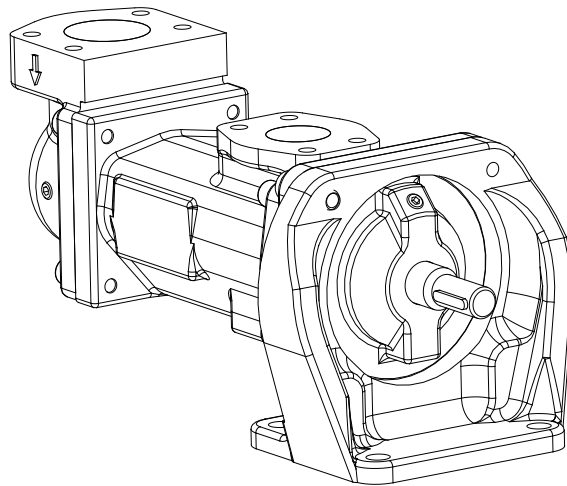



CFHN SERIES PRODUCT SERVICE MANUAL






Metric standards apply for all pumps covered by this manual with regard to Mounting dimensions, external connections, bolts, bolt threads, plugs and bearings.



	WARNING	
<p>This manual AND the following CE-compliant manuals should be read thoroughly, and in their entirety, prior to pump installation, operation and maintenance:</p> <p>Manual No. SRM00100 – Safety and Operation Manual.</p> <p>Manual No. SRM00101 – Installation, General Maintenance and Trouble Shooting Manual.</p>		
<p>Electronic copies of all referenced manuals can be obtained at www.imopump.com.</p>		

Manual No. SRM00103	Rev. 01 (14-0036)	January 2014
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READ THIS ENTIRE PAGE BEFORE PROCEEDING

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

Warning Level	Risk Level	Consequences of disregarding the warning
 DANGER	Immediate Acute Risk	Death, Serious Bodily Harm
 WARNING	Potential Acute Risk	Death, Serious Bodily Harm
 CAUTION	Immediate Hazardous Situation	Minor Bodily Harm, Material Damage
<i>i</i> NOTE	Potentially Hazardous Situation	Minor Bodily Harm, Material Damage

Symbol	Meaning
	Safety Warning – Take note of all information highlighted by a Safety Warning Sign and follow the instructions to avoid damage to equipment, injury to personnel or death.
	Electrical Hazard – Contact with electrical equipment can cause shock. Contact of electrical equipment with water can cause shock. Do NOT touch with wet hands. Always disconnect when not in use.

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IMPORTANT NOTE
If operation of pump is critical to your business, we strongly recommend keeping a spare pump in stock at all times. As a minimum, a minor repair kit (O-rings, gaskets, shaft seal, bearings and retainers) should be kept in stock so pump refurbishment can be readily accomplished after inspection.

A. GENERAL INSTRUCTIONS

Instructions found herein cover disassembly, assembly and parts identification of all size CFHN series Imo 3-screw pumps, sizes 20 through 330.

NOTE: Individual contracts may have specific provisions that vary from this manual. Should any questions arise which are not addressed in this manual, refer to contract and to Manual No.'s SRM00100 and SRM00101. See front cover for manual descriptions. For additional information/technical assistance please contact Technical Service Department of Imo Pump at (704) 289-6511.

Every effort was made to prepare text of manual so engineering and design data is transformed into most easily understood wording. Imo Pump must assume personnel assigned to service pump have sufficient technical knowledge and are experienced to apply sound safety and operational practices which may not be otherwise covered by manual.

	WARNING
If instructions in this manual 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 manual covers only CFHN series pumps. These pumps have been designed for general use in lubricating, seal and distillate fuel oil applications. Size and construction of each pump is identified in model number on pump nameplate. Definitions of model designators are identified in Figure 1.

Figure 1 – Model Designator Definitions

CFHN Model Nomenclature																																																																																								
Example →	CFH	N	020	R	46	K	C	/000	Available Size & Thread Pitch Angle Combinations*																																																																															
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* R (CW) shaft rotation direction is considered "standard", however, L (CCW) rotation is offered for all available combinations of size and thread pitch angle.

Note
All pumps models except Size 20 have weep holes that will readily allow for detection and collection of any mechanical seal leakage that might occur.

C. DESCRIPTION OF EQUIPMENT

CFHN series pumps are positive displacement, rotary screw pumps consisting of a precision bored housing that encloses a drive screw (power rotor) and two intermeshing driven screws (idler rotors). These screws, when rotating, form a succession of closures or cavities. As they rotate, fluid is moved axially from inlet to outlet port in a continuous, uniform flow with minimum fluid pulsation and pump noise.

