# INSTRUCTION MANUAL
# AND
# PARTS LIST
# FOR
# PG/RG3D_-187, 218, 250 and 312
# SERIES PUMPS

**WARNING**

**This Instruction Manual and General Instructions Manual, CA-1, should be read thoroughly prior to pump installation, operation or maintenance.**

| | | |
|---|---|---|
| **Manual No. SRM00086** | **Rev. 01 (21-0001)** | **October, 2021** |

# READ THIS ENTIRE PAGE BEFORE PROCEEDING

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

**DANGER**

Failure to observe precautions noted in this box can result in severe bodily injury or loss of life.

**WARNING**

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.

**CAUTION** **ATTENTION**

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 pump and/or protection of pump itself are marked by the sign: **ATTENTION** |

**ATTENTION**

If operation of pump is critical to your business, we strongly recommend you keep a spare pump or major repair kit in stock at all times. As a minimum, a minor repair kit (o-rings, gaskets, shaft seal and bearings) should be kept in stock so pump refurbishment after internal inspection can be accomplished.

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## A. GENERAL INSTRUCTIONS

**The instructions found herein cover the disassembly, assembly and parts identification of PG/RG3D-187, 218, 250 and 312 series pumps. Both the original design with idler cups and the newer design with hydrostatic idlers are covered.**

**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 the 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 installation, operation, inspection, and maintenance of equipment supplied. Every effort was made to prepare text of manual so that engineering and design data is transformed into the most easily understood wording. Imo Pump must assume 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

This instruction manual covers series PG/RG3D-187, 218, 250 and 312 Imo pumps. This series of pumps has been designed for use in hydraulic, lubricating and seal oil applications, The model and design construction of each pump can be identified by the designator code on the pump nameplate. Definitions of model designators are identified in figure 1.

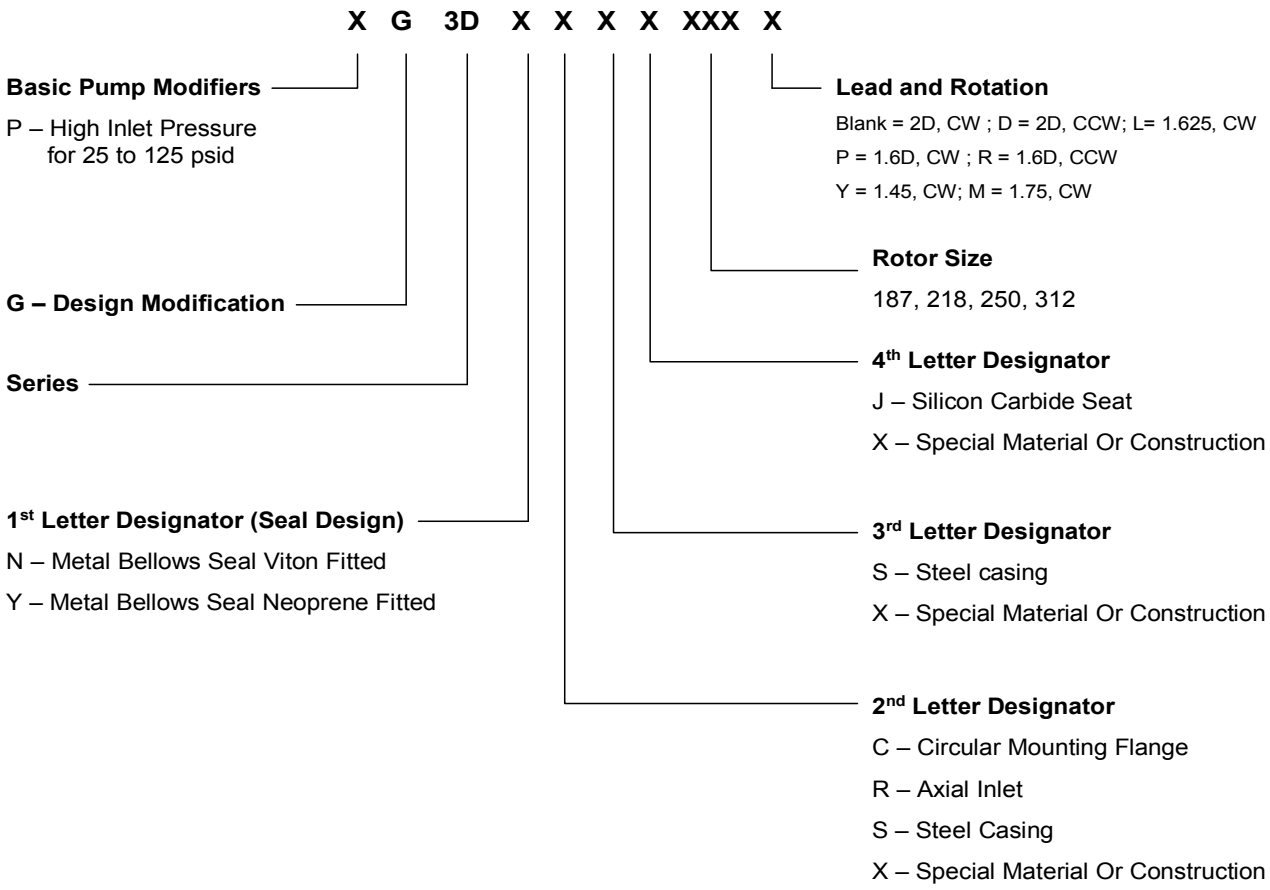
## C. DESCRIPTION OF EQUIPMENT

PG/RG3D-187, 218, 250 and 312 series pumps are positive displacement, rotary screw pumps consisting of a precision bored housing which encloses a driven screw (power rotor) and two 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 instruction manual covers Imo Series PG/RG3D-187, 218, 250 and 312 pumps. Model of each pump is identified on pump nameplate. Refer to figure 1 and table 1 for instructional keys when using manual.

