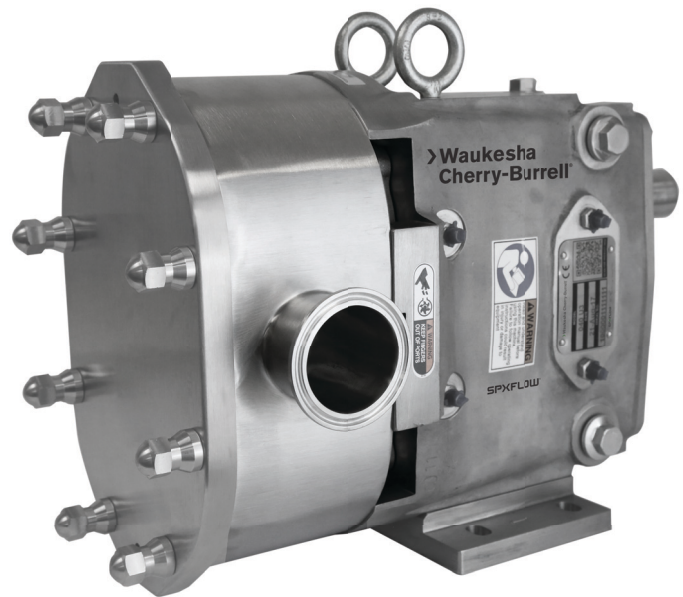


Waukesha Cherry-Burrell®

INSTRUCTION MANUAL

Universal 3 Series

Rotary Positive
Displacement Pump



FORM NO.: 95-03103

REVISION: 09/2024

SPXFLOW®

READ AND UNDERSTAND THIS MANUAL PRIOR TO
OPERATING OR SERVICING THIS PRODUCT.

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Revision Date: 09/2024

Publication: 95-03103

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Warranty

LIMITED WARRANTY: Unless otherwise mutually agreed to in writing, (a) SPX FLOW US, LLC (SPX FLOW) goods, auxiliaries and parts thereof are warranted to the Buyer against defective workmanship and material for a period of twelve (12) months from date of installation or eighteen (18) months from date of delivery, whichever expires first, and (b) SPX FLOW services are warranted to Buyer to have been performed in a workman-like manner for a period of ninety (90) days from the date of performance. If the goods or services do not conform to the warranty stated above, then as Buyer's sole remedy, SPX FLOW shall, at SPX FLOW's option, either repair or replace the defective goods or re-perform defective services. If Buyer makes a warranty claim to SPX FLOW and no actual defect is subsequently found, Buyer shall reimburse SPX FLOW for all reasonable costs which SPX FLOW incurs in connection with the alleged defect. Third party goods furnished by SPX FLOW will be repaired or replaced as Buyer's sole remedy, but only to the extent provided in and honored by the original manufacturer's warranty. Unless otherwise agreed to in writing, SPX FLOW shall not be liable for breach of warranty or otherwise in any manner whatsoever for: (i) normal wear and tear; (ii) corrosion, abrasion or erosion; (iii) any good or services which, following delivery or performance by SPX FLOW, has been subjected to accident, abuse, misapplication, improper repair, alteration (including modifications or repairs by Buyer, the end customer or third parties other than SPX FLOW), improper installation or maintenance, neglect, or excessive operating conditions; (iv) defects resulting from Buyer's specifications or designs or those of Buyer's contractors or subcontractors other than SPX FLOW; or (v) defects resulting from the manufacture, distribution, promotion or sale of Buyer's products; (vi) damage resulting from the combination, operation or use with equipment, products, hardware, software, firmware, systems or data not provided by SPX FLOW, if such damage or harm would have been avoided in the absence of such combination, operation or use; or (vii) Buyer's use of the goods in any manner inconsistent with SPX FLOW's written materials regarding the use of such product. In addition, the foregoing warranty shall not include any labor, dismantling, re-installation, transportation or access costs, or other expense associated with the repair or replacement of SPX FLOW goods. THE WARRANTIES CONTAINED HEREIN ARE THE SOLE AND EXCLUSIVE WARRANTIES AVAILABLE TO BUYER AND SPX FLOW HEREBY DISCLAIMS ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ANY PERFORMANCE OR PROCESS OUTCOME DESIRED BY THE BUYER AND NOT SPECIFICALLY AGREED TO BY SPX FLOW. THE FOREGOING REPAIR, REPLACEMENT AND REPERFORMANCE OBLIGATIONS STATE SPX FLOW'S ENTIRE AND EXCLUSIVE LIABILITY AND BUYER'S EXCLUSIVE REMEDY FOR ANY CLAIM IN CONNECTION WITH THE SALE AND FURNISHING OF SERVICES, GOODS OR PARTS, THEIR DESIGN, SUITABILITY FOR USE, INSTALLATION OR OPERATIONS.

Shipping Damage or Loss

If equipment is damaged or lost in transit, file a claim at once with the delivering carrier. The carrier has a signed Bill of Lading acknowledging that the shipment has been received from SPX FLOW in good condition. SPX FLOW is not responsible for the collection of claims or replacement of materials due to transit shortage or damages.

Warranty Claim

All warranty claims should initially be directed to the SPX FLOW authorized distributor (Distributor) from whom Buyer purchased the product(s) in question. Warranty claims must have a Returned Material Authorization (RMA) from the Distributor or SPX FLOW or returns will not be accepted. The Distributor and SPX FLOW will assess the product(s) and make any necessary or appropriate repairs or replace the product, as determined by SPX FLOW in its sole discretion, in accordance with the above warranty statement. If it is determined that any necessary repairs for the product(s) are not covered by warranty, Buyer will be contacted prior to the performance of such repairs or the return or destruction of such product(s), as applicable.

Claims for shortages or other errors must be made in writing to SPX FLOW or Distributor, as applicable, within ten (10) days after delivery. This does not include transit shortage or damages. Failure to give such notice shall constitute acceptance and waiver of all such claims by Buyer.

Safety

READ AND UNDERSTAND THIS MANUAL PRIOR TO INSTALLING, OPERATING, OR SERVICING THIS EQUIPMENT

SPX FLOW recommends users of our equipment and designs follow the latest Industrial Safety Standards. At a minimum, these should include the industrial safety requirements established by:

1. Occupational Safety and Health Administration (OSHA)
2. National Fire Protection Association (NFPA)
3. National Electrical Code (NEC)
4. American National Standards Institute (ANSI)

⚠ WARNING

Severe injury or death can result from electrical shock, burn, or unintended actuation of equipment. Recommended practice is to disconnect and lockout industrial equipment from power sources, and release stored energy, if present. Refer to the National Fire Protection Association Standard No. NFPA70E, Part II and (as applicable) OSHA rules for Control of Hazardous Energy Sources (Lockout-Tagout) and OSHA Electrical Safety Related Work Practices, including procedural requirements for:

- Lockout-tagout
- Personnel qualifications and training requirements
- When it is not feasible to de-energize and lockout-tagout electrical circuits and equipment before working on or near exposed circuit parts

Before putting SPX FLOW equipment into operation, the operator shall analyze the application for all foreseeable risks, their likelihood to occur and the potential consequences of the identified risks as per ISO 31000 and ISO/IEC 31010 in their actual current version.

Locking and Interlocking Devices: These devices should be checked for proper working condition and capability of performing their intended functions. Make replacements only with the original equipment manufacturer's OEM renewal parts or kits. Adjust or repair in accordance with the manufacturer's instructions.

Periodic Inspection: Equipment should be inspected periodically. Inspection intervals should be based on environmental and operating conditions and adjusted as indicated by experience. At a minimum, an initial inspection within 3 to 4 months after installation is recommended. Inspection of the electrical control systems should meet the recommendations as specified in the National Electrical Manufacturers Association (NEMA) Standard No. ICS 1.3, Preventative Maintenance of Industrial Control and Systems Equipment, for the general guidelines for setting-up a periodic maintenance program.

Replacement Equipment: Use only replacement parts and devices recommended by the manufacturer to maintain the integrity of the equipment. Make sure the parts are properly matched to the equipment series, model, serial number, and revision level of the equipment.

Warnings and cautions are provided in this manual to help avoid serious injury and/or possible damage to equipment:

⚠ DANGER

Immediate hazards which WILL result in severe personal injury or death.

⚠ WARNING

Hazards or unsafe practices which COULD result in severe personal injury or death.

⚠ CAUTION

Hazards or unsafe practices which COULD result in minor personal injury or product or property damage.

Warnings

1. Read the instructions before installing the pump and starting it up. Always follow the guidelines for assembly in order to achieve optimum operational reliability.
2. Always check that the specifications of the motor and the motor control unit are correct, particularly in operating environments where there may be a risk of explosion.
3. Pumps should only be installed, disassembled, repaired and assembled by personnel trained in servicing pumps.
4. Always ensure that all electrical installation is carried out by qualified staff.
5. Never hose down or clean the electric motor directly with water or cleaning fluid. If the motor will be used in a washdown environment a washdown designed motor must be used.
6. Never dismantle the pump before the motor has been disconnected from the power supply. Remove the fuses and disconnect the cable from the motor terminal box.
7. Never dismantle the pump until the isolating valves on the suction and discharge side have been closed and the immediate pipe system has been drained. If the pump is used for hot and/or hazardous fluids, special precautions must be taken. In such cases follow the local regulations for personal safety when working with these products.
8. Always ensure that all pipe connections have been fitted and tightened properly before the pump is started. If the pump is used for hot and/or hazardous liquids, take special care: follow the local regulations for personal safety when working with these products.
9. Always wear personal protective equipment according to the requirements established by OSHA, NFPA, NEC (See page 10).
10. Always remove all assembly and auxiliary tools from the pump before starting it up.
11. Make sure product lines and power cables are laid in suitable guides/trays.
12. Always ensure that no debris of any kind is present in the pump.
13. Always ensure that the pump and the motor shafts are properly aligned.
14. Always ensure that the suction and discharge valves isolating the pump are fully open before starting the pump.
15. Never close or obstruct the outlet of the pump as the pressure in the system will increase above the specified maximum pressure of the pump and cause damage to the pump.
16. There are rotating parts in the pump. Never put hands or fingers into a pump while it is in operation.
17. The pump components and piping may contain sharp edges. Handle the rotors carefully because edges may be sharp. Wear gloves while installing and servicing the pump to help avoid injuries from these hazards.
18. Never touch the gear case during operation. The surface temperature may exceed 110°F (43°C). The pump cover and body may be cold or hot depending on the product (CIP at 190°F (88°C) or 300°F (149°C) product, for example).
19. Never touch the motor or motor shroud (if supplied) during operation, as it can become very hot.
20. When moving the pump, use appropriate lifting devices. Attach lifting devices to the eye bolts on the gear case; the gear case has holes for attaching lifting eye bolts. Always use securely fitted lifting straps when lifting with a crane or similar lifting gear. See "Lifting" on page 16.
21. Never drop parts on the floor.
22. Never exceed the maximum temperature or operating pressure specified under "Operating Parameters" on page 16.
23. Guards should be used when applicable. See page 17, page 28, and page 179.
24. Make sure to keep the work area clear of machine parts, tools, product lines, foreign materials, and power cables to avoid potential hazards.

