




## K12DHZ-312P Pump

### PRODUCT SERVICE MANUAL


**Imo Part Number / BOM # 3220/523**


|                                                                                                                                                                                                         |         |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|--|
|                                                                                                                      | WARNING |  |
| <p>This manual and the "General Installation, Operation, Maintenance and Troubleshooting Manual" (SRM00046) should be read in their entirety prior to installing, operating or servicing this pump.</p> |         |  |

|                     |        |                |
|---------------------|--------|----------------|
| Manual No. SRM00102 | Rev 00 | November, 2011 |
|---------------------|--------|----------------|



## READ ENTIRE PAGE BEFORE PROCEEDING

FOR SAFETY OF PERSONNEL AND TO PREVENT DAMAGE TO EQUIPMENT, THE FOLLOWING NOMENCLATURE HAS BEEN USED IN THIS MANUAL:

|                                                                                                      |               |  |
|------------------------------------------------------------------------------------------------------|---------------|--|
|                     | <b>DANGER</b> |  |
| Failure to observe precautions noted in this box can result in severe bodily injury or loss of life. |               |  |

|                                                                                                                                                                                                      |                |  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--|
|                                                                                                                     | <b>WARNING</b> |  |
| Failure to observe precautions noted in this box can cause injury to personnel by accidental contact with equipment or liquids. Protection should be provided by user to prevent accidental contact. |                |  |

|                                                                                            |                |  |                  |
|--------------------------------------------------------------------------------------------|----------------|--|------------------|
|                                                                                            | <b>CAUTION</b> |  | <b>ATTENTION</b> |
| Failure to observe precautions noted in this box can cause damage or failure of equipment. |                |  |                  |

|                                                                                                           |                                                                                    |                                                                                                                                                      |
|-----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| Non compliance of safety instructions identified by the following symbol could affect safety for persons: | Safety instructions where electrical safety is involved are identified by:         | Safety instructions which shall be considered for reasons of safe operation of the pump and/or protection of the pump itself are marked by the sign: |
|                         |  | <b>ATTENTION</b>                                                                                                                                     |

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### IMPORTANT NOTE

If operation of pump is critical to your business, we strongly recommend keeping a spare pump or major repair kit in stock at all times. For expeditious pump refurbishment, as a minimum, keep a minor repair kit (o-rings, gaskets, shaft seal and bearings) in stock.

## A. GENERAL INSTRUCTIONS

Instructions found herein cover disassembly, assembly and parts identification for the K12DHz-312P pump.

**NOTE:** *Individual contracts may have specific provisions that vary from this manual. Should any questions arise which may not be answered by these instructions, refer to General Instructions Manual, CA-1, provided with your order. For further detailed information and technical assistance please refer to Imo Pump, Technical/Customer Service Department, at (704) 289-6511.*

This manual cannot possibly cover every situation connected with inspection, and maintenance of equipment supplied. Every effort was made to prepare text of manual so that engineering and design data is transformed into most easily understood wording. Imo Pump assumes personnel assigned to operate and maintain supplied equipment and apply this instruction manual have sufficient technical knowledge and are experienced to apply sound safety and operational practices which may not be otherwise covered by this manual.

In applications where equipment furnished by Imo Pump is to become part of processing machinery, these instructions should be thoroughly reviewed to ensure proper fit of said equipment into overall plant operational procedures.



### WARNING

If installation, operation and maintenance instructions are not correctly and strictly followed and observed, injury to personnel or serious damage to pump could result. Imo Pump cannot accept responsibility for unsatisfactory performance or damage resulting from failure to comply with instructions.