NOTE: CFHN pumps are **NOT** bi-rotational; Inlet and outlet ports can **NOT** be reversed.


D. ORDERING INSTRUCTIONS

All correspondence pertaining to replacement parts for equipment must refer to instruction manual number and should be addressed to nearest Imo pump representative. Handling of replacement part orders will be greatly facilitated if directions below are carefully observed:

1. Provide number of instruction manual with revision level and date.
2. Provide model number of the pump for which part is desired. Number appears on nameplate.
3. Designate desired part by Position No. and name as shown on assembly drawing and as listed in Table 2 below.

E. OPERATION

E.1 – LIQUID LIMITATIONS

	CAUTION
<p>Pump is designed for liquids having general characteristics of oil including requirement for at least some lubricity. Since pump ball bearing is lubricated by pumped liquid due to open ball bearing design, <u>never</u> operate CFHN pumps with a liquid having a viscosity less than 2.0 cSt (33 SSU).</p> <p><u>Never</u> operate pump on water.</p>	

E.2 – OPERATING LIMITS


	CAUTION
<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 that system's operating requirements are within pump's capabilities.</p>	

Table 1 – Pump Operating and Structural Limits

Maximum Speed	5000 RPM for size 20 models
.....	4000 RPM for size 40 to 170 models
.....	3600 RPM for 330 model
Viscosity	3,200 cSt (15,000 SSU) maximum / 2.0 cSt (32.6 SSU) minimum for all models

NOTE: Do not alter design viscosity without prior consultation with Colfax Pump. Consult factory for allowable operating viscosities at specific speeds and pressures.

Temperature	-18° to 107°C / 0° to 225°F
Inlet Pressure – Maximum	3.4 bar-g / 50 psig
Differential Pressure – Maximum	41.4 bar / 600 psi
Discharge Pressure – Maximum	41.4 bar-g / 600 psig
Drive	direct only
Filtration	See Manual SRM00101 (description on front cover)
Mounting	foot or flange mounted
Shaft Rotation	available in CW or CCW versions

NOTE: Pump is **not** bi-rotational

F. PARTS LIST

Part number identifiers (POSITION NUMBERS / POS. NO.'s) contained in Table 2 refer to circled numbers shown on assembly drawings, Figures 4, 5 and 6.

Table 2 – Parts List

POS. NO.	QTY	DESCRIPTION
1	1	Housing
2	1	Inlet Cover
3	0, 2, 4 or 8	Bolt (See Note)
4	1	Inboard Cover
6	4,6 or 8	Bolt (See Note)
7	1	Power Rotor
8	2	Idler Rotor
11	1 X	Ball Bearing
13	1	Key


POS. NO.	QTY	DESCRIPTION
15 X	1	Retaining Ring
16 X	1	Seal
20	1	Bracket (Foot Mount Pumps Only)
21	2	Bolts for Foot Bracket
26 X	1	O-Ring (size 40 to 90)
31 X	1	O-Ring (Qty 2 on size 20 Pumps)
47	2	Plug
95	1	Pin

X = Minor Repair Kit Item


- Note:**
- POS. NO. 3: Qty 4 on axial inlet versions of all pump sizes 20 through 330.
 - POS. NO. 3: Qty 2 on right angle inlet versions of size 20 pumps.
 - POS. NO. 3: Qty 0 on right angle inlet versions of size 40 through 90 pumps.
 - POS. NO. 3: Qty 8 on right angle inlet versions of size 140 through 330 pumps (Qty 12 on Foot Mount versions)
 - POS. NO. 6: Qty 6 on right angle inlet versions size 20 pumps.
 - POS. NO. 6: Qty 8 on right angle inlet versions of sizes 40 through 90.



G. INSPECTION

Interval for inspection and replacement of worn parts varies with properties of pumped liquid and can only be determined by experience. A worn pump will be noticeable by excessive vibration, noise, reduction in flow output and/or reduction in system pressure.

	CAUTION
All CFHN Series internal pump parts, including ball bearing, are lubricated by pumped liquid. Pumping a liquid which contains abrasive materials, that is too low in viscosity or lubricity, or that is corrosive, will significantly reduce service life and call for shorter service intervals.	

H. PUMP MAINTENANCE

	WARNING
Failure to observe precautions while installing, inspecting, and maintaining the pump can cause injury to personnel from accidental handling, e.g.: Liquids that may harm skin or clothing, fire hazard risks from flammable liquids, or injury from high pressure fluid jets.	

 	DANGER
BEFORE working on equipment, be sure all power to the equipment is disconnected and locked-out.	

H.1 – GENERAL COMMENTS


Part number identifiers (POSITION NUMBERS / POS. NO.'s) within parenthesis such as (8) refer to circled numbers shown on assembly drawings, Figures 4, 5 and 6.

