EXPERT IN ENGINEERED

VACUUM SYSTEMS SINCE 1993

Performance. Reliability. Efficiency.

333 Rt 46 W

Building A,

Fairfield, NJ 07004

1-800-297-3550

www.nescompany.com

Operation & Maintenance Manual for NX Series Vacuum Pumps and Compressors

NES COMPANY

Manual Index

List of Sections

List of Sketches and diagram

List of Illustrations

List of Tables

Section 1. Safety

Safety first.

Wear safety glasses, lab coats, long pants, close-toed shoes, and gloves when performing all vacuum operations. Vacuum pumps must be stored on spill trays to prevent oil spills. Vacuum pump areas may be insulated for noise, if necessary. All used vacuum pump oils must be disposed of through EH&S procedures.

Safety During Operation

While the pump is under Operation, the following safety precautions are to be taken care of.

- Ensure that electrical cables/cords and power switches are free from defects or loose connections.
- Ensure that pumps have belt guards in place during Operation to prevent hands or don't wear loose clothing or loose clothing from getting caught in the belt pulley.
- Do not operate pumps near containers of flammable chemicals, flammable chemical wastes, or combustible materials such as paper or cardboard.
- Use correct vacuum tubing (thick walls), not thin Tygon-type hoses.
- Do not place pumps in an enclosed, unventilated cabinet allowing heat and exhaust to build up.
- Replace old tubing; crumbly tubing can degrade performance.
- Use the shortest length of tubing that reaches where needed.
- Do not use solvents that might damage the pump.
- Always close the valve between the vacuum vessel and the pump before shutting off the pump to avoid sucking vacuum oil into the system.
- Place a pan under the pumps to catch/collect oil drips.
- Check oil levels and change the oil when necessary. Replace and adequately dispose of vacuum pump oil that is contaminated with condensate. Used pump oil must be disposed of as hazardous waste per EH&S Procedures.
- With rotary oil pumps, many vapors condense in the pump oil. Solvents in the oil degrade its performance (and eventually ruin the pump), create a chemical hazard when the oil is changed, and are emitted in an oil mist vented from the system. Other vapors pass directly into the exhaust stream. To avoid these problems:
- Trap evaporated materials with a cold trap before they reach the pump. Depending on the material that is to be trapped, this can be a filtration flask either at room temperature or placed in an ice bath. For more volatile solvents, more sophisticated options exist (e.g., dry ice trap).
- Ensure that the pump exhaust is vented properly.

Safety During Service

Before engaging in the Operation or Maintenance of a vacuum pump or compressor, the following precautions should be taken.

- First, stop the pump.
- Make sure current/power switches and circuit breakers are shut off and identify with proper tagging for "Do Not Switch On."
- Pass air into/out of the piping so that the pump pressure equal to atmospheric pressure
- Empty/clear the service liquid before….
- If the pump operated in harmful liquid/media, make sure to wash with an appropriate liquid.
- Keep a record for each pump to record oil change dates and keep track of the maintenance schedule.

Section 2. General Information

2.1 About this manual

For this document, we used the word "Machine" for the vacuum pump and compressor.

This manual contains information for the users of the NES machine model NX. This information includes a description of how to operate, service, and maintain this machine.

2.2 How the machine works.

Please see figure 1. The main components, like casing/body, rotor, cone, shaft, heads, bearing housing, suction, and discharge ports. A rotor and shaft assembly are mechanically connected to an external electric motor. The rotor shaft assembly remains inside the casing and creates a closed chamber.

Seal liquid (typically water) is allowed to pass through the inside of the chamber. As seen in Figure 2, the fluid path takes place inside the machine. The arrangement is made by design so that the rotor center is offset from the center of casings/body housing, taking an eccentric positioning. The liquid is rotated inside the chamber and thrown against the inner walls of the chamber by centrifugal force. The seal liquid now seals the spaces between the vanes.

Due to the eccentricity of the rotor placement, these vane spaces change in volume. Influent process material experiences this change in volume through compression and expansion, creating pressure differentials that ultimately result in vacuum suction and compression. The process fluid enters the inlet port through to the cone, where it immediately enters the rotor spacing. The universal stuffing box prevents seal liquid from leaking out, and the bearing housings keep the rotor rotating without hindrance from friction forces. The process material is expanded and compressed, exiting through the cone outlet and through the discharge port.

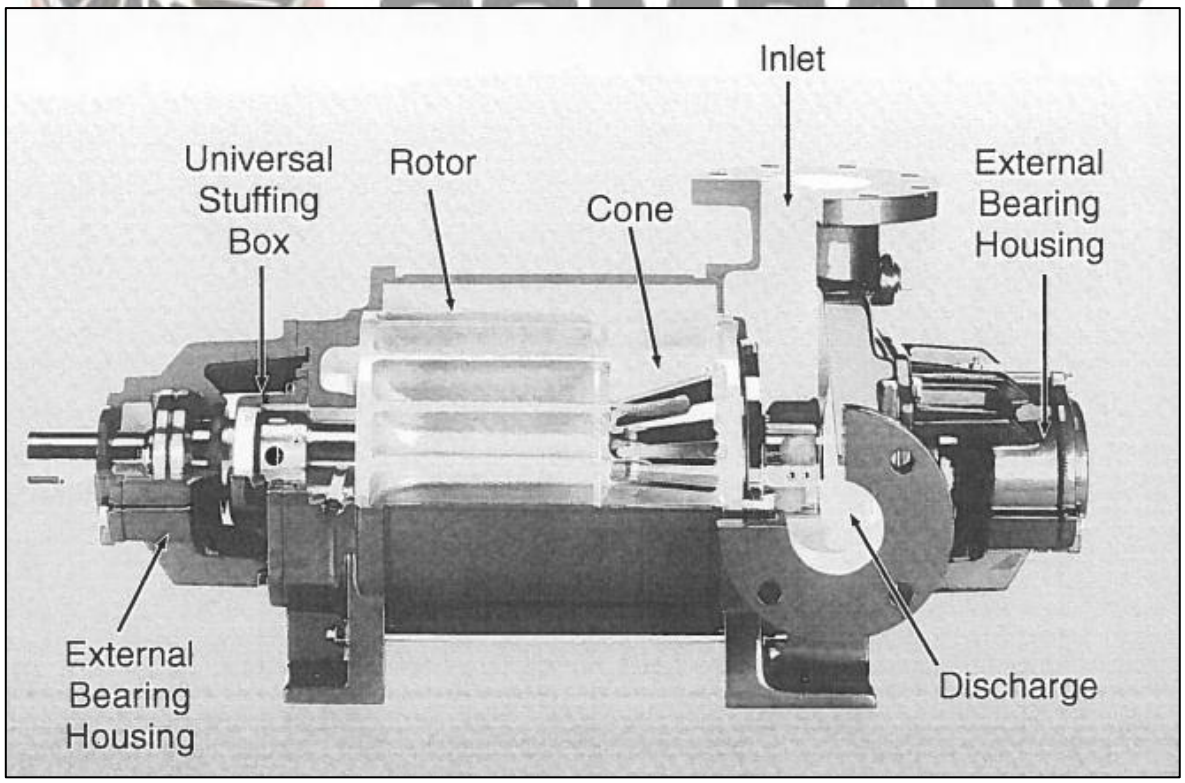
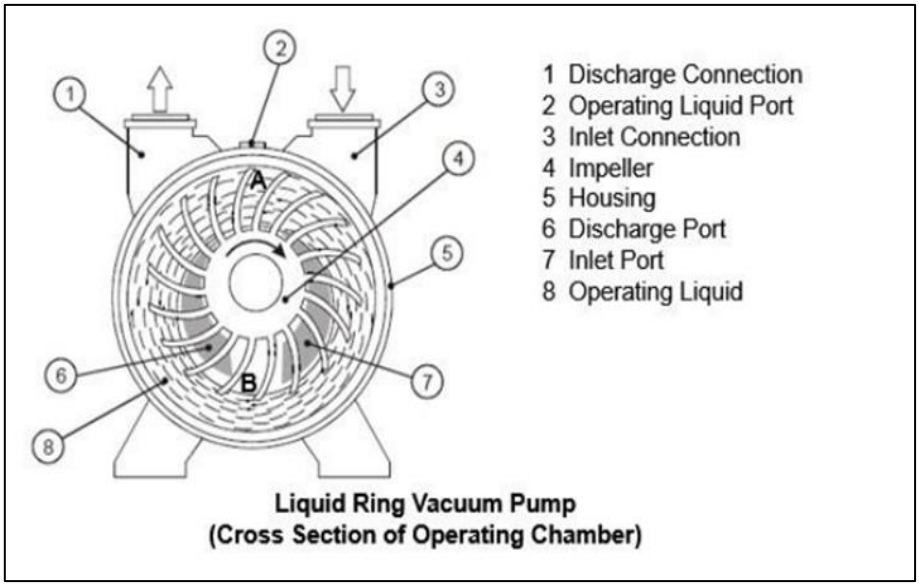
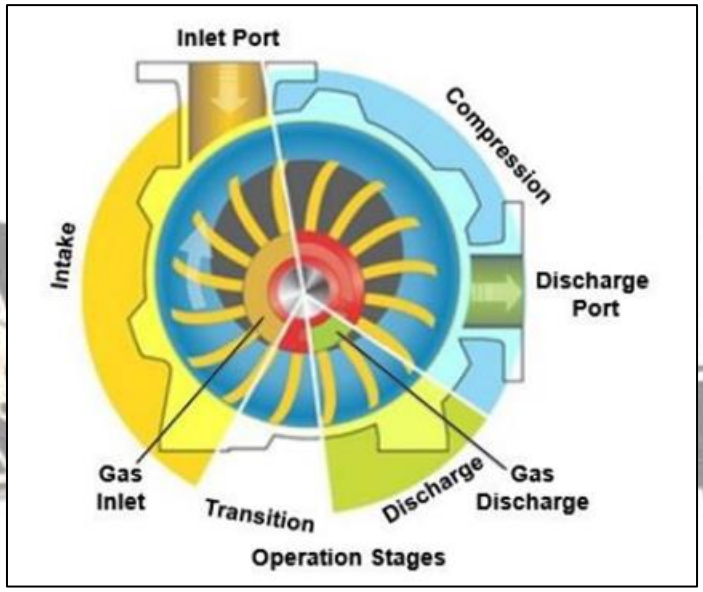


