



Product Service Manual For DLH12DHT SERIES PUMPS





<u>Pump Size</u>	<u>Bill of Material</u>	<u>Assembly Drawings</u>
275	3217/568 - DLH12DHTX - 275	Figure 3
312	3220/561 - DLH12DHT - 312	Figure 3
	3220/567 - DLH12DHT - 312P	Figure 3
350	3222/544 - DLH12DHT - 350	Figure 3
	3222/557 - DLH12DHT - 350G	Figure 3
400	3225/531 - DLH12DHST - 400P	Figure 3
	3225/532 - DLH12DHST - 400AJ	Figure 3
	3225/534 - DLH12DHST - 400A	Figure 3
	3225/535 - DLH12DHST - 400	Figure 3
	3225/530 - DLH12DHSTX - 400AJ	Figure 3
	3225/533 - DLH12DHSTX - 400P	Figure 3
	3225/536 - DLH12DHSTX - 400P	Figure 3

	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. SRM00094	Rev. 06 (20-0051)	JULY, 2020
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READ 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 the equipment or liquids. Protection should be provided by the user to prevent accidental contact.		
	CAUTION	ATTENTION
Failure to observe the precautions noted in this box can cause damage or failure of the 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: <p style="text-align: center;">ATTENTION</p>

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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.

A. GENERAL INSTRUCTIONS

Instructions found herein cover disassembly, assembly and parts identification of Series DLH12DHT pumps.

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, SRM00046, provided with your order. For further detailed information and technical assistance please refer to Imo Pump, Technical/Customer Service Department, at (704) 289-6511.*

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 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 DLH12DHT Imo pumps. This series of pumps has been designed for use in high pressure crude oil applications including those at low viscosities. Model, and design construction of each pump can be identified by designator code on pump nameplate. Definitions of model designators are identified in Figure 1.

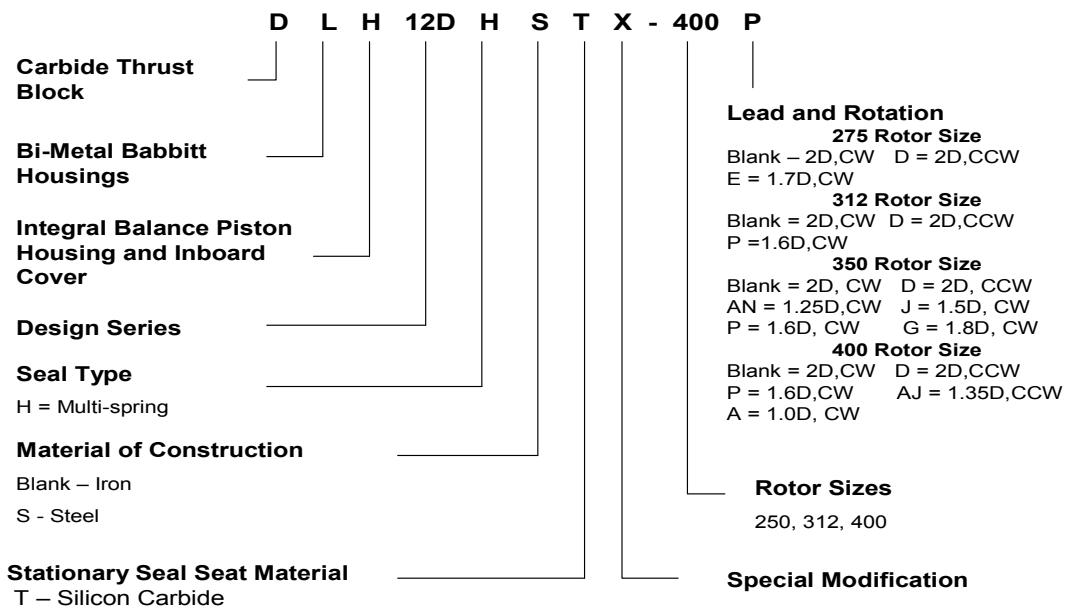
C. DESCRIPTION OF PUMP FEATURES

DLH12D Series pumps are positive displacement, rotary screw pumps consisting of precision bored housing that encloses a driven screw (power rotor) and four 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. Pumps contain a sealed, grease packed, ball bearing and carbide thrust and carbide balance piston bushing for extended wear in contaminated fluids.