## B. INTRODUCTION

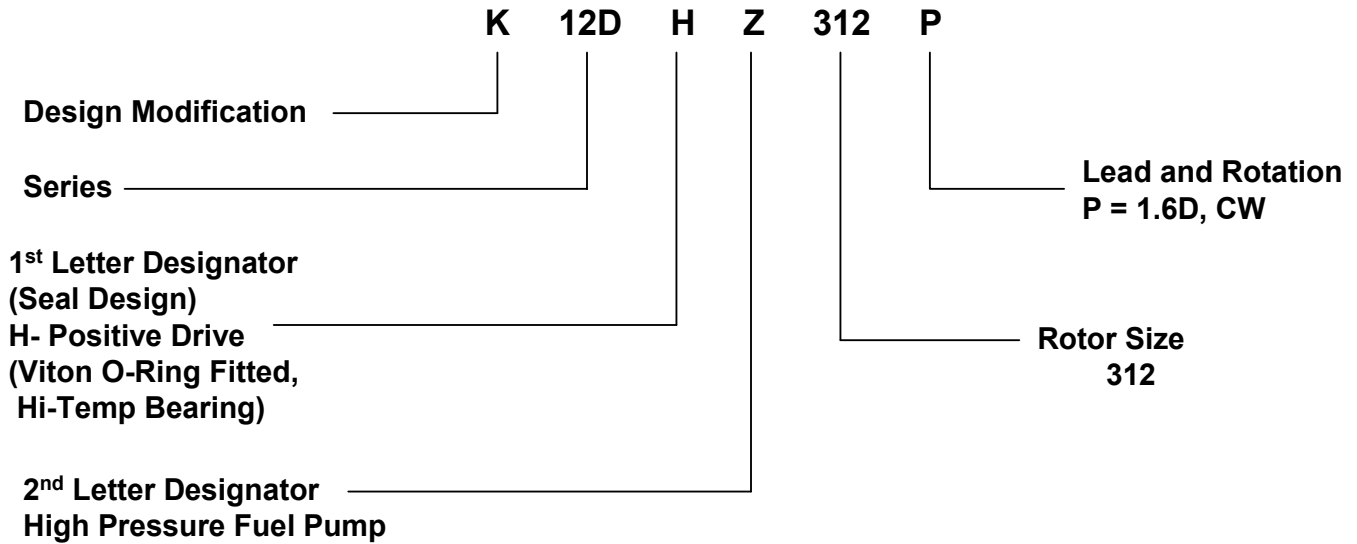
Instruction manual covers the K12DHz-312P Imo pump. This pump has been designed for use in high temperature clean fuel oil applications. Model of each pump can be identified by bill of material and description on pump nameplate.

## C. DESCRIPTION OF EQUIPMENT

The K12DHz-312P pump is positive displacement, rotary screw pumps consisting of precision bored housings that enclose a driven screw (power rotor) and eight intermeshing following screws (idler rotors). These screws, when rotating, form a succession of closures or cavities. As they rotate, fluid is moved axially from inlet port to outlet port in a continuous, uniform flow with minimum fluid pulsation and pump noise.

**D. PUMP MODEL IDENTIFICATION**

This service manual covers the K12DHZ-312P pump. Model of pump is identified on pump nameplate. Refer to Pump assembly drawing and Table 2 for instructional keys when using this manual.



**E. ORDERING INSTRUCTIONS**

When corresponding with Imo Pump regarding K12DHZ-312P pumps, refer to pump nameplate, this service manual, and assembly drawing as instructed below:

1. From pump nameplate, record the pump model number, serial number and manufactured date.
2. Record service manual number, revision and date.
3. From assembly drawing and/or parts list (table 2) in manual, provide identification numbers(s) and names for replacement part(s).
4. Give above information to your Imo service representative.

Imo sales and service representatives are listed herein and in General Instruction Manual, SRM00046.

**F. OPERATION**

**F.1 LIQUID LIMITATIONS**

|                                                                                               |                |  |                  |
|-----------------------------------------------------------------------------------------------|----------------|--|------------------|
|                                                                                               | <b>CAUTION</b> |  | <b>ATTENTION</b> |
| Never operate with water. Pump is designed for liquids having general characteristics of oil. |                |  |                  |

## F.2 OPERATING LIMITS

|                                                                                                                                                                                                                                                                                                                                                                                                                          | CAUTION | ATTENTION |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|-----------|--|
| <p>Operating conditions, such as speed, fluid viscosity, temperature inlet pressure, discharge pressure, filtration, duty cycle, drive type, mounting, etc., are interrelated. Due to these variable conditions, specific application limits may be different from that of operational limitations. Equipment must not be operated without verifying system's operating requirements are within pump's capabilities.</p> |         |           |  |

**Under no circumstances are following operating limits (specified in Table 1) to be exceeded without specific approval from Imo Pump.**