Figure 1. Pump Functional Elements





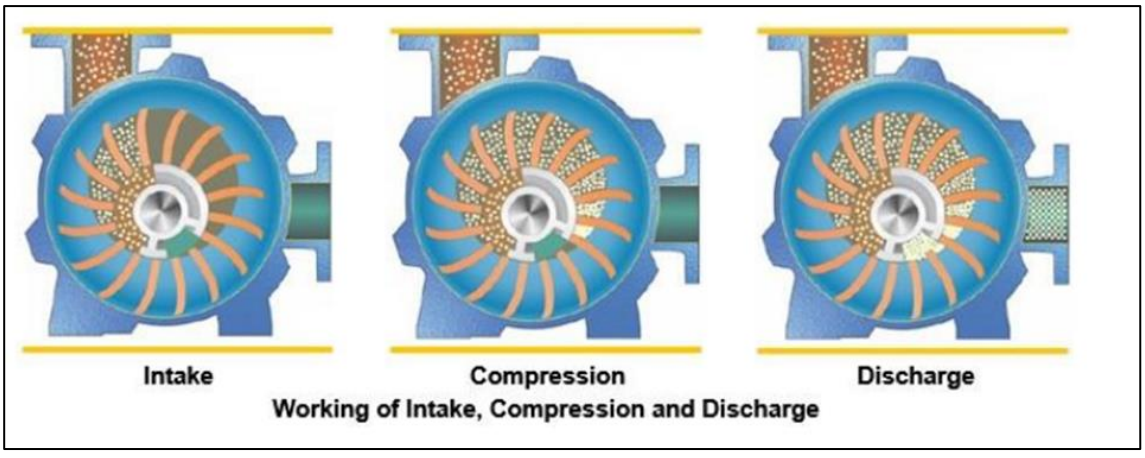


Figure 2. Liquid Compressant and Air flow

Section 3. Operation

3.1 First time – Initial start-up preparation.

Alert – Contact your NES representative for start-up preparation/assistance.

3.2 Seal flow rate

For compressor:

Recommended seal water rate 1/4 GPM per HP. This applies to both iron and stainless-steel pumps. When employing the orifice, valve, and gauge setup, establish the seal flow by fine-tuning the valve until the pressure gauge upstream of the orifice indicates a pressure that is ten pounds per square inch gauge (psig) higher than the pressure measured downstream of the orifice. This set parameter will establish the necessary flow rate.

CAUTION!

INITIATE THE FLOW OF COMPRESSANT LIQUID BEFORE ACTIVATING THE PUMP DRIVE MOTOR, WHETHER THE PUMP IS BEING OPERATED SOLELY TO VERIFY THE ROTATION DIRECTION OR FOR OTHER PURPOSES.

For vacuum pump:

Ensure all piping connections fully tighten/sealed to all fluid paths. The liquid compressant is typically fresh water at 60 °F (15 °C). The flow rate to the pump shall be as specified in table 1. Variation in the flow rate of + or – 25% will not damage the pump, but wide variations in flow may alter the pump specified capacity.

When using the orifice, cock, and gauge configuration, set the seal flow by adjusting the cock until the pressure gauge upstream from the orifice reads ten psig greater than the orifice's meter downstream. This set parameter will establish the necessary flow rate.

Pump Size	Seal Flow Rate – GPM (m3/hr)	
NX	0 to 25" Hg Vac	25" to 28" Hg Vac.
NX 35	1.5 (0.34)	3.0 (0.68)
NX 45	1.5 (0.34)	3.0 (0.68)
NX 60	5.0 (1.14)	10.0 (2.29)
NX 80	5.0 (1.14)	10.0 (2.29)
NX 130	6.0 (1.36)	12.0 (2.72)
NX 150	12.0 (2.72)	24.0 (5.44)
NX 250	14.0(3.18)	28.0 (6.36)
NX 350	15.0 (3.40)	30.0 (6.80)
NX 500	25.0 (5.68)	50.0 (11.36)

Table 1. Seal Flow Rate

3.3 Machine Drain and Flush

Immediate after installation/alignment, ensure the machine fully drains and flush properly. Unscrew the seal water drain plug and activate the shut-off valve to allow the supply of seal water; after the factory test completion, the pump flushed with water-soluble preservative oil during shipment, which should come out and visible as light orange or cream colour. Keep on flush the pump with fresh water until clear water flows through. Shut off the seal water by closing the shut-off valve, drain the system, and then install the plugs with the use of a pipe thread compound.

3.4 Initial Inspection

Conduct the below initial inspection before starting the pump.

CAUTION!

CONDUCT ALL OF THE BELOW INSPECTION STEPS TO ENSURE USERS' SAFETY AND MACHINE PROTECTION.

a. Make the machine isolate, secure lock, and label / identify all the power switch/connections to ensure no accidental starting or human error is avoided.
b. Make sure all drain plugs properly screwed through the holes / installed.
c. Prime the machine manually with liquid compressant until it overflows.
d. Check the separator, the receiver, and the heat exchanger is installed to ensure that all shipping plug protectors have been removed and that all open connections have been plugged or piped.
e. Check all piping to make sure that the power connections have been made to the pump and its basic system following NES installation drawing(s) that have been supplied with the pump. Contact NES representative before proceeding. Make sure all piping is the correct size, adequately connected and supported as well.
f. Check that machine mounting bolts/studs properly tighten and secured from base plate holes or T – slots firmly.
g. Check all other operational components of the system and associated connections with the machine to ensure that they are according to the equipment manufacturer guidelines/recommendations.
h. Check that all other machines controlling components are at the right place/locations and correct orientation as per NES / equipment manufacturer installation drawing(s) / piping

drawings to achieve accurate flow directions and functional operations.

i. Check the pump suction/inlet to ensure that the inlet screen and clean-out connections have been properly made and are free of tools, machines, and debris.
j. Make sure the discharge connection free from any obstructions.
k. Remove the coupling or Belt guard and rotate the pump shaft by hand or aid suitable tools for the bigger machine in the flow direction given on the machine and installation drawing. The machine shaft must rotate free. If the pump shaft is bound and can't be free rotated by manual efforts, contact the NES representative for necessary assistance.

CAUTION!

DO NOT ATTEMPT TO CLEAR THE JAM BY CONNECTING THE MOTOR OR ANY OTHER POWER SOURCE, LEADING TO HEAVY INTERNAL DAMAGE TO THE MACHINE.

l. Inspect coupling and V-belt alignment, as stated in NES Instruction manual No. for NES machines.
m. When main supply valves open and the machine primed as described in the 3rd step, bump the drive motor for the machine to check for shaft rotation's proper direction.

CAUTION!

NEVER OPERATE THE MACHINE WITHOUT SUFFICIENT PRIME AND SEAL LIQUID FLOW. HIGH LIQUID SEAL PRESSURE DOES NOT NECESSARILY INDICATE THAT THE FLOW IS SUFFICIENT. CHECK FLOW FROM VACUUM PUMP DISCHARGE PORT (OR WATER TRAP SILENCER).

CAUTION!

MAKE SURE THAT THE COUPLING OR V BELT DRIVE IS COVERED WITH THE SUITABLE PROTECTING GUARD BEFORE STARTING THE DRIVE MOTOR

3.5 Machine Start-up and Operation Checkpoints.

- When the initial checks and pre-operational check procedures have been completed, start the machine operation checks.

CAUTION!

IF THE MACHINE IS TO UNDERGO A SYSTEM CHECK, INFORM THE RELEVANT PLANT PERSONNEL BEFORE INITIATING THE MACHINE ONLINE, ESPECIALLY DURING THE INITIAL STARTUP. STARTING A SYSTEM UNEXPECTEDLY CAN POSE SAFETY RISKS.

From the troubleshooting, Section 4, if any operational difficulties arise when performing the below steps:

a. Check the machine and the system for sufficient prime, and then turn on all primary water supply sources to the pump and heat exchanger is used.
b. With the water, supply sources turned on, and all personnel and equipment clear of the pump system, supply power to the drive motor.

NOTE

IF THE MACHINE OPERATION BECOMES UNSTABLE, THERE WILL BE AN INCREASE IN MACHINE VIBRATION LEVELS, ACCOMPANIED BY A DECREASE IN MACHINE VOLUME/OUTPUT. IF THE MACHINE FAILS TO STABILIZE, PROMPTLY SHUT OFF THE SYSTEM AND IDENTIFY THE ROOT CAUSE OF THE ISSUE.

c. While the pump is being stabilized at the required inlet vacuum, check the liquid seal flow (water) to the pump. Make sure that the fluid seal is flowing out of the separator or water trap silencer drain.
d. Maintain a constant check on the temperature of the pump casing during the start-up procedure. If the temperature rises rapidly or is 40 *F(22*C) or more above the liquid supply temperature, shut down the system/machine immediately and determine the cause of the issue.
e. Upon machine startup, continuously monitor the temperature of the bearing brackets until it stabilizes, ensuring a minimum stabilization period of 30 to 40 minutes.

CAUTION!