NOTE: If upon disassembly, significant wear on power or idler rotors or rotor housing is found, Imo Pump recommends replacement of entire pump.

H.2 – TOOLS REQUIRED

Procedures described in this manual require common mechanics hand tools, arbor press, torque wrench and suitable lifting device such as sling for smaller pumps or strap for larger models.


H.3 – PUMP DISASSEMBLY

	WARNING
Fluid leakage may make floor slippery and cause personal injury when pump is removed from system or when it is disassembled.	


Perform the following steps before disassembling pump:

- a) If pump is driven by an electric motor, de-energize and lock out power to driver and tag power control box "**WARNING - Out of Service**". Proceed similarly for other type drivers.
- b) Close all inlet and outlet valves and tag valves "**WARNING - Out of Service**".
- c) Vent pressure in pump and drain pumped liquid.
- d) Remove pipe fittings/flanges at pump inlet and outlet openings.
- e) Remove bolts holding pump to its mounting.
- f) Remove coupling hub and key (13) from power rotor (7) shaft and place pump on suitable workbench.

NOTE: CFHN Series pumps incorporate highly finished precision parts that must be handled carefully to avoid damaging critical machined surfaces. Removed parts should be tagged for identification and their exact positions in pump should be noted so new and removed parts can be properly replaced.

	CAUTION
When removing inboard cover (4) from pump, DO NOT pull out power rotor (7) and idler rotors (8) at same time since they may drop out and be damaged. If rotors start to come out, hold them in place.	

1. Remove inboard cover (4) from pump housing (1) after first removing bolts (3 or 6) from cover (4).
2. Remove O-ring (31) and stationary seat (see Figures 2 and 3) of seal (16) from inboard cover (4).

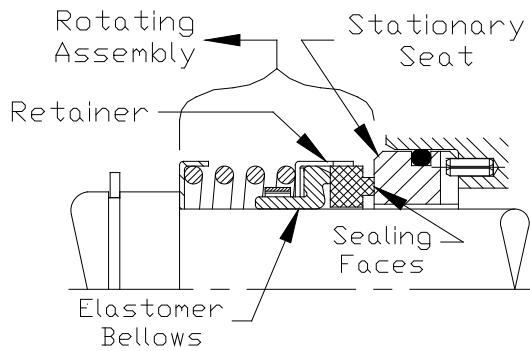
	CAUTION
In next step, rotors will be removed from pump. They will come out as a unit. Use care to support rotor set as it is withdrawn from housing so idlers will not be dropped on floor.	

3. Remove rotor set, power rotor (7) and two idler rotors (8), from pump by grasping and gently pulling on drive shaft end of power rotor (7). When ends of idler rotors (8) clear discharge end of housing (1), hold all 3 rotors together and ease out as an assembly. Once rotor assembly is removed, disengage both idler rotors (8) and set aside.
4. Mechanical Seal Removal - See Figures 2 and 3 below.
 - a. For Elastomer Bellows Type – Figure 2 – Slide rotating assembly off power rotor (7).
 - b. For Metal Bellows Type Seals – Figure 3 – Loosen set screw(s) at least 2 turns and slide rotating assembly from power rotor

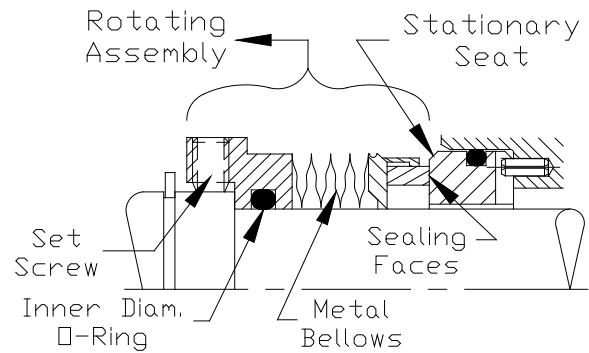
NOTE:

- If only replacing seal, skip to Steps 3 through 10 in PUMP ASSEMBLY / REASSEMBLY section below to install new seal and complete pump reassembly.
- If remainder of pump needs to be disassembled, proceed with Step 5 immediately below.

**Figure 2
Elastomer Bellows Mechanical Seal**



**Figure 3
Metal Bellows Mechanical Seal**



- Remove ball bearing (11) from power rotor (7) by first removing retaining ring (15) from groove in power rotor (7) shaft. Ball bearing (11) can then be removed with a gear puller or arbor press.

	CAUTION	
Removal of bearing by force applied to its outer ring could damage bearing.		

