



IMO<sup>®</sup>

**INSTRUCTION MANUAL**

**Series 3NBF  
for Hydraulic Elevator Service**

**WARNING**

**READ THIS INSTRUCTION MANUAL AND CA-1 BEFORE  
INSTALLATION, OPERATION, OR MAINTENANCE**

**Instructions 3NBF-ELEV (R-1)**

This manual now is  
identified as part no.  
SRM00022

## FOREWORD

This manual covers IMO Pump Division Series 3NBF AMR pumps for hydraulic elevator service. Field repairs are normally limited to servicing mechanical seal and ball bearing. This manual provides instructions for these operations plus instructions for complete pump overhaul.

## INSTALLATION AND OPERATION

### Inlet Position

To rotate inlet head, remove bolts (005) and rotate inlet head to desired position, using caution not to damage gasket (003). Gasket (003) must be replaced if damaged. To reassemble, install gasket (003) and inlet head (021) on case (001). Install bolts (005) and torque bolts to proper torque value listed in Table 1, page 3.

### Piping

Piping to the pump must be independently supported and not allowed to impose strains on the pump. Such strains, if imposed, may cause distortion and malfunction of the pump.

### WARNING

Prior to adding oil and/or start-up of a new or replacement pump, clean tank and flush all lines free of debris that will have accumulated during fabrication and installation. One large particle can completely wreck the pump in a fraction of a second.

### Priming

For units that do not have an overhead tank, a priming connection in suction line should be provided. Prime pump before initial start-up by pouring hydraulic fluid into priming point or pump suction. Rotate pump slowly by hand until rotors are wet and suction line is as full of fluid as possible.

### Suction Line

All joints in suction line must be tight and sealed to prevent air from being drawn into pump with negative suction pressure or leaks with positive suction pressure. Position suction line and/or inlet head so that fluid cannot drain from pump while shut down.

### Suction Strainer

A suction strainer with adequate flow rate and minimum pressure drop should be used to keep contamination from entering pump. Maximum pressure drop (when dirty) across strainer plus all other losses in pump suction line at maximum fluid viscosity, including static lift, must not exceed suction lift capability of pump. Regular cleaning of suction strainer must be included in maintenance of unit. NOTE: Keeping fluid and system clean is essential in achieving maximum pump life.

### Alignment - Belt-Driven Pumps

Mount sheaves as close to bearing retainer as possible to minimize load on shaft. Align sheaves with a straight edge so that faces are parallel with no offset. Misaligned sheaves can cause noise, shorten belt life, and reduce bearing life of pump and motor.

Apply belt tension according to belt manufacturer's recommendations. After tension is applied, recheck sheave alignment. Do NOT apply too much tension on belts. Loose belts slip and wear excessively. Excessive tension on belt may cause misalignment, belt failure, and in extreme cases, pump shaft failure.

For smooth, quiet, high speed operation, sheaves must be balanced, and shaft bores must be concentric with belting grooves. When matched belts are removed, they should be kept in sequence and replaced exactly in grooves from which they were removed.

### **Alignment - Direct Driven Pumps**

All pump-driver sets must be checked for proper alignment when the unit is installed and after all piping has been connected to the pump. A flexible coupling is not intended to permit permanent misalignment. Proper alignment must be established and maintained to obtain maximum pump life. Follow these steps:

1. Install pump and/or motor. Before aligning the units, ensure that all stresses are removed from pump and that foot of pump case fully conforms to its support.
2. Set coupling end face gap as specified by coupling manufacturer. Perform rough alignment of face and rim of coupling using feelers and straight edge
3. Perform final alignment of pump and driver shaft using dial indicators. Acceptable alignment has been obtained when the F.I.R. (Full Indicator Runout) is less than or equal to .005" in both the face (angularity) and rim (parallelism) checks while rotating both shafts in the same direction for 360 degrees.
4. In special cases, "hot alignment" when pump and motor are at operating temperature may be required.

Periodically check alignment of pump and driver. Realign as necessary. Maintaining proper alignment is necessary for quiet operation and maximum equipment life.