**Figure 1 – Model Designator Definitions**




## E. ORDERING INSTRUCTIONS

When corresponding with Imo Pump regarding PG/RG3D-187, 218, 250 and 312 series pumps, refer to pump nameplate, this instruction manual, and assembly drawings as instructed below:

1. From pump nameplate, record pump model number, serial number, and manufactured date.
2. Record instruction manual number, revision, and date.
3. From instruction manual, record figure numbers that apply to replacement part(s).
4. From assembly drawing or parts list (see table 2) provide IDP number(s) and names for replacement part(s).
5. Give above information to your Imo service representative.

Imo sales and service representatives are listed herein and in General Instruction Manual, CA-1.

# F. OPERATION

## F.1 LIQUID LIMITATIONS

Never operate with thin liquids such as solvents or water. Pump is designed for liquids having general characteristics of oil.

## .2 OPERATING LIMITS

| CAUTION | ATTENTION |
|---|---|
| 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 operational limitations. Equipment must not be operated without verifying system operating requirements are within pump's capabilities. | |

**Under no circumstances should following operating limits (specified in table 1 be exceeded without specific approval from Imo Pump.**

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

| Condition | Limit |
|---|---|
| Maximum Speed | 3600 rpm 187, 218, 250<br>2700 rpm for 312 |
| Minimum Viscosity | 32 SSU |
| Maximum Viscosity | 2500 SSU |
| Minimum Liquid Temperature | 0°F |
| Maximum Liquid Temperature (figure 1) | 200°F |
| Maximum Inlet Pressure | 300 psig |
| Maximum Discharge Pressure (Continuous Duty) | 500 psig |
| Filtration | Refer to General Instruction Manual, CA-1 |
| Drive | Direct or Belt |
| Mounting | Foot mounted in any attitude |

## G. PARTS LIST

**Table 2 – Pump Parts List**

| IDP | QTY | DESCRIPTION | KIT | IDP | QTY | DESCRIPTION | KIT |
|---|---|---|---|---|---|---|---|
| 1 | 1 | Case | | 18 | 4 | Cap Screws | |
| 2 | 1 | Housing | XX | 19 | 2 | Idlers | XX |
| 3 | 1 | Pipe Plug | | 20 | 2 | Idler Cups (Idler Cup Design Only) | XX |
| 4 | 1 | Anti-Rotation Tube | X | 21 | 2 | Thrust Plate | XX |
| 5 | 2 | O-ring | X | 22 | 1 | Thrust Spacer | |
| 6 | 1 | O-ring | X | 23 | 2 | Hex Cap Screws | |
| 7 | 1 | O-ring | X | 24 | 2 | Washer | |
| 8 | 1 | O-ring | X | 25 | 1 | Mechanical Seal** | XX |
| 9 | 1 | Inboard Cover | XX | 26 | 1 | Inlet | |
| 10 | 8 | Cap Screws | | 27 | 1 | Spacer | |
| 11 | 1 | Power Rotor | XX | 32 | 2 | Pipe Plug | |
| 13 | 2 | Snap Rings | X | 44 | 1 | O-ring | X |
| 14 | 1 | Seal Seat Adapter | XX | 46 | 4 | O-rings (312 size only) | X |
| 15 | 1 | Bearing | X | 48 | 1 | O-rings (312 size only) | X |
| 16 | 1 | Key | | 67 | 3 | Pipe Plugs (250 size only) | |
| 17 | 1 | Bearing Retainer | | 92 | 1 | Retaining Ring (218,250 sizes Only) | X |

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

## H. PUMP MAINTENANCE

**WARNING**

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.

**DANGER**

**BEFORE** working on equipment, make sure all power to equipment is disconnected and locked-out.

### H.1 GENERAL COMMENTS

**NOTE:** Part number identifiers (IDP) contained within parenthesis, such as (9), refer to circled numbers shown on assembly drawings.

De-energize driver before starting with any maintenance action.

## H.2 TOOLS REQUIRED

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

## H.3 Disassembly Procedure

Determine pump model identification on pump nameplate to select applicable pump assembly. Refer to that assembly for the following instructions.

⚠ **CAUTION**

Fluid leakage from disassembly of pump may make floor slippery and can cause personal injury

.

**NOTE:** PG/RG3D pumps incorporate highly finished precision parts that must be handled carefully to avoid damage to critical machined surfaces. Parts removed should be tagged for identification and exact positions in pump carefully noted so new parts, or same parts, are properly replaced without damage

1. Close suction and discharge piping to pump. Vent pressure from pump. Disconnect piping. Remove drain plugs (32) and drain unit. Remove pump from driver, coupling and base plate. Remove coupling hub and key (16).

2. Remove bearing retainer (17) from inboard cover (9) by removing bolts (18).

3. Remove assembled power rotor (11) from inboard cover (9). Removal of power rotor (11) includes removal of snap rings (13), ball bearing (15), seal seat adapter (14), mechanical seal (25) and, in the case of 218 and 250 size, snap ring (92).