**Table 1 – Normal Pump Operating and Structural Limits**

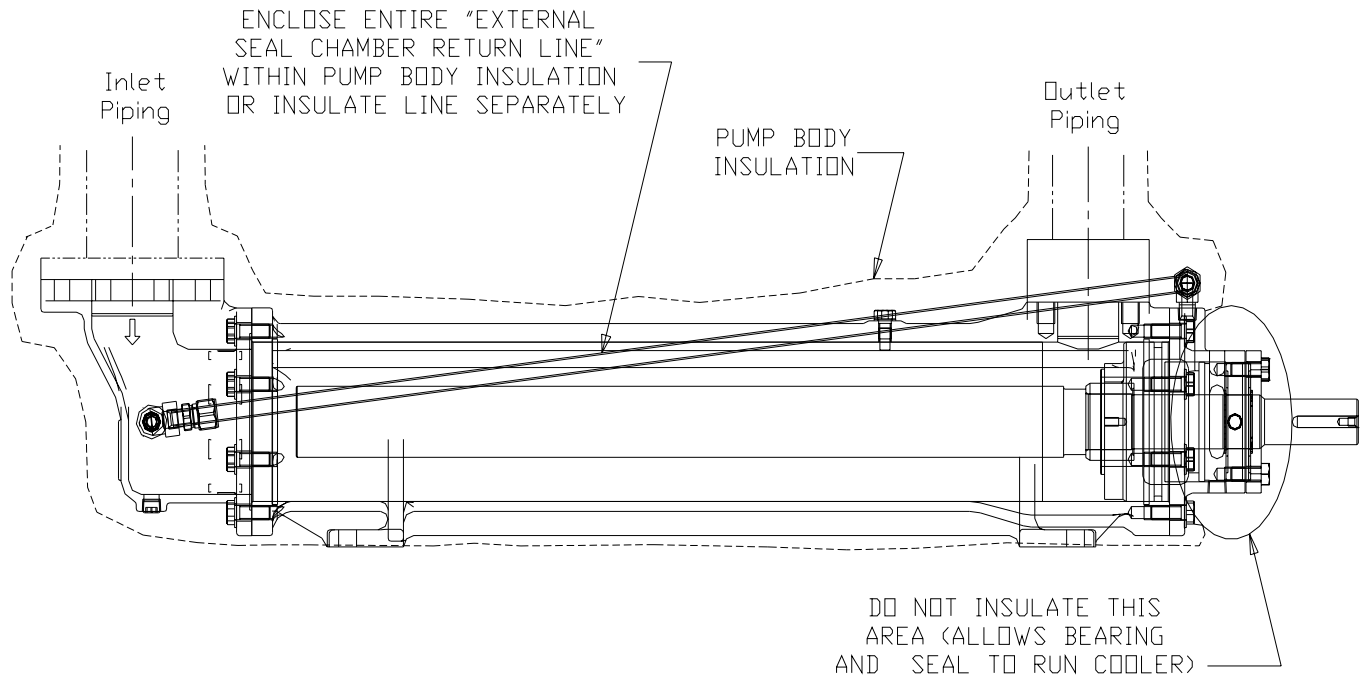
|                                            |                                            |
|--------------------------------------------|--------------------------------------------|
| MAXIMUM SPEED .....                        | 2500 RPM                                   |
| VISCOSITY .....                            | 1 cSt Minimum – 3000 SSU (650 cSt) Maximum |
| MINIMUM – MAXIMUM LIQUID TEMPERATURE ..... | 0 to 275°F (-18 to 135 C)*                 |
| MAXIMUM INLET PRESSURE .....               | 150 psig                                   |
| MAXIMUM DISCHARGE PRESSURE .....           | 2200 psig, Continuous Duty                 |
| FILTRATION .....                           | (See General Instruction Manual, SRM00046) |
| DRIVE .....                                | Direct Only                                |
| MOUNTING .....                             | Foot or Flange Mounted in Any Attitude     |

\* See instructions below for running over 200°F

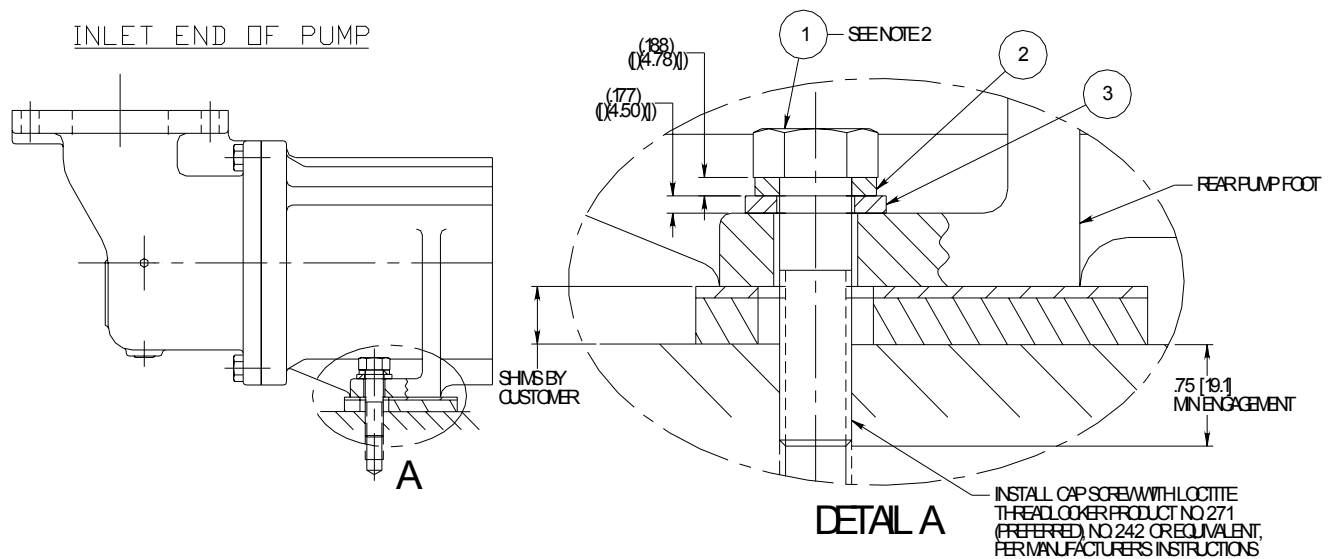
### F3. High Temperature Operation (Above 200°F (93°C))