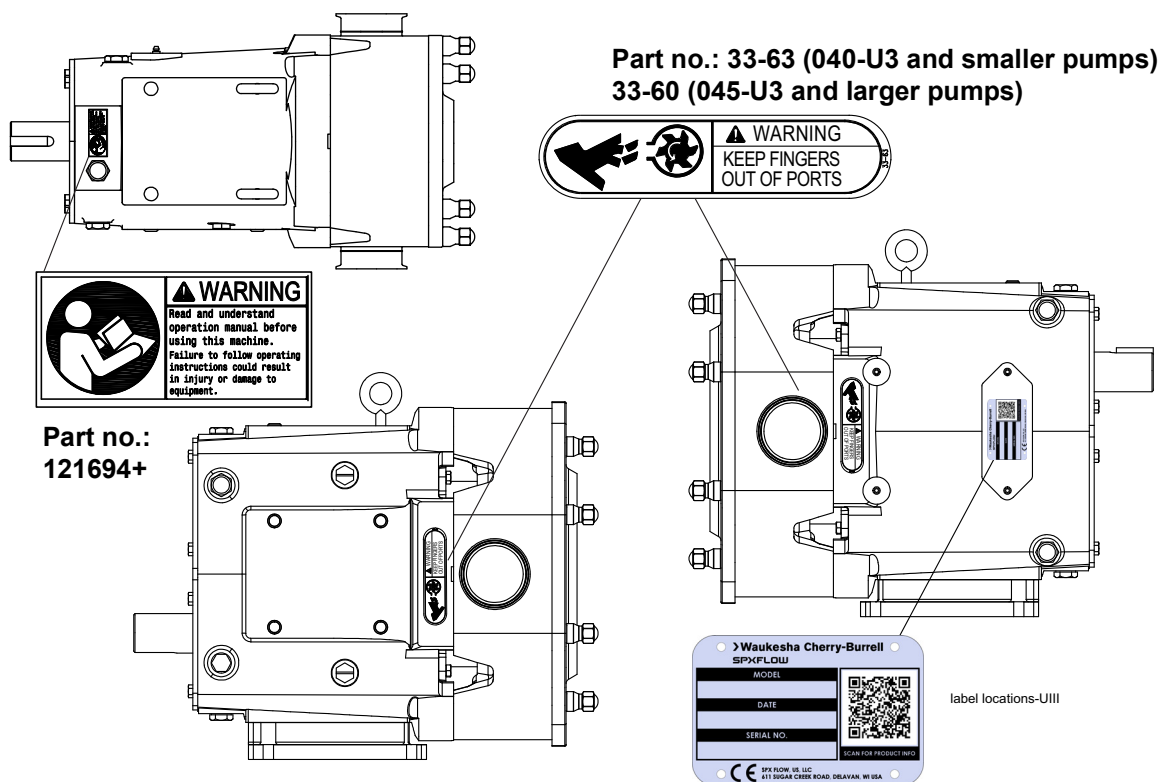
Replacement Labels

⚠ WARNING

The following labels are installed on your equipment. If these labels are removed or become unreadable, contact SPX FLOW customer service at 1-800-252-5200 or 262-728-1900, and refer to the part numbers below for replacement labels. See also items 65 and 66 in the parts list section starting on page 132.

Application Instructions

Apply to a clean, dry surface. Remove the backing from the label, place it in proper position, protect it with a cover sheet and burnish it. (A soft rubber roller also may be used to press the label into place.) Apply all labels to be readable from the front of the pump. The labels below are affixed to the pumps as shown.



IMPORTANT

1. Pump and Drive are factory aligned.
2. Recheck alignment after installation and before start-up.
3. Recheck alignment periodically, to maximize service life.

PD100-235b

Part no: 33-95

This label is supplied on base packages, on the side of the gear case.

IMPORTANT

To avoid damage to the shaft seals and/or pump parts:

DO NOT START this pump unless Seal Flush has been installed and is turned ON.

PD100-236a

Part no: 112446+

This label is supplied with pumps with double mechanical seals and single mechanical flush. It is attached to the eye bolt.

Care of Component Materials

NOTE: SPX FLOW recommends the use of an FDA-approved anti-seize compound on all threaded connections.

WARNING

Failure to comply with the Care of Component Materials could lead to bodily injury.

Stainless Steel Corrosion

Corrosion resistance is greatest when a layer of oxide film is formed on the surface of stainless steel. If film is disturbed or destroyed, stainless steel becomes much less resistant to corrosion and may rust, pit or crack.

Corrosion pitting, rusting and stress cracks may occur due to chemical attack. Use only cleaning chemicals specified by a reputable chemical manufacturer for use with 300 series stainless steel. Do not use excessive concentrations, temperatures or exposure times. Avoid contact with highly corrosive acids such as hydrofluoric, hydrochloric or sulfuric. Also avoid prolonged contact with chloride-containing chemicals, especially in presence of acid. If chlorine-based sanitizers are used, such as sodium hypochlorite (bleach), do not exceed concentrations of 150 ppm available chlorine, do not exceed contact time of 20 minutes, and do not exceed temperatures of 104°F (40°C).

Corrosion discoloration, deposits or pitting may occur under product deposits or under gaskets. Keep surfaces clean, including those under gaskets or in grooves or tight corners. Clean immediately after use. Do not allow equipment to set idle, exposed to air with accumulated foreign material on the surface. Corrosion pitting may occur when stray electrical currents come in contact with moist stainless steel. Ensure all electrical devices connected to the equipment are correctly grounded.

Alloy 88

Waukesha Alloy 88 is the standard rotor material for Universal 1, Universal 2, Universal 3, Universal TS, Universal Lobe, Universal 420/520, and 5000 Series Rotary PD pumps. This alloy was developed specifically for corrosion resistance and close operating clearance requirements of high performance rotary positive displacement pumps. Alloy 88 is a nickel based, corrosion-resistant, non-galling or seizing material. The ASTM designation is A494 Grade CY5SnBiM (UNS N26055), and the material is listed in the 3-A Sanitary Standards as acceptable for product contact surfaces.

The corrosion resistance of Alloy 88 is approximately equal to AISI 300 Series Stainless Steel. However, Alloy 88 has limited resistance to certain aggressive chemicals that may be commonly used in contact with AISI 300 Series Stainless Steel.

Do not use Alloy 88 in contact with nitric acid. Nitric acid is commonly used to passivate new installations of stainless steel equipment. Do not allow nitric acid based passivation chemicals to contact Alloy 88 rotors. Remove the rotors during passivation and use a separate pump to circulate the passivation chemicals. Also, if nitric acid-based CIP cleaning chemicals are used, remove the rotors prior to CIP cleaning and clean them separately by hand in a mild detergent. If you have questions regarding other aggressive chemicals, please contact SPX FLOW Application Engineering for assistance.

Elastomer Seal Replacement Following Passivation

Passivation chemicals can damage product contact areas of this equipment. Elastomers (rubber components) are most likely to be affected. Always inspect all elastomer seals after passivation is completed. Replace any seals showing signs of chemical attack. Indications may include swelling, cracks, loss of elasticity or any other noticeable changes when compared with new components.

Introduction

Pump Receiving

⚠ DANGER

The pump contains internal moving parts. DO NOT put hands or fingers into the pump body ports or drive area at any time during operation. To avoid serious injury, DO NOT install, clean, service, or repair the pump unless all power is off and locked out.

All ports are covered at the factory to keep out foreign objects during transit. If covers are missing or damaged, remove the pump cover (if damaged) and thoroughly inspect the fluid head. Be sure that the pumping head is clean and free of foreign material before rotating the shaft.

Each standard Waukesha Cherry-Burrell brand pump is shipped completely assembled and lubricated. Review "Operation" on page 28 before operating the pump.

Intended Use

The Universal 3 Series Rotary Positive Displacement Pump is exclusively intended for pumping liquids, especially in food and beverage installations.

Refrain from using the pump in a manner which exceeds the scope and specifications stated in this manual.

Any use exceeding the margins and specifications set forth is considered to be not intended.

SPX FLOW is not liable for any damage resulting from such activities. The user bears the full risk.

⚠ WARNING

Improper use of the pump leads to:

- damage
- leakage
- destruction
- potential failures in the production process

Equipment Serial Number

All Waukesha Cherry-Burrell brand pumps are identified by a serial number on the gear case nameplate, which is stamped on the pump body and cover.

⚠ CAUTION

The gear case, body, and cover must be kept together as a unit due to backface, rotor, and cover clearances. Failure to do so will damage the pump.