D. PUMP MODEL IDENTIFICATION

Instruction manual covers Imo Series DLH12DHT pumps. Model of each pump is identified on pump nameplate.

Figure 1 – Model Designator Definitions



E. ORDERING INSTRUCTIONS

When corresponding with Imo Pump regarding Series DLH12DHT 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 the assembly drawing and/or parts list (Table 2) in manual, provide IDP number(s) and names for replacement part(s).
4. Give above information to your Imo service representative. Please call 1-877-853-7867 for further guidance.

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.

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 below. Equipment must not be operated without verifying system's operating requirements are within pump's capabilities.</p>	

Under no circumstances are the following operating limits to be exceeded without specific approval from Imo Pump.

Table 1 – Normal Pump Operating and Structural Limits

MAXIMUM SPEED	1800 Rpm
VISCOSITY	8 cSt (52 SSU) Minimum – 20,000 SSU (4,315 cSt) Maximum
MINIMUM – MAXIMUM LIQUID TEMPERATURE.....	0 to 250 F (-18 to 121 C)
MAXIMUM INLET PRESSURE.....	150 psig
MAXIMUM DISCHARGE PRESSURE.....	2200 psig, Cont. Duty
FILTRATION.....	(See General Instruction Manual, SRM00046)
DRIVE	Direct only
MOUNTING	Foot or Flange mounted in any attitude

G. PARTS LIST

Table 2 – Pump Parts List

IDP	QTY	DESCRIPTION	KIT	IDP	QTY	DESCRIPTION	KIT
1	1	Case		31	2	Discharge Idlers	XX
2	1	Discharge Housing	XX	35	2	Housing Snap Rings	XX
3	2	Housing and Inboard Cover O-Ring	X	36	1	Inlet O-Ring	X
4	2	Vent Pins		37	1	Inlet	
5	1	Fastener Seal	X	38	2	Drain Plugs	
6	1	Stop Pin		41	1	90° elbow tube to MNPT	
7	1	Inlet Housing	XX				
8	1	Inboard Cover		42	1	Seal Return Tubing	
9	1	Balance Piston Bushing	XX	43	1	Hyd. Flareless –MPT Fitting	
11	1	Idler Stop	XX	44	1	½” NPT Nipple	
13	1	Anti-Rotation Tube (275 and 312 Sizes Only)		45	1	NPT Elbow	
14	4	Idler Stop Hex Bolts (Except 275 and 350 Sizes)		46	2	Inlet Idlers	XX
15	16	Cover Hex Bolts (8 on 400 Size Only)		48	1	Housing Spacer	
17	1	Shaft	XX	49	2	Thrust Spacer	
19	1	Seal	X	50	1	Thrust Plate	XX
20	1	Seal Seat Adapter		51	1	Thrust Block	
23	2	Bearing Snap Rings	X	52	2	Thrust Plate Capscrews (Also Idler Stop Bolts on 275 and 312 Sizes)	
25	1	Bearing	X	53	2	Thrust Block Cap Screws	
26	1	Bearing Retainer		55	8	Inboard Cover Hex Capscrews (400 Size Only)	
27	4	Bearing Retainer Capscrews		56	1	Seal Spacer (275 and 312 Sizes Only)	
29	1	Check Nut (400 Size Only)		83	1	Seal Seat Adapter O-Ring	X
30	1	Check Nut Setscrew (400 Size Only)		91	8	Washers (275 and 400 Size 3225/530 Only)	

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

Refer to assembly drawings for correct pump size for following instructions.

NOTE: Part number identifiers (IDP's) contained within parenthesis such as (9) refer to circled numbers shown on assembly drawings 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 and 7 thru 10 and H.4, Steps 6 thru 9 **ONLY**.



