Product Service Manual

For

AA3G Series Pumps

Size 95 Through 162

WARNING

The IMO General Installation Operation, Maintenance and Troubleshooting Manual, (No. SRM00046), this manual, and associated component manuals supplied with the unit should be read thoroughly prior to pump installation, start-up, operation, maintenance or troubleshooting.

Manual No. SRM00020	Rev. 08 (20-0051)	February 2020

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:

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

CONTENTS

ATTENTION

If operation of this 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 AA3G Series, Imo pumps.

NOTE: Individual contracts may have specific provision 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 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 the 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.

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 series AA3G Imo Pumps. Series of pumps has been designed for general use in lubricating, seal and distillate fuel oil applications. The size and construction of each pump is identified in model number on the pump nameplate. Definitions of model designators are identified in Figure 1.

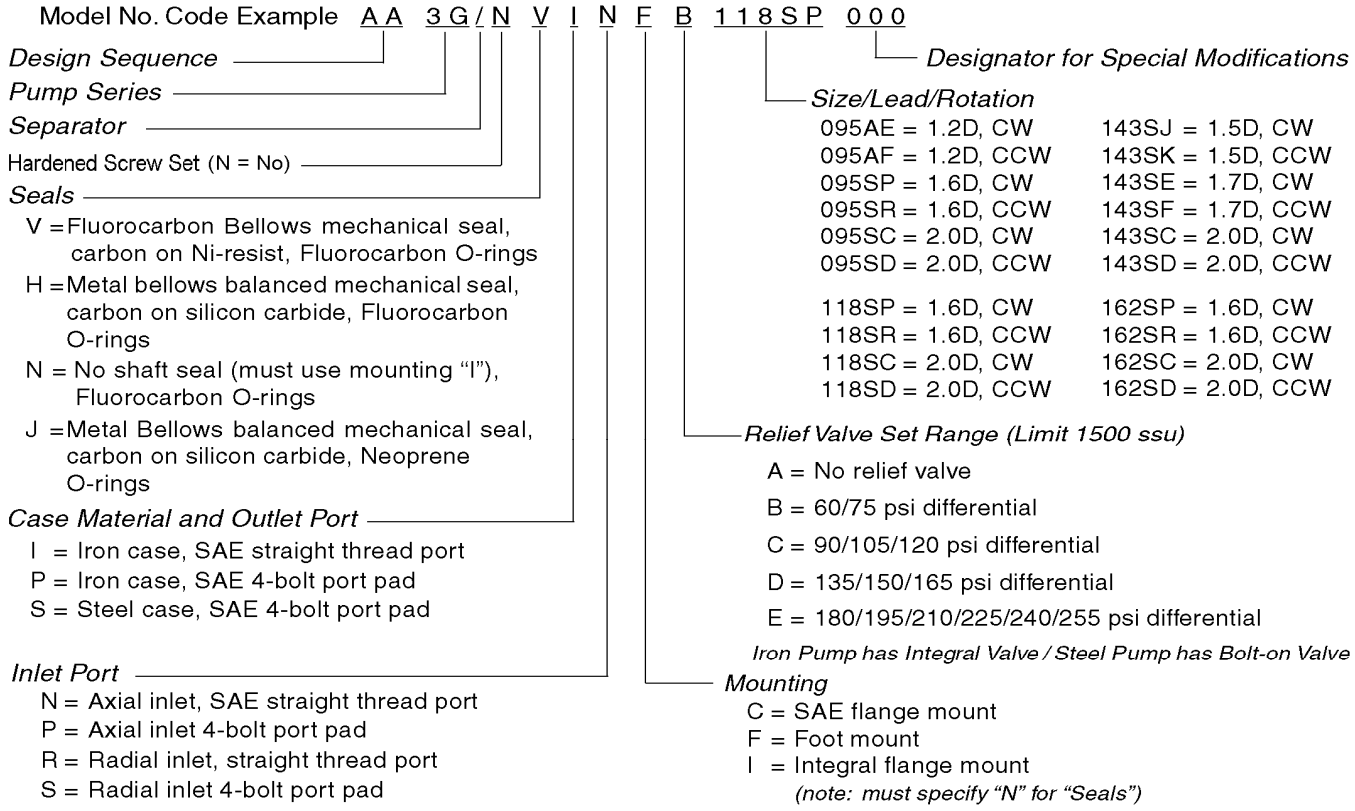


Figure 1 – Model Designator Definitions

C. DESCRIPTION OF EQUIPMENT

The AA3G 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, the fluid is moved axially from inlet to outlet port in a continuous, uniform flow with minimum fluid pulsation and pump noise.