IF A BEARING BRACKET TEMPERATURE IS 50 ° F (28 °C) OR MORE THAN THE MACHINE CASING TEMPERATURE, SHUT DOWN THE MACHINE IMMEDIATELY AND DETERMINE THE CAUSE OF THE ISSUE; HOWEVER, APPLY LOGICAL RELATIONS WITH THE ATMOSPHERIC TEMPERATURE AT THE USER LOCATION.

NOTE

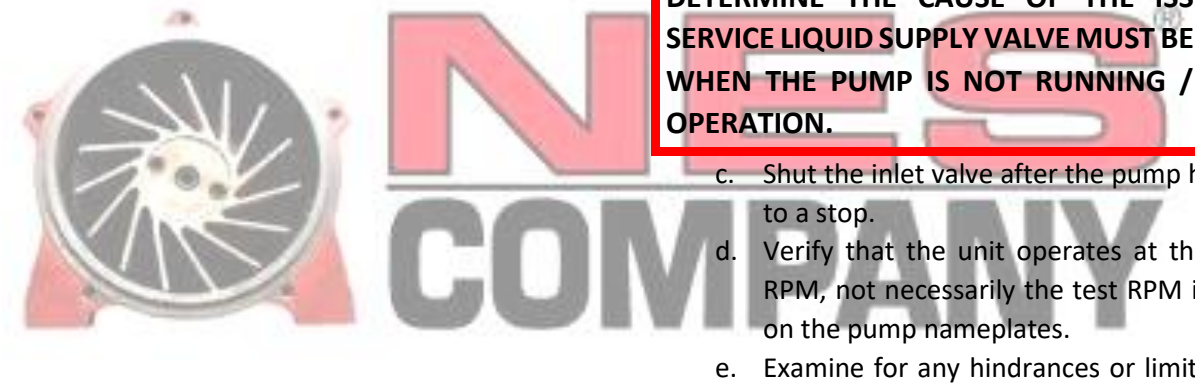
IF THERE IS ABNORMAL BEARING NOISE, VIBRATION, ODOR / SMELL, OR SMOKE OCCURS, SHUT DOWN THE MACHINE IMMEDIATELY AND DETERMINE THE CAUSE OF THE ISSUE.

f. Inspect the machine for vibration and noise. Abnormal levels of vibration and noise indicate an issue with the machine. If excessive, promptly shut down the machine and investigate the root cause of the problem.

3.6 Stopping the Operation

The following steps should be performed when shutting down the machine.

a. Cut off the power of the drive motor.
b. Shut off the service liquid supply valve. If a solenoid valve is in use, it will automatically close when the power is disconnected.



Section 4. Troubleshooting

4.1 Detecting Troubles.

NES machines require less attention than checking the ability to obtain full volume or maintain the constant vacuum. If a V-Belt drive is used, V-Belt tension should be checked periodically, and the V-Belts should be checked for any sign of wear. V-Belts usually are rated for service lives of 24,000 hours based on the make used. If operating difficulties arise, make the following checks:

a. Verify the seal flow rate matches the specifications outlined in Table 1.
b. Confirm the accurate direction of the pump shaft rotation by referring to the cast or plate arrow direction on the pump's body.

NOTE

IF THERE IS ABNORMAL BEARING NOISE, VIBRATION, ODOR / SMELL, OR SMOKE OCCURS, SHUT DOWN THE MACHINE IMMEDIATELY AND DETERMINE THE CAUSE OF THE ISSUE THE SERVICE LIQUID SUPPLY VALVE MUST BE CLOSED WHEN THE PUMP IS NOT RUNNING / UNDER OPERATION.

c. Shut the inlet valve after the pump has come to a stop.
d. Verify that the unit operates at the proper RPM, not necessarily the test RPM indicated on the pump nameplates.
e. Examine for any hindrances or limitations in the gas inlet line. If the pump is halted due to temperature fluctuations, abnormal noise or vibrations, or misalignment in coupling or V-Belt drive, consult NES Installation Instructions for NES Vacuum Pumps and Compressors, for guidance on alignment and V-Belt tensioning procedures.

NOTE

IF THE ISSUE PERSISTS DESPITE THESE CHECKS, CONTACT YOUR NES REPRESENTATIVES BEFORE PROCEEDING WITH THE DISMANTLING OR DISASSEMBLY OF THE PUMP. WE WILL PROVIDE ASSISTANCE IN IDENTIFYING AND RESOLVING THE PROBLEM.

4.2 Troubleshooting Guide

Trouble	Cause	Remedy / Corrective Action
The motor is on, but it does not start up, and no noise is heard.	At least two electric cables are cut off	Check the fuses, the terminals, and the cables.
The motor does not start up, but a buzzing sound is heard	One or more electric cables are cut off	As above / Strip the pump / Empty, de-scale, and clean the pump
	The pump rotor is locked	Re-assemble the pump / Check that the clearance between the impeller, the rotor, and the body is correct.
Automatic cut off switch trips just after starting-up	Short circuit in the motor winding	Check the motor windings
	Motor overloaded	Decrease the service liquid flow
	Too high discharge back pressure	Reduce back pressure
	Inlet flow contains too much liquid	Reduce liquid quantity
	Pump is locked	See locked pump rotor
The absorbed power is more significant than rated	Scale deposits	Strip and clean the pump
	Discharge back pressure is too high	Reduce back pressure
	Inlet flow contains too much liquid	Reduce liquid quantity
	Motor overloaded	Decrease the service liquid flow
The vacuum is not achieved	No supply of service liquid	Check the inlet line of the service liquid
	Air entering the system	Check all the connections and seals and tighten up as needed
	Wrong rotation direction	Invert the rotation direction by interchanging any two electrical leads
Inadequate vacuum level	The pump is too small	Replace the pump with a bigger size
	Too low service liquid flow	Increase service liquid flow
	Service liquid temperature is too high	Cool service liquid or increase the flow
	Air entering the system	Check all the connections and seals and tighten up as needed
	Mechanical seals are leaking	Replace the mechanical seal
	Internal erosion of the pump	Strip the pump to replace the damaged parts
Unusual noise or screeching	Pump cavitation	Feed air, fit a valve to the suction port, or add an anti-cavitation valve
	Too high service liquid flow	Ensure proper seal flow rate. Decrease if too high
	Noisy Bearings	Replace the bearings
Liquid leaks occur between the pump bodies	Faulty gaskets	Replace gaskets
	Loose bolts	Check the bolts are tightened to proper torque levels

Section 5. Preventive maintenance

5.1 Periodic maintenance

NOTE

THE PROVIDED SCHEDULES SHOULD BE ADJUSTED AS NEEDED TO ACCOMMODATE USER-SPECIFIC OPERATING CONDITIONS.

5.2 At Six-month intervals

a. If the drive coupling requires lubrication, ensure it is filled with oil or grease following the guidelines provided by the coupling manufacturer.

b. Inspect the pump bearings and apply lubrication as specified in section 5.4.

c. Re-lubricate the drive motor bearings following the instructions provided by the motor manufacturer.

d. Examine V-Belts (if utilized) for appropriate tension and signs of wear. Replace them as needed. Refer to NES Installation Instructions, NES Vacuum Pumps, and Compressors for detailed information on tensioning and replacement.

5.3 Twelve-month intervals

a. Examine the pump bearings following the guidelines in Paragraph 5.4.

b. Replace the stuffing box packing as outlined in Paragraph 5.5.

5.4 Bearing Lubrication

The bearings come pre-lubricated before shipment and do not need additional lubrication for approximately six months. To assess the condition and grease quantity in the bearing bracket, follow the procedure below.

NOTE

APPLY LUBRICATION TO THE BEARINGS ANNUALLY, UNLESS THE PUMP IS IN OPERATION WITHIN A CORROSIVE ATMOSPHERE OR USING A LIQUID COMPRESSANT OTHER THAN WATER, IN WHICH CASE, THE LUBRICATION INTERVAL SHOULD BE SHORTENED. ENSURE LUBRICATION IS PERFORMED WHILE THE PUMP IS ACTIVELY RUNNING.

a. Withdraw and detach the bearing caps.
b. Inspect the bearing caps for grease condition, looking for contamination or water presence.
c. If the grease is contaminated, follow the procedures outlined in Section 6, Paragraphs 6.2 and 6.3 to remove and discard the bearing.
d. Thoroughly flush the bearing bracket and bearing cap to eliminate all grease and contaminants.

e. Reassemble the bearing, cap, and associated components according to the instructions in Section 6, Paragraphs 6.17 to 6.20.

Table 2 General Grease Requirements

Premium quality industrial grease
Consistency grade: NLG1 # 2
Oil Viscosity (minimum):
- @100 *F(38*C) – 500 SSU (108 cSt)
- @210*F(99*C) – 58 SSU (10 cSt)

Thickener (Base): Lithium, Lithium complex or Polyurea for optimum water resistance.
Performance characteristics at operating temperature
- Operating temperature range; at least 0* to 250*F (-18* to 121*C)
- Long life performance
- Good mechanical and chemical stability.

Additives – Mandatory
- Oxidation inhibitors
- Rust inhibitors

Additives – Optional
- Anti-wear agents
- Corrosion inhibitors
- Metal deactivators
- Extreme pressure (EP*) agents

Additives – Objectionable
- Molybdenum disulfide (MoS2)
- Tackiness agents

*some greases exhibit EP characteristics without the use of EP additives. These EP characteristics are not objectionable.

Table 2 cont. : General Grease Recommendations

NES Standard grease recommendations (By manufacturer) The following is a list of some grease that exhibit the desired characteristics required by NES.