For high temperature operation, Imo recommends:

1. Use a spacer double disk type coupling (Thomas DBZ-C or equivalent) to eliminate need for hot alignment.
2. Insulate pump case per Figure 1, except ball bearing area, to keep temperature of all components approximately the same.
3. Torque down **rear** feet of pump per instructions with flat washer and spring washer to allow foot of case to float as case expands with high temperature. See Figure 2. Front feet should be torqued to approximately 200 lb-ft with no washer or Loctite required.



**Figure 1 - RECOMMENDED AREAS FOR PUMP INSULATION**



NOTE: TIGHTEN BOLTS UNTIL SPRING LOCKWASHER IS FULLY COMPRESSED, NOTE TORQUE VALUE AND TIGHTEN AN ADDITIONAL 10 LB-FT [13.6 Nm]

|     |     |                                      |          |              |
|-----|-----|--------------------------------------|----------|--------------|
| 3   | 2   | 3/4 HARDENED CIRCULAR WASHER         | STEEL    | PP002ABH-12  |
| 2   | 2   | 3/4 REGULAR SPRING LOCKWASHER        | STEEL    | PP002DA-12   |
| 1   | 2   | 3/4-10X2-3/4 LONG HEX HEAD CAP SCREW | STEEL    | PP007LCA-44  |
| P/N | QTY | DESCRIPTION                          | MATERIAL | IMO REF ONLY |

**Figure 2 – REAR FOOT BOLTING ARRANGEMENT FOR 200 °F AND ABOVE.**

## G. PARTS LIST


Table 2 – Pump Parts List


| IDP | QTY | DESCRIPTION            | KIT | IDP | QTY | DESCRIPTION              | KIT |
|-----|-----|------------------------|-----|-----|-----|--------------------------|-----|
| 1   | 1   | Case                   |     | 42  | 2   | Bearing Retaining Ring   | X   |
| 2   | 1   | Inlet Head             |     | 43  | 1   | Bearing Retainer         |     |
| 3   | 2   | Dowel Pin              |     | 46  | 1   | Inboard Cover            |     |
| 4   | 16  | Case Bolts             |     | 47  | 4   | Bearing Retainer Bolts   |     |
| 6   | 1   | Stop Pin               | XX  | 48  | 1   | Seal Seat Adapter        |     |
| 7   | 1   | Dyna Seal              | X   | 49  | 1   | Ball Bearing             | X   |
| 8   | 2   | Housing Retaining Ring | XX  | 63  | 1   | Power Rotor              | XX  |
| 9   | 1   | Inlet O-Ring           | X   | 66  | 1   | 90° Elbow                |     |
|     |     |                        |     | 67  | 2   | Pipe Plug                |     |
| 21  | 2   | Suction Idler          | XX  | 68  | 1   | Nipple                   |     |
| 22  | 1   | Idler Stop             | XX  | 69  | 1   | Tube Fitting             |     |
| 23  | 2   | Thrust Cups            | XX  | 70  | 1   | 90° tube to MNPT fitting |     |
| 24  | 1   | Discharge Housing      | XX  | 71  | 1   | Seal Pipe                |     |
| 25  | 1   | Seal                   | X   | 73  | 1   | Suction Housing          | XX  |
| 26  | 3   | Tube                   | XX  | 79  | 1   | Floating BP Bushing      | XX  |
| 27  | 4   | Tube O-Ring            | X   | 80  | 1   | Seal Seat Adapter O-Ring | X   |
| 28  | 2   | Housing O-Ring         | X   | 81  | 1   | Cap Screw                |     |
| 29  | 1   | Thrust Cage            | XX  | 91  | 16  | Hardened Washers         |     |
| 38  | 1   | Seal Spacer            |     | 102 | 1   | Orifice Plug             |     |

X = Minor Repair Kit Items.

XX = Major Repair Kit Items. (Items marked (X) are included in Major Repair Kit).