### **Rotation**

Before connecting belts or coupling, check driver rotation to ensure that it matches required rotation of the pump. Extended reverse rotation may cause damage. When coupling is connected and shafts are correctly aligned, pump should turn freely by hand. On initial start-up, it is suggested that driver be "jogged" before continuous operation to ensure that system and pump and motor are functioning properly and rotating in intended direction.

### **Fluid**

Use only hydraulic fluid recommended for use with pump. Supplementary oil additives are not recommended. Regular checks should be made of condition of hydraulic fluid and fluid level in reservoir. Follow fluid manufacturer's recommendations for maintaining fluid, fluid level in reservoir, and establishing when fluid is to be changed. When adding or replacing fluid, use enough fluid to return fluid level in tank to its normal operating point. Be sure fluid temperature is controlled so that minimum allowable viscosity at maximum operating conditions is not exceeded and that maximum viscosity at cold start does not cause suction lift limits to be exceeded.

### **CAUTION**

When replacing or adding fluid, do not permit foreign material to enter fluid and system.

Check fluid level in tank before and after start-up to ensure that it is within operating limits. If fluid is low, or drops as system fills on start-up, add sufficient clean hydraulic fluid to tank to bring fluid to its normal operating level.

### **Valves**

Before starting pump, check all valves to ensure that they are in proper position and that there is no possi-

bility of starting the pump with a blocked suction or discharge line and that the pump is filled with oil. Using a bleed point at the high point in system, vent air from system on start-up.

Relief valve setting should be approximately 5% above maximum system operating pressure. Do NOT set relief valve higher than maximum pressure rating of pump.

## MAINTENANCE

### General

If installation and alignment instructions are carefully followed, the pump should operate satisfactorily with very little attention. Field maintenance is generally limited to periodic maintenance checks and replacement of mechanical seal (020), ball bearing (011), gasket (003) and O-ring (002) (Minor Repair Kit).

To perform maintenance on Series 3NBF pumps, the following procedures shall be completed prior to any maintenance action:

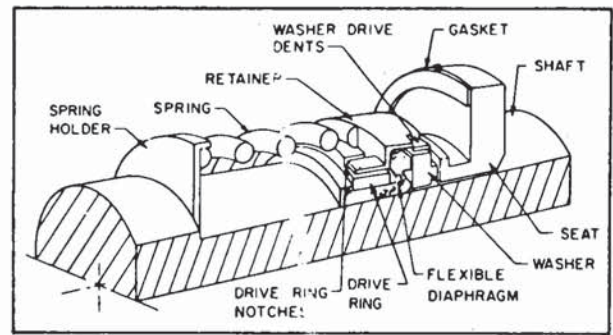
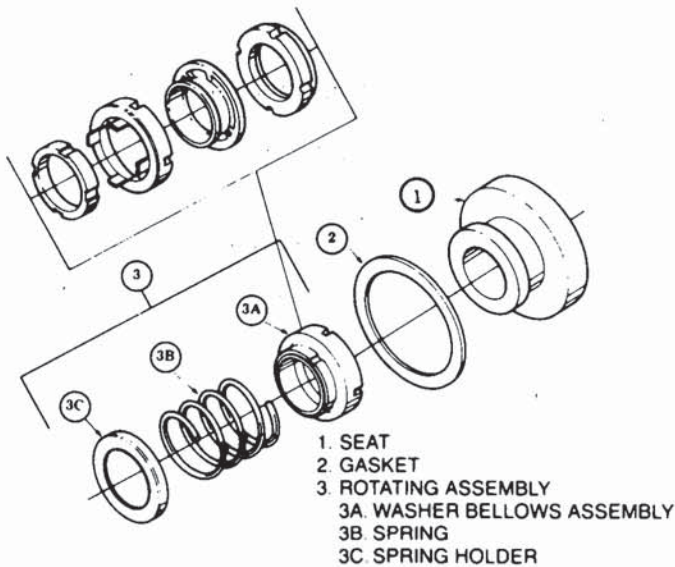
1. Close inlet and outlet valves and tag "Out-of-Service."
2. Deenergize pump driver and tag "Out-of-Service." Remove drive belts, hub and key (012) from pump power rotor (006) shaft.