D. ORDERING INSTRUCTIONS

All correspondence pertaining to renewal parts for equipment must refer to instruction manual number and should be addressed to nearest Imo representative. The handling of renewal orders will be greatly facilitated if the following directions are carefully observed:

1. Give the number of instruction manual with revision level and date.
2. Give the model number of the pump for which part is desired. This number appears on nameplate.
3. Designate desired part by the IDP number and name as shown on assembly drawing and as listed in Table 2 in this instruction manual.

E. OPERATION

E-1 – LIQUID LIMITATIONS – Never operate with water. The pump is designed for liquids having the general characteristics of oil.

E-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 that of operational limitations. This equipment must not be operated without verifying the system's operating requirements are within pump's capabilities.	

Table 1 – Pump Operating and Structural Limits

Maximum Speed .....5000 RPM for –95 models and 4000 RPM for –118 to -162 models.
Viscosity ..... 15000 SSU (3200 cSt) Max./ 1500 SSU (325 cst) Max. for Relief Valve models.
2.0 cst Minimum for all models.

NOTE: Consult factory for allowable operating viscosity at specific speeds and pressures.

DO NOT alter design viscosity without prior consultation with Imo Pump.

Temperature..... 0° to 225°F (-18° to 107°C)
Inlet Pressure .....50 psig (3.4 Bar) Max.
Differential Pressure.....250 psig (17.2 Bar) Max.
Discharge Pressure.....300 psi (20.7 Bar) Max.
Drive .....Direct Only
Filtration.....See General Installation Manual, CA-1
Mounting.....Foot or Flange Mounted
Shaft Rotation.....Available in CW or CCW versions.
Pump is **NOT** bi-rotational.

E-3 – MODELS WITH RELIEF VALVES

CAUTION **ATTENTION**

Optional built-in relief valve is intended for momentary protection of the pump against overpressure. It is **Not** intended to be a pressure or flow control device. Continuous bypass of pumped liquid through this valve will cause liquid to heat up very rapidly. Excessive temperature rise will damage the pump.

The optional externally connected relief valve can be used as a pressure or flow control device if its bypass line is piped back to fluid tank and not the pump inlet. Minimum and maximum relief valve set pressures are 60 psid (4.1 Bar) and 255 psid (17.6 Bar) respectively.

⚠ **DANGER**

Relief valves are pre-set at factory. <u>DO NOT TAMPER WITH RELIEF VALVE</u>. Tampering with relief valve will void pump warrantee and can cause bodily injury or loss of life. If relief valve must be adjusted, return pump to factory.

F. PARTS LIST TABLE – TABLE 2

IDP	QTY	DESCRIPTION
1	1	Housing
2	1	Inlet Cover
3	0, 2 or 4	Bolt (See Note)
4	1	Inboard Cover
5	4	Bolt (Ext. RV)
6	4,6 or 8	Bolt (See Note)
7	1	Power Rotor
8	2	Idler Rotor
10	1	O-Ring (Ext. RV)

IDP	QTY	DESCRIPTION
11	1	Ball Ring
13	1	Key
15	1	Retaining Ring
16X	1	Seal
19	1	Breakdown Bushing (Steel Pumps Only)
26X	1	O-Ring (-118 to -162)
31X	1	O-Ring (See Note)
47	2	Plug
95	1	Pin

X = Minor Repair Kit Item

Note: IDP 3: Qty 4 on axial inlet versions of all pump sizes (95 through 162).
IDP 3: Qty 2 on all other versions of 95 size pumps.
IDP 3: Qty 0 on all other versions of sizes 118 through 162.
IDP 6: Qty 4 on axial inlet versions of all pump sizes (95 through –162).
IDP 6: Qty 6 on all other versions of 95 size pumps.
IDP 6: Qty 8 on all other versions of sizes 118 through 162.
IDP 31: Qty 2 on –95 pump.

G. INSPECTION

The Interval for inspection and replacement of worn parts varies with properties of pumped liquid and can only be determined by experience. All internal parts of 3G Series pumps are lubricated by pumped fluids. Pumping liquid which contains abrasive materials or liquid that is corrosive will significantly reduce service life and call for shorter service intervals. A worn pump will be noticeable by excessive vibration, noise, reduction in flow output and/or reduction in system pressure.

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 (IDPs) contained in Table 2 and shown within parenthesis such as (8) refer to circled numbers shown on the assembly drawings, Figures 3 and through 8.

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, an arbor press, a torque wrench and a suitable lifting device such as a sling for smaller pumps or a strap for larger models.

H-3 – PUMP DISASSEMBLY

CAUTION **ATTENTION**

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

The following steps are required before starting any maintenance action:

a) De-energize and lock out power to driver and tag power control box "**WARNING - Out of Service**".
b) Close all inlet and outlet valves and tag valves "**WARNING - Out of Service**".
c) Vent pressure from pump and drain pumping 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 locate pump on a suitable workbench.
g) On pumps with external relief valves, remove relief valve by removing socket head cap screws (5) and O-ring (10.). See Figure 7.