## H. PUMP MAINTENANCE

|                                                                                                                                                                                       | <b>WARNING</b> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| Failure to observe precautions while installing, inspecting and maintaining pump can cause injury to personnel from accidental handling of liquids that may harm skin or clothing, or fire hazard risks from flammable liquids, or injury from high pressure fluid jets. |                |

|                   | <b>DANGER</b> |
|------------------------------------------------------------------------------------------------------|---------------|
| <b>BEFORE</b> working on equipment, make sure all power to equipment is disconnected and locked-out. |               |

### H.1 GENERAL COMMENTS


Part number identifiers contained within parenthesis such as (10) refer to circled numbers shown on assembly drawing, Figure 4 and Table 2.

### H.2 TOOLS REQUIRED

Procedures described in this manual require common mechanics hand tools, a torque wrench, dial indicator and suitable lifting device (such as) slings, straps, etc.

### H.3 DISASSEMBLY PROCEDURES

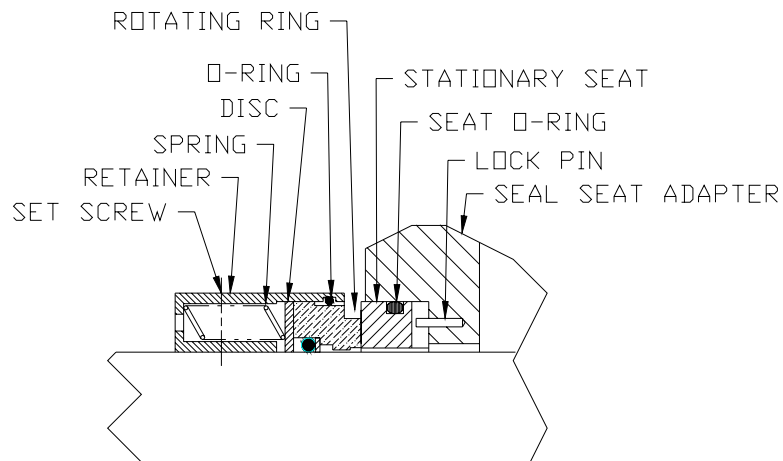
**SPECIAL NOTE:** To service mechanical seal and ball bearings **ONLY** perform H.3, Steps 1, 7, 8 and 9 and H.4, Steps 8, 9, 10 and 11 **ONLY**.

|                                                                                           |                |  |
|-------------------------------------------------------------------------------------------|----------------|--|
|          | <b>WARNING</b> |  |
| Fluid leakage from disassembly of pump may make floor slippery and cause personal injury. |                |  |

1. Close suction and discharge piping to pump and disconnect piping. Remove seal piping (71). Remove drain plugs (67), and drain unit. Remove pump from driver, coupling and base plate. Remove coupling hub and key (31).
2. Remove bolts (4) and inlet head (2). Remove O-ring (9) from inlet head (2).
3. Remove spiral rings (8) from grooves in case (1).
4. Remove thrust cage (29), then oil balance tube (26) with O-rings (27) from either cage (29) or inlet housing (73). Remove O-rings (27) from tube (26).
5. Remove idler cups (23) from suction idlers (21).
6. Remove suction idlers (21) by unscrewing them from inlet end of pump. Remove remaining idlers (35) from housings (73, 24) by rotating power rotor (63) in a counter-clockwise direction.

|                                                                              |                  |
|------------------------------------------------------------------------------|------------------|
| <b>CAUTION</b>                                                               | <b>ATTENTION</b> |
| Do not permit idlers (21, 35) to drop as they emerge from housings (73, 24). |                  |

7. Remove bolts (47) and bearing retainer (43) from inboard cover (46).
8. Remove assembled power rotor (63). Removal of power rotor (63) includes removal of Truarc rings (42), ball bearing (49), seal adapter (48), spacer (38) and mechanical seal (25).



**Figure 3 – Multi-Spring Seal**

9. Disassemble power rotor (63) as follows (See seal insert Figure 3):
  - a. Using a flat nosed tool, such as a screw driver, remove Truarc rings (42) located on both sides of ball bearing (49) from their grooves in power rotor (63).



- b. Sealed ball bearing is assembled to power rotor (63) with a light press fit. Ball bearing (49) may be removed by using a bearing puller or a vertical arbor press. When using press, two pieces of key stock are to be placed through openings of mechanical seal seat adapter (48) underneath ball bearing (49) on both sides of power rotor shaft. Key stock should be long enough to support power rotor (63) as it is placed in press. Press ram is to be positioned against power rotor (63) coupling end face. Gently press power rotor (63) through ball bearing (49). Ensure power rotor (63) does not fall to floor once ball bearing (49) is off of its diameter.
  - c. Remove seal seat adapter (48) from power rotor (63), (See seal insert Figure 4) then remove stationary seat from seal seat adapter (48). Loosen set screws on mechanical seal rotating assembly body and remove rotating seal seat from power rotor (63). Remove spacer (38) from the power rotor (63).
10. Remove O-ring (80) from inboard end cover (46).
  11. Remove bolts (4) and inboard cover (46) from case (1).
  12. Remove O-ring (28) from inboard cover (46).
  13. Remove tube (26) from idler stop (22).
  14. Remove idler stop (22) from inboard cover (46) by removing bolts (81).
  15. Remove floating balance piston (79) from inboard cover (46).
  16. Remove stop pin (6) and Dyna seal (7) from case (1).
  17. Remove housing (24) from case (1) and O-ring (28) from housing (24).
  18. Remove Orifice Plug (102) from discharge housing (24).