Pump Shaft Location

There are two pump drive shaft locations:

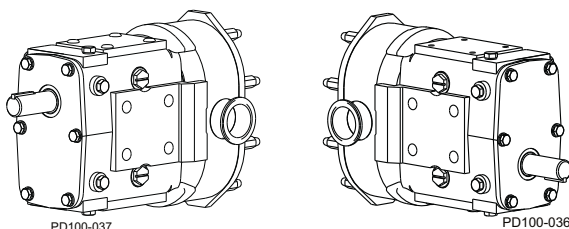
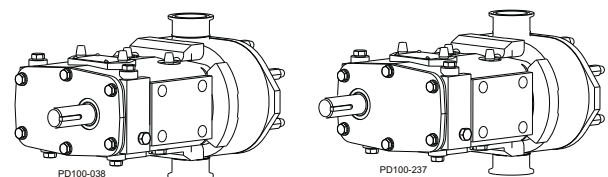


Figure 1 - Upper and Lower Shaft Mount



**Figure 2 - Sidemount Left Hand and Right Hand
(as viewed from pump cover)**

Operating Parameters

U3 Model	Nominal Displacement per revolution	Maximum Nominal Capacity	Inlet/Outlet	Optional Inlet/Outlet	Maximum Product Pressure**	Max. RPM
006	.0082 gal (.031 liter)	8 gpm (1.8 m ³ /hr.)	1"	1 1/2"	300 psi (20.7 bar)	1000
015	.0142 gal (.054 liter)	11 gpm (2.5 m ³ /hr.)	1-1/2"	-	250 psi (17.2 bar)	800
018	.029 gal (.110 liter)	20 gpm (4.5 m ³ /hr.)	1-1/2"	2"	200 psi (13.8 bar)	700
030	.060 gal (.227 liter)	36 gpm (8.2 m ³ /hr.)	1-1/2"	2"	250 psi (17.2 bar)	600
040	.076 gal (.288 liter)	46 gpm (10.4 m ³ /hr.)	2"	-	150 psi (10.3 bar)	600
045	.098 gal (.371 liter)	58 gpm (13.2 m ³ /hr.)	2"	-	450 psi (31.0 bar)	600
060 063	.153 gal (.579 liter)	90 gpm (20.4 m ³ /hr.)	2-1/2"	3"	300 psi (20.7 bar)	600
130 133	.253 gal (.958 liter)	150 gpm (34.1 m ³ /hr.)	3"	-	200 psi (13.8 bar)	600
180	.380 gal (1.438 liter)	230 gpm (52.2 m ³ /hr.)	3"	-	450 psi (31.0 bar)	600
210	.502 gal (1.900 liter)	300 gpm (68.1 m ³ /hr.)	4"	-	500 psi (34.5bar)	600
220 223	.521 gal (1.972 liter)	310 gpm (70.4 m ³ /hr.)	4"	-	300 psi (20.7 bar)	600
320	.752 gal (2.847 liter)	450 gpm (102 m ³ /hr.)	6"	-	300 psi (20.7 bar)	600

Rectangular Flange Models

U3 Model	Nominal Displacement per revolution	Maximum Nominal Capacity	Inlet W x L Inches	Outlet	Maximum Pressure**	Max. RPM
014	.0142 gal (.054 liter)	5.68 gpm (1.3 m ³ /hr.)	1.53 x 4.77	1 1/2"	250 psi (17.2 bar)	400
034	.060 gal (.227 liter)	24 gpm (5.5 m ³ /hr.)	1.87 x 6.9	1 1/2"	250 psi (17.2 bar)	400
064	.153 gal (.579 liter)	61 gpm (13.9 m ³ /hr.)	2.53 x 9.09	2 1/2"	300 psi (20.7 bar)	400
134	.253 gal (.958 liter)	101 gpm (22.9 m ³ /hr.)	3.27 x 9.52	3"	200 psi (13.8 bar)	400
184	.380 gal (1.438 liter)	152 gpm (34.5 m ³ /hr.)	3.36 x 11.33	3"	450 psi (31.0 bar)	400
214	.502 gal (1.900 liter)	200 gpm (45.4 m ³ /hr.)	3.55 x 12.8	4"	500 psi (34.5bar)	400
224	.521 gal (1.972 liter)	208 gpm (47.2 m ³ /hr.)	4.17 x 11.36	4"	300 psi (20.7 bar)	400
324	.752 gal (2.847 liter)	300 gpm (68.1 m ³ /hr.)	4.37 x 12.82	6"	300 psi (20.7 bar)	400

** For all pump sizes with O-ring seals, the maximum product pressure is 100 psi (7 bar).

Other inlet/outlet sizes are available. Contact SPX FLOW Application Engineering.

Pump max temperature is 300°F (149°C).

Operating temperatures depend on the rotor style used. See the rotor descriptions below.

Rotor Style	Recommended for use with liquid temperatures between:*
Low Viscosity	-40°F (-40°C) to 180°F (82°C)
Standard Clearance	-40°F (-40°C) to 300°F (149°C)
316SS Clearance	-40°F (-40°C) to 200°F (93°C)

* Contact SPX FLOW Application Engineering for higher pressures or higher temperature applications.

⚠ DANGER

Operating the pump outside the stated operating parameters may result in severe personal injury or death.

"Low Viscosity" rotors may be used with liquid temperatures up to 180°F (82°C).

Between 160° (71°C) and 200°F (93°C), consider other application factors, such as; speed of operation, differential pressure, lubricating properties of liquid being pumped, and product viscosity. If these factors trend toward a difficult application (high speed, high pressure, non-lubricating) then "Standard" clearance rotors are recommended.

"Standard" clearance rotors are recommended for use with liquid temperatures between -40°F (-40°C) and 300°F (149°C). They provide additional clearance in the front face area plus rotor to body areas. Because of this additional clearance there is more slip (inefficiency) with low viscosity liquids, which the pump must overcome with higher operating speed (rpm.) VHP (viscous horsepower) is slightly lower when using standard clearance rotors. Standard clearance rotors are also used when the product viscosity is above 200 CPS.

"316SS" clearance rotors are made from 316 stainless steel material (in place of standard non-galling alloy 88) and recommended for use at temperatures up to 200°F (93°C). These rotors provide additional clearance all around (more than Standard clearance alloy 88 rotors) to ensure no running contact between the 316 SS rotors and other 316 SS pump components. Because of this additional clearance, there is more slip (inefficiency) with low viscosity liquids, which the pump must overcome with higher operating speed (rpm). VHP (viscous horsepower) is slightly lower when using "316SS" clearance rotors.

NOTE: Consult SPX FLOW Technical Services for applications near 300°F (149°C) or above 200°F (93°C) with 316SS rotors. For clearance data, see Table 22, "Rotor Clearances," on page 122.

Certifications

EHEDG

Only pumps containing the elastomers and seals listed on the EHEDG certificate are EHEDG-certified. To maintain compliance, pumps must have process connections that meet EHEDG guidelines and must be mounted in a free-drain position.

Pumps must be connected to process piping using sanitary welds or EHEDG-approved process connections as described in the EHEDG Position Paper, "Easy cleanable Pipe couplings and Process connections" found under "Free Documents" on www.ehedg.org.

To search for EHEDG certificates, go to www.ehedg.org, locate the Testing and Certification" menu heading and select "Certified Equipment." Scroll down to the "Full Text Search" option, type in "SPX FLOW" and select the "Go" button.

3-A

Only designs meeting 3-A Standards are 3-A certified. To maintain compliance, pumps must have process connections that meet 3-A Standards and must be mounted in a free-drain position.

To search for 3-A certificates, go to www.3-a.org/3-A-Symbol/Search-Database-of-Current-Certificates. From here, you can search by Company, Certificate Number, or Standard:

Company: SPX Flow US, LLC
Certificate: 29 (for all SPX FLOW Centrifugal and Rotary Pumps)
Standard: 02-__ for Centrifugal and Positive Rotary Pumps;
63-__ for Sanitary Fittings. ("__" indicates the current revision.)

ATEX

Only pumps that are listed as ATEX on the pump nameplate (see Figure 310 on page 180) are ATEX-certified.

Pumps for Life™ program

To maintain peak pump performance, the SPX FLOW Pumps for Life Program™ offers customers who have maintained their pump with SPX FLOW genuine parts, to exchange an old Universal 3 pump for a brand new pump purchased at a remanufactured pump price discount.

To participate, contact your authorized SPX FLOW Distributor and provide the three serial numbers (serial tag, pump body, and cover) of any Universal 3 pump being considered for the pump exchange program.

Qualification Guidelines for Operating Staff

Definitions

Operator: A person who is capable of handling the installation, interior, operation, warnings, cleaning, repair or transportation of the machine.

Trained person: A person who is instructed in the tasks given and the possible dangerous situation that may occur. The person is also aware of the protection installations and measures.

Skilled worker: A person who based upon his or her background and due to his or her knowledge, is able to perform the tasks, and has an appropriate knowledge of the provisions given.

Table 1: Qualification Guidelines for Operating Staff

Phase of Life	Task Example	Prerequisite for the operating staff	
		Trained person	Skilled worker
Transport	Lift	x	
	Loading	x	
	Unloading	x	
Assembly and Installation/ Commissioning	Assembly/fastening of the machine		x
	Connection to the electric grid		x
	Filling of lubricant to drive motors	x	
Operation	Startup	x	
	Controlling	x	
	Surveillance	x	
	Shutdown	x	
Cleaning, Maintenance	Cleaning	x	
	Refilling of lubricants	x	
	Disconnection from energy supply	x	
	Assembly/Disassembly of parts	x	
Troubleshooting	Disconnection from energy supply	x	
	Troubleshooting	x	
	Assembly/Disassembly of parts	x	
	Repair	x	
Dismounting/Unplugging from plant	Removal of energy supply	x	
	Dismount		x
	Lift		x
	Loading		x
	Unloading		x

Installation

Important Safety Information

⚠ DANGER

The pump contains internal moving parts. DO NOT put hands or fingers into the pump body ports or drive area at any time during operation. To avoid serious injury, DO NOT install, clean, service, or repair the pump unless all power is off and locked out and the pump is de-pressurized.

⚠ WARNING

The pump components and piping may contain sharp edges. Handle the rotors carefully because edges may be sharp. Wear gloves while installing and servicing the pump to help avoid injuries from these hazards.

⚠ CAUTION

Maintenance should be performed only by trained personnel. See "Qualification Guidelines for Operating Staff" on page 18.

