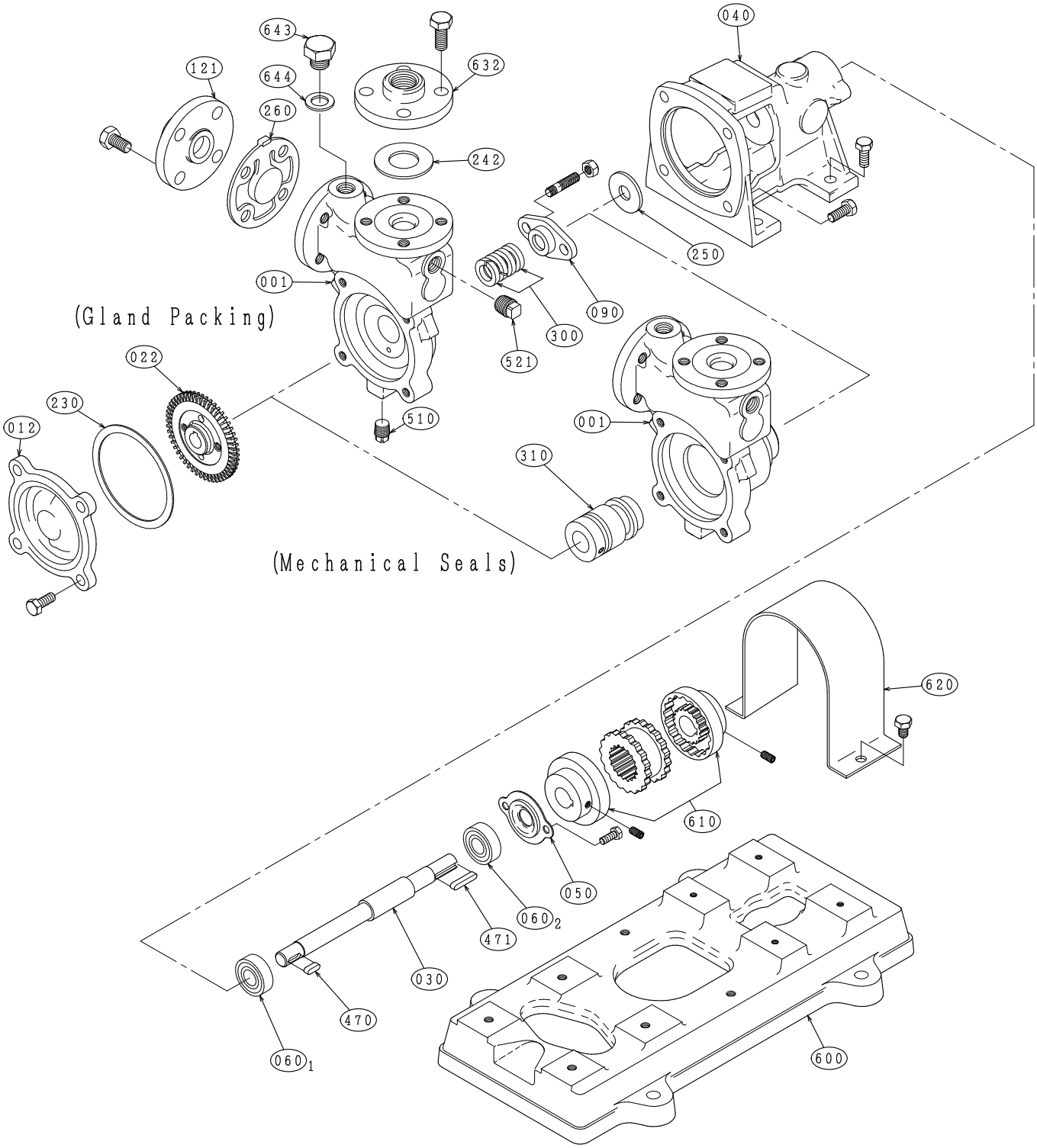
Request

When ordering parts, be sure to tell the necessary matters according to "When Ordering Parts", which is reported in last page of this manual.

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 ○ Oversized suction line.	○ 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. ○ Replace with correct sized pipe.
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. ○ Worn liner rings. ○ 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. ○ Replace worn parts. ○ Adjust alignment of parts, replace worn parts. ○ Replace worn parts.
Occurrence of overloads	○ Large head. (Flow quantity is small) ○ Liquid is heavy or viscous. ○ The pump and electrical motor are in poor alignment. ○ Too many RPM. ○ The gland packing has been over tightened. ○ The shaft is deformed. ○ Rotating parts are rubbing against each other.	○ Open 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.	○ Insufficient lubricant. ○ Too much grease. ○ The pump and electrical motor are in poor alignment. ○ The ball bearing is damaged. ○ The shaft is deformed. ○ The inappropriate type of lubricant. ○ The lubricant has deteriorated. ○ The coupling key has moved.	○ Replenish lubricant. Replace ball bearing. ○ Remove excess lubricant. ○ Realign and tighten the bolt. ○ Replace worn parts. ○ Repair, replace worn parts. ○ Replace with specified type. ○ Replace more often. ○ Tighten set bolt.
Unusual vibrations or noise from the pump.	○ Pump base is incomplete. ○ Foundation bolts or shims are loose. ○ Coupling rubber is worn. ○ The pump and electrical motor are in poor alignment. ○ 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　WS－20・25



This diagram is representative presentation.
Configurations on some models may vary.