| <b>CAUTION</b>                                                 | <b>ATTENTION</b> |
|----------------------------------------------------------------|------------------|
| Do not permit housing (24) to drop as it is removed from pump. |                  |

19. Remove tube (26) from housing (24 or 73), and O-rings (27) from tube (26).
20. Remove aligning vent pins (3) from housing (24 or 73).
21. Remove housing (73) from case (1).

| <b>CAUTION</b>                                                 | <b>ATTENTION</b> |
|----------------------------------------------------------------|------------------|
| Do not permit housing (73) to drop as it is removed from pump. |                  |

#### **H.4 PUMP ASSEMBLY PROCEDURE**

**Note:** Prior to reassembly of pump, all parts should be cleaned and inspected for nicks and burrs. Replace all worn or damaged parts. Imo Pump recommends replacement of all O-rings (9, 27, 28, and 80), Dyna Seal (7), mechanical seal (25) and ball bearing (49) when these parts are disturbed from their previously installed positions. Coat all parts with light lubricating oil to assist in assembly.

**Note:** Bolts (81) have Nylok threads. Torque stated on assembly drawing for bolt (81) does not include additional torque to install fasteners containing Nylok inserts. Torque required for first application is much higher than for subsequent applications. To ensure required preload on Nylok fastener is achieved for each application, the following procedure is mandatory assembly practice.

1. Using a suitable torque wrench, install fastener in mating piece until Nylok insert is completely engaged. Note torque required.
  2. Add torque measured in step 1. to torque value on assembly drawing.
  3. Complete tightening fastener to torque value determined in 2.
1. Install O-ring (28) and orifice plug (102) in discharge housing (24).
  2. Install discharge housing (24) in pump case (1), from suction end of case, aligning groove in housing (24) to stop pin hole in case (1). Install stop pin (6) with Dyna Seal (7) in case (1).
  3. Install O-rings (27) on oil balance tube (26) and oil balance tube (26) in one end of inlet housing (73). Install stop pins (3) in same end of inlet housing (73).
  4. Install assembled inlet housing (73) in case (1), ensuring that oil balance tube (26) and vent pins (3) engage holes in discharge housing (24).
  5. Install tube (26) in outboard end of discharge housing (24)
  6. Install balance piston (79) on inboard cover (46). Install idler stop (22) on inboard cover (46) with cap screws (81). Torque cap screws to value on assembly drawing. Install O-ring (28) on inboard cover (46).
  7. Install inboard cover (46) on case (1) using bolts (4). Be sure that tube (26) lines up with pin hole in inboard cover (46). Torque bolts to proper value on assembly drawing.
  8. Assemble power rotor (63) and mechanical seal (25) as follows (see seal insert Figure 3 above).
    - a. Install seat O-ring in groove of mechanical seal (25) stationary seat. Install mechanical stationary seat in seal seat adapter (48) ensuring that spring pin is properly positioned to engage slot in seal seat.
    - b. Install spacer (38) on power rotor (63).
    - c. Install mechanical seal rotating assembly on power rotor (63) next to spacer (38). Apply Loctite 242 or equivalent to seal set screws and tighten set screws.
    - d. Wipe mechanical seal rotating and stationary faces with a clean, lint free cloth before assembling faces together.
    - e. Install assembled bearing spacer (48), with stationary seat to power rotor shaft next to mechanical seal rotating face.
    - g. Install inner Truarc ring (42) in groove of power rotor (63).
    - h. Press bearing (49) on power rotor (63), pressing only on inner race of ball bearing (49) until it is located next to inner Truarc ring (42).
    - i. Install outer Truarc ring (42) in groove of power rotor (63).

9. Install O-ring (80) in seal bore of inboard cover (46).
10. Install assembled power rotor (63) in pump, centering all parts as they enter inboard cover (46). Align one of openings in spacer (48) over drain in inboard cover (46).
11. Install bearing retainer (43) on inboard cover (46) using bolts (47). Torque bolts to values indicated on assembly drawing.
12. Install idlers (35, 21) into housings by meshing threads with power rotor thread and screwing them into housing idler bores.
13. Install idler balance piston housings (23) to ends of suction idlers (21).
14. Install O-rings (27) on oil balance tube (26) and oil balance tube (26) in inlet housing (73).
15. Install thrust cage (29) to pump case (1), ensuring that pin hole in thrust cage (29) engages tube (26) in suction housing (73).
16. Install retaining rings (8) to pump case (1).
17. Install O-ring (9) to groove in inlet head (2).
18. Install inlet head (2) using bolts (4). Torque bolts to values indicated on assembly drawing.
19. Install seal piping (71) and drain plug (67).