NOTE: The 3G Series 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 their exact positions in the pump carefully noted so that new parts, or removed parts can be properly replaced.

CAUTION **ATTENTION**

When removing inboard cover (4) from pump in step 1, below, DO NOT pull out the rotors (7 & 8) since they may drop to floor and be damaged. If rotors start to come out, hold them in place.

1. Remove bolts (6) from inboard cover (4) and then remove inboard cover (4) from pump housing (1).
2. For lip seal installed pumps, remove lip seal (16) and O-ring (31) from inboard cover (4). For mechanical seal installed pumps, remove stationary seat of seal (16) and O-ring (31) from inboard cover (4).

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

3. Remove power rotor (7) and idlers (8) by grasping shaft of power rotor and easing it out of housing (1). Set idlers (8) aside.
4. For mechanical seal pumps, perform the following:
   a) For Elastomeric Bellows Type Seals (see Figure 2 below) – Slide rotating assembly (3) of mechanical seal (16) off power rotor (7).
   b) For Metal Bellows Type Seals (see Fig 3 below) – Loosen set screw (3F) and slide rotating assembly (3) from power rotor (7).

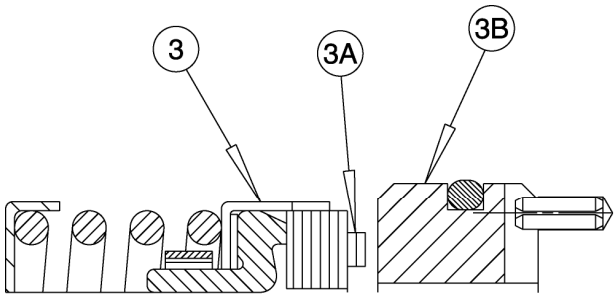


Figure 1 – Elastomeric Bellows Type Mechanical Seal

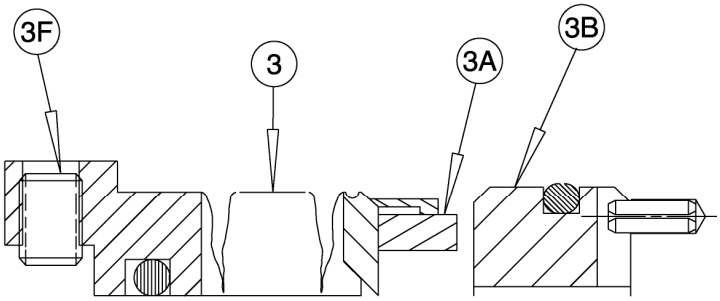


Figure 2 – Metal Bellows Mechanical Seal

NOTE: ***IF ONLY REPLACING SEALS***, pump disassembly is complete. For seal installation, proceed to section H5 and complete steps 3 and 7 through 10 and 12 through 16. For mechanical seal installation, complete steps 4 through 9 and 11 through 16. If the remainder of pump needs to be disassembled, proceed below.

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

NOTE: Imo Pump strongly recommends replacement of the ball bearing every time the bearing is pressed off the power rotor.

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

H.5 – PUMP REASSEMBLY, SEE FIGURES 3 through 8

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 clean, lubricating oil or pumped product, if applicable.

CAUTION	**ATTENTION**
Bearing service life could be significantly reduced if bearing is pushed on by its outer race.	

1. Install ball bearing (11) onto shaft (7) using an arbor press and sleeve by pushing on ball bearing (11) inner race **only** until ball bearing (11) is positioned against shoulder on power rotor (7).
2. Install retaining ring (15) in groove in power rotor (7).
3. Before installing seal (16), insure power rotor (7) shaft is clean and has no burrs or sharp edges.
4. If pump has a lip seal (16), install lip seal into outboard cover (4) and skip to step 8 below.

   NOTE: Seal Lip is graphite impregnated Teflon and should not be lubricated when installed.

5. If pump has a mechanical seal (16), apply clean lubricating oil to rotor shaft at seal diameter.

   a. **If seal has elastomeric rubber bellows, (see figure 1)**, apply light film of oil to bore of bellows and install rotating assembly (3) on power rotor (7) shaft with a twisting motion by pushing on seal retainer **only** with fingers. Do not touch carbon face with fingers. Clean carbon face of seal with alcohol and lint free cloth. Apply light film of clean lubricating oil to carbon face.

   b. **If seal is metal bellows type, (see figure 2)**, apply a light film of oil to rotating seat O-ring of seal and slide rotating assembly (3) on power rotor shaft (7). For 95 sizes only, be sure slots in rotating assembly (3) line up with seal return hole in power rotor shaft). Tighten setscrew (3F). Do not touch carbon seal face with fingers. Clean carbon face of seal with alcohol and lint free cloth. Apply light film of clean lubricating oil to carbon face.