4. Disassemble power rotor (11) as follows:

   a. Using a flat nosed tool, such as a screw driver, remove snap ring (13) located on coupling side of ball bearing (15) from groove in power rotor (11).

   b. Sealed ball bearing (15) is assembled to power rotor (11) with light press fit. Ball bearing (15) may be removed by using bearing puller or vertical arbor press. When using press, place two pieces of key stock through openings of mechanical seal seat adapter (14) underneath ball bearing (15) on both sides of power rotor shaft. Key stock should be long enough to support power rotor (11) as it is placed in press. Position press ram against power rotor (11) coupling end face. Gently press power rotor (11) through ball bearing (15). Ensure power rotor (11) does not fall to floor once ball bearing (15) is off of its diameter.

   c. Remove thread side snap ring (13).

   d. Remove seal seat adapter (14) with stationary seal seat. Remove stationary seal seat with O-ring from seal seat adapter (14).

e. Remove rotating seat from shaft (11) by loosening setscrew. On size 218 and 250 only, remove snap ring (92)

f. Remove O-ring (44) or (48) for size 312 from inboard cover.

If only doing seal maintenance, disassembly is complete. Use steps 4 through 8 in reassembly procedure for installation of seal (25) and bearing (15) onto power rotor (11) and re-assembly of power rotor (11) into pump.

If major repair is to be done, continue below.

5. Remove inboard cover (9) by removing bolts (10). Remove O-ring (7) from inboard cover (9).

6. Remove tube (4) with O-rings (5) and spacer (27) from housing (2) or inboard cover (9). Discard O-rings (5).

7. Remove inlet head (26) by removing bolts (10). Remove O-ring (8) from inlet head (26).

8. Remove thrust plate (21) and spacers (22) and in the case of the 312 size, O-rings (46) by removing bolts (23) and washers (24).

9. Remove cups (20) where applicable from idlers (19) and idlers (19) buy screwing them out of housing (2).

| CAUTION | ATTENTION |
|---|---|
| Do not permit idlers (19) to drop as they emerge from housing (2). | |

10. Remove housing (2) from inlet end of case (1) and remove O-ring (6) from housing (2).

## H4. Pump Reassembly

**NOTE:** Prior to reassembly of pump, clean and inspect all parts for nicks and burrs. Replace all worn or damaged parts. Imo Pump recommends replacement of all O-rings, mechanical seal (25) and ball bearing (15) when these parts are disturbed from their previously installed positions. Coat all parts with light lubricating oil to assist in assembly.

1. Install O-ring (7) in case (1) and then inboard cover (9) in case with cap screws (10) being sure that seal vent hole (3) is in the top side vertical position. Torque bolts (10) to value on assembly drawing corresponding to pump type.

2. Install O-rings (6) in groove in housing (2), O-rings (5) in grooves in housing tube (4) and housing tube (4) in housing (2). Install spacer (27) on housing tube (4).

3. Install housing (2) in case (1) being sure that housing tube (4) mates with hole in inboard cover (9).

4. Inspect power rotor (11) shaft and remove any nicks or burrs which are present. Polish power rotor shaft to remove any rust or oxidants that may be present under shaft sleeve. Imo pump recommends replacement of ball bearing (15), mechanical seal (25), and O-ring (44 or (48) for size 312) when these parts are disturbed from their original installed position. All parts should be coated with light lubricating oil to assist in assembly.

5. Assemble power rotor (11) and mechanical seal (25) as follows (Installation is easier with the power rotor vertical):

    a. If pump size is 218 or 250, install snap ring (92) on shaft. On sizes 187 of 312, snap ring not required.

    b. Install seal (25) rotating seal on shaft (11) until it seats against either power rotor balance piston or snap ring (92). Tighten seal set screws.

    c. Install O-ring in groove of mechanical seal stationary seat. Install seat including O-ring in seal seat adapter (14) ensuring that groove in back of stationary seat mates to spring pin in seal seat adapter (14). Clean seal face with isopropyl alcohol and a lint free rag. Put a small amount of clean system fluid or light oil on seal running face. Install the rotating ring running face which is installed in the seal seat adapter (14) against the stationary seat face.

    d. Install inner snap ring (13) in groove of power rotor (11).

    e. Press bearing (15) on power rotor (11), pressing only on inner race of ball bearing (15) using an installation sleeve until it is located next to inner snap ring (13). Be sure to line up seal seat adapter (14) so that locates on the face of the bearing (15) nears its OD.

    f. Install outer snap ring (13) in groove of power rotor (11).

6. Install O-ring (44) or (48) for size 312 in seal bore of inboard cover (9).

7. Install assembled power rotor (11) in pump, centering all parts as they enter inboard cover (9). Align one of openings in spacer (14) over drain in inboard cover (9).

8. Install bearing retainer (17) on inboard cover (9) using bolts (18) Torque bolts (18) to value on assembly drawing corresponding to pump type.

9. Install idlers (19) into housing (2) by meshing their threads with power rotor thread.

10. If idler cup design, install cups (20) on idlers (19).

11. Install bolts (23) and lock washers (24) in thrust plate (21). If pump is 312 size, install O-rings (46) on bolts (23) (These O-rings should be installed evenly spaced along bolt length, two to a bolt.) Install spacers (22) on bolts (23).