### Servicing Mechanical Seal and Ball Bearing

1. Remove bolts (014) and retainer (013). Grasp power rotor (006) shaft and pull assembled power rotor from pump.
2. Remove retaining rings (009). Using a bearing puller mounted with pull arms under mechanical seal (020) seat (1, Figure 1), pull bearing (011), retaining ring (010) and seat (1, Figure 1) of mechanical seal (020) off power rotor (006). Remove bearing puller.
3. Clean and inspect each part for nicks and burrs. Using a buffing wheel, remove all burrs. Particular attention must be given to keyway and retaining ring grooves of power rotor (006) to ensure removal of all sharp edges. Wipe all parts with light lubricating oil prior to installation.
4. Slide mechanical seal (020) rotating assembly (3, Figure 1) on power rotor (006) shaft next to piston. Slide mechanical seal stationary seat (1, Figure 1) on power rotor shaft next to stationary assembly.
5. Compress seat (1, Figure 1) of mechanical seal down on spring (3B, Figure 1) and install inner retaining ring (009) on power rotor (006). Slide retaining ring (010) over power rotor (006) to rest on mechanical seal (020). Press ball bearing (011) on power rotor (006) until bearing is next to installed retaining ring (009), then install second retaining ring (009) in groove of power rotor (006).
6. Install gasket furnished with new mechanical seal flat in counterbore of cover (004). Install assembled power rotor into pump, centering each part as it enters cover (004) and ensuring that retaining ring (010) is properly positioned with slot down for drainage. (See note on Figure 2 drawing.)
7. Install retainer (013) using bolts (014). Torque bolts (014) to proper torque value listed in Table 1.
8. Install coupling key (012) and hub on power rotor (006). Install drive belts and check alignment. Prime pump to expel all air prior to starting.

**TABLE 1. Torque Values**

| Bolt | Rotor Size 187             | Rotor Sizes 218 & 250      |
|------|----------------------------|----------------------------|
| 005  | 18 lbs. ft. (± 2 lbs. ft.) | 49 lbs. ft. (± 2 lbs. ft.) |
| 014  | 18 lbs. ft. (± 2 lbs. ft.) | 24 lbs. ft. ± 2 lbs. ft.)  |
| 018  | 18 lbs. ft. (± 2 lbs. ft.) | 18 lbs. ft. ± 2 lbs. ft.)  |



**FIGURE 1. Crane Type 21 Mechanical Seal**

### **Pump Disassembly**

For complete pump overhaul and disassembly, complete procedures outlined in Steps 1 through 3 of Servicing Mechanical Seal and Ball Bearing. Continue pump disassembly as follows:

1. Remove bolts (005) and cover (004). Remove O-ring (002) from groove of cover (004).
2. Remove bolts (005) and inlet head (021). Remove gasket (003) from either inlet head (021) or flange of case (001).
3. Remove bolts (018) with lockwashers (019), spacers (017) and thrust plate (016).
4. Remove idlers (015) from bores of case (001).

### **Pump Assembly**

Prior to assembly of pump, check each part and remove nicks and burrs by buffing. Coat each part with light lubricating oil prior to assembly.