NOTE: Imo Pump strongly recommends replacing ball bearing every time it is removed from power rotor.

- Remove inlet head (2) after first removing four bolts (3 or 6) from inlet head (2).
- Remove O-ring (26 or 31, depending on pump size) from inlet head (2).

H.4 – PUMP ASSEMBLY / REASSEMBLY

NOTE: Prior to pump assembly, all parts should be cleaned and inspected for nicks, burrs or gouges. When ready for assembly, wipe all parts, including bolts, O-rings and seal faces with a clean, lubricating oil or pumped product, if applicable.

	CAUTION	
Bearing service life could be significantly reduced if pushed onto shaft by outer ring.		

- Install ball bearing (11) onto shaft (7) using an arbor press and sleeve by pushing on ball bearing (11) inner ring **only** until ball bearing (11) is positioned against shoulder on power rotor (7).
- Install retaining ring (15) in groove into power rotor (7).
- Before installing seal (16), insure power rotor (7) shaft is clean and has no burrs or sharp edges.

	CAUTION	
To avoid seal leaks, avoid contacting sealing faces of mechanical seal with any objects, including fingers. Objects can scratch sealing surfaces. Acids in finger oils can etch them.		

- Mechanical Seal (16) Installation – See Figures 2 and 3 above.

Clean and Lubricate Sealing Face – Clean sealing faces of rotating assembly and stationary seat with alcohol and lint free cloth. Apply light film of clean lubricating oil to both sealing faces.

ROTATING ASSEMBLY


- Seals with Elastomer (rubber-like) Bellows – Apply light film of oil to elastomer bore of rotating assembly and push it onto power rotor (7) shaft with twisting motion. Do not allow fingers to touch sealing face.
- Seals with Metal Bellows – Apply light film of clean lubricating oil to O-ring in rotating assembly bore and push onto power rotor shaft (7) with a rotating motion. For size 20 only, make sure slots in rotating assembly line up with seal return hole in power rotor shaft (7). Tighten seal setscrew(s).

STATIONARY SEAT

- Apply light film of clean lubricating oil to O-ring on outer diameter of stationary seat. Install stationary seat into bore in inboard cover (4) with fingers so slot in non-running face of seal is facing into inboard cover (4). Do not touch sealing face with fingers or any tools. Be sure stationary seat is all the way to bottom of bore in inboard cover (4) and slot in seal mates up to pin (95).

RE-CLEAN / RE-OIL SEALING FACES – Do this only if faces accidentally touched during installation process.

5. Mesh two idler rotors (8) and power rotor (7) together into a rotor assembly making sure ends of idler rotors are properly engaged into slots in power rotor.
6. Install rotors by positioning pump housing in a vertical position and sliding rotor assembly into housing bore (1) until ball bearing (11) bottoms out in housing bore.
7. Lubricate and install O-ring (31) in groove in inboard cover (4).
8. Install inboard cover (4) on housing (1).


	CAUTION	
To maximize seal life, seal vent in cover must be oriented at 12:00 o'clock when pump is horizontally mounted in its installed position. Vent orientation not critical when unit is vertically mounted.		

9. Install four bolts (3 or 6) into inboard cover (4) and thread bolts into housing (1). Torque bolts to value shown on assembly drawing (Figures 4, 5 or 6).
10. Install O-ring (31) in groove in inlet head (2).
11. Install inlet head (2) onto housing (1) with cap screws (3 or 6).
12. Install key (13) into keyway on drive end of power rotor (7). If appropriate, install drive coupling over key (13) and drive end of power rotor (7).

I. INSTALLATION, ALIGNMENT AND TROUBLESHOOTING

Install coupling to pump drive shaft. Align pump and driver shafts per Manual SRM00101.

Connect piping to pump. Open inlet and outlet line valves. Vent air from seal chamber before starting pump by opening pipe plug at inboard end of pump until oil comes out. This will assure that seals are lubricated at startup.

	DANGER	
3-screw pumps are positive displacement types. They must NOT be started with blocked outlet lines.		

For detailed instructions regarding installation, alignment, operation general maintenance and trouble shooting, see Manuals SRM00101.