CAUTION

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 (42). Remove drain plugs (38), and drain unit. Remove pump from driver, coupling and base plate. Remove coupling hub and key (28). On 400 Size pumps, remove check nut (29) with setscrew (30).
2. Remove capscrews (15) and inlet head (37).
3. Remove O-ring (36) from inlet head (37).
4. Remove capscrews (53) to remove thrust plates (51 & 50) and spacers (49). Disassemble thrust plate (50) from block (51) by removing capscrews (52).
5. Remove spiral rings (35) from grooves in case (1), except on 3225/350. Remove housing spacer (48).
6. Remove idlers (46, 31) by unscrewing them from inlet end of pump. (Discharge idlers (31) may be removed by rotating pump counterclockwise.)



CAUTION

Do not permit idlers (46, 31) to drop as they emerge from housing (24).

7. Remove bolts (27) and bearing retainer (26).
8. Remove assembled power rotor (17). Removal of power rotor (17) includes removal of retaining rings (23), ball bearing (25), mechanical seal (19), seal seat adapter (20) and seal spacer (56) where applicable.
9. Disassemble power rotor (17) as follows. See figure 2 for seal drawing:
 - a. Using a flat nosed tool, such as a screw driver, remove retaining rings (23) located on both sides of ball bearing (25) from their grooves in power rotor (17).
 - b. Sealed ball bearing (25) is assembled to power rotor (17) with a light press fit. Ball bearing (25) 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 seal seat adapter (20) underneath ball bearing (25) on both sides of power rotor shaft. Key stock should be long enough to support power rotor (17) as it is placed in press. Press ram is to be positioned against power rotor (17) coupling end face. Gently press power rotor (17) through ball bearing (25). Ensure power rotor (17) does not fall to floor once ball bearing (25) is off of its diameter.
 - c. Remove mechanical seal stationary seal seat adapter (20) from power rotor (17) shaft. Remove mechanical seal stationary sealing face from adapter (20). Loosen set screws on mechanical seal rotating assembly body and remove power rotor (17). Remove seal spacer (56) where applicable.
10. Remove O-ring (83) from inboard cover (8).
11. Remove bolts (15 or 55) and washers (91) where applicable and inboard cover (8) from case (1).
12. Remove O-ring (3) from inboard cover (8).
13. Remove idler stop subassembly (11) from inboard cover (8) by removing bolts (14).
14. Remove balance piston bushing (9) from inboard cover (8) and tube (13) from inboard cover, where applicable.
15. Remove stop pin (6) and fastener seal (5) from case (1).
16. Remove housing (2, 7) from case (1). Remove O-ring (3) from housing (2).



CAUTION

Do not permit housing (24) to drop as it is removed from pump.

17. Remove vent pins (4) from housing (2 or 7).

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, gaskets, mechanical seal and ball bearing 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 (3) in groove of housing (2).
2. Install housing (2) in pump case (1), from suction end of case, aligning groove in housing (2) to stop pin (6) hole in case (1). Install stop pin (6) with fastener seal (5) in case (1).
3. Install balance piston bushing (9) in bore of inboard cover (8).
4. Install idler stop (11) on inboard cover (8) with capscrews (14). Torque cap screws (15) to value on appropriate assembly drawing. Install tube (13) on inboard cover (8) where applicable.
5. Install O-ring (3) in inboard cover (8). Install inboard cover (8) in case (1). Be sure vent return hole (41) in inboard cover (8) is facing up and tube (13) mates with hole in housing (2). Secure with cap screws (15 or 55) and washers (91) where applicable. Torque cap screws to value on appropriate assembly drawing.
6. Assemble mechanical seal (19), See figure 2 below, and ball bearing (25) as follows.
 - a. Install O-ring in groove of mechanical seal (19) stationary seat. Install mechanical stationary seat in mechanical seal seat adapter (20) ensuring that spring pin is properly positioned to engage slot in seal seat.
 - b. Install seal spacer (56), where applicable and then mechanical seal (25) rotating assembly on power rotor (17).
 - c. Wipe mechanical seal rotating and stationary faces with a clean, lint free cloth before assembling faces together.
 - d. Install assembled seal seat adapter (20) on power rotor shaft and carefully place the mechanical seal stationary face on the mechanical seal rotating face.
 - e. Install inner retaining ring (23) in groove of power rotor (17).
 - f. Position shaft (17) in arbor press with helix end of power rotor on the press. Press ball bearing (25) on power rotor (17), pressing only on inner race of ball bearing (25) until it is located against inner retaining ring (23).
 - g. Install outer retaining ring (23) in groove of power rotor (17).
 - h. Tighten mechanical seal rotating assembly (see figure 2) setscrews.
7. Install O-ring (83) to inboard cover (8) counter bore. A small amount of grease may be applied to hold the O-ring (83) in place.
8. Install assembled power rotor (17) in pump, centering all parts as they enter inboard cover (8). Align one of openings in seat seal adapter (20) over drain in inboard cover (8).
9. Install bearing retainer (26) to inboard cover (8) using bolts (27). Torque cap screws (27) to value on appropriate assembly drawing.
10. Install idlers (31) and then (46) into rotor housings (2, 7) by meshing threads with power rotor thread and screwing them into housing idler bores.
11. Install spacer (48) in pump case (1) bore and position next to housing (7).