12. Install thrust plate assembly including thrust plate (21), washers (24), bolts (23) and spacers (22) and O-rings (46) if 312 size on housing (2). Torque bolts (23) to value on assembly drawing corresponding to pump type.

13. Install O-ring (8) in groove in inlet head (26) and inlet head on case (1) with bolts (10). Torque bolts (10) to value on assembly drawing corresponding to pump type.

**NOTE:** Inlet head (26) can be rotated and repositioned in 90 degree increments to suit suction piping. To change inlet position remove bolts (10) and rotate inlet head (28) to desired position. Install bolts (10) and torque to proper values indicated on assembly drawing.

14. Install coupling hub key (16). Install and align pump and driver as specified in General Instruction Manual, CA-1.

## I. TROUBLESHOOTING

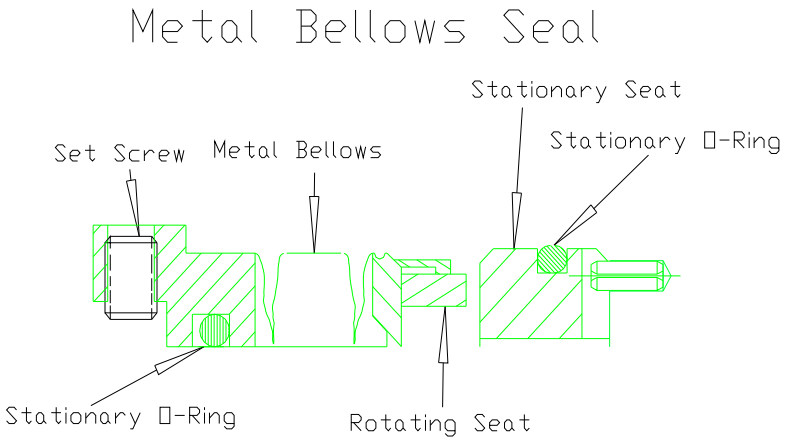
For assistance with troubleshooting see the General Instruction Manual, CA-1.

## 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.

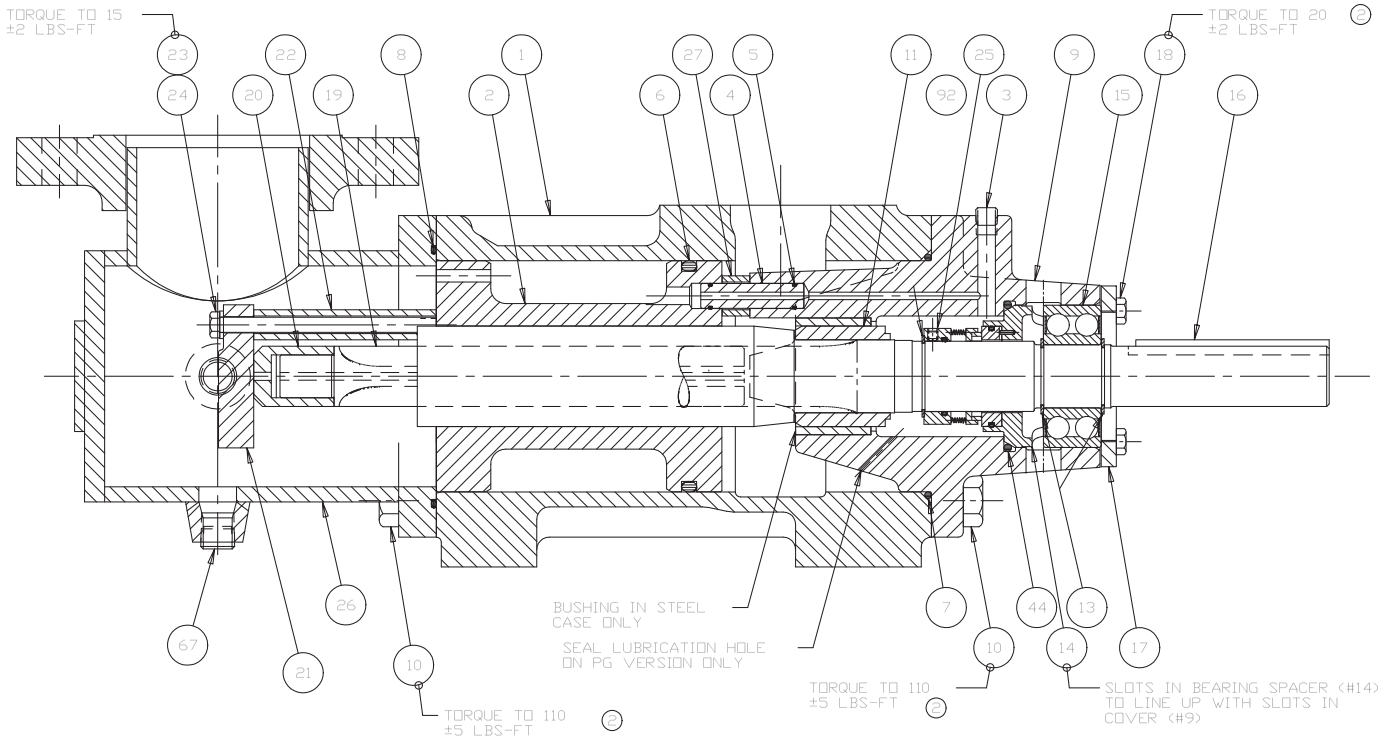
Our factories provide maintenance as well as overhaul and test facilities the in event user prefers to return pumps for inspection or overhaul. Factory-overhauled pumps are normally tested and warranted “as-new” for a period of one year from date of shipment. For either field service or factory overhaul 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, kit purchase is preferred 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.