Lifting



Figure 3 - Lifting location

⚠ CAUTION

When moving the pump, use appropriate lifting devices. Always use securely fitted lifting straps/chains when lifting with a crane or similar lifting gear.

⚠ DANGER

Do not stand underneath the pump while it is being lifted.

As shown in Figure 3, attach lifting straps/chains to the two eye bolts on the top of the gear case.

Table 2: Pump Weights (less motor or base)

U3 Model	Weight, lb (kg)	U3 Model	Weight, lb (kg)
006	60 (27)	060, 063, 064	290 (132)
014, 015	62 (28)	130, 133, 134	310 (141)
018	65 (29)	180, 184	498 (226)
030, 034	114 (52)	210, 214	510 (231)
040	117 (53)	220, 223, 224	748 (339)
045	284 (129)	320, 324	817 (371)

⚠ CAUTION

For Unit orders (a pump and motor mounted on a common baseplate (not pictured)), use straps to lift the unit by the baseframe at either end. Do not lift by the eye bolts on the pump or motor. Due to the wide range of pump sizes and motors, SPX FLOW cannot give lifting instructions here for all configurations. Contact SPX FLOW or an authorized lifting expert if questions arise.

⚠ CAUTION

To lift the cover on a 210, 214, 320, or 324-U3, attach an eye bolt to the threaded hole in the cover and attach lifting straps or chains to the eye bolt.

⚠ CAUTION

To lift the body of a 130, 133, 134, 180, 184, 210, 214, 220, 223, 224, 320, or 324-U3, use a lifting strap threaded through the ports on either side of the body.

⚠ CAUTION

To lift the gear case assembly on pumps larger than 018-U3, attach lifting straps/chains to the two eye bolts on the top of the gear case.

Install Pump and Drive Unit

⚠ CAUTION

Install the pump and piping system in accordance with local codes and restrictions. Practices described in this manual are recommended for optimum performance.

⚠ CAUTION

The motor must be installed by qualified personnel, e.g., a licensed electrician.

All system equipment, such as motors, sheaves, drive couplings, speed reducers, etc., must be properly sized to ensure satisfactory operation of your Waukesha Cherry-Burrell brand pump within its limits. Customer-supplied motors should have a basic level of safety to prevent electrical hazards, and should be dealt with in accordance with the manufacturer's instructions.

In a typical installation configuration, the pump and drive unit are mounted on a common base plate. The unit can be installed in any of the arrangements shown in Figure 4 through Figure 7.

NOTE: The gap between the pump body and gear case is required for 3-A sanitary standards.

NOTE: When installing a unit as shown in Figure 7, level the unit before installing the bolts.

The shaded area in Figure 4 through Figure 7 indicates the guard location.

See "Pump Shaft Guards" on page 179.

⚠ WARNING

Full guards must be installed to isolate operators and maintenance personnel from rotating components.

Guards are provided as part of a complete pump and drive package and are selected by SPX FLOW Engineering for the pump, base, and motor ordered. Do not modify the guard provided by SPX FLOW. If the guard provided by SPX FLOW is lost, contact SPX FLOW Customer Service and provide your order number or PO number of the pump to order a correctly-sized replacement guard.

If the pump was not purchased as a unit, it is the responsibility of the customer to ensure proper guarding. Refer to your local regulations for guidance.

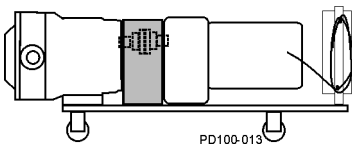


Figure 4 - Portable Base

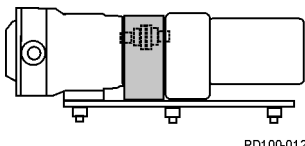


Figure 5 - Adjustable Leg Base

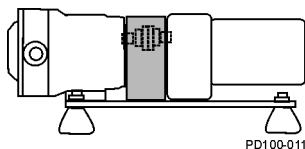


Figure 6 - Leveling and/or Vibration Isolation Pads

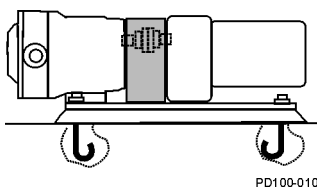


Figure 7 - Permanent Installation on Foundation

Install Connections and Piping

⚠ CAUTION

These pumps are positive displacement design and will be severely damaged if operated with closed valves in discharge or inlet lines. The pump warranty is not valid for damages caused by a hydraulic overload from operation or start-up with a closed valve in the system.

Piping Support

To minimize forces exerted on the pump, support all piping to the pump independently with hangers or pedestals. Such forces can cause misalignment of the pump parts and lead to excessive wear of rotors, bearings, and shafts.

Figure 8 shows typical supporting methods used to independently support each pipe, reducing the weight effect of piping and fluid on the pump.

⚠ WARNING

Do not exceed 50 lb (22.7 kg) load on pump inlet or discharge ports. Exceeding this limit may cause damage to the pump.

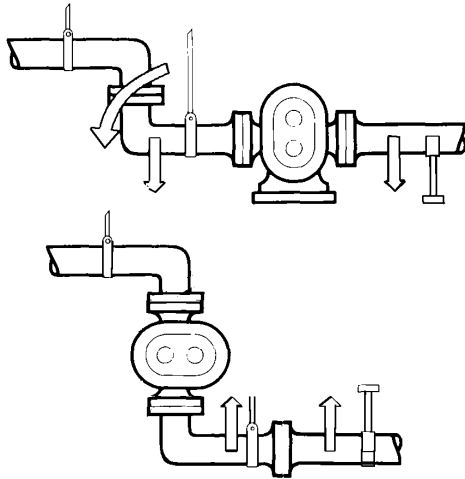


Figure 8 - Piping Support

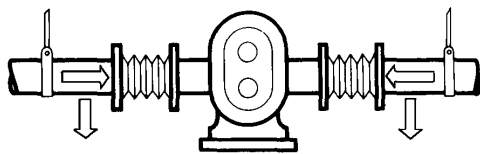


Figure 9 - Flexible Connections and Supports

Expansion Joints

Thermal expansion of piping can cause tremendous forces. Use thermal expansion joints to minimize these forces on the pump.

Flexible joints can be used to limit transmission of mechanical vibration. Ensure that the free ends of any flexible connections in the system are anchored.

Inlet Piping

Install the pump below the supply liquid level to reduce the air in the system by flooded suction, to prevent the pump from becoming air-bound (Figure 10).

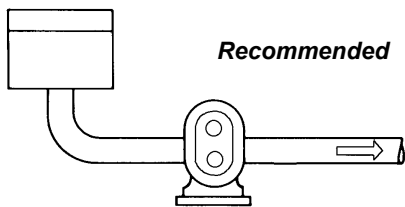


Figure 10 - Pump Below Supply

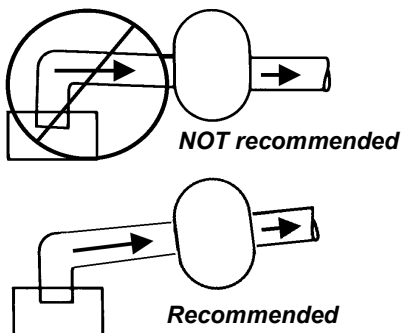


Figure 11 - Piping Slope

If the pump is installed above the supply liquid level, the piping on the inlet side must slope up toward the pump, preventing air pockets in the pipes (Figure 11).

Install Check Valves

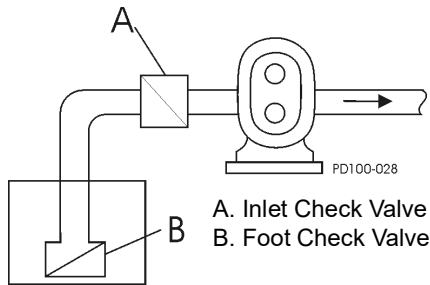
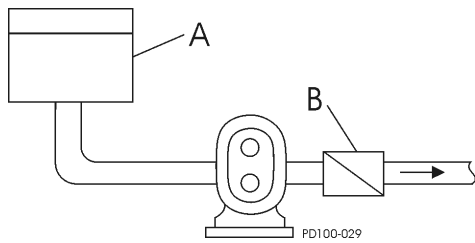


Figure 12 - Inlet Check Valve



- A. Closed Tank - produces vacuum on liquid (Low Absolute Pressure)
 B. Check Valve (outlet)

Figure 13 - Discharge Check Valve

Install Isolation Valves

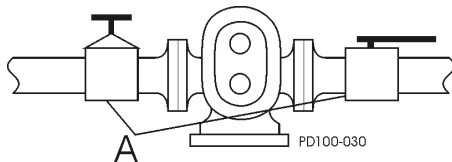


Figure 14 - Isolation Valves

Install Pressure Gauges

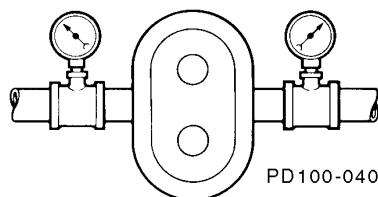


Figure 15 - Pressure and Vacuum Gauges

Inlet Side on Lift Applications

Use check valves to keep the inlet line full, particularly with low-viscosity fluids (Figure 12).

Discharge Side

For systems with liquid under a vacuum, install a check valve on the discharge side of the pump. The check valve prevents back-flow (air or fluid) to aid in the initial start-up by minimizing the required differential pressure supplied by the pump to start the flow (Figure 13).

Isolation valves permit pump maintenance and safe pump removal without draining the system (Figure 14, item A).

NOTE: Make sure the inlet flow is not restricted. Don't start the pump deadheaded, e.g., operated with no flow through it.

Pressure and vacuum gauges provide valuable information about pump operation (Figure 15). Wherever possible, install the gauges to help provide information on the following:

- Normal or abnormal pressures
- Indication of flow
- Changes in pump condition
- Changes in system conditions
- Changes in fluid viscosity

Install Relief Valves

Install relief valves to protect the pump and piping system against excessive pressure. SPX FLOW recommends installing an external relief valve designed to bypass fluid from the pump outlet to the inlet side of the system (See Figure 16, Figure 17, and Figure 18).