12. Install spiral rings (35) in groove in pump case (1) bore, not required on BM 3225/530.
13. Assemble thrust plate and block (50 & 51) with capscrews (52). Torque cap screws (52) to value on assembly drawing. Install spacers (49) and thrust plate assembly, to housing (7) using cap screws (53). Torque cap screws (53) to value depending on pump size on appropriate assembly drawing
14. Install O-ring (36) in groove in inlet head (37).
15. Install inlet head (37) using bolts (15) and washers (91) where applicable. Torque bolts to value on assembly drawing.
16. Install seal piping (42), including fittings, if they were removed, and drain plugs (38).

Note: Inlet head (37) can be rotated and repositioned in 90° increments to suit suction piping. To change inlet position, disconnect seal piping (42), remove bolts (15) and washers (91) where applicable and rotate inlet head to desired position. Install bolts (15) and washers (91), where applicable and torque to value on assembly drawing. Reconnect seal piping (42).

17. Install coupling hub key (28), coupling half and check nut (29) with set screw (30), where applicable. Install and align pump and driver as specified in General Instruction Manual, SRM00046.

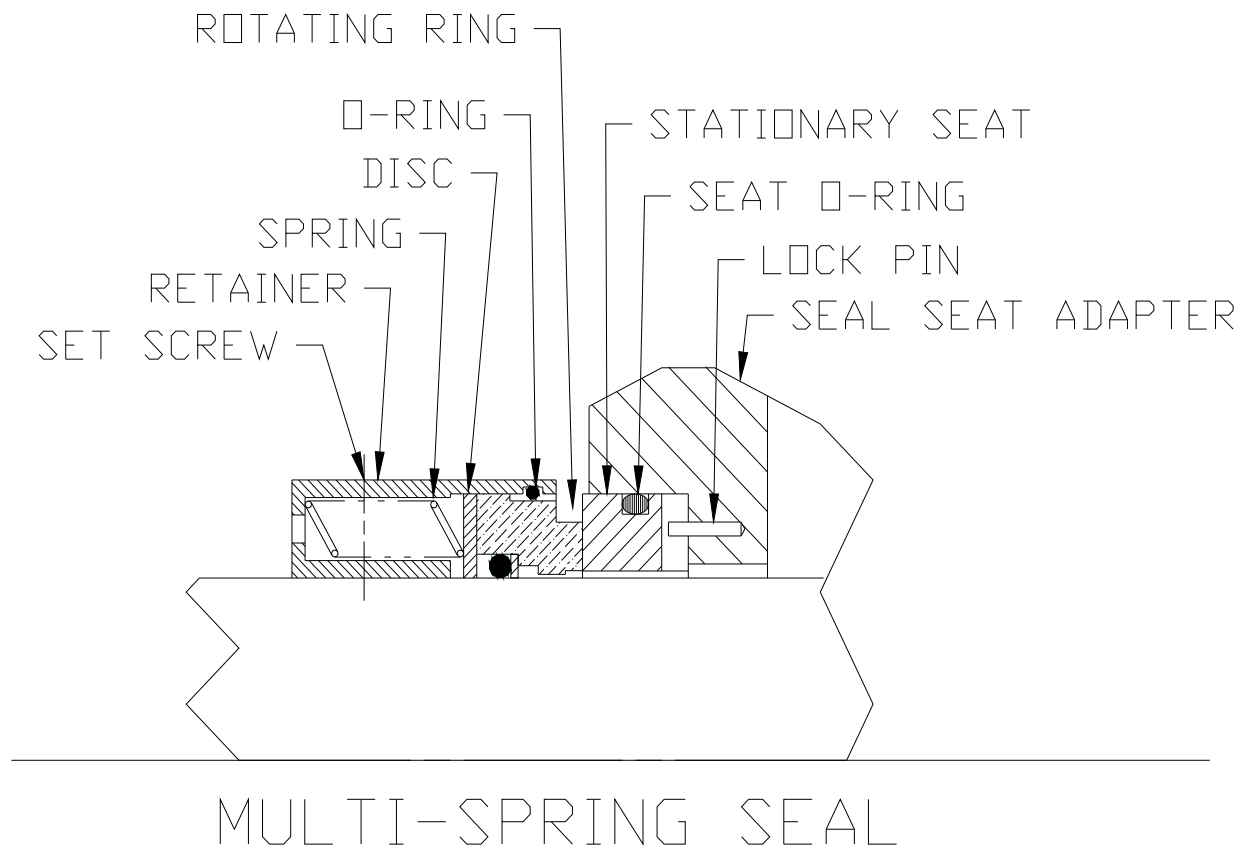


Figure 2

H. TROUBLESHOOTING

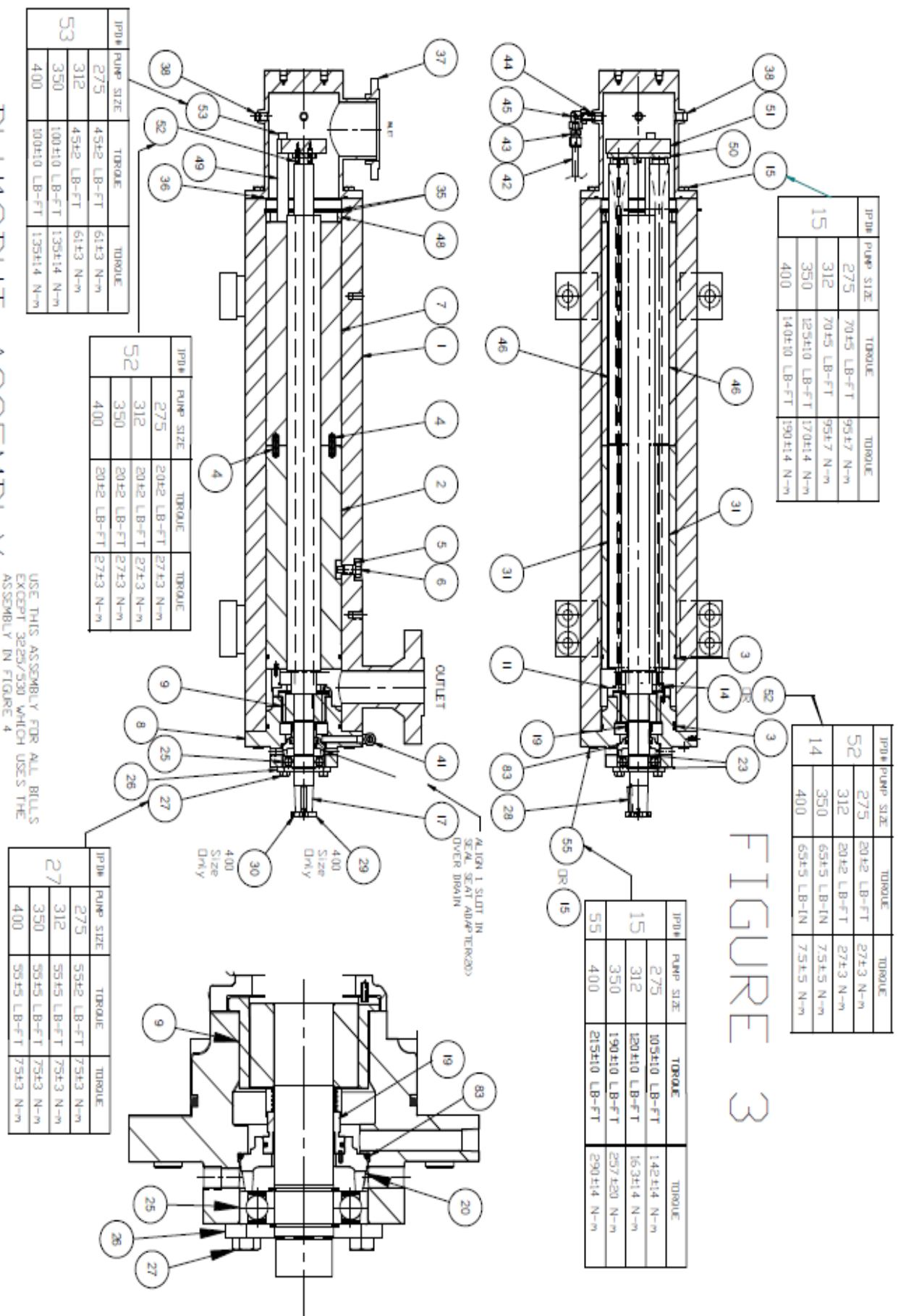
For assistance with troubleshooting see General Instruction Manual, SRM00046.