**Note:** Inlet head (2) can be rotated and repositioned in 90° increments to suit suction piping. To change inlet position, disconnect seal piping (71), remove bolts (4) and rotate inlet head to desired position. Install bolts (4) and torque to proper values indicated on assembly drawing. Reconnect seal piping (71).

20. Install coupling hub key (31). Install and align pump and driver as specified in General Instruction Manual, SRM00046 or if CE compliance is required, see “CE - Installation, Maintenance & Troubleshooting Manual”, SRM00101.

## **.5 SPECIAL TESTING INSTRUCTIONS**

After pump has been reassembled with a major kit, it is recommended that a break-in test be performed to allow idlers to polish into babbitted housing bores. For this test, pump should be run to maximum required working pressure starting from 300 psig, in 200 psig increments, holding each pressure for five minutes.

### **I. TROUBLESHOOTING**

For assistance with troubleshooting see “General Installation, Operation, Maintenance and Troubleshooting” Manual, SRM00046 or if CE compliance is required, see “CE - Installation, Maintenance & Troubleshooting Manual”, SRM00101.

### **J. FIELD AND FACTORY SERVICE AND PARTS**

Imo Pump maintains a staff of trained service personnel that can provide pump installation, pump start-up, maintenance/overhaul and troubleshooting supervision as well as installation and maintenance training.

Our factories provide maintenance, overhaul and test facilities in event user prefers to return pumps for inspection or overhaul. Pumps that have been factory-overhauled are normally tested and warranted “as-new” for a period of one year from date of shipment. For either field service or factory overhaul assistance, contact your local Imo Sales Office or representative at Technical/Customer Service Department in Monroe, NC, USA.

Most pumps have repair kits available. Minor Repair Kits are used to repair leaking seals, bad bearings and/or for re-assembly after pump tear-down. They include (as applicable) pump shaft seals, packing, all gaskets/O-rings and bearings. Major Repair Kits are sufficient to rebuild completely worn-out pumps to “as-new” condition. They include all parts found in Minor Repair Kits plus all major internal parts subject to wear. Since kits have all necessary parts, it is preferred that they be purchased rather than selecting individual parts. When parts are individually selected from Parts List, some needed components are often overlooked. In addition, mixing worn or used parts with new parts risks rapid wear and shortened service life from new parts.