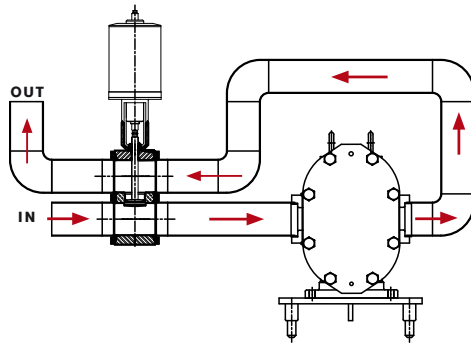


Figure 16 - WR63 Reverse-Acting Over-Pressure Relief Valve

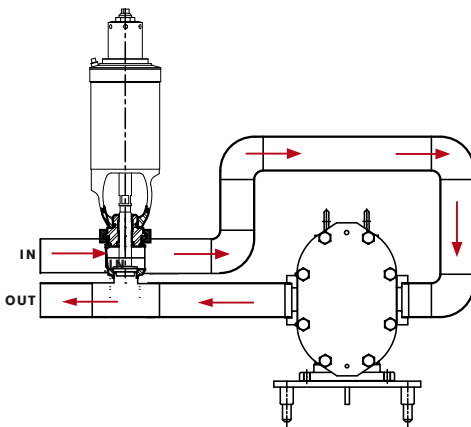


Figure 17 - WR61C Air-to-Raise Valve with Adjustable-Spring Actuator

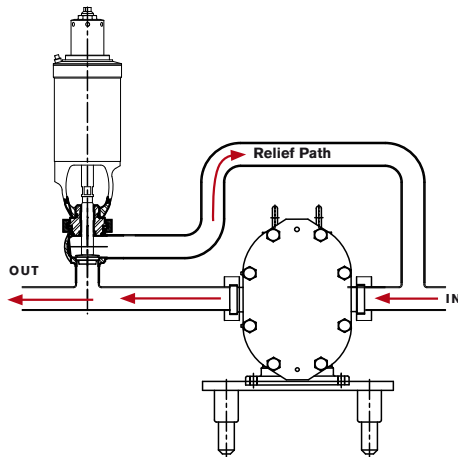
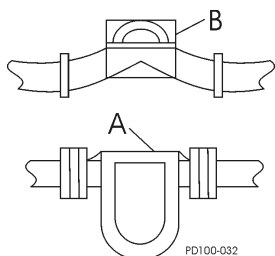


Figure 18 - WR61T 4RHAR Valve

Inlet Side Strainers and Traps



A. Strainer B. Magnetic Trap

Figure 19 - Inline Strainers and Traps

CIP (Clean-In-Place) Design

⚠ CAUTION

In order to avoid temperature shock after the introduction of hot CIP fluid, stop the pump before filling the pumphead with hot CIP fluid. Once the hot CIP fluid has filled the pumphead, allow up to 15 minutes for the pump fluid components to thermally expand, then re-start the pump.

NOTE: Depending on pump model, pipe size, fluid properties, and rotor clearance, some configurations will not supply sufficient flow rate to achieve the required line velocity of 5 ft/sec (1.5 m/s) for CIP. Upon installation, check the line velocity for each specific application. If the velocity is not sufficient, add a booster pump in line in order to reach the required velocity. Contact SPX FLOW Application Engineering for further questions.

NOTE: Make sure to jog the rotors during draining to ensure that all fluid drains from the seal area.

Inlet side strainers and traps (Figure 19, items A and B, respectively) can be used to prevent foreign matter from damaging the pump.

Select carefully to prevent cavitation caused by the restriction of the inlet. If inlet strainers are used, they must be serviced regularly to prevent clogging and flow stoppage.

The design of the Universal 3 provides complete access of the CIP solution to all product contact surfaces:

- The flat body profile (minimum requirement for standard CIP installations) allows complete draining of the side-mounted pump (see Figure 2 on page 15), and provides the CIP solution access to the entire profiled cover gasket groove.
- The flat on the rotor hubs provide solution access to the shaft seal areas for difficult cleaning applications
- Extra CIP rotor option available with two flats add extra clean ability in the shaft seal areas.

Guidelines

Use the following guidelines when designing and installing the CIP system to ensure successful cleaning:

- Ensure that the velocity rate of CIP solutions is adequate to clean the entire circuit. For most applications, a velocity of 5 ft/sec (1.5 m/s) is sufficient. For the CIP solution to achieve the proper velocity, the pump drive must have enough speed range and horsepower. The required inlet pressure also must be satisfied. If the pump does not supply enough CIP solution velocity, a separate CIP supply pump with an installed bypass may be used. To determine the appropriate bypass arrangement, contact SPX FLOW Application Engineering.
- Make sure that a differential pressure is created across the pump. Differential pressure will push CIP solutions through close-clearance areas of the pump, resulting in better cleaning action. The high pressure side may be either the inlet or outlet side. 30 psi (2 bar) is the minimum required differential pressure for most applications. For difficult cleaning applications, higher pressure or longer cleaning cycles may be required.
- The pump must be operated during CIP to increase turbulence and cleaning action within the pump.
- If complete draining is required, the pump must be in the side mount position.

Seal Flush Connections

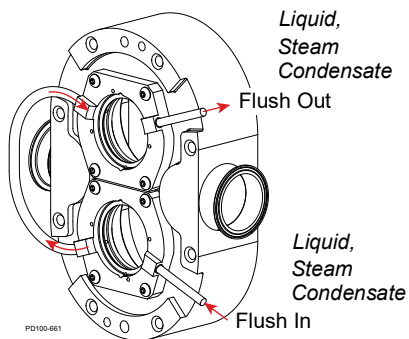


Figure 20 - Flush Piping - Liquid, Steam Condensate

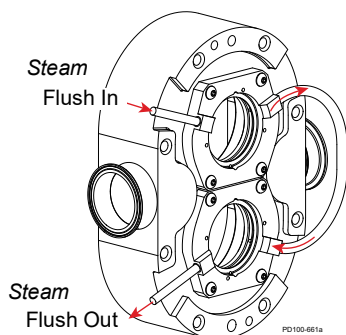


Figure 21 - Flush Piping - Steam

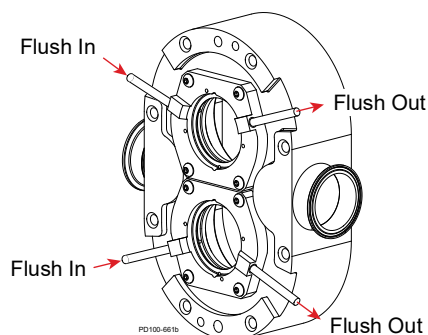


Figure 22 - Flush Piping - Liquid, Steam, Steam Condensate

NOTE: If ports are vertical (pump is side-mounted, not shown): Liquid/steam condensate: In bottom, out top
Steam: In top, out bottom

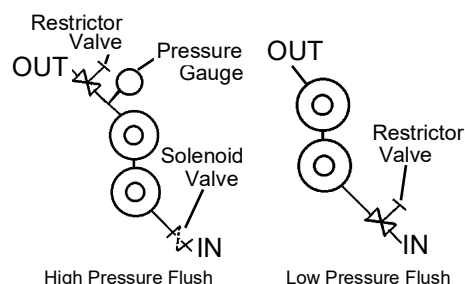


Figure 23 - Flush Piping Setup

Double Mechanical Seal

Pumps with double seals require flushing.

The flush media (water or lubricating fluid compatible with the product) must be connected and flowing whenever the pump is operated.

⚠ WARNING

Operating the pump without flush will damage the seal and pump parts due to excess heat from dry running.

⚠ CAUTION

Check for buildup or restrictions (kinking) in the flush lines or fittings at regular intervals. SPX FLOW recommends using clear (transparent) flush lines for easier observation.

Two 1/8-inch female pipe thread (NPT) flush connections are located in the seal housing pieces.

1. Connect the flush inlet to the lower connection, and the outlet to the upper connection, to flood the flush area completely (Figure 20).
2. Connect the flush outlet for unrestricted flow to the drain.

NOTE: As shown (ports horizontal), if **steam** is used as a flush media, connect the inlet at the upper connection, and the outlet at the lower connection to ensure condensation removal (Figure 21).

If **steam condensate** is used as a flush media, connect the inlet at the lower connection, and the outlet at the upper connection (Figure 20). See note under Figure 22.

3. Use cool, filtered flush media to obtain maximum service life of the seal components. If the pumped product is sticky or solidifies at room temperature, use warm or hot flush media.
4. Install a pressure reducing valve and flow control valve (needle valve) on the flush supply line. Set the supply pressure at a maximum of 220 psi (15 bar). The required flow rate is 0.5-0.8 gpm (1.9-3.0 l/m).

NOTE: The difference between the product-side pressure and the flushing pressure must not exceed 102 psi (7 bar).

5. Also install a solenoid valve in the flush supply and wire it in series with the motor starter to provide an automatic start/stop of the flush media flow before the motor turns on and after the motor turns off.

Double O-Ring Seal

1. Set flow rate of approximately 1/4 gpm for most applications. For high temperature applications, increase flow.
2. Flushing media is restricted on the inlet side and has free flow to drain on the outlet side.
3. Typical flushing connections are 1/8" NPT female pipe taps.

NOTE: For O-ring seals, the maximum product pressure is 100 psi (7 bar).

Check Coupling Alignment



Figure 24 - Lovejoy Coupling



Figure 25 - T.B. Woods® Coupling

Pumps and drives ordered from the factory and mounted on a common base plate are aligned before shipment. Alignment **must** be re-checked after the complete unit has been installed and piping completed. Periodic re-checking is advisable during the pump service life.

- SPX FLOW recommends using a flexible coupling to connect the drive to the pump. Several different types are available, including couplings with slip or overload provisions. SPX FLOW provides Lovejoy (Figure 24) or T.B. Woods® (Figure 25) couplings unless otherwise specified when ordering. Flexible couplings can be used to compensate for end play and small differences in alignment.
- Align the pump and drive shaft as closely as possible:
 - Pump and Drive are factory aligned.
 - Re-check alignment after installation and before start-up.
 - Re-check alignment periodically, to maximize service life.