6. Apply light film of clean lubricating oil on seat and O-ring of stationary seat (3B) of mechanical seal (16). Install stationary seat (3B) into bore in inboard cover (4) with fingers (do not touch seal face with any tools) so slot in face of seal is facing into inboard cover (4). Be sure stationary seat (3B) is all the way to bottom of bore in inboard cover (4) and slot in seal mates up to pin (95) in inboard cover (4).
7. Clean stationary seat of mechanical seal (16) in inboard cover (4) with alcohol and soft, lint free cloth, and apply light film of clean lubricating oil to carbon face.
8. Mesh the two idler rotors (8) and power rotor (7) together into a rotor assembly making sure idler rotors and balance piston are properly engaged.
9. 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.
10. Install O-ring (31) in groove in inboard cover (4).
11. If pump has lip seal (16), install seal installation tool (see figure 8) on coupling end of power rotor (7). Then, carefully install inboard cover (4) on housing being sure that inboard cover (4) is kept square with power rotor shaft and inner lip seal lip (16) does not roll under as cover (4) is installed.

CAUTION	**ATTENTION**
Failure to use seal installation tool (See Figure8) on lip seal units is likely to result in improper lip seal installation.	

12. If pump has mechanical seal, install inboard cover (4) on housing (1) without seal installation tool.

CAUTION	ATTENTION
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.	

13. Install the four bolts (6) into inboard cover (4) and thread bolts into housing (1). Torque bolts to values shown on assembly drawing.
14. Install O-ring (31) in groove in inlet head (2).
15. Install inlet head (2) onto housing (1) with cap screws (3 or 6).
16. Install key (13) into power rotor (7) keyway and coupling on shaft (7).
17. On pumps with external relief valves, install relief valve using cap screws (5) and O-ring (10). See figure 8. Relief valve can be installed in original position or facing 180° from original position.

. - INSTALLATION, ALIGNMENT AND TROUBLESHOOTING

Install coupling to driver shaft and align pump and driver as detailed in Installation Manual, CA-1.

After pump is connected to piping and inlet and outlet valves are open, be sure to 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.

For detailed instructions regarding installation, alignment, operation and trouble shooting, see General Installation, Operation, Maintenance & Troubleshooting 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 in the event the 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 the Technical/Customer Service Department in Monroe, NC, USA.

Most pumps have minor 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. Since kits have all the necessary parts, it is preferred that they be purchased rather than selecting individual parts. When parts are individually selected from the 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 the new parts.