J. FIELD AND FACTORY SERVICE / PARTS

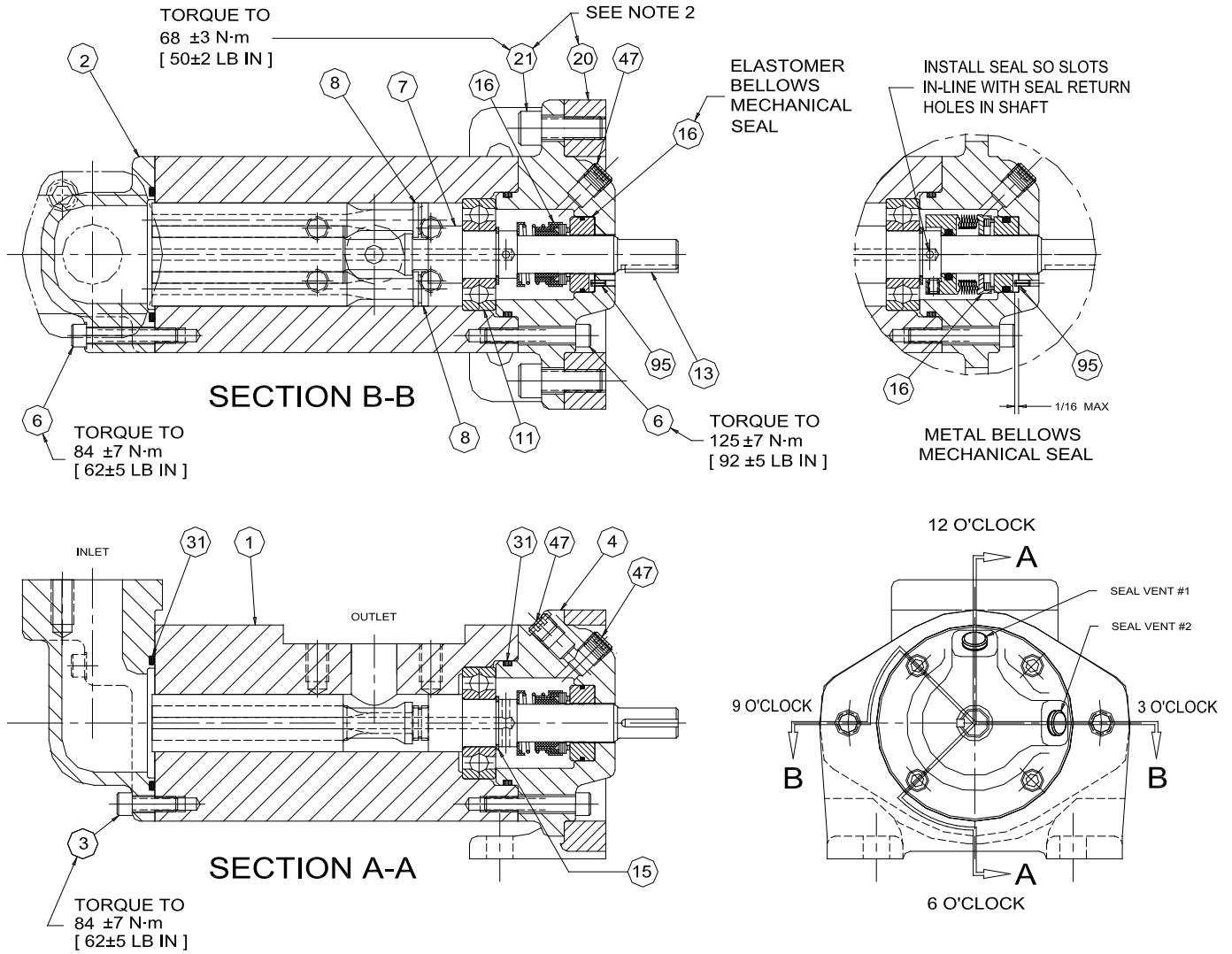
Imo Pump maintains a staff of trained service personnel that can provide pump installation, pump start-up, maintenance/overhaul and troubleshooting supervision as well as installation and maintenance training.

Our factories have facilities and personnel to inspect, maintain, overhaul and test pumps in the event user prefers to return pumps for these services. 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 the Technical/Customer Service Department in Monroe, NC, USA, (704) 289-6511.