Check Angular Alignment

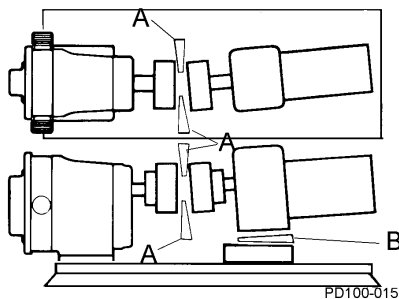


Figure 26 - Check Angular Alignment

1. Using feeler gauges or taper gauges (Figure 26, items A and B), check the alignment at four points every 90 degrees around the coupling; **adjust to equal dimension at all points.**
2. Set the space between the coupling halves to the manufacturer's recommended distance.
3. Install shims to bring the system into alignment.

Check Parallel Alignment

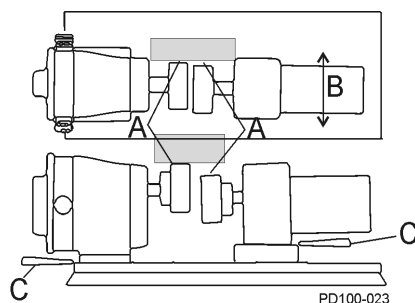


Figure 27 - Check Parallel Alignment

1. Check both the horizontal and vertical alignment of the pump and drive using a straight edge.
2. Using a feeler gauge at location "A" in Figure 27, determine the direction and amount of movement needed (Figure 27, item B).
3. If necessary, shim at location "C" and/or move drive as needed.

Check Belt and Chain Drive Alignment

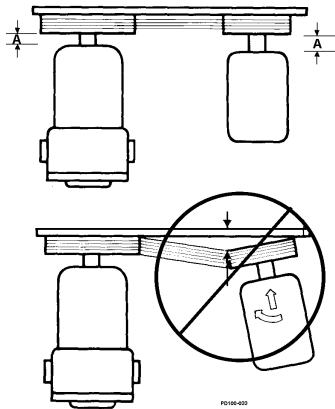


Figure 28 - Aligning Belt and Chain Drives

Use a straight edge to visually check the belt or chain alignment. Keep the shaft distance to a minimum (Figure 28, item A).

After the piping is complete and before the belts are installed, manually turn the pump shaft to ensure it turns freely.

Check Pump Rotation

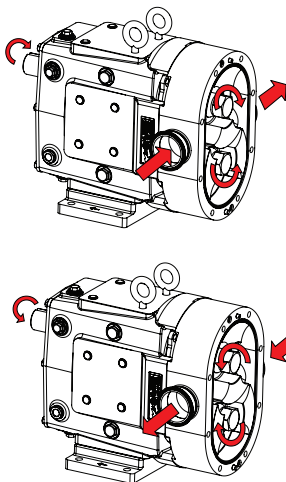
Check the direction of the drive rotation to determine the rotation direction of pump (Figure 29). After the correct drive rotation is verified, connect the coupling and assemble the pump and coupling guards.

NOTE: The pump is bidirectional.

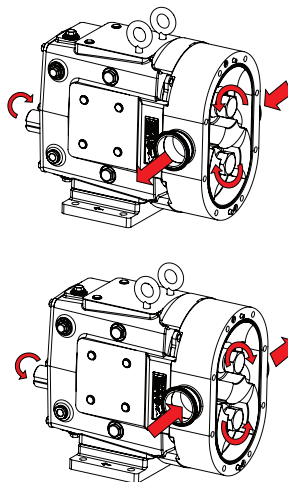
⚠ CAUTION

The pump covers in the figures below have been removed to view the rotor rotation. Never operate the pump with the covers removed.

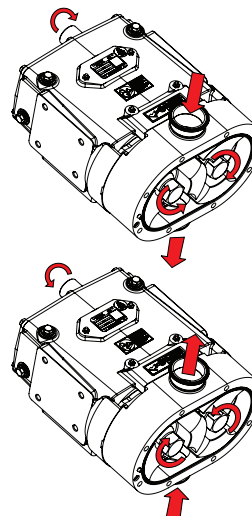
**Upper Shaft Drive Flow,
Horizontal Porting,
Vertical mount**



**Lower Shaft Drive Flow,
Horizontal Porting,
Vertical mount**



**Upper Shaft Drive
Flow, Vertical Porting,
Horizontal mount**



**Lower Shaft Drive
Flow, Vertical Porting,
Horizontal mount**

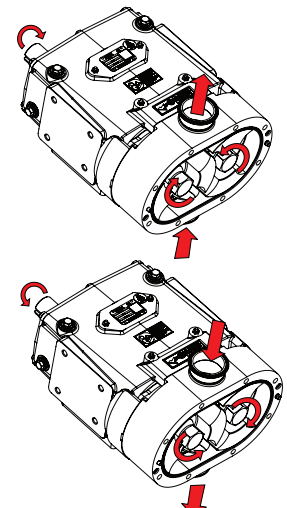


Figure 29 - Pump Rotation (Liquid End Shown)

Operation

Important Safety Information

⚠ DANGER

The pump contains internal moving parts. DO NOT put hands or fingers into the pump body ports or drive area at any time during operation. To avoid serious injury, DO NOT install, clean, service, or repair the pump unless all power is off and locked out and the pump is de-pressurized.

⚠ WARNING

Handle the pump components carefully because edges may be sharp. Wear gloves while installing and servicing the pump to help avoid injuries from these hazards.

⚠ CAUTION

Maintenance should be performed only by trained personnel. See “Qualification Guidelines for Operating Staff” on page 18.

⚠ CAUTION

These pumps are positive displacement, low slip design and will be severely damaged if operated with closed valves in the discharge or inlet lines. The pump warranty is not valid for damages caused by a hydraulic overload from operation or start-up with a closed valve in the system.

Pre-Startup Checklist

⚠ CAUTION

The motor must be installed by qualified personnel, e.g., a licensed electrician.

⚠ CAUTION

Consult the motor or VFD manufacturer's manual for setup, operation, disassembly, and troubleshooting of the motor or VFD, or contact the manufacturer.

⚠ CAUTION

Do not use this pump to flush a newly-installed system. Severe damage may occur to the pump and system if the pump is used to flush the system.

Remove the rotors during system flushing, to prevent debris from being trapped between the rotors and the pump body. This debris may damage the pump upon startup.

⚠ WARNING

Do not start a pump with seal flush unless the seal flush is installed and turned on.

1. Ensure that the pump is correctly installed as described in “Installation” on page 16. Review “Install Relief Valves” on page 23 and install relief valves as needed.
2. Check the coupling alignment. See “Check Coupling Alignment” on page 26.
3. Ensure that the pump and piping are clean and free of foreign material such as welding slag, gaskets, etc.
4. Ensure that all piping connections are tight and leak-free. Where possible, check the system with non-hazardous fluid.
5. Ensure that the pump and drive are lubricated. See “Lubrication” on page 31.
6. Ensure that all valves are open on the discharge side and a free flow path is open to the destination.
7. Ensure that all guards are in place and secure.

⚠ CAUTION

Full guards must be installed to isolate the operators and maintenance personnel from the rotating components. Guards are provided as part of a complete pump and drive package. See page 19 and page 179.

8. Double mechanical seals require adequate supply and flow of clean flushing fluids.
9. Ensure that all valves are open on the inlet side and fluid can fill the pump. A flooded suction installation is recommended.
10. Check the direction of pump and drive rotation to ensure that the pump will rotate in the proper direction. See “Check Pump Rotation” on page 27.

Starting the Pump

⚠ WARNING

Keep a safe distance (1.6 ft/.5 m) away from the pump during startup.

⚠ CAUTION

The motor must be installed by qualified personnel, e.g., a licensed electrician.

⚠ WARNING

In order to avoid temperature shock after the introduction of hot or cold product, stop the pump before filling the pumphead with product. Once the product has filled the pumphead, allow up to 15 minutes for the pump's fluid components to thermally adjust, then re-start the pump.

1. Start the pump drive. Where possible, start at a slow speed or jog.
2. For sanitary applications, sanitize the pump per customer requirements before putting the pump into service.
3. Check to make sure that the liquid is reaching the pump. If pumping does not begin and stabilize, check "Troubleshooting" on page 128.

Stopping the Pump

⚠ WARNING

Keep a safe distance (1.6 ft/.5 m) away from the pump during shutdown.

⚠ CAUTION

The motor must be installed by qualified personnel, e.g., a licensed electrician.

1. Shut off the power to the pump drive
2. Shut off the supply and discharge lines.

Maintenance

Important Safety Information

⚠ WARNING

The pump components and piping may contain sharp edges. Handle the rotors carefully because edges may be sharp. Wear gloves while installing and servicing the pump to help avoid injuries from these hazards.

⚠ WARNING

Never touch the gear case during operation. The surface temperature may exceed 110°F (43°C). The pump cover and body may be cold or hot depending on the product (CIP at 190°F (88°C) or 300°F (149°C) product, for example).

⚠ DANGER

The pump contains internal moving parts. DO NOT put hands or fingers into the pump body ports or drive area at any time during operation. To avoid serious injury, DO NOT install, clean, service, or repair the pump unless all power is off and locked out and the pump is de-pressurized. Shut off and drain product from the pump prior to disconnecting the piping.

⚠ CAUTION

Maintenance should be performed only by trained personnel. See “Qualification Guidelines for Operating Staff” on page 18.

⚠ CAUTION

Make sure the pump is securely bolted or clamped down prior to performing any maintenance work. The pump center of gravity changes as parts are added or removed, and could result in tipping of an unsecured pump.

⚠ CAUTION

Make sure to keep the work area clear of machine parts, tools, product lines, foreign materials, and power cables to avoid potential hazards.

⚠ CAUTION

Make sure appropriate lighting is available: at least 1000 lux, independent of daylight and weather conditions.

⚠ CAUTION

Before carrying out any maintenance and repair work on cold components, ensure that the machine parts in question are sufficiently heated. The contact temperature of accessible machine parts must not be lower than those in the EN ISO 13732-1.