REVISION HISTORY

| CHG NO | ZONE | REV | DESCRIPTION | DATE | BY | APPROVED |
|---|---|---|---|---|---|---|
| 95-P1097 | ALL | 01 | FLG WAS SKT WD, ADDED DRAINS | 10-09-95 | WLW | AEL |
| 01-0139 | ALL | 02 | CHANGED FORMAT REVISED TORQUES | 03-16-01 | BMR | BMR |
| | | | | | | |




| | | | | |
|---|---|---|---|---|
| MATERIAL | | DRAWN | CSH | 11-18-93 |
| PROCESS | | CHECKED | | |
| UNLESS OTHERWISE SPECIFIED ASME Y14.5M-1994. 1. ALL DIMENSIONS ARE IN INCHES. 2. FRACTIONAL ± 1/32 ON MACHINED DIMENSIONS. 3. HOLES AND COUNTERBORES TO ES 3.17.4. 4. UNTOLERANCED DECIMAL D/MENSIONS ARE ± .031. 5. MACHINED SURFACES 250√ FINISH. 6. BREAK SHARP CORNERS .015 ± .005. 7. CHAMFERS AND RADII LESS THAN .050 ± .015. 8. ANGLES ±0.5°, CHAMFERS ±5.0°. 9. SCREW THDS. TO ANSI B.1.1 (CL. 1,2 OR 3). 10. TAPERED PIPE THDS. TO ANSI B1.20.1. | | APPD | MJC | 03-09-94 |
| | | METHODS | | |
| THIRD ANGLE PROJECTION | FIRST ORDER | USED ON | ES109 | |