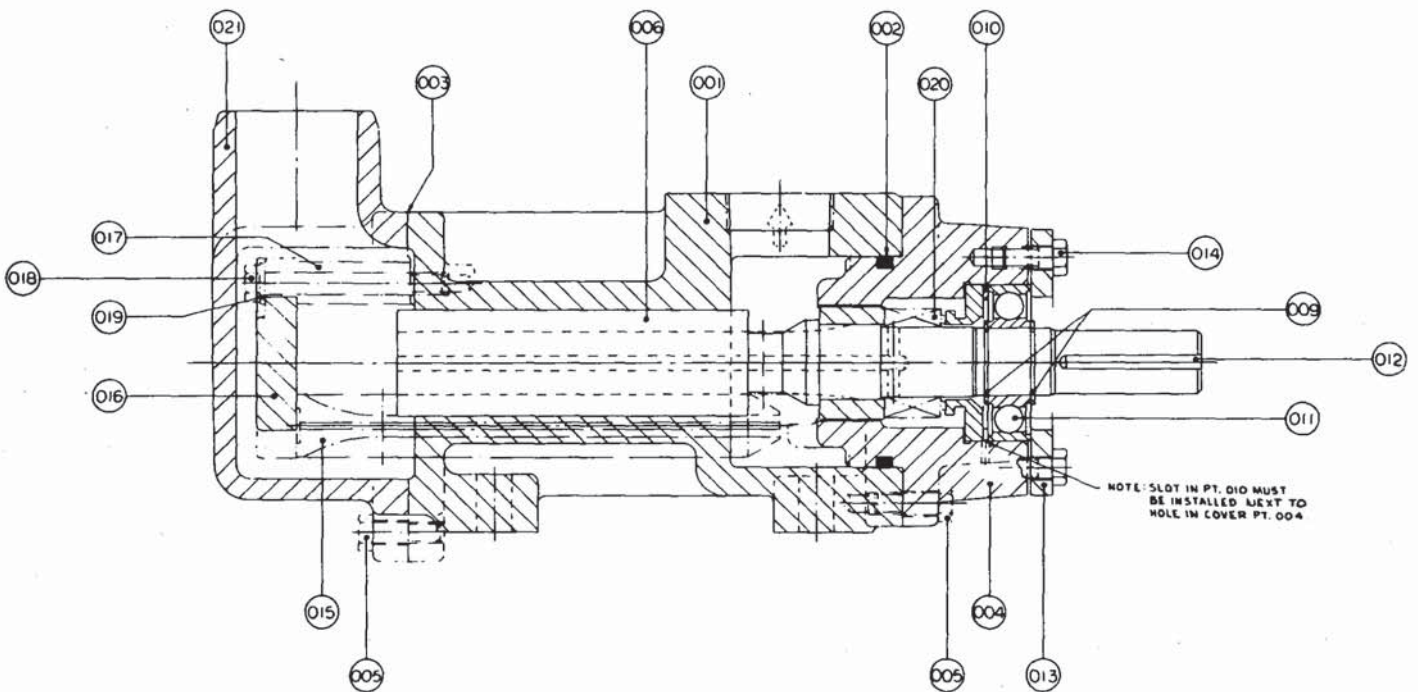
1. Install O-ring (002) in groove of cover (004) and install cover (004) on case (001) using bolts (005).  
Torque bolts (005) to proper torque value listed in Table 1. NOTE: Cover (004) must be installed with drain hole down.
2. Complete Steps 4 through 8 of Servicing Mechanical Seal and Ball Bearing, then thread idlers (015) in idler bores of case (001) at inlet end. Install spacers (017) and thrust plate (016) on case (001) using bolts (018) and lockwashers (019). Torque bolts (018) to proper value listed in Table 1.
3. Install gasket (003) and inlet head (012) on case (001) using bolts (005). Torque bolts (005) to proper torque value listed in Table 1.

**TABLE 2. List of Materials**

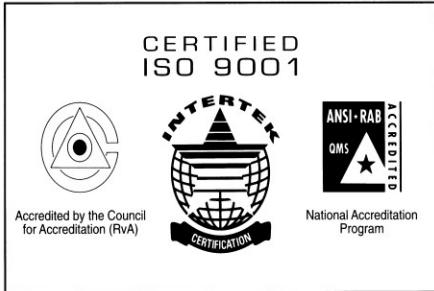
| Part No. | Description        | Part No. | Description    |
|----------|--------------------|----------|----------------|
| 001      | Case               | 013      | Retainer       |
| 002 X    | O-ring             | 014      | Bolt (4)       |
| 003 X    | Gasket             | 015      | Idler (2)      |
| 004      | Cover              | 016      | Thrust Plate   |
| 005      | Bolt (8)           | 017      | Spacer (2)     |
| 006      | Power Rotor        | 018      | Bolt (2)       |
| 009 X    | Retaining Ring (2) | 019      | Lockwasher (2) |
| 010      | Retaining Ring     | 020 X    | Seal           |
| 011 X    | Ball Bearing       | 021      | Inlet Head     |
| 012      | Key                |          |                |

X denotes recommended spare parts for normal field maintenance and minor overhauls and constitute a Minor Repair Kit.

Quantities are one (1) except when denoted in parentheses after part description.



**FIGURE 2. Pump Assembly Drawing SD-5625**



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