⚠ CAUTION

To lift the cover on a 210, 214, 320, or 324-U3, attach an eye bolt to the threaded hole in the cover and attach lifting straps or chains to the eye bolt.

⚠ CAUTION

To lift the body of a 130, 133, 134, 180, 184, 210, 214, 220, 223, 224, 320, or 324-U3, use a lifting strap threaded through the ports on either side of the body.

⚠ CAUTION

To lift the gear case assembly on pumps larger than 018-U3, attach lifting straps/chains to the two eye bolts on the top of the gear case.

Before detaching port connections to the pump:

- Close the suction and discharge valves.
- Drain the pump and clean or rinse, if necessary.
- Disconnect or shut off the electrical supply and lock out all power.

Lubrication

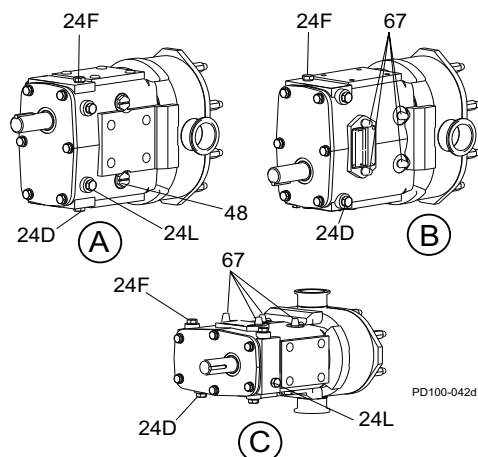


Figure 30 - Lubrication Points

- A. Upper Shaft Drive Pump (Standard)
- B. Lower Shaft Drive Pump (Optional)
- C. Side-Mount Pump (Optional)
- 24D. Oil Drain Plug
- 24F. Oil Fill Plug
- 24L. Oil Level Check Plug, Sight glass
- 48. Grease Clean-out Plug
- 67. Grease Fittings

Gear Oil Specification

Standard: ISO Grade 320, SAE 140 or AGMA Number 6EP, part no. 118402+.
Food-grade: part no. 000140003+.

Bearing Lubricant Grease

Standard: NLGI Grade No. 2, EP, Lithium-based lubricant, part no. 118401+.
Food-grade: part no. 000140002+.

Drive Lubrication

Refer to the manufacturer's manual shipped with the drive for proper drive lubrication and frequency.

Gears

Gears are factory-lubricated with gear oil at the quantity shown in Table 3 on page 31. **Change the oil every 750 hours.**

NOTE: Aggressive washdown or extreme running conditions may require more frequent lubrication intervals.

When the pump is not running, the gear oil level is correct when the oil level is visible in the sight glass. Check the oil level regularly.

When the pump is running, the oil level may be difficult to see and may appear cloudy.

Universal 3 pumps are shipped with the oil level at or slightly above the sight glass.

Bearings

Bearings are factory-lubricated with grease. Re-lubricate them at the quantity shown in Table 3 on page 31. **Grease the bearings every 750 hours.**

NOTE: Aggressive washdown or extreme running conditions may require more frequent lubrication intervals.

Excess grease will accumulate in the gear case and must be removed through the cleanout hole covered with a stainless plug with O-ring (Figure 30, item 48). Check the cleanout plugs for any collection of gear oil.

Best practice is to clean out this area every time you grease the pump. Water can accumulate in the gear case from condensation or from aggressive washdown. If water is found in the gear case, clean out this area more frequently.

Table 3: Lubrication Quantities

Universal 3 Model	Oil Capacity (Gears)		Grease Quantity (per Bearing)	
	Top or Bottom	Side Mount	Front	Rear
006, 014, 015, 018	1.3 oz (40 ml)	3.3 oz (100 ml)	.37 oz (11 ml)	.13 oz (4 ml)
030, 034, 040	2.0 oz (60 ml)	4 oz (120 ml)	.60 oz (18 ml)	.21 oz (6 ml)
045, 060, 063, 064, 130, 133, 134	6.0 oz (170 ml)	9.5 oz (280 ml)	.84 oz (25 ml)	.76 oz (22 ml)
180, 184, 220, 223, 224	11 oz (320 ml)	20 oz (600 ml)	1.33 oz (39 ml)	1.03 oz (30 ml)
210, 214, 320, 324	17 oz (500 ml)	44 oz (1300 ml)	1.96 oz (58 ml)	1.16 oz (34 ml)

Maintenance Inspections

⚠ DANGER

The pump contains internal moving parts. DO NOT put hands or fingers into the pump body ports or drive area at any time during operation. To avoid serious injury, DO NOT install, clean, service, or repair the pump unless all power is off and locked out and the pump is de-pressurized. Shut off and drain product from the pump prior to disconnecting the piping.

Detecting wear in the early stages can reduce repair costs and down time. A simple “look-feel” inspection of the pump during breakdown cleaning is recommended to detect signs of trouble at an early stage.

A detailed maintenance inspection should be scheduled annually. See “Annual Maintenance” on page 33.

Refer to the “Maintenance Inspection Chart” on page 34 for possible causes and solutions to common issues discovered during inspection.

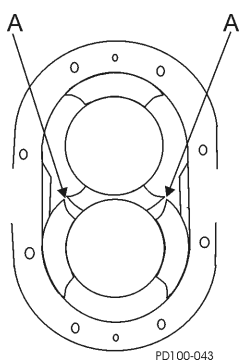


Figure 31 - Rotor to Rotor Tip Clearance

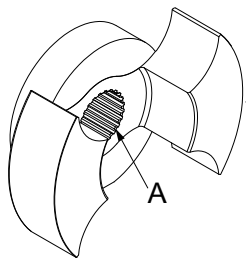
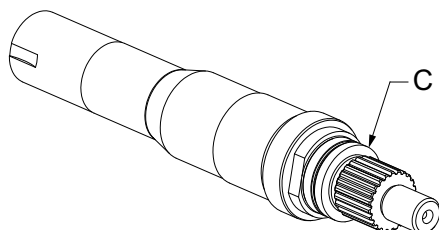


Figure 32 - Shaft and Rotor Inspection

Inspection of Rotor Tips

Remove the cover (see “Remove Cover” on page 36) and check for metal-to-metal contact between the rotor wings. When contact is detected, repair or replace the pump.

Visually inspect the rotors for rotor tip to rotor tip contact and rotor tip to rotor hub contact. Manually rotate the pump drive shaft and ensure that the rotor tip clearance is equal on both sides as indicated in Figure 31.

Inspection of Shaft and Shaft Shoulder

Visually inspect the shaft for twists or bends; replace it as necessary. Visually inspect the shaft shoulder (Figure 32, item C) for excessive wear; replace it as necessary. If the shaft shoulder has a sharp edge, remove the edge with a file to prevent cutting the shaft O-ring on installation.

Inspection of Rotor

Visually inspect the rotors for worn splines (Figure 32, item A) and hub wear at the rotor stress points (see arrows in Figure 33 on page 33). Each time the rotors are removed, replace the product side seal O-rings.

NOTE: Rotor hub and shaft shoulder wear are caused by operating with a loose rotor nut(s) for extended periods.

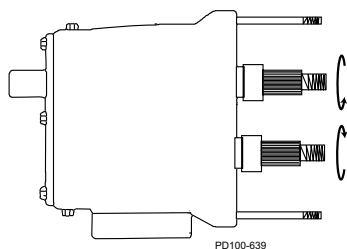


Figure 33 - Backlash Check

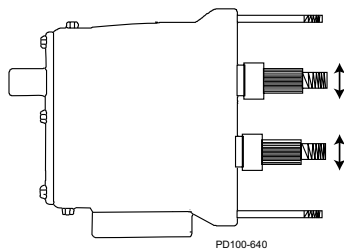


Figure 34 - Bearing Deflection Check

Annual Maintenance

Inspection of Gears and Bearings

Gear backlash

With the fluid head and seals removed, feel for gear backlash by rotating either shaft by hand. The other shaft must engage immediately. Perform this check three times at 60-degree intervals. If play (backlash) is evident, remove the gear case cover, check the gear teeth for wear, and ensure that the gear is not loose on the shaft. If the gear teeth are worn, replace the gears. If the gear is loose on the shaft, inspect the shaft key and keyway; replace as necessary.

Check bearing condition

With the fluid head and seals removed, check the bearing condition by applying (by hand) an up or down force of approximately 30 lbs (14 kg). If movement is detected, the bearing may be failing. Also check the shaft movement forward or backward. If the bearing is failing, replace the bearing and review the lubrication section starting on page 31.

⚠ DANGER

The pump contains internal moving parts. DO NOT put hands or fingers into the pump body ports or drive area at any time during operation. To avoid serious injury, DO NOT install, clean, service, or repair the pump unless all power is off and locked out and the pump is de-pressurized. Shut off and drain product from the pump prior to disconnecting the piping.

At least annually, perform the procedures and corrective measures outlined in "Maintenance Inspections" on page 32, in addition to the following preventive maintenance:

- Check the bearings with a dial indicator for shaft radial play. If the deflection is equal to or greater than the rotor-to-body diametrical clearance (see "Checking for Proper Clearance" on page 121), replace the bearings.
- Remove the gear case cover and inspect the gears for wear, backlash and looseness. Loosen and torque the gear retaining nuts to the proper torque.
- Thoroughly inspect the rotors for worn splines, hub wear and stress cracks (see arrows in Figure 35). Use the dye check method to detect any fatigue-type cracks at rotor stress points.
- Review the performance record on the pump, and check the radial and backface clearances to determine wear and effect on performance. Adjustment to the operating speed can compensate for wear in some applications.

⚠ CAUTION

When bearings or shafts are replaced in the field, take care to correctly position the shaft by shimming it to maintain sufficient running clearances between the rotor wing faces and the pump body faces (backface and cover face). It is important to hold the same backface dimension for both rotors, within 0.0005" (0.0127 mm), to avoid crossover interference.