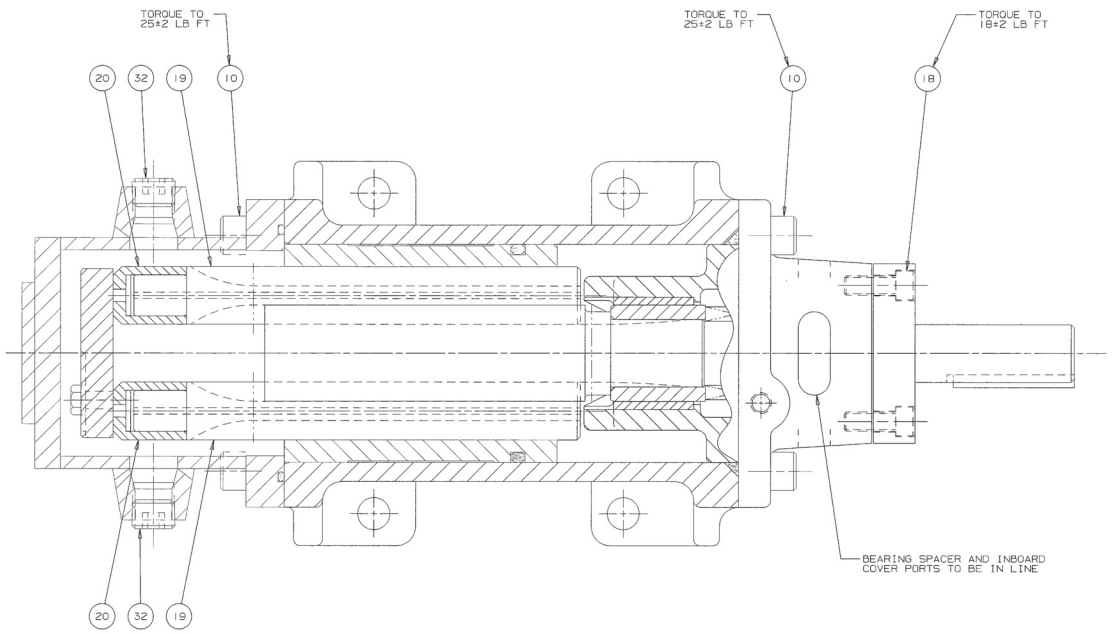
CIRCOR IMO®

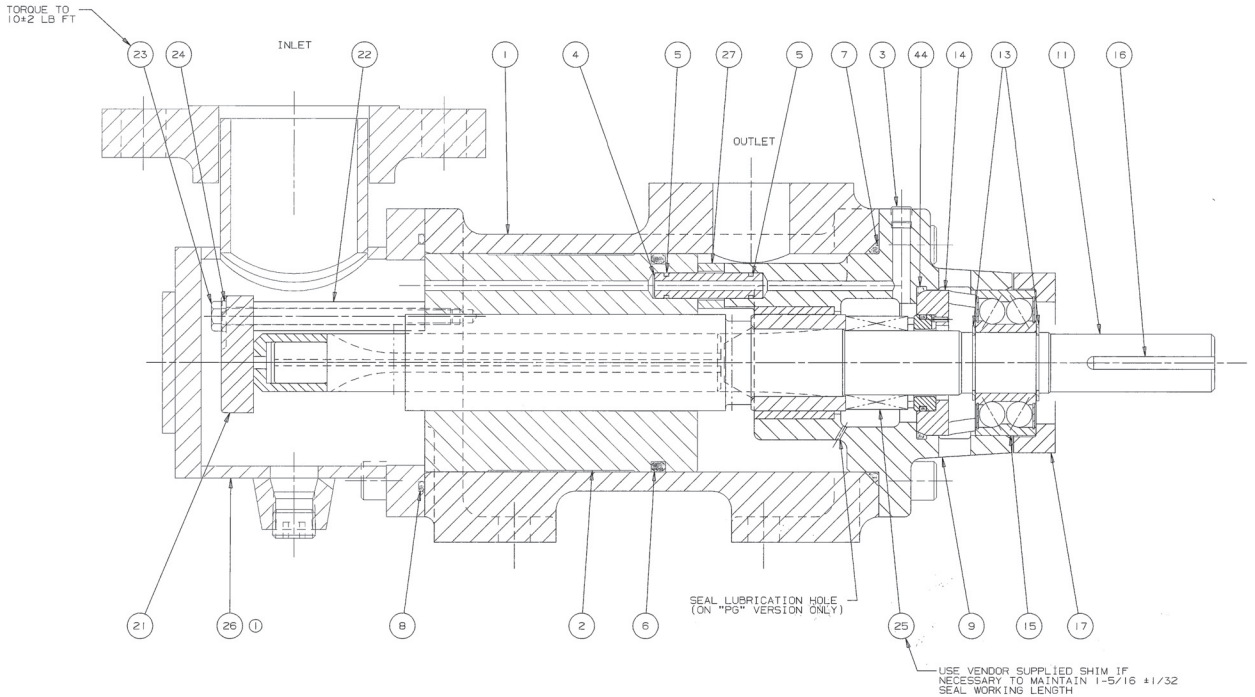
TITLE: ASSEMBLY GENERIC [P,R] G3DN J-250

| SIZE | CAGE CODE | DWG NO |
|---|---|---|
| C | 59180 | SF6020 |

SCALE 1/2 WEIGHT SHEET 1 OF 1

| MATERIAL | WT 102 LBS |
|---|---|
| ES SPEC | |
| COML | |
| PROCESS | |




NOTES:
1. INSTALL NAMEPLATES PER ES 3.36.3.

| CHG NO | ZONE | CHG | ALTERATION | DATE | BY | CH'KD |
|---|---|---|---|---|---|---|
| 96-P0137 | G | 1 | CHANGED INLET HEAD | 2-14-96 | JMB | AEC |

UNLESS STATED OTHERWISE
ANSI Y14.5M-1982
1. FRACTIONAL ± 1/64 ROUND DIMENSIONS.
2. TWO PLACE DECIMALS, .XX ± .010.
3. THREE PLACE DECIMALS, .XXX ± .005.
4. MACHINED SURFACES 250 µ" FINISH.
5. BREAK ALL SHARP EDGES .010 R MAX.
6. SCREW THDS. TO ANSI B1.1 (UNC-2 OR 3).
7. TAPERED PIPE THDS. TO ANSI B1.20.1.

Imo Industries Inc.
IMO Pump Division
Airport Road
P.O. Box 5020
Monroe,NC,USA 28111-5020

| CAGE CODE | TITLE |
|---|---|
| 59180 | ASSEMBLY GENERIC [PG,RG]3DNSJ-187 |

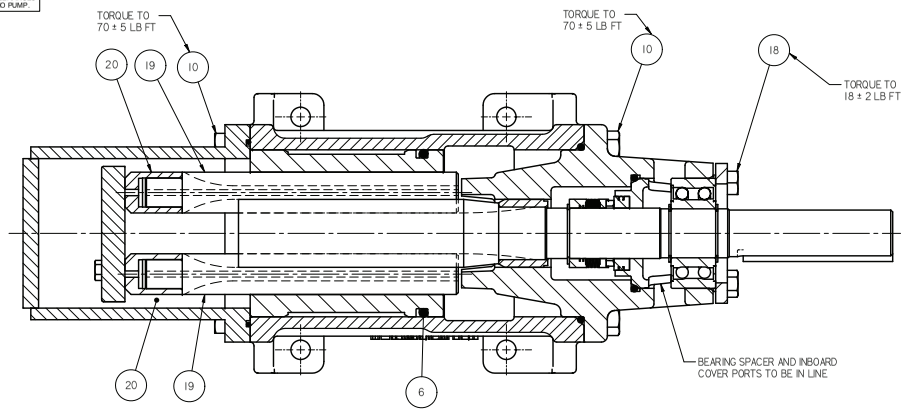
| | | |
|---|---|---|
| DRAWN | BNRS | 3-21-94 |
| CHECKED | NRS | 3-25-94 |
| APPD | MJC | 3-29-94 |
| METHODS | | |