Grease Manufacturer	Product
Exxon	Unirex N2
Mobil	Mobilux 2
Chevron	Chevron SRI-2
Atlantic	Arco Multipurpose
Amoco	Rykon Premium 2
Gulf Oil	Gulfcrown No. 2

Note: This is not the approval of these products to be used, it is only for reference. Have your local lubricant partner cross reference these greases for an equivalent, as long as it meets the general requirements.
The Grease compatibility: The above greases are NES standard grease. To maximize grease performance, it is recommended that intermixing of different greases be kept to a minimum.

5.5 Stuffing Box Packing

Establish a preventive maintenance schedule for the tightening and replacement of the packing in the pump's stuffing boxes. For pumps used in continuous process systems, the packing in the stuffing boxes should be replaced during the annual shutdown. More frequent replacement may be necessary for severe process applications where the liquid compressant in the pump is contaminated by foreign material.

When replacing the packing in a stuffing box, follow these steps:

NOTE

IF LANTERN GLANDS (10) ARE UTILIZED, DOCUMENT THE NUMBER AND POSITION OF PACKING RINGS ON EITHER SIDE OF THE LANTERN GLAND FOR PROPER REALIGNMENT.

a. Position the slinger (3) against the bearing bracket.

b. Loosen and extract gland nuts from studs.

c. Shift the packing gland assembly as distant from the stuffing box as feasible. If it's a screwed assembly, disassemble it by removing two nuts, lock washers, and screws that secure the halves of the packing gland assembly. Detach the two halves.

d. Insert the tips of packing pullers into the packing.

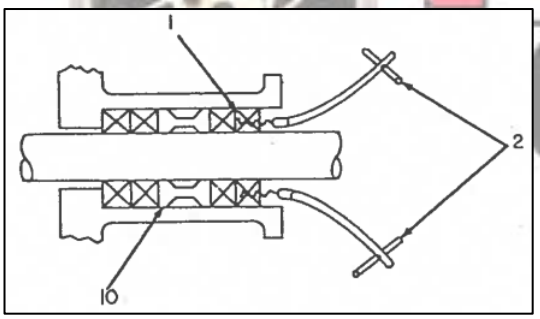


Figure 3. Removing Stuffing Box Packing

Figure 4. Stuffing Box Lantern Gland Puller

a. Extract the packing from the stuffing box.

b. If lantern glands are present, utilize two lantern gland pullers made from 1/8" diameter steel wire, as depicted in Figure 4.

c. Maneuver the bent tips of each lantern gland puller around the outer diameter of the lantern gland in the stuffing box until the pullers catch in the slots on opposite sides.

d. Remove the lantern gland from the stuffing box.

e. Screw the tips of packing pullers into the remaining packing and pull out of the stuffing box.

f. Thoroughly clean the stuffing box and inspect the shaft for severe scoring and wear, following the specifications in Section 6, Para 6.9.3, before installing new packing.

Install the new packing into the stuffing box by following these steps:

a. Create two hard rubber strips to match the outer diameter (OD) of the shaft and the inner diameter (ID) of the stuffing box, as depicted in Fig 5 C, to serve as pushers for the packing rings.

b. Apply lubrication to the inner diameter of the packing rings using Molykote G – n paste or an equivalent.

c. Unwind the packing into a spiral by pulling the ends axially apart, following the illustration in Fig. 5 A.

d. Maneuver each packing ring onto the shaft and into the stuffing box area, as demonstrated in Figure 5 B.

e. Employing the pushers created in step a, firmly insert the first packing ring into the stuffing box. Ensure that the packing ring is seated against the end of the stuffing box, as depicted in Fig 6 C. Stagger the location of the butted ends of the ring so that each successive ring is offset by 180 degrees (refer to Fig 5 D). Verify that each packing ring is securely seated.

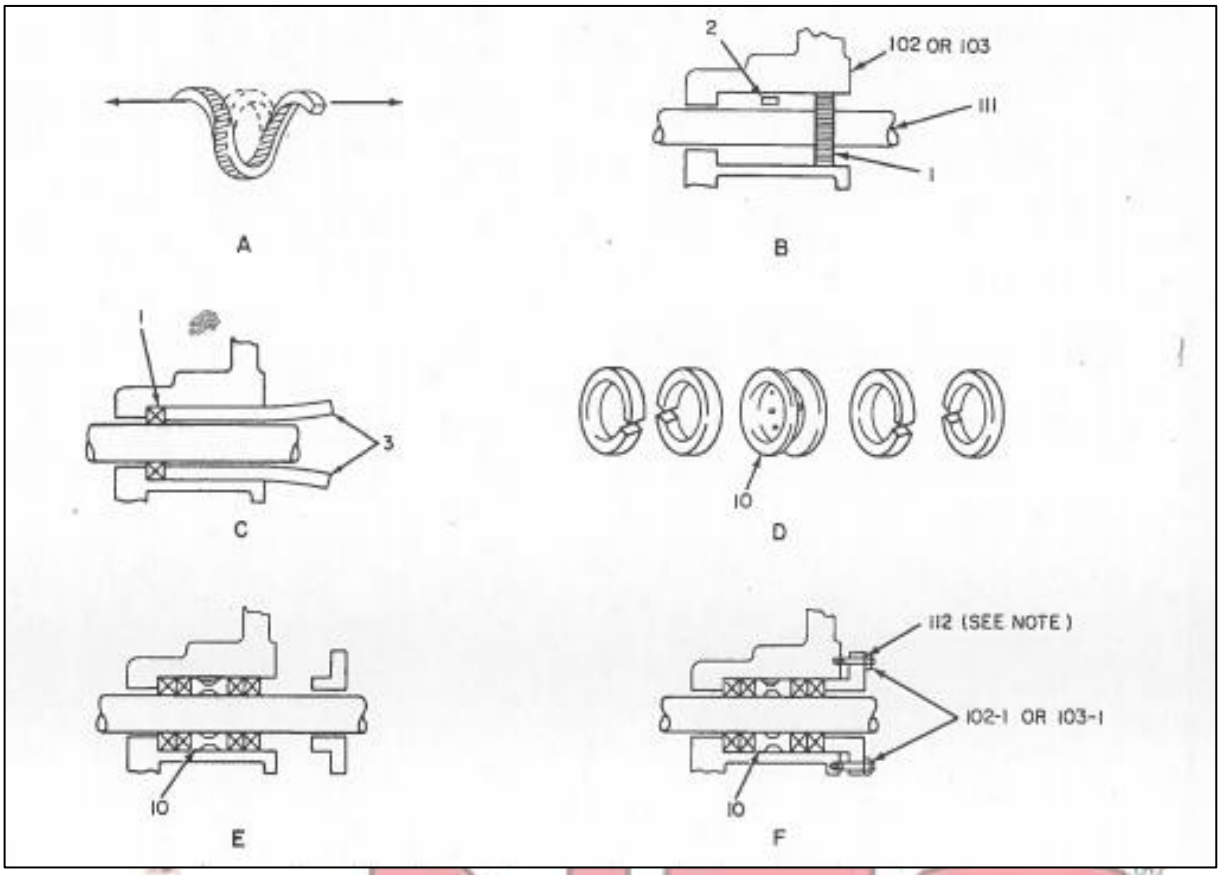
f. If provided, install the lantern gland (10).

g. Install all remaining packing rings as outlined in the preceding step.

h. Place the two halves of the packing gland assembly onto the shaft and connect them using two screws, lock washers, and nuts. Slide the packing gland assembly onto the studs until it aligns flush against the last packing ring installed. Install and evenly finger-tighten the gland nuts (see Fig 5 F).

i. Initiate the pump following the instructions in Section 3. Observe the stuffing box's temperature as the pump operates, ensuring consistent leakage from the stuffing box at all times. If there is no leakage or if the stuffing box overheats, halt the pump and identify the cause. Replace the packing if necessary.

j. After the pump has run steadily for ten minutes with a stable leakage, systematically tighten the gland nuts one flat at a time at ten-minute intervals until there is a leakage of approximately 45 to 60 drops per minute from the gland without overheating. This procedure is crucial for providing lubrication to the packing, preventing scoring, and avoiding shaft burning. Subsequent gland nut tightening should occur with the pump operating at average working temperature and vacuum.



1. Packing Ring
2. Lantern Gland Supply Connection
3. Packing Ring Pusher
10. Lantern Gland
101. Body
101-1. Gland Nut
103. Fixed Bearing End Head
103-1. Gland Nut
112. Packing Gland Assembly

* When used

Figure 5. Packing / Stuffing Box

5.6 Shutdown Periods

If the pump is to be idle for 2-3 weeks, manually rotate the pump at least once a week to prevent the accumulation of rust between the parts that may lead to seizing. If the pump is scheduled to be out of operation for more than 3 weeks, follow the steps below to avoid seizing during storage due to rust formation.

a. Eliminate all pipe plugs from the pump drains and allow all liquid to drain from the pump. Subsequently, replace the pipe plugs.

b. Disconnect the discharge piping of the pump and close off the pump discharge flange.

d. Commence by filling the pump approximately 1/4 full of water-soluble preserving oil, such as J.L. Quimby NRP 100 or an equivalent, through the inlet flange.

e. Initiate the pump and rotate it for a duration of 5 to 15 seconds, followed by shutting down the pump. Restart the pump and rotate for an additional 5 to 15 seconds before shutting down.

f. Drain all the preserving fluid from the pump, intending to reuse it, by removing all drain plugs as indicated in step a. Subsequently, replace the pipe plugs using a suitable pipe thread compound.

g. Perform any necessary touch-ups on areas where paint has chipped off and apply Houghton's Rust Veto #344 or an equivalent as required.

h. Blank off the pump inlet.

Section 6 Disassembly, Inspection, and Re-Assembly

6.1 Dismantling Pump

Before proceeding with the disassembly of the pump, ensure that the electrical input is isolated, locked, and tagged out. Disconnect the seal liquid connections, coupling to the drive motor or V-belt drive, as well as the inlet and outlet connections. It is crucial to carry out the disassembly and reassembly of the pump on a level surface. As parts become accessible during the disassembly process, mark them for proper identification.