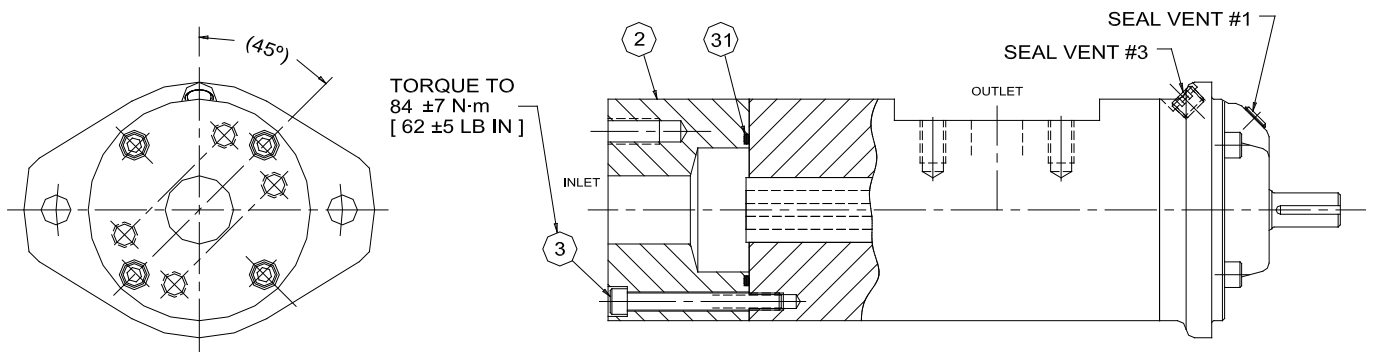
Minor Repair Kits are available for CFHN series pump models. Minor Repair Kits are used to repair leaking seals, rough or failed bearings and/or for re-assembly after pump tear-down. They include (as applicable) mechanical seals, O-rings, bearings and any part that might be damaged during disassembly (e.g., retainer rings). Kits contain all necessary parts. Individual parts within Minor Repair Kits are not sold. If major pump components (e.g., rotors or housings) are heavily worn or damaged, entire pump should be replaced.

Figure 4
CFHN020 Pumps



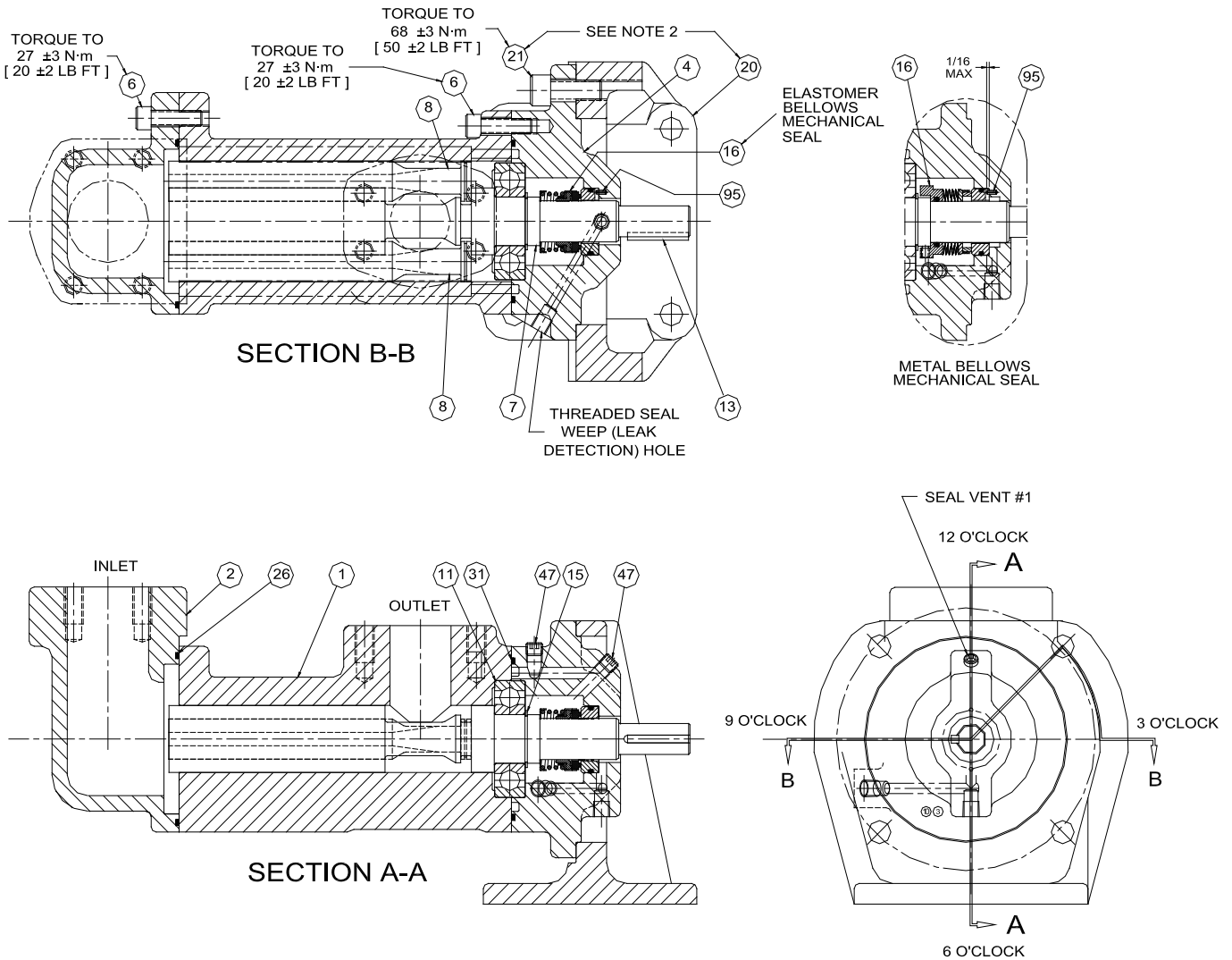
NOTES:

1. TO MAXIMIZE SEAL LIFE, A SEAL VENT MUST BE ORIENTED AT 12:00 O'CLOCK WHEN PUMP HORIZONTALLY MOUNTED IN ITS INSTALLED POSITION. VENT ORIENTATION NOT CRITICAL WITH VERTICAL MOUNTING.
2. THESE PARTS FOR FOOT BRACKET OPTION ONLY.



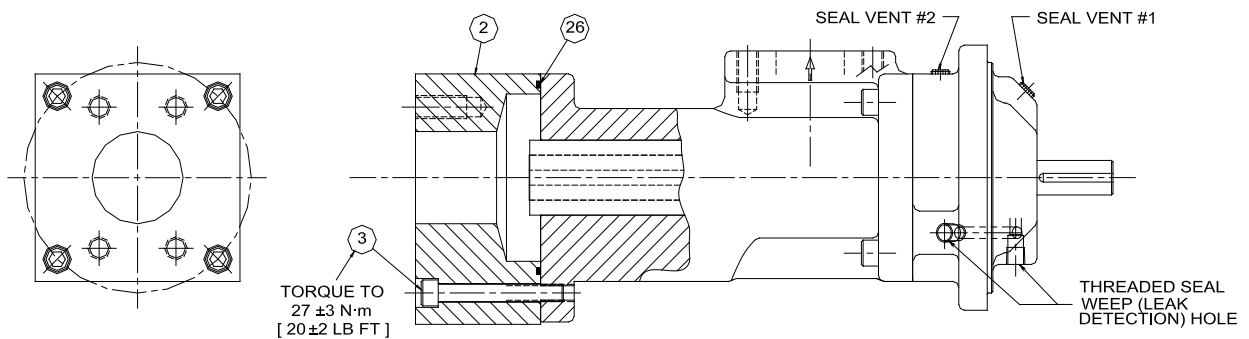
VIEWS SHOWING SAE 4-BOLT AXIAL INLET OPTION

Figure 5
CFHN040, 060 and 090 Pumps



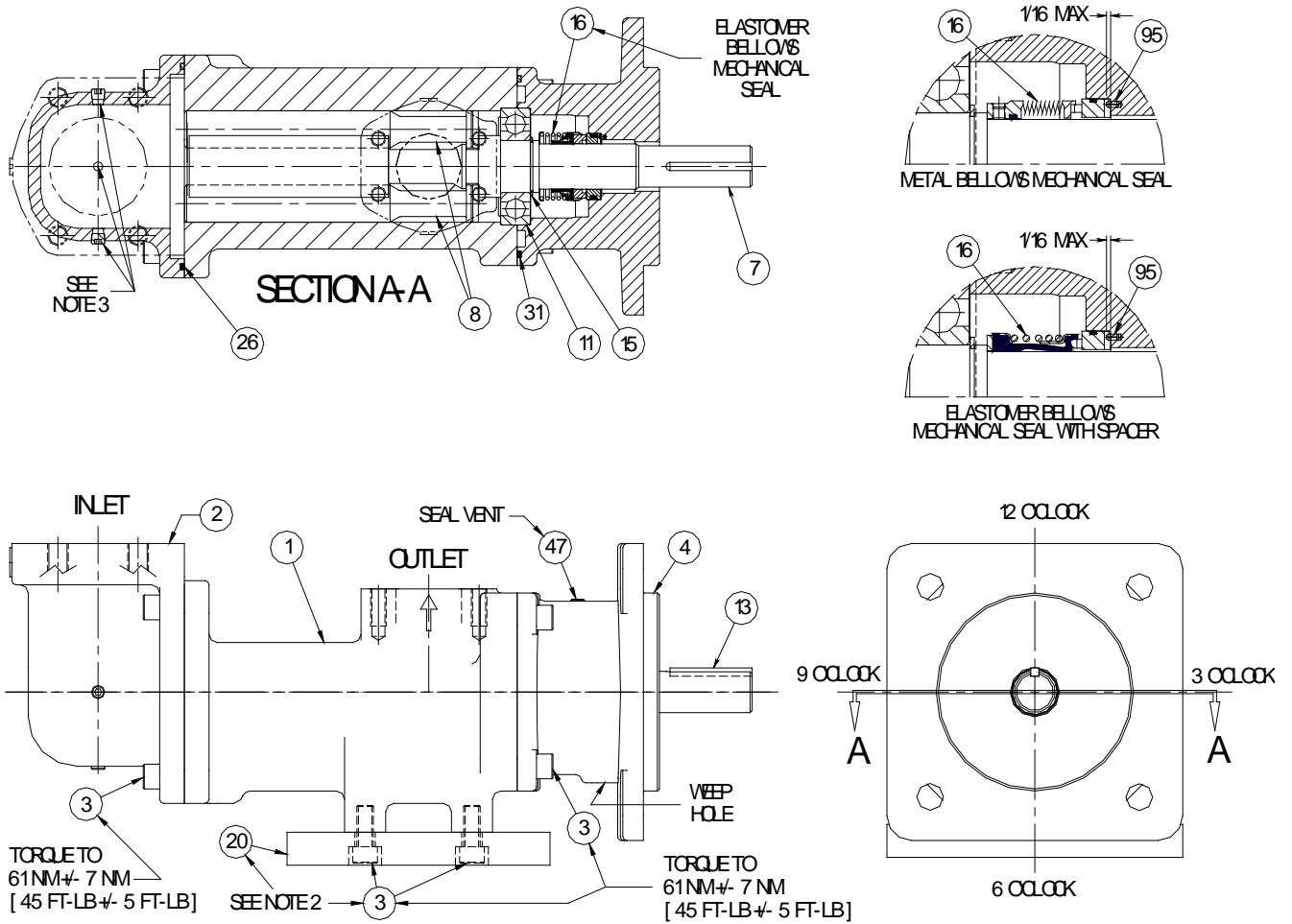
NOTES:

1. TO MAXIMIZE SEAL LIFE, SEAL VENT MUST BE ORIENTED AT 12:00 O'CLOCK WHEN PUMP HORIZONTALLY MOUNTED IN ITS INSTALLED POSITION. VENT ORIENTATION NOT CRITICAL WITH VERTICAL MOUNTING.
2. THESE PARTS FOR FOOT BRACKET OPTION ONLY.



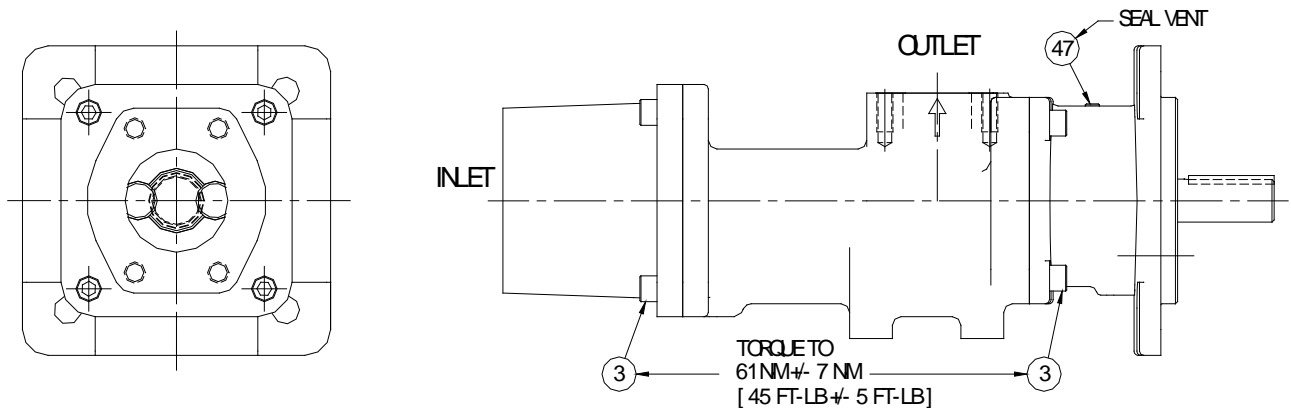
VIEWS SHOWING AXIAL SAE 4-BOLT INLET

Figure 6
CFHN140, 170 and 330 Pumps



NOTES

1. TO MAXIMIZE SEAL LIFE, SEAL VENT MUST BE ORIENTED UPWARD (12 O'CLOCK) WHEN PUMP IS HORIZONTALLY MOUNTED IN ITS INSTALLED POSITION. VENT ORIENTATION NOT CRITICAL WITH VERTICAL MOUNTING.
2. THESE PARTS FOR FOOT MOUNT OPTION ONLY.
3. INLET COVER DRAIN PLUGS ONLY PRESENT ON SOME SPECIAL MODELS.



VIEWS SHOWING AXIAL SAE 4-BOLT INLET

CE



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