SCALE 1/1
FIRST ORDER 088582
SYMBOL SF6032
F

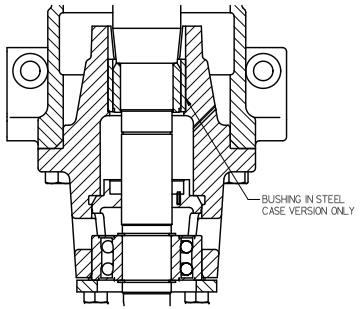
ASSEMBLY

REVISION HISTORY

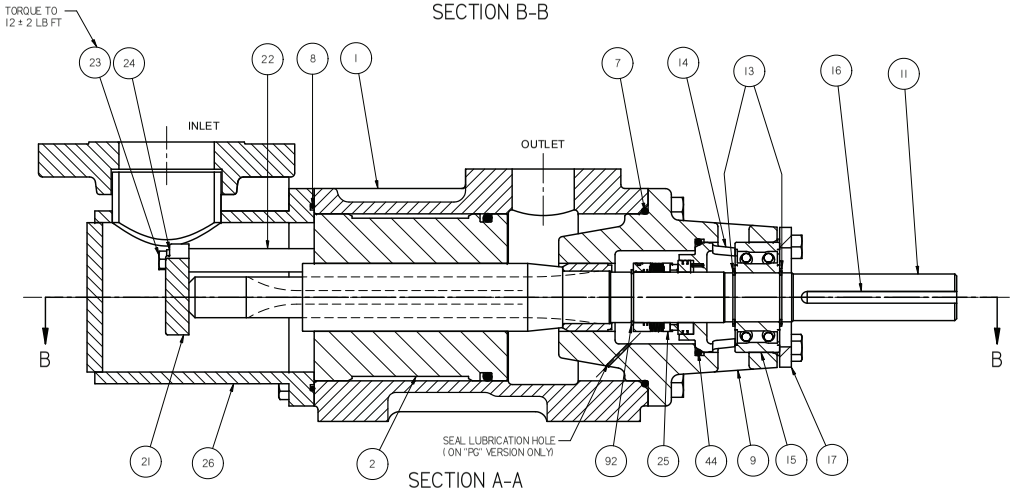
| CHG NO | ZONE | REV | DESCRIPTION | DATE | BY | APPROVED |
|---|---|---|---|---|---|---|
| 12-0238 | ALL | 2 | REDRAWN ON CAD, UPDATED TORQUES | 6-22-12 | ERH | CHH |
| | | | | | | |
| | | | | | | |



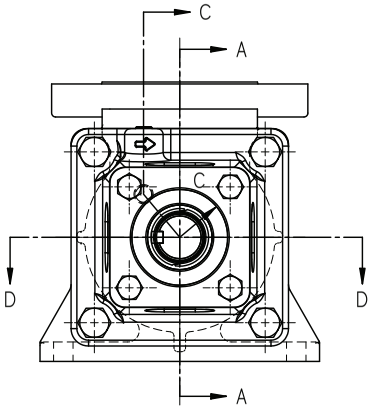

SECTION B-B

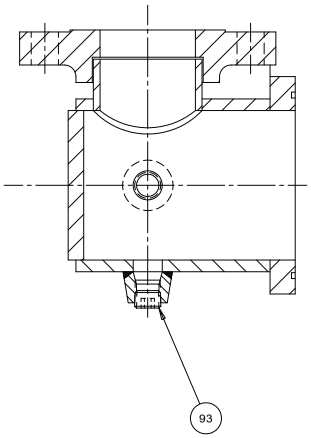



SECTION D-D

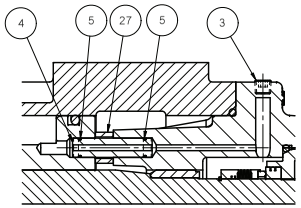



SECTION A-A




AUXILIARY VIEW FOR INLET HEADS REQUIRING THREDOLET DRAINS AND PLUGS




SECTION C-C

NOTES:
1. INSTALL NAMEPLATES PER ES 3.36.3.

| | | |
|---|---|---|
| DRAWN | NRS | 5-5-94 |
| CHECKED | NRS | 5-5-94 |
| APPD | MJC | 5-27-94 |
| METHODS | | |

MATERIAL
PROCESS

UNLESS OTHERWISE SPECIFIED
ASME Y14.5M-1994.
1. ALL DIMENSIONS ARE IN INCHES.
2. FRACTIONAL ±1/32 ON MACHINED DIMENSIONS.
3. DECIMAL ±.010 ON CASTINGS.
4. BREAK SHARP CORNERS .015 x .025.
5. CHAMFERS AND RADII LESS THAN .090 x .015.
6. ANGLES 45.0°, CHAMFERS ±5.0°.
7. HOLES AND COUNTERBORES TO ES 3.17.4.
8. SCREW THDS. TO ANSI B1.1 (CL. 1,2 OR 3).
9. TAPERED PIPE THDS. TO ANSI B1.20.1.