Prior to initiating the disassembly, gather all the necessary parts, materials, standard tools, and any specially fabricated tools mentioned in the subsequent paragraphs. These tools and equipment are essential for the smooth disassembly and reassembly of the pump.

WARNING!

WHEN LIFTING THE PUMP ASSEMBLY, EMPLOY A SLING WRAPPED AROUND THE BEARING BRACKETS. DO NOT LIFT BY WRAPPING A SLING AROUND THE OUTSIDE OF THE BODY, AS LIFTING IN THIS MANNER CAN CAUSE BENDING AND DAMAGE TO THE TIE RODS.

Parts and Materials

a. Minimum recommended spares specified in Legend for Section 9 (which should be kept on hand at all times).

NOTE

IT IS NOT RECOMMENDED TO DISASSEMBLE A PUMP UNLESS THE FOLLOWING REPLACEMENT ITEMS ARE AVAILABLE FOR RE-ASSEMBLY: TWO SETS OF STUFFING BOX PACKING (1) OR MECHANICAL SEALS (2); ONE SET OF ADJUSTING SHIMS (4); ONE SET OF GASKETS (101-3, 105-3, 115-3, 120-3); TWO LANTERN GLANDS (10); AND FLOATING AND FIXED END BEARINGS (119 AND 120). PLEASE REFER TO SECTION 9 FOR MORE DETAILS.

b. Molykote G-n paste or an equivalent.
c. Loctite Primer T and Loctite 242 (required only if gland studs (103-2 or 150-2) require replacement).
d. Any standard grease.
e. Grease as specified in Table 2 for the bearings.
f. Solvent such as kerosene.
g. Eye bolts.
h. Two metric jackscrews to set end travel.

Standard Tools:

a. Metric socket wrench set with a shaft extension. In most cases, open-end or box wrenches can be substituted for socket wrenches.
b. Metric hexagonal (Allen) wrenches.
c. Spanner wrench (for bearing locknuts).

Note

Machinist's hammer and brass drift can be substituted if spanner Wrench is not available.

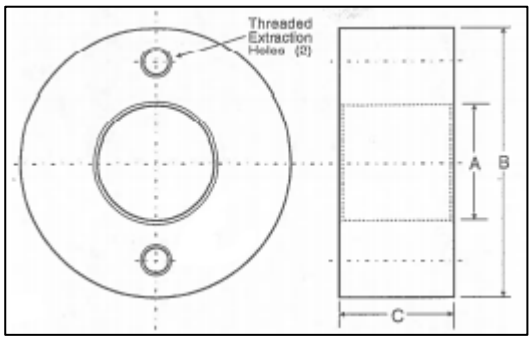
d. Spirit level.
e. Leaf (feeler) gauge.
f. Metal straightedge.
g. Press approximately 80-ton capacity. Press must indicate the amount of force applied and is only required if the rotor or shaft requires replacement.
h. Dead blow mallet.
i. Machinist's dial indicator with suitable clamps and mounts.
j. Needle-nosed pliers.
k. Propane torch and 250°F (121°C) temp stick.
l. Bearing heater.
m. Thermally insulated gloves.
n. Floor jack.
o. Appropriately sized hoist and slings.
p. Torque Wrench 0-450 ft-lbs.
q. Bearing puller.

Special Tools:

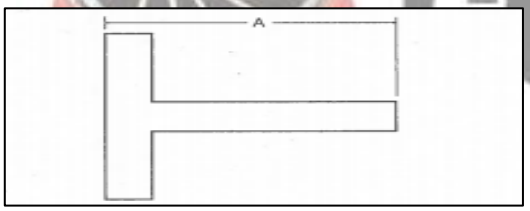
a. Dummy Bearings – Figure 6a (needed for pumps with mechanical seals only).
b. Rotor/Shaft Assembly Gage – Figure 6b.

6.2 Remove Idle End Bearing and Bracket

a. Remove the three bolts (117-1) securing the idle end bearing cap.
b. Take off the idle end bearing cap (117) from the bearing bracket (109).
c. Unscrew the locknut (120-1) from the end of the shaft.
d. Loosen the four screws (109-1) securing the bearing bracket.
e. Remove the pipe plug next to the bearing bracket to create working space.



Pump Model NX		Dimensions - inches "A"	"B"	"C"
35/45	Drive End	1.773 +.001 (45.03 +.02)	3.936-.001 (99.97-.02)	.9843 (25)
	Idle End	1.773 +.001 (45.03 +.02)	3.936-.001 (99.97-.02)	1.5625 (36.69)
60/80	Drive End	2.166 +.001 (55.02 +.02)	4.723-.001 (119.96-.02)	1.1417 (29)
	Idle End	2.166 +.001 (55.02 +.02)	4.723-.001 (119.96-.02)	1.9375 (49.21)
100/130	Drive End	2.560 +.001 (65.02 +.02)	4.723-.001 (119.96-.02)	1.2205 (31)
	Idle End	2.501 +.001 (63.52 +.02)	4.723-.001 (119.96-.02)	2.5625 (65.09)
150	Drive End	2.560 +.001 (65.02 +.02)	5.511- .001 (139.98-.02)	1.2992 (33)
	Idle End	2.501 +.001 (63.52 +.02)	4.723-.001 (119.96-.02)	2.5625 (65.09)



Pump Model NX	Dimensions- inches (mm) "A"
35/45	7.844 +/-.015 (199.24 +/- .38)
60/80	8.438 +/-.015 (214.33 +/- .38)
100/130	9.375 +/-.015 (238.13 +/- .38)
150	9.500+/-.015 (241.30+/-.38)
250	10.500+/-.015 (266.70+/-.38)
350	10.700+/-.015 (272.26+/-.38)
500	11.62500+/-.015 (295.28+/-.38)

Figure 6. Special Tools

f. Place a three-jaw puller onto the bearing bracket, aligning the jaws as illustrated in Figure 7. Ensure the puller jaws are positioned on the back of the flats on the bracket.

g. Tighten the puller until the shims (4) can be taken out.

h. Measure and note the thickness of the shims.

i. Remove the four screws securing the bearing bracket.

j. Further tighten the puller until the bearing bracket can be lifted off.

k. Invent a bearing bracket design allowing the bearing (120) to smoothly slide out. If necessary, consider implementing a mechanism to push the bearing out from the opposite side.

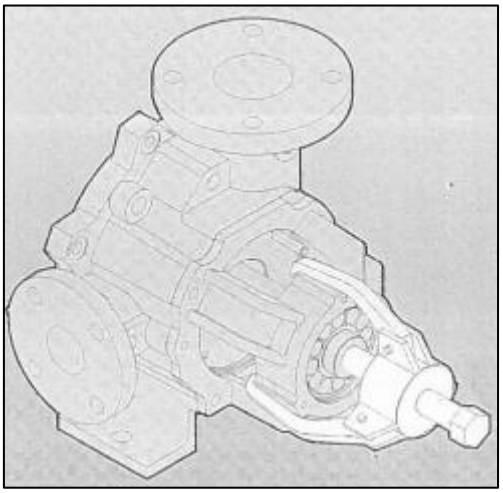


Figure 7. Disassembling Bearing Bracket

6.3 Remove Drive End Bearing and Bracket

a. Remove the three drive-end bearing cap bolts (115-1)

b. Remove the drive end bearing cap (115) from the bearing bracket (108).

c. Remove the four bearing bracket screws (108-1).

d. Position a three-jaw puller onto the bearing bracket as shown in Figure 7. The jaws of the puller should be placed into the back of the flats on the bracket. Tighten the puller to the point where the bearing can be removed.

e. Invert bearing bracket so that the bearing (119) slides out. It may be required to push the bearing out from the opposite side.

6.4 Removing Head and Cone Assembly

a. Remove the nuts (101-4), washers (101-5), and tie rods (101-1) from the head (103) and end plate (150).
b. Slide the head and cone assembly (103) off of the shaft. Be sure to support the rotor and shaft.
c. Remove the body gasket (101-3) and discard.
d. Remove the gland nuts (103-1) from the studs (103-2) and remove the gland assembly (112).
e. Remove packing (1) and discard.

6.5 Removing Lobe from End Plate

a. Carefully detach the lobe (101) from the end plate (150) and shaft/rotor, ensuring adequate support for the rotor and shaft.

b. Eliminate the body gasket (101-3) and properly dispose of it.

c. Loosen the gland nut (150-1) from the studs (150-2) and detach the gland assembly (112) from the end plate.

d. Take out the packing (1) and discard it appropriately.

6.6 Remove Rotor and Shaft Assembly

a. Extract the rotor and shaft assembly from the end plate.
b. Examine the rotor tapered bore and shaft according to the guidelines outlined in Paragraphs 5.9.2 and 5.9.3.

6.7 Removing Rotor from Shaft

a. Record the measurement of dimension A (Table 3) from the flat face of the rotor to the fixed bearing journal shoulder.
b. Screw the idle end bearing locknut (120-1) onto the shaft (111) to safeguard the threads.
c. Elevate the rotor and shaft assembly using a chain hoist and sling.
d. Slip a bushing or pipe section, appropriately sized to fit over the idle end of the shaft, ensuring the face of the bushing contacts only the rotor (110) hub face.

NOTE

PRESS WITH 80-TON CAPACITY IS REQUIRED. PRESS SHOULD BE LARGE ENOUGH TO ACCOMMODATE ROTOR DIAMETER.

e. Place the rotor and shaft assembly in the press, aligning the drive end of the shaft with the press ram and the bushing (installed in step d) against the press backup plate.
f. Ensure adequate support for the idle end of the shaft as it is pushed away from the rotor. Support the rotor using blocks or a sling passed through the rotor blades and around the shroud, as illustrated in Figure 8.