NO.	NAME OF PART	NO.	NAME OF PART	NO.	NAME OF PART
001	Casing	230	Cover Packing	521	Pressure Gauge Plug
012	Cover	242	Flange Packing	600	Common Base
022	Impeller	250	Deflector	610	Coupling
030	Shaft	260	Suction Valve	620	Coupling Guard
040	Metal Casing	300	Gland Packing	632	Flange
050	Bearing Cover	310	Mechanical Seals	643	Priming Plug
$060\frac{1}{2}$	Ball Bearing	470	Impeller Key	644	Priming Packing
090	Gland	471	Coupling Key		
121	Suction flange	510	Drain Plug		

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 cover (012) from the casing (001). The pump interior can now be inspected. Check to be sure that there is no conspicuous wear or damage.
4 Remove the impeller (022) and the impeller key (470).
※1. Regarding mechanical seals
Loosen the set screw, and remove the mechanical seal (310) from the shaft (030).
5 Remove the casing (001) from the metal casing (040), and remove the deflector (250) from the shaft (030).
6 Remove the bearing cover (050) from the metal casing (040), and remove the shaft (030).
(For oil bath bearings, be sure to remove the oil drain plug (422), and drain any residual oil beforehand.)

⚠ *Caution*

- *Take care not to damage the lip on the oil seals (401) and (402). To do so could result in leakage.*

※2. About gland packing models
Remove the gland (090) from the casing (001) and remove the gland packing (300).
⑦ Remove the suction flange (121), and remove the suction valve (260).

Reassembling the Pump

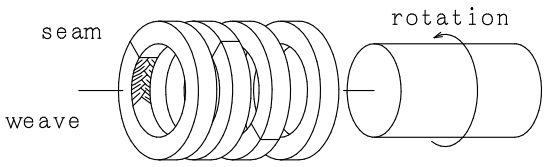
Reassemble the pump following the breakdown procedure in reverse order. At that time, follow the precautions shown below:
(1) Adjust the gap between the impeller (022) and the cover (012) and the casing (011) by means of utilize the cover packing (230). The number of sheets are on the basis of the number at breaking down.
(2) The suction valve (260) should fall under its own weight, so be sure to pull up on it from the top when attaching the suction flange (120) or (121).
(3) Replace all old packing with new ones.
(4) Replace all worn or damaged parts.
(5) Clean all parts.

Replacing the Gland Packing

In cases where there is conspicuous leakage from the shaft even after tightening the packing, or when there is conspicuous heat, in is necessary to replace the gland packing.
Be sure that the packing seams are offset when inserting.
For woven packing, orient the weave to the rotation of the shaft as shown in the diagram below.

⚠ *Caution*

- *Be sure to orient the packing properly when inserting. Failure to do so could accelerate the rate of wear of the shaft and sleeve.*

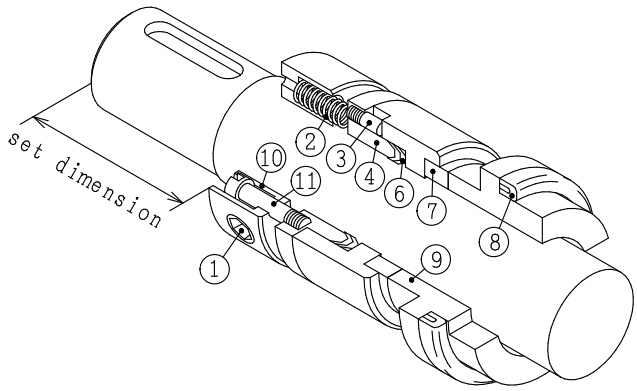


Replacing Mechanical Seals

(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 shaft, sleeve, and sliding parts of the mechanical seal.
(Use a detergent oil compatible with the liquid to be pumped.)
(4) When placing an insert into the casing, use the plastic pipe that was included with the replacement mechanical seals.
(5) Be sure that the casing pin is placed securely in the insert notch.

⚠ *Caution*

- *Be careful not to damage the shaft or sleeve. 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
3	Drive pins	9	Insert
4	Comp ring	10	Coller
6	Shaft packings	11	Spring pins

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 7 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.

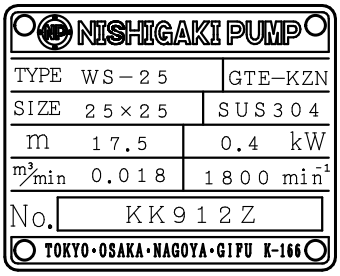
When Ordering Parts

(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 CONSTRUCTION SYMBOL
(shown for reference on the name plate, GTEKZN) pump configuration
③ SIZE ———— inlet/outlet size
④ SUS ———— pump material
⑤ $m \cdot m^3/min$ ———— pump specifications
⑥ kW ———— electrical motor output
⑦ min^{-1} ———— synchronous revoling speed
⑧ No. ———— pump serial number

Example of a stainless steel pump (WS-25)



NISHIGAKI PUMP MFG. CO., LTD.

Head quarters: 12-1, 3-chome, Mikasa-dōri, Kasamatsu-cho, Hashima-gun, Gifu, 501-6088 Japan.
Telephone 〈058〉 388-3531 Telfax 〈058〉 388-3754

Tokyo office: Kōken-Bidg., 34-8, 2-chome, Kameido, Kōtō-ku, Tokyo, 136-0071 Japan.
Telephone 〈03〉 3637-3761 Telfax 〈03〉 3685-8697

Chubu office: 351, 3-chome, Nakaotai, Nishi-ku, Nagoya, 452-0822 Japan.
Telephone 〈052〉 503-1633 Telfax 〈052〉 503-1662

Osaka office: 13-10, 1-chome, Itachibori, Nishi-ku, Osaka, 550-0012 Japan.
Telephone 〈06〉 6532-4481 Telfax 〈06〉 6532-4504

Hashima factory: 1-83, Sotoawano, Oguma-cho, Hashima-city, Gifu, 501-6261 Japan.
Telephone 〈058〉 392-2064 Telfax 〈058〉 391-3479

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(2017. 4)