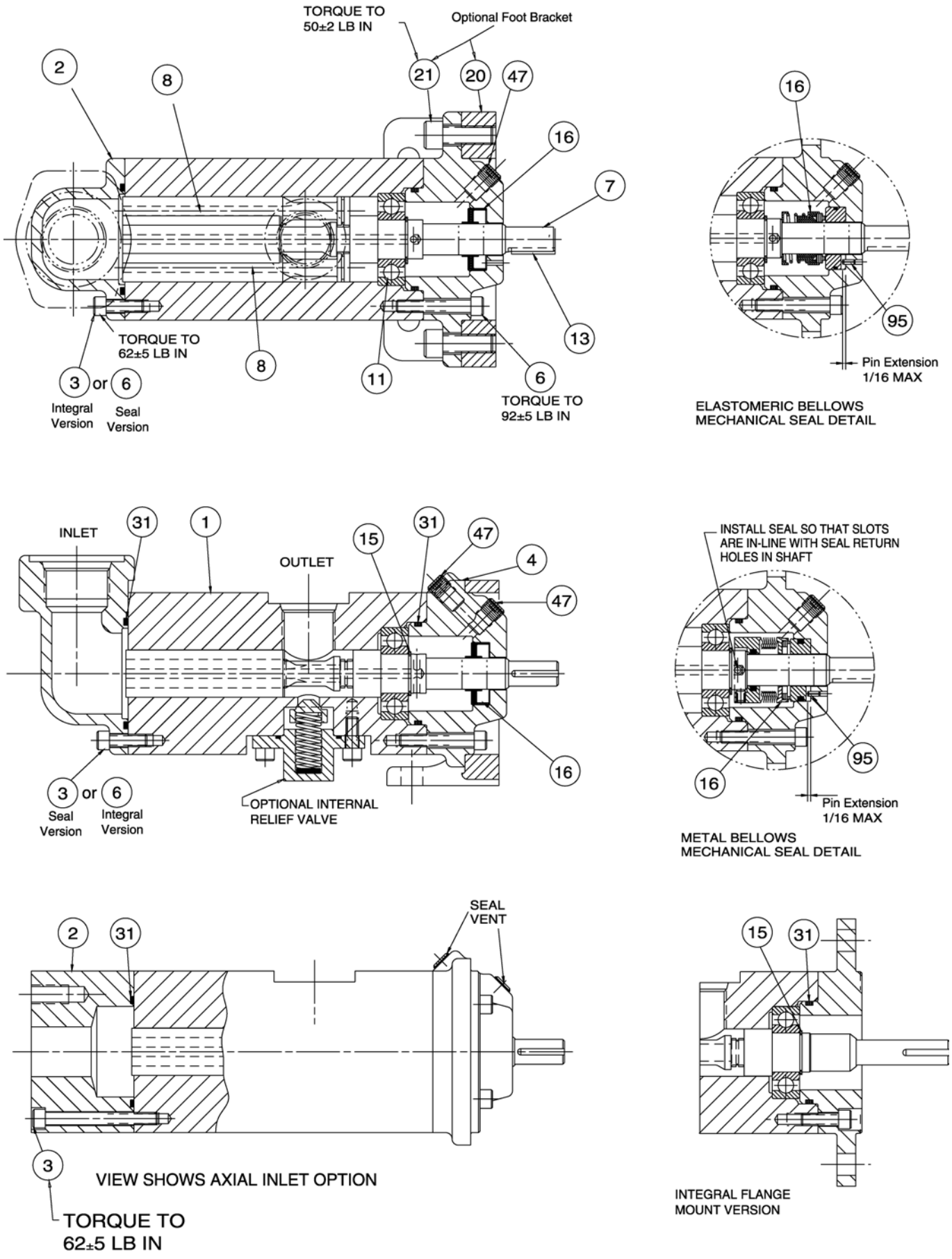


Figure 3 – AA3G-95 Iron Pump Assembly

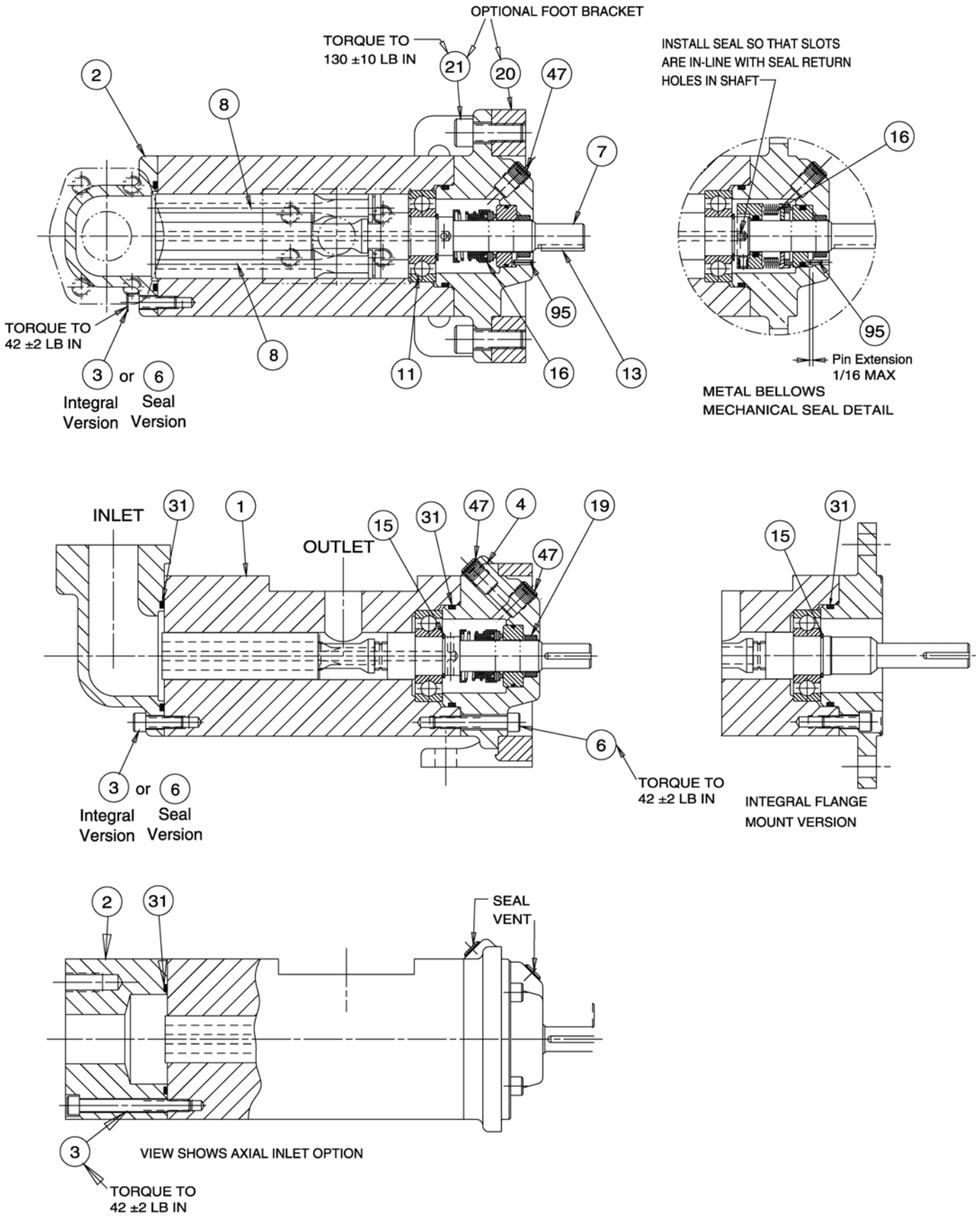


Figure 4 – AA3G-95 Steel Pump Assembly

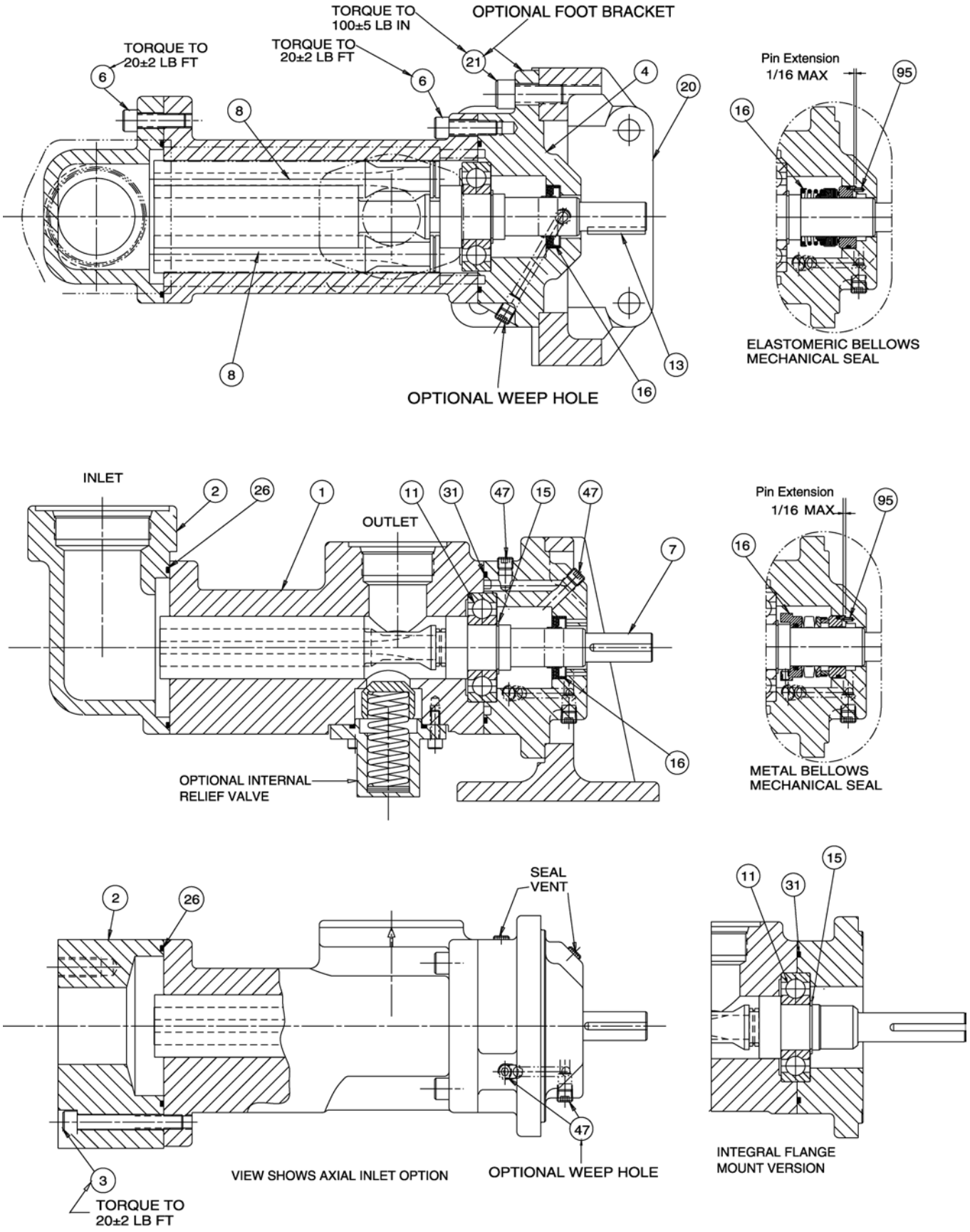


Figure 5 – AA3G-118 to 162 Iron ump Assembly

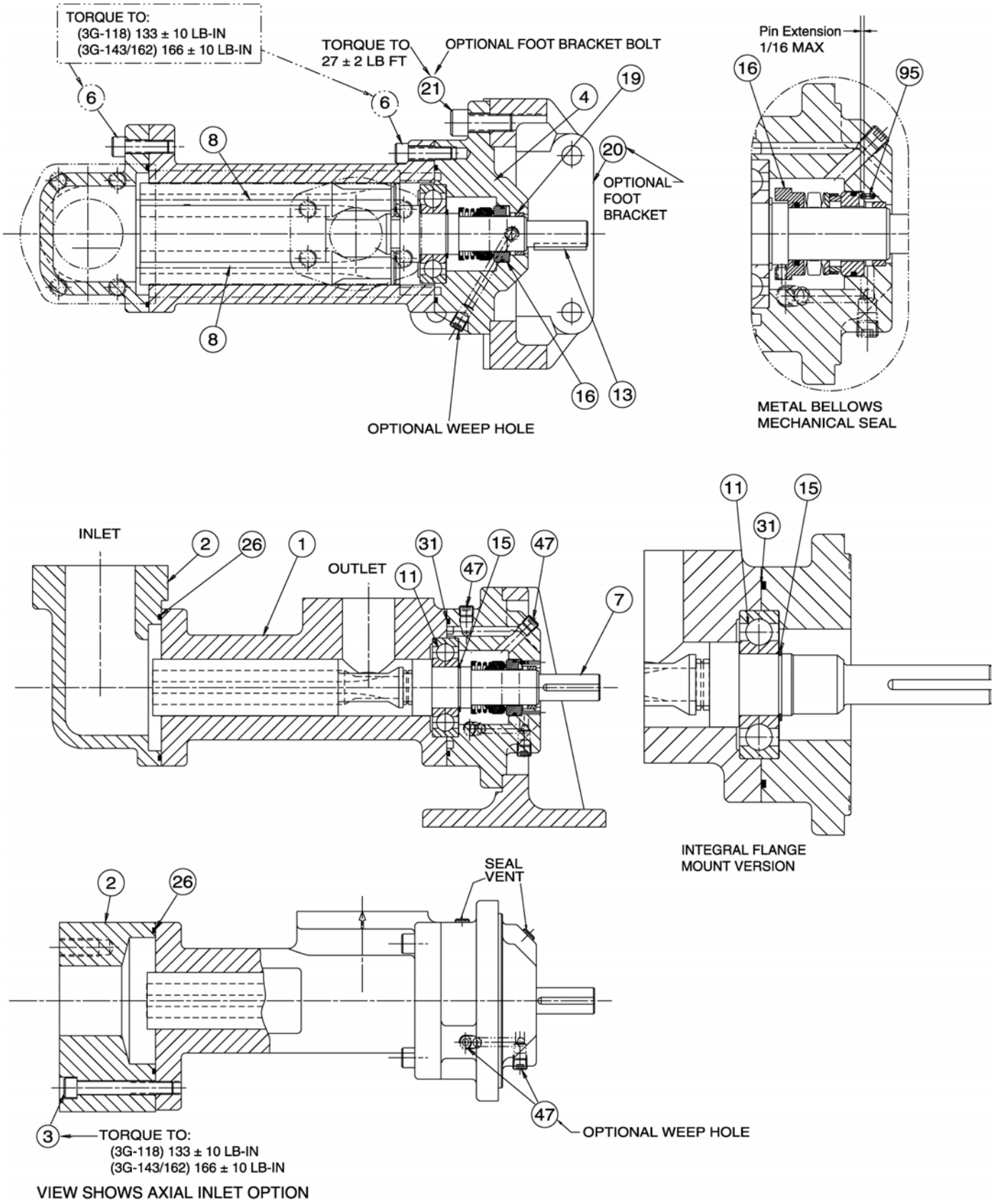