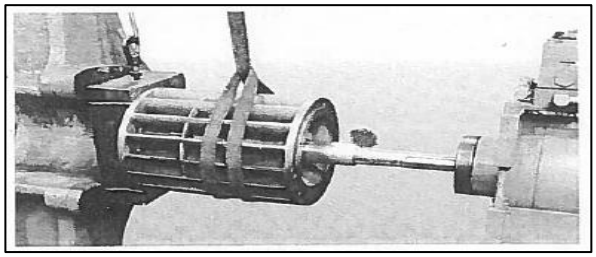


Figure 8 Removing Rotor from Shaft

6.8 Removing Cone from Head

If the examination of the cone reveals that replacement or reworking is necessary, follow these steps:

NOTE

MAKE SURE TO LABEL THE CONE AND HEAD BEFORE DISASSEMBLING TO GUARANTEE CORRECT ALIGNMENT DURING REASSEMBLY OF THE CONE ONTO THE HEAD.

a. Use an Allen wrench to loosen and remove each cone screw (105-1) by tapping the wrench with a mallet; repeat for all eight cone screws.
b. Gently tap the side of the cone (105) with a soft-headed mallet to release it from the head.
c. Pull the cone away from the head.
d. Take out the gasket (105-3) and dispose of it.
e. Extract the ball valve assembly (18) from the cone.

6.9 Inspection of Disassembled Parts

With the pump disassembled, inspect the parts for wear as described in the following paragraphs.

NOTE

IF THERE ARE ANY QUESTIONS ABOUT THE REUSABILITY OR REPAIR OF WORN MAJOR PUMP PARTS, CONTACT YOUR LOCAL N.E.S. REPRESENTATIVE.

6.9.1 Cone

Inspect the normally worn tapered surfaces of the cone, which should be smooth, requiring cleaning and light filing around the ports and tips. In cases where foreign material has entered the pump suction inlet during operation, circular score marks may be evident around the outside of the cone tapers. Assess the cone for damage and wear using the following steps:

a. Use a straightedge and feeler gauge, as illustrated in Fig. 9, to check for uneven wear and scoring between the ports and at the edges of the ports.

b. Localized wear or scoring less than 0.010 inches deep is acceptable unless the pump is required to operate at or near maximum capacity.

c. If score marks are not too deep, high spots can be removed by light filing.

d. If localized wear or scoring exceeds 0.010 inches in depth, contact your local N.E.S. Representative for assistance in determining the reusability of the cone.

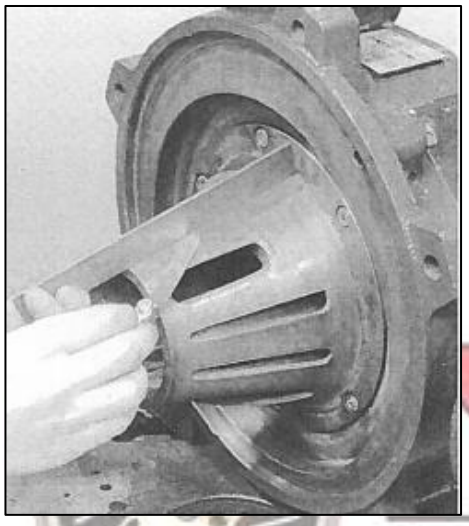


Figure 9. Inspecting Cone for Wear

6.9.2 Rotor

Examine the tapered cone bore of the rotor using the same criteria as for the tapered surface of the cone:

Check for uneven wear, undercutting, or scalloping on the cone bore tapered surface, employing a straightedge and feeler gauge as depicted in Figure 9.

If localized wear, undercutting, or scalloping exceeds 0.010 inches (0.254 mm) in depth, seek assistance from your N.E.S. Representative to assess the reusability of the rotor. Minor pitting is considered acceptable.

6.9.3 Shaft

Inspect the shaft diameters where the packing seats are for any signs of excessive wear. If the shaft exhibits scoring or has worn through the metal surface, consult your N.E.S. Representative for guidance in assessing the reusability of the shaft. Additionally, scrutinize the shaft journal for indications of pick-up, and thoroughly check all surfaces for wear or damage.

6.10 Reassembling Pump

Refer to Parts and Materials, Standard Tools, and Special Tools, Section 5.1

CAUTION!

BEFORE REASSEMBLY, METICULOUSLY CLEAN ALL PARTS, ENSURING THE REMOVAL OF ANY OLD GASKET MATERIAL FROM MOUNTING FLANGES. ELIMINATE ANY BURRS FROM MATING SURFACES AND MOUNTING FACES FOR OPTIMAL REASSEMBLY.

6.11 Reassembling Rotor and Shaft

To reassemble the rotor on the shaft, proceed as follows.

a. File the taper bores of the rotor to eliminate burs and high spots.

b. Inspect the shaft for dents or rough spots on the rotor seat and bearing journals.

c. Stone or polish the shaft until smooth.

d. Apply Molykote GN paste or an equivalent to the rotor hub bore and rotor seat of the shaft to prevent damage from friction or pick-up when the shaft is pressed into the rotor.

e. Thread the idle end bearing locknut onto the shaft to protect the threads.

f. Verify the proper rotation of the rotor before assembly, ensuring it is clockwise when viewed from the drive end.

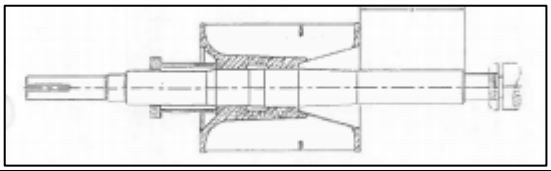
g. Insert the drive end of the shaft into the rotor bore and gently tap with a fiber hammer.

h. Place the rotor shaft assembly into the press with the idle end of the shaft aligned with the ram end of the press.

i. Ensure the rotor shaft assembly is level, checking for any misalignments.

j. Press the rotor onto the shaft using the provided gauge or a straightedge and scale, as depicted in Figure 10, to measure the assembly location. The rotor is correctly positioned when the gauge is flush with or the measurement aligns with the values indicated in Table 3, from the rotor face to the shoulder of the idle-end bearing journal.

k. The minimum and maximum allowable press forces and assembly distances are as outlined in Table 3.



Pump Size NX	Dimension A Inches (mm)	Press Force Tons (Metric Tons)	
		Maximum	Minimum
35	7.844 ±.015 (199.24±.38)	7 (6.35)	3 (2.72)
45	7.844 ±.015 (199.24±.38)	13 (11.79)	4 (3.63)
60	8.438 ±.015 (214.33±.38)	19 (17.24)	6 (5.44)
80	8.438 ±.015 (214.33±.38)	22 (19.96)	7 (6.35)
130	9.375 ±.015 (238.13±.38)	23 (20.87)	8 (7.25)
150	9.500+/-.015 (241.30+/-.38)	25 (22.70)	8 (7.25)
250	10.500+/-.015 (266.70+/-.38)	31 (28.1)	10 (9.10)
350	10.700+/-.015 (272.26+/-.38)	55 (49.9)	25 (23.6)
500	11.62500+/-.015 (295.28+/-.38)	66 (59.9)	31 (28.1)

Table 3. Allowable Press Forces

CAUTION!

IF THE ASSEMBLY FORCE RECORDED IS NOT WITHIN THE SPECIFIED LIMITS ABOVE, DO NOT INSTALL THE ASSEMBLED ROTOR AND SHAFT IN THE PUMP. CONTACT YOUR LOCAL N.E.S. REPRESENTATIVE TO DETERMINE WHETHER THE ROTOR/SHAFT MUST BE REPLACED.

l. Reposition the lifting sling on the rotor to a new point of balance and remove the assembly from the press.

m. Remove the bearing locknut from the shaft.

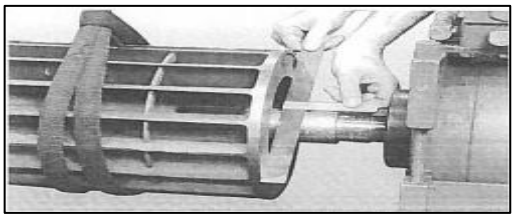


Figure 10 Reassembling Rotor and Shaft

6.12 Install Cone in Head

If the head and cone assembly has been disassembled, reassemble it as follows:

a. If a new cone (105) is being installed, carefully check it against the old cone for the correct part number and remove rust preventive from surfaces using a solvent such as kerosene.

b. File the taper surfaces on the cone smooth, paying special attention to the edges of cone parts.

c. Place one ball (18) in each chamber of the ball check retainer (18-1) and attach the retainer cover (18-4) to the ball check retainer. Use Loctite 242 for the screws holding the retainer cover. Assemble the ball check retainer subassembly onto the cone, using Loctite 242 for the screws holding the ball check retainer assembly into the cone. For NX models 100 and larger, screw studs (105-2) into the back of the cone using Loctite 242. Place one ball in each chamber and temporarily tape them to the cone.

d. Place the head (103) with the cone side up. Apply a light coat of PST or Vaseline to the cone face of the head.

e. Apply a light coat of PST or Vaseline to the replacement gasket (105-3) and position the gasket on the head.

f. Lower the cone into place on the head, making certain that the holes in the cone flange align with the tapped holes in the head. Thread in the socket head cone screws (105-1) and tighten them in a star pattern so that the cone is properly squared.

g. After tightening the screws, tap the Allen wrench with a mallet to finish tightening each screw.

g. After tightening the screws, use a mallet to tap the Allen wrench and finish tightening each screw.

h. Apply a light coat of Molykote powder to the surface of the cone.

i. For NX models 100 and larger, remove the tape holding the balls.