I. 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 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, 1-877-853-7867.

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.



IP08	PUMP SIZE	TORQUE	TORQUE
15	275	70±5 LB-FT	95±7 N-m
	312	70±5 LB-FT	95±7 N-m
	350	125±10 LB-FT	170±14 N-m
400	140±10 LB-FT	190±14 N-m	

IP08	PUMP SIZE	TORQUE	TORQUE
52	275	20±2 LB-FT	27±3 N-m
	312	20±2 LB-FT	27±3 N-m
	350	65±5 LB-IN	75±5 N-m
400	65±5 LB-IN	75±5 N-m	

IP08	PUMP SIZE	TORQUE	TORQUE
15	275	105±10 LB-FT	142±14 N-m
	312	120±10 LB-FT	163±14 N-m
	350	190±10 LB-FT	257±20 N-m
400	215±10 LB-FT	290±14 N-m	

IP08	PUMP SIZE	TORQUE	TORQUE
53	275	45±2 LB-FT	61±3 N-m
	312	45±2 LB-FT	61±3 N-m
	350	100±10 LB-FT	135±14 N-m
400	100±10 LB-FT	135±14 N-m	

IP08	PUMP SIZE	TORQUE	TORQUE
52	275	20±2 LB-FT	27±3 N-m
	312	20±2 LB-FT	27±3 N-m
	350	20±2 LB-FT	27±3 N-m
400	20±2 LB-FT	27±3 N-m	