INTERESTED PARTS
FIRST ORDER
ES109A
USED ON
3212/255

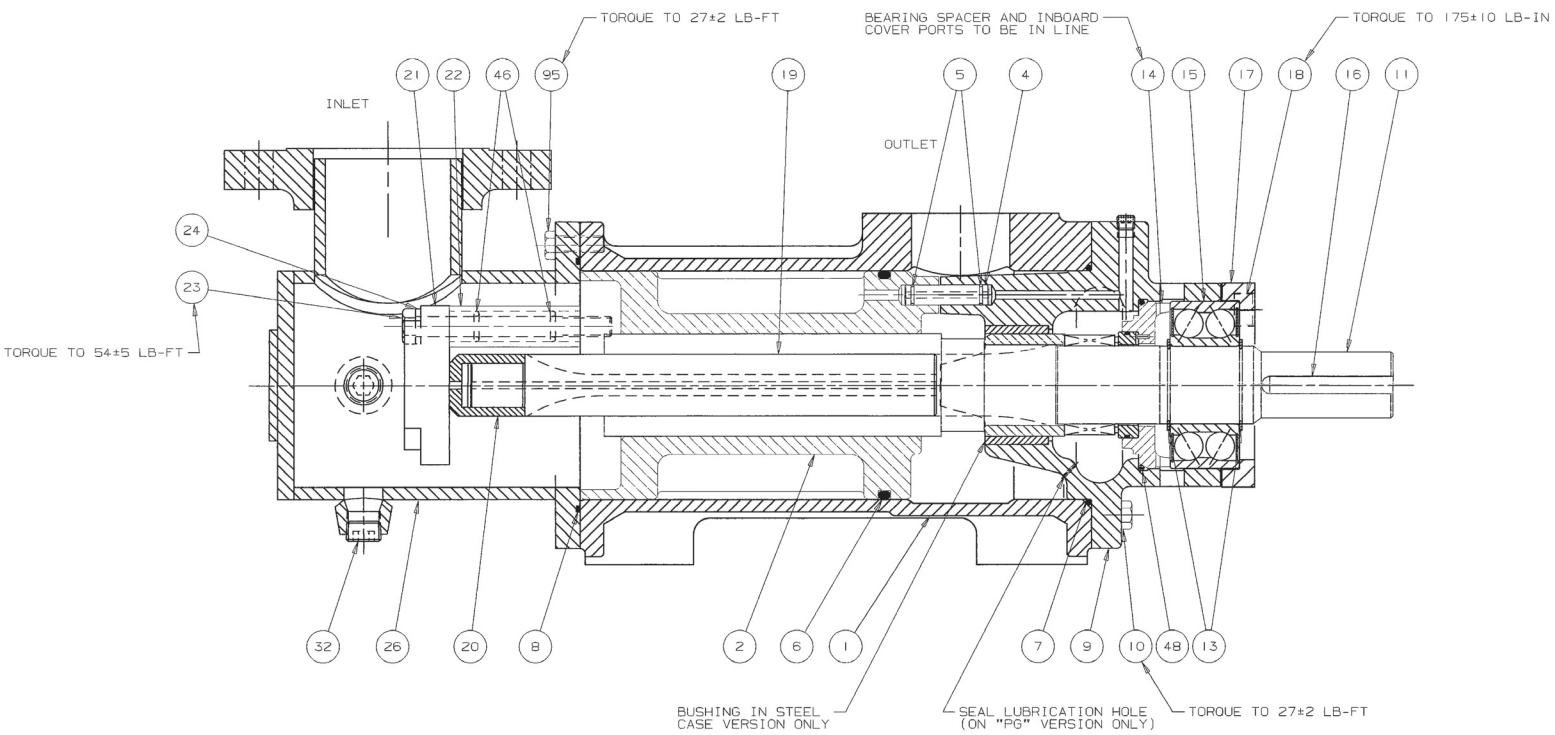
Imo Pump
1710 Airport Road
PO Box 5020
Monroe, NC USA
28111.5020

TITLE
ASSEMBLY
[P,RIG3DN_J-218_

| SIZE | CAGE CODE | DWG NO |
|---|---|---|
| D | 59180 | SF6035 |

| SCALE | WEIGHT | SHEET |
|---|---|---|
| 1/2 | 150 LBS | 1 OF 1 |

| MATERIAL | WT | LBS |
|---|---|---|
| ES SPEC | | |
| COML | | |
| PROCESS | | |




NOTES:
1. INSTALL NAMEPLATES PER ES 3.36.3.

| CHG NO | ZONE | CHG | ALTERATION | DATE | BY | CH'KD |
|---|---|---|---|---|---|---|
| 96-D1047 | B2,C2 | 2 | ADDED IDP NO'S 8 & 48 | 1-2-97 | JTT | |
| 95-D1162 | B-4 | 1 | PART NO 18 TORQUE WAS LB-FT | 10-26-95 | NRS | MJC |

UNLESS STATED OTHERWISE
ANSI Y14.5M-1982.
1. FRACTIONAL ± 1/32 ON MACHINED DIMENSIONS.
2. TWO PLACE DECIMALS .XX ± .010.
3. THREE PLACE DECIMALS .XXX ± .005.
4. MACHINED SURFACES 250 √ FINISH.
5. BREAK SHARP CORNERS .015 ± .005.
6. SCREW THDS. TO ANSI B1.1 (CL. 1,2 OR 3).
7. TAPERED PIPE THDS. TO ANSI B1.20.1.

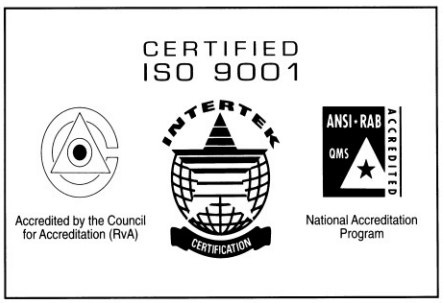
Imo Industries Inc.
IMO Pump Division
Airport Road
P.O. Box 5020
Monroe,NC,USA 28111-5020

| CAGE CODE | TITLE |
|---|---|
| 59180 | ASSEMBLY GENERIC [P,R]G3DN_J-312_ |

| | | |
|---|---|---|
| DRAWN | NRS | 7-12-95 |
| CHECKED | NRS | 8-3-95 |
| APPD | | |
| METHODS | | |

SCALE 1/2
FIRST ORDER 097920
SYMBOL SF6100
SIZE D

ASSEMBLY

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