6.13 Assemble Rotor/Shaft Assembly into Head

a. Apply a light coat of grease to both sides of the body gasket (101-3) and position it into the head rabbet. Use PST for gaskets on stainless pumps.

b. Insert the rotor shaft assembly into the head.

c. Ensure the rotor is correctly seated and firmly against the cone by using a feeler gauge. A 0.002” feeler gauge should not pass between the rotor and cone tapers when the rotor is firmly against the cone.

6.14 Lobe and End Plate Assembly

a. Slide the body (101) over the rotor shaft assembly and onto the head rabbet.
b. Apply a light coat of grease to both sides of the body gasket (101-3) and position it onto the end plate rabbet.
c. Slide the end plate (150) with the body gasket (101-3) over the shaft.
d. Use standard tie rods to align and slide the end plate and body. Tighten the tie rods lightly.

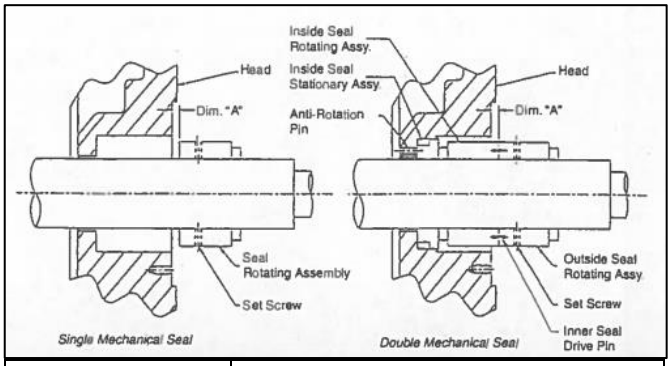
6.15 Assemble Mechanical Seals into Pump

This step is required only if mechanical seals are used and pertains specifically to the standard mechanical seals.
a. Remove the rotating element (2-1) of the mechanical seal from its packaging (Do not remove the retaining clips of the mechanical seal). Moisten the inside diameter of the Teflon wedge in the seal element with soapy water (dish detergent and water on your finger). Insert the rotating element onto the shaft (111) with the sealing surface facing outward. Repeat the process on both sides of the pump.
b. Install lip seals (5) into the bearing brackets (108, 109). The sealing lips must face away from the bearing cavity and should be lightly coated with grease along the lips and outside diameter.
c. Bolt the bearing brackets to the end plate (150) and head (103). In a horizontal assembly, it may be necessary to use a hoist to help center the rotor and shaft during assembly.
d. Install the dummy bearing onto both bearing journals of the shaft and then proceed to install the bearing caps (115, 117).

NOTE
ENSURE THAT THE CORRECT BEARING BRACKET IS INSTALLED ON EACH END OF THE PUMP, AS THE BEARING BRACKET MAY VARY BETWEEN THE IDLE AND DRIVE ENDS DEPENDING ON THE PUMP MODEL.

e. Attach a dial indicator to the shaft extension to measure end travel readings from the face of the drive end bearing bracket.
f. Loosen the bolts securing the idle end bearing bracket to the head. Utilize the threaded holes in the idle-end bearing bracket flange to pull the rotor shaft assembly against the cone until the rotor shaft assembly can no longer be turned. The rotor is now firmly against the cone. Set the dial indicator to zero.
g. Position the rotor within the end travel range as specified in Table 7.
h. Set the rotating assembly as illustrated in Figure 11, using the offset dimension A. Once the seal is properly positioned, double-check to ensure that the rotor is within the correct end travel range. Tighten the mechanical seal lock screws and secure the seal onto the shaft. Repeat the process on both sides of the shaft.
i. Remove the bearing brackets and the dummy bearings.

j. Remove the seal retainer clips.



Pump Model	Dimension "A" in Inches (mm)
NX 35 thru 150	1 / 16" (1.59)

Figure 11. Mechanical Seal Assembly

Pump Model NX	Seal Type	Shaft Diameter
30 / 45	*For more information, please contact your NES Representative*	2.125" (55mm)
60 / 80		2.75" (70mm)
100/130		3.0" (75mm)
150		3.375" (85mm)

Table 4. Standard Mechanical Seals

6.16 Mechanical Seal Retainer Assembly

This step applies to pumps equipped with mechanical seals only.
a. Moisten the Teflon ring of the mechanical seal stationary element (2-2) with soapy water. Insert the stationary element into the retainer (6) with the sealing surface facing outward. Ensure that the slot in the back of the seal stationary element aligns with the anti-rotation pin in the retainer, and that the element is seated against the back wall of the retainer.
b. Install the pipe plugs in the upper tapping of each retainer.
c. Place the retainer gaskets (6-3) on the head and lobe. No pipe sealant or grease is permitted, as the mechanical seal areas must be free of any contaminants.
d. Slide each retainer onto the shaft but do not fasten them to the head or end plate at this time.

6.17 Assemble Bearing Brackets onto End plate and Head

a. For pumps with packing only, mount slingers (3) and tension springs (3-1) onto the idle and drive ends of the shaft.
b. Install lip seals (5) into bearing brackets (108,109). The sealing lips should face away from the bearing cavity and be lightly coated with grease along the lips and outside diameter.
c. Fasten bearing brackets to the end plate (150) and head (103).

6.18 Assemble Drive End Bearing and Cap

a. Apply a thin layer of bearing grease to the bearing journal on the shaft.
b. Slide the bearing (119) onto the bearing journal of the shaft. Tap the bearing backward until it is seated against the shaft shoulder.
c. Pack the bearing by hand with grease.
d. Apply a thin layer of grease on the gasket (115-3) for the drive end outer bearing cap and place the gasket onto the cap (115).
e. Apply a thin layer of grease to the outside diameter and sealing surface of the lip seal (5-1), and install it into the outer drive end bearing cap (115).
f. Slide the cap onto the shaft and fasten the bearing cap to the bracket (108) using three bolts.

6.19 Assemble Idle End Bearing and Cap

a. Install the idle end bearing (120) onto the shaft following a similar procedure to the installation of the drive end bearing (refer to Section 5.18). Ensure that the bearing is properly grease-packed.

b. Secure the bearing in place with the locknut (120-1) using the appropriate-sized spanner wrench.

c. Position the outer ring gasket (120-3) over the shaft against the idle end bearing (120).

d. Attach the bearing cap (117) to the bracket (109).

e. Align the pump's feet by placing it on a level surface and slightly loosening the tie rods. Once aligned, tighten the tie rods to the torque values specified in Table 6.

Pump Model NX	35 / 45	60 / 80 / 130	150/250	350	500
Nut Torque Ft-Lbs (N-m)	32(44)	58(78)	94 (124)	144 (195)	190 (258)

Table 5. Tie Rod Torque Values

6.20 Setting End Travel

a. Secure a dial indicator to the shaft extension, allowing readings to be taken from the face of the drive end bracket (108).

b. Loosen the bolts (109-1) securing the idle end bearing bracket (109) to the head (103). Utilize the threaded holes in the flange of the idle end bearing bracket to pull the rotor shaft assembly against the cone until the rotor shaft assembly cannot be turned. This indicates that the rotor is now firmly against the cone. Set the indicator reading to zero.

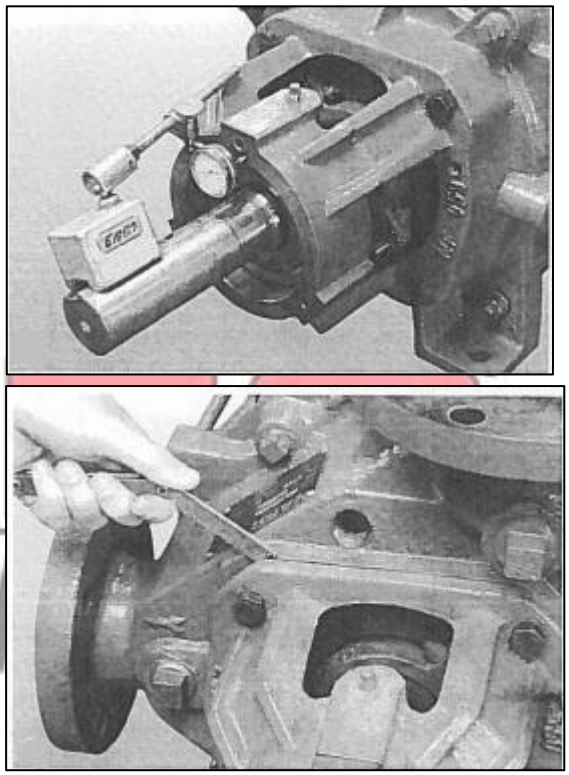


Figure 12. Setting End Travel

Pump Size: NX	Vacuum Pump inches (mm)		Compressor inches (mm)	
	Iron	Stainless Steel	Iron	Stainless Steel
35	0.020-0.025 (.508-.635)	0.040-0.045 (1.016-1.143)	0.040-0.045 (1.016-1.143)	0.060-0.065 (1.524-1.651)
45	0.020-0.025 (.508-.635)	0.040-0.045 (1.016-1.143)	0.040-0.045 (1.016-1.143)	0.060-0.065 (1.524-1.651)
60	0.020-0.025 (.508-.635)	0.040-0.045 (1.016-1.143)	0.040-0.045 (1.016-1.143)	0.060-0.065 (1.524-1.651)
80	0.020-0.025 (.508-.635)	0.040-0.045 (1.016-1.143)	0.040-0.045 (1.016-1.143)	0.060-0.065 (1.524-1.651)
130	0.025-0.030 (.635-.762)	0.050-0.060 (1.27-1.524)	0.050-0.060 (1.27-1.524)	0.075-0.090 (1.905-2.286)
150	0.035-0.040 (.889-1.016)	0.070-0.080 (1.778-2.032)	0.050-0.060 (1.778-2.032)	0.105-0.120 (2.667-5.161)
250	0.045-0.050 (1.143-1.27)	0.090-0.100 (2.286-2.54)	0.090-0.100 (2.286-2.54)	0.135-0.150 (3.429-3.81)
350	0.060-0.065 (1.524-1.651)	0.120-0.130 (3.048-3.302)	0.120-0.130 (3.048-3.302)	0.180-0.195 (4.572-4.953)
500	0.065-0.070 (1.651-1.778)	0.130-0.140 (3.302-3.556)	0.130-0.140 (3.302-3.556)	0.195-0.210 (4.953-5.334)

Table 6. End Travel Settings

c. Move the rotor shaft assembly away from the cone until the indicator reflects the end travel specified in Table 7.