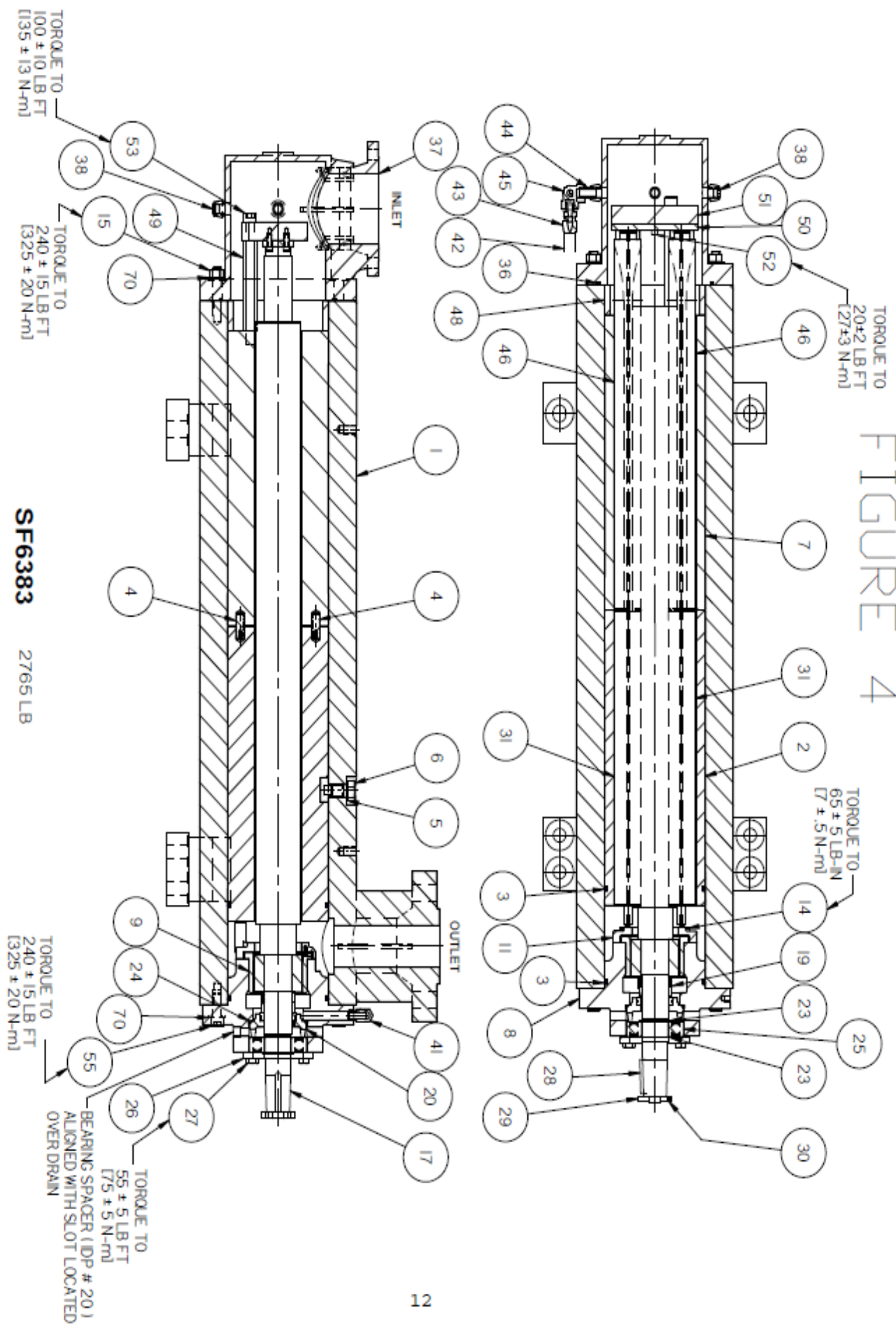
IP08	PUMP SIZE	TORQUE	TORQUE
27	275	55±2 LB-FT	75±3 N-m
	312	55±2 LB-FT	75±3 N-m
	350	55±2 LB-FT	75±3 N-m
400	55±2 LB-FT	75±3 N-m	

DLH12DHT ASSEMBLY

USE THIS ASSEMBLY FOR ALL BILLS EXCEPT 3225/330 WHICH USES THE ASSEMBLY IN FIGURE 4

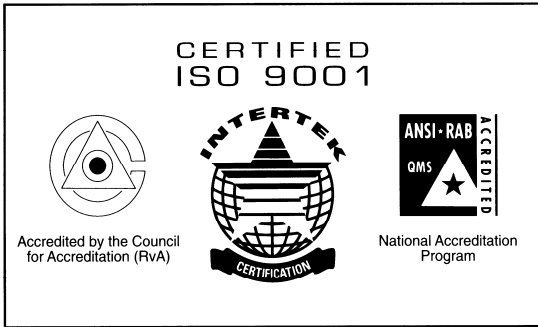
FIGURE 3

FIGURE 4



ASSEMBLY FOR 3225/530 (DLH12DHSTX-400)

SF6383 2765 LB



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