Figure 6 – AA3G-118 to 162 Steel Pump Assembly

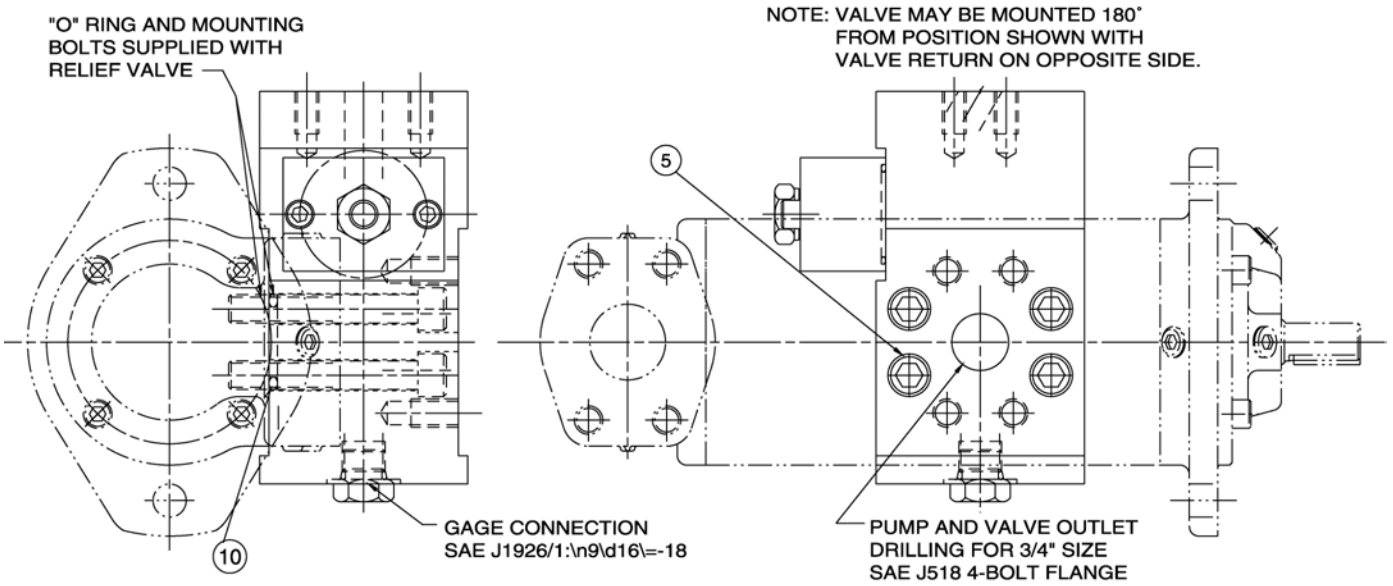
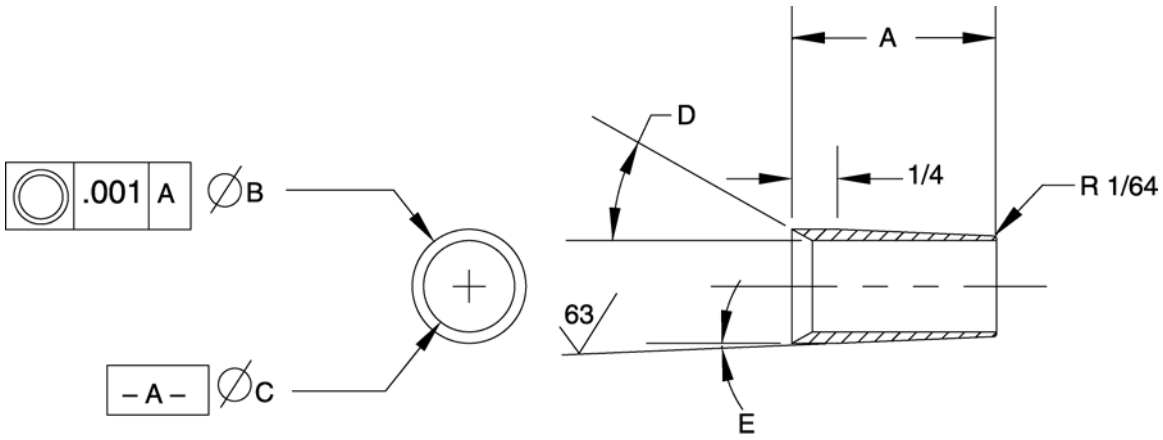


Figure 7 – View of Relief Valve on Pump

Note: Seal installation tool can either be manufactured or purchased from Imo. contact Imo for price and delivery of installation tool.

Material: Steel, Gray Iron, Nylon, VC or any hard material that will give a smooth finish.



	"A"	"B"	"C"	"D"	"E"
	Overall Length	OD	ID	Installation Angle	Taper
	in.	in.	in.	Deg.	Deg.
3G-95	1 - 1/8	.625 / .629	.501 / .505	29	2.5
3G-118	1 - 1/4	.750 / .754	.625 / .63	14	1.5
3G-143 / 162	1 - 1/4	1.001 / 1.005	.751 / .755	29	2.5

Figure 8 – AA3G Lip Seal Installation Tool

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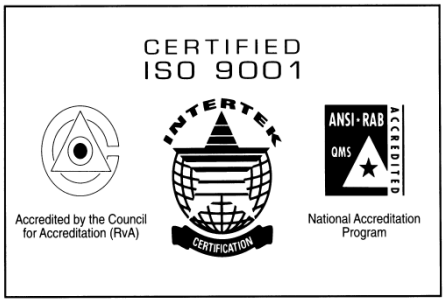

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