NOTE

MAKE SURE THAT THE SHAFT ROTATES FREELY WITHOUT ANY RUBBING OR CONTACT.

d. With the rotor at the correct end travel setting, check the gap between the idle end bearing bracket face and the mating face on the head using a feeler gauge.

NOTE

CHECK GAPS IN FOUR PLACES AT 90˚ INTERVALS AND RECORD READINGS.

e. Choose the necessary shim thickness based on the average of the four readings.

f. Install shims in the gap and secure them with bolts holding the bearing bracket to the head.

g. Reevaluate the indicator on the drive end bearing bracket. The indicator reading should remain consistent.

6.21 Installation of Packing into Head and End Plate

a. Follow the detailed instructions in Section 4.5 for the proper installation of the packing.

b. Remove gland nuts (103-1, 150-1) and shift gland assemblies (112) away from the head and end plate.

c. For compressors, insert one set of packing (5 rings) into the head and end plate. For vacuum pumps, install two rings of packing, place the lantern gland (10) into position, and then add two more rings of packing.

NOTE

BEFORE INSTALLING EACH PACKING RING INTO THE PUMP, ENSURE TO APPLY A THIN LAYER OF GN PASTE TO THE INNER SURFACE OF EACH RING. IT IS CRUCIAL TO USE AN INSTALLATION TOOL TO PROPERLY SEAT EACH PACKING RING IN THE STUFFING BOX. ADDITIONALLY, MAKE CERTAIN THAT THE PACKING JOINTS ALTERNATE AT 180 DEGREES.

d. Reinstall gland assemblies onto the stuffing box studs. Do not fully tighten the nuts on the stuffing box studs.

6.22 Complete Installation of Mechanical Seals

This step is required for pumps furnished with mechanical seals only.

a. Slide the retainers (6) into the machined rabbet on the head (103) and end plate (150) and secure them with cap screws (6-1). Tighten the screws evenly.

6.23 Compressors

For compressors, add the equalizer line piping. See installation drawing.

Pump Model NX	Packing Size	Ring Dimensions
35	3/8" x 3/8" (10mm x 10mm)	2 1/8" ID x 2 7/8" OD (55 mm ID x 75mm OD)
45	3/8" x 3/8" (10mm x 10mm)	2 1/8" ID x 2 7/8" OD (55 mm ID x 75mm OD)
60	½" x ½" (12.5 mm x 12.5 mm)	2 ¾" ID X 3 ¾" OD (70mm ID x 95mm OD)
80	½" x ½" (12.5 mm x 12.5 mm)	2 ¾" ID X 3 ¾" OD (70mm ID x 95mm OD)
130	½" x ½" (12.5 mm x 12.5 mm)	3" ID x 4" OD (75mm ID x 100mm OD)
150	½" x ½" (12.5 mm x 12.5 mm)	3" ID x 4" OD (75mm ID x 100mm OD)
250	5/8" x 5/8" (16 mm x 16 mm)	4 1/2" ID x 5 1/2" OD (105mm ID x 137mm OD)
350	5/8" x 5/8" (16 mm x 16 mm)	4 3/2" ID x 6" OD (120mm ID x 152mm OD)
500	3/4" x 3/4" (20 mm x 20 mm)	5 1/2" ID x 6 3/4" OD (130mm ID x 170mm OD)

Table 7. Packing Size

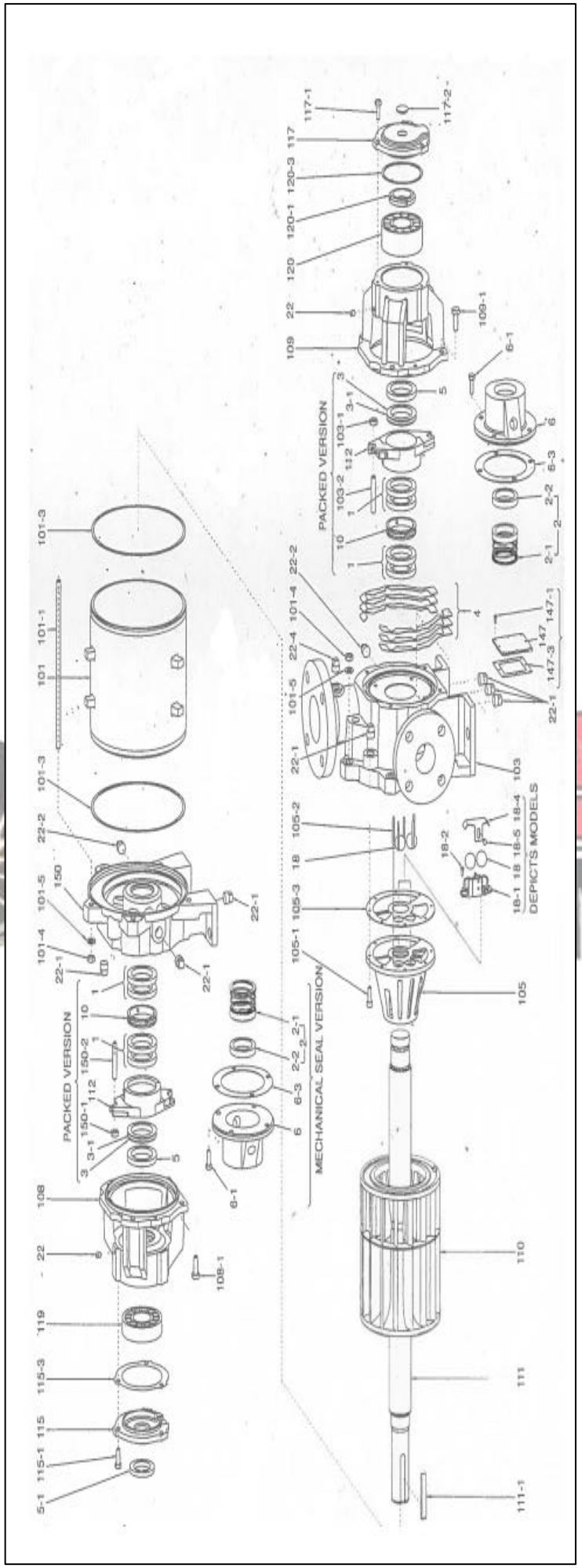
Section 7 Spare Parts

When ordering spare parts, please refer the part name, the pump model, and also the nameplate reference and the pump serial number.

Section 8 Warranty Claims and Returns

If a warranty is being claimed, the pump is to be shipped to our company in a closed package. It is to be emptied and cleaned before packaging. For safety reasons, if the pump has been working with harmful or dangerous liquids it is to be washed with appropriate materials before shipping. Please contact N.E.S. before shipping any items to our facilities.

Index No.	Description	Qty.
1	*Packing	4
2	*Seal Assembly	2
3	Slinger	2
3-1	Spring	2
4	*Shim	AR
5	*Lip Seal	2
5-1	*Lip Seal, D.E., Outer	1
6	Retainer Seal	2
6-1	Retainer Seal Bolt	8
6-3	Retainer Seal Gasket	2
10	Lantern Gland	2
18	Check Ball Valve	2
18-1	Check Ball Valve Retainer	1
18-2	Retainer Screw	2
18-4	Stop Plate	1
18-5	Stop Plate Screw	1
22	Pipe Plugs	2
22-1	Pipe Plugs	7
22-2	Pipe Plugs	2
22-4	Pipe Plugs	1
101	Body	1
101-1	Axial Rod	5
101-3	*Gasket	2
101-4	Rod Nuts	10
101-5	Rod Washers	10
103	Head, I.E.	1
103-1	Gland Nut, I.E.	2
103-2	Gland Stud, I.E.	2
105	Cone, I.E.	1
105-1	Bolt, I.E. Cone	20
105-2	Studs	AR
105-3	*Gasket, I.E. Cone	1
108	Bearing Bracket, D.E.	1
108-1	Bearing Bracket Bolt, I.E.	4
109	Bearing Bracket, I.E.	1
109-1	Bearing Bracket Bolt, I.E.	4
110	Rotor	1
111	Shaft	1
111-1	Shaft Key	1
112	Gland	2
115	Cap, Outer D.E.	1
115-1	Bolts, D.E. Outer Bearing Cap	3
115-3	*Gasket, D.E. Outer Bearing Cap	1
117	Cap, Outer I.E.	1
117-1	Bolts, I.E. Outer Bearing Cap	3
117-2	Nameplate, Cap	1
117-3	*Gasket, I.E. Outer Bearing Cap	1
119	*Bearing, D.E.	1
120	*Bearing, I.E.	1
120-1	*Locknut, I.E. Bearing	1
120-3	*Lock washer, I.E. Bearing	1
147	Cover Plate	1
147-1	Cover Plate Screw	6
147-3	Cover Plate Gasket	1
150	End Plate	1
150-1	Gland Nut, D.E.	2
150-2	Gland Stud, D.E.	2


PACKED VERSION
MECHANICAL SEAL VERSION
DEPICTS MODELS