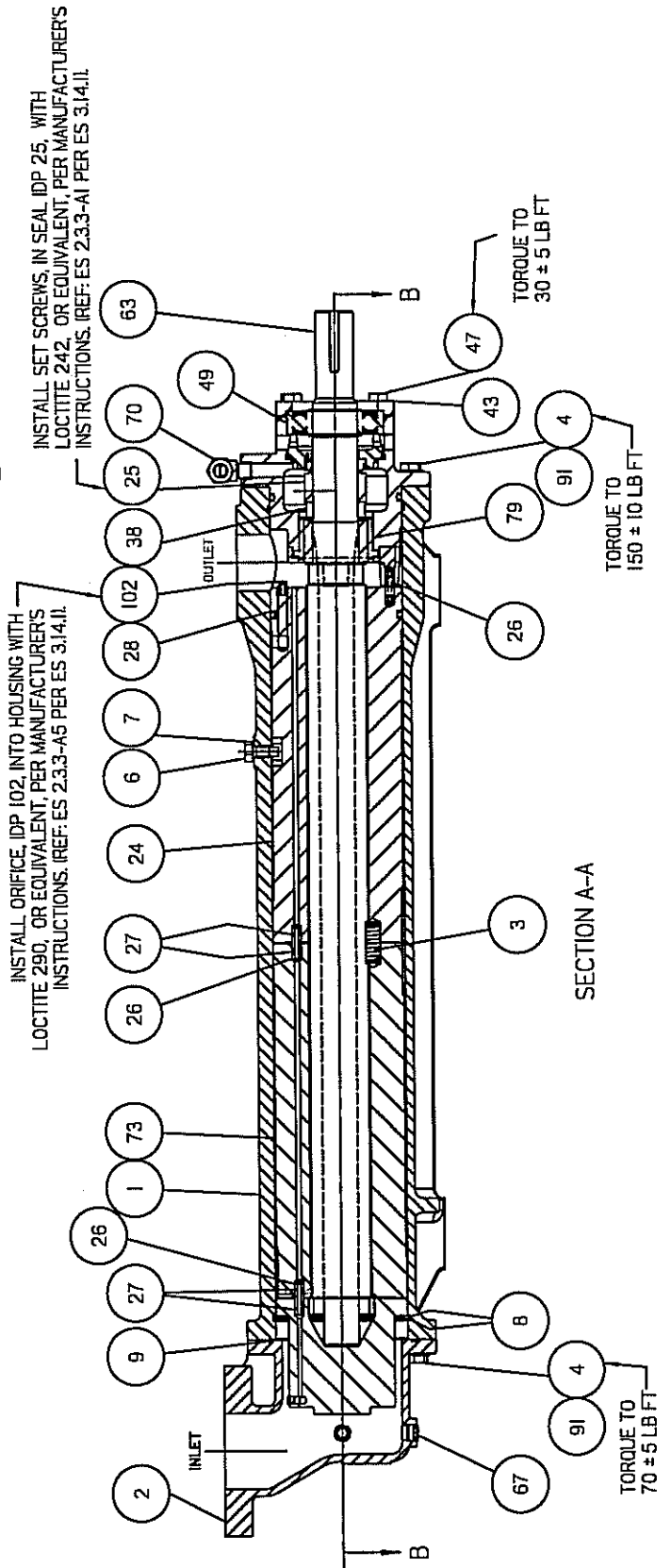
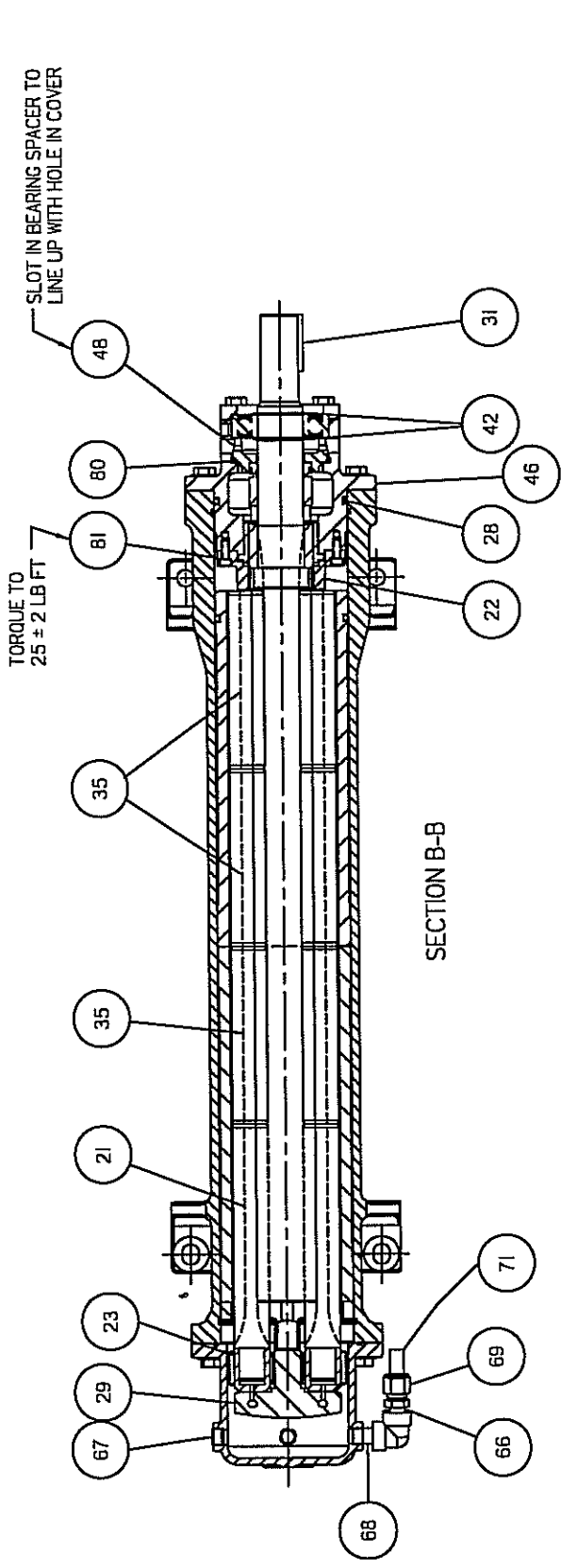


FIGURE 4 - K12DZH-312P ASSEMBLY



A Colfax Business Unit

**IMO Pump**

1710 Airport Road 28110

PO Box 5020

Monroe, NC/USA 28111-5020

TEL: 1+ (704)289-6511

Email: [imo.pump@colfaxcorp.com](mailto:imo.pump@colfaxcorp.com)

Web: [www.imo-pump.com](http://www.imo-pump.com)