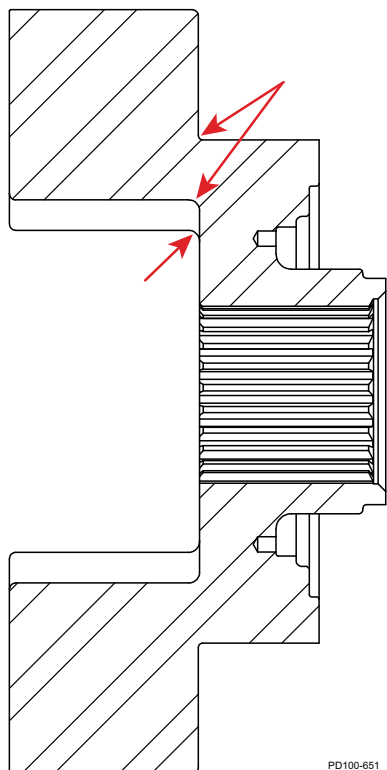


Figure 35 - Rotor Stress Points

Maintenance Inspection Chart

Frequency	Check for	Possible Causes	Possible Solutions
At least weekly	Low oil level, oil contamination, oil leaks	Oil leak from gear case cover oil seal or gear case rear oil seal Loose back cover Oil plug damaged	Replace oil seals (items 12 & 13 in the parts lists starting on page 133) Check or replace oil plug. See "Lubrication" on page 31.
Weekly	Leaks - Product	Damaged seals Damaged elastomers	Replace seals Replace elastomers
Weekly	Leaks - Flush fluid	Damaged seal, fitting, or flush tube Damaged flush-side seal components Damaged elastomers.	Replace seal, fitting, or flush tube Replace flush-side seal components Replace elastomers
Monthly	Excess grease in cleanout plugs	Excess grease accumulates as part of normal operation	Remove excess gear oil from cleanout plugs (Figure 30, item 48 on page 31).
Every 3 months	Damaged front grease seals.	Seal may be old and worn. No oil on lips to lubricate. Shaft worn under seals. Worn bearings.	Replace seals. Properly lubricate with oil when installing. Inspect shaft surface under seals. Replace bearings.
Every 3 months	Damaged rear oil seal.	Seal may be old and worn. No oil on lips to lubricate. Shaft worn under seals. Not centered on shaft when installed. Worn bearings.	Replace seal. Properly lubricate with oil when installing. Inspect shaft surface under seals. Replace bearings.
Every 3 months	Rotor tip to rotor tip contact or uneven rotor tip to rotor tip clearance.	Hard object jammed into rotors and twisted shafts. Worn gear teeth. Worn gear keyway.	Replace shafts. Install strainers if necessary. Check and replace gears if necessary.
Every 3 months	Rotor tip to rotor hub contact.	Loose rotor nut(s). Backface clearances not even. Bearings need replacing.	Torque rotor nut(s) properly. Verify backface clearances are even. Check and replace bearings.
Every 3 months	Rotor-to-body or rotor-to-cover contact	Loose rotor nut(s) Excessive hydraulic loads Incorrect front face/backface clearances Bearings need replacing.	Torque rotor nut(s) properly. Review pressure rating on page 16. Verify front face/backface clearances are within the values listed on page 122. Check and replace bearings.
Every 3 months	Worn rotor or shaft splines.	Loose rotor nut(s).	Replace rotors and shafts. Torque rotor nut(s). See "Torque Values" on page 127.
Every 3 months	Worn rotor hub end or shaft shoulder.	Loose rotor nut(s). Rotors slammed against shoulder when installed.	Torque rotor nut(s). See "Torque Values" on page 127. Replace rotors and shafts or shim front bearing(s) to maintain proper backface clearances.
Every 3 months	Sharp edged shaft shoulder.	Loose rotor nut(s). Rotors slammed against shoulder when installed. Backface clearances not even.	Torque rotor nut(s). See "Torque Values" on page 127. Remove sharp edge with file to prevent cutting shaft O-ring. Verify backface clearances are even.

Frequency	Check for	Possible Causes	Possible Solutions
Every 3 months	Gear backlash.	Lack of lubrication. Excessive hydraulic loads. Loose gear locknuts. Worn gear teeth.	Check lubrication level and frequency. Reduce hydraulic loads. Torque locknuts to specified torque values. See "Torque Values" on page 127. Check and replace gears if necessary.
Every 3 months	Worn or broken gear teeth.	Lack of lubrication. Excessive hydraulic loads. Loose gear locknuts.	Check lubrication level and frequency. Reduce hydraulic loads. Torque locknuts to specified torque values. See "Torque Values" on page 127. Check and replace gears if necessary.
Every 3 months	Loose gears.	Gear locknuts not torqued properly. Locking assembly not torqued properly. Worn gear key.	Torque gear nut to specified torque value. See "Torque Values" on page 127. Check and replace gears if necessary. Inspect gear key, shaft keyway and shaft, replace if necessary.
Every 3 months	Loose bearings, axially or radially.	Lack of lubrication. Excessive hydraulic loads. Product or water contamination.	Check lubrication level and frequency. Reduce hydraulic loads. Ensure no excess grease build-up. Replace bearings if necessary.

Cleaning

Determine the pump cleaning schedule on-site for materials being processed and plant maintenance schedule.

To disassemble the fluid head, see "Fluid Head Disassembly - Cover and Rotors" on page 36. Remove and clean the cover O-ring, pump seals, and the rotor nut assembly. Inspect and replace them as necessary.

NOTE: Always replace the rotor nut O-rings and product-side seal O-rings when reassembling the pump. If the area behind these seals becomes soiled, contact SPX FLOW Application Engineering for a specific cleaning and sanitizing procedure validated to remove bacteria. If a chlorine solution (200 ppm available chlorine) is used, it should leave no residual deposits which would remain in the pump.

⚠ CAUTION

Acid cleaners have a much higher metal corrosion rate and pump parts should remain in acid cleaning solutions no longer than necessary. Any strong inorganic mineral-based acids that are harmful to your hands would be harmful to pump parts. See "Stainless Steel Corrosion" on page 14.

In applications where material can harden in the pump during shutdown, a CIP cleaning, flush, or disassembly of the fluid head and manual cleaning is strongly recommended. See "CIP (Clean-In-Place) Design" on page 24.

Fluid Head Disassembly - Cover and Rotors

NOTE: SPX FLOW recommends replacing elastomers every time the pump is serviced.

Table 4: Cover Nuts Wrench Size

Model U3	Wrench Size
006, 014, 015, 018, 030, 034, 040	5/8"
045, 060, 063, 064, 130, 133, 134, 180, 184, 220, 223, 224	7/8"
210, 214, 320, 324	1"



Figure 36 - Remove cover



Figure 37 - Remove cover gasket

⚠ DANGER

The pump contains internal moving parts. **DO NOT** put hands or fingers into the pump body ports or drive area at any time during operation. To avoid serious injury, **DO NOT** install, clean, service, or repair the pump unless all power is off and locked out and the pump is de-pressurized. Shut off and drain product from the pump prior to disconnecting the piping.

⚠ WARNING

The pump components and piping may contain sharp edges. Handle the rotors carefully because edges may be sharp. Wear gloves while installing and servicing the pump to help avoid injuries from these hazards.

⚠ CAUTION

Make sure the pump is securely bolted or clamped down prior to performing any maintenance work. The pump center of gravity changes as parts are added or removed, and could result in tipping of an unsecured pump.

Remove Cover

1. Remove the cover nuts from the cover. Using a soft hammer, tap the cover off the body studs and dowel pins.
2. Place the cover on a protected surface with the finished surfaces facing up.

⚠ CAUTION

To lift the cover on a 210, 214, 320, or 324-U3, attach an eye bolt to the threaded hole in the cover and attach lifting straps or chains to the eye bolt.

3. Remove and inspect the cover gasket.

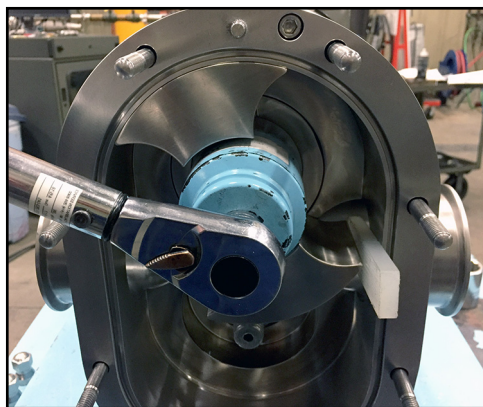


Figure 38 - Remove Rotor Nut

Remove Rotor Nuts

1. Use the rotor blocking tool (part number 139790+) to keep the rotors from turning when removing the rotor nuts.

NOTE: When working on a rotor, always block the rotor against the body, not against the other rotor. See Figure 38.

NOTE: SPX FLOW recommends using the Non-Marring Socket Tool for Rotor Nuts to protect the rotor nut. See Table 5 and page 122.

Table 5: Rotor Nut Wrench Size and Socket Tool

U3 Model	Wrench Size	Socket Tool
006, 014, 015, 018	15/16"	140074+
030, 034, 040	1-1/4"	139795+
045, 060, 063, 064, 130, 133, 134	1-5/8"	139796+
180, 184, 220, 223, 224	2-1/4"	139797+
210, 214, 320, 324	2-3/8"	126536+

2. Remove the rotor nuts.
3. Remove the rotor nut O-rings from each rotor nut.

NOTE: Discard the O-rings from the rotor nut; these are intended for one-time use only.



Figure 39 - Remove O-ring

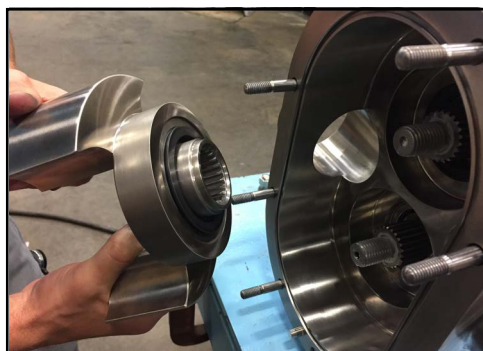


Figure 40 - Remove rotor

Remove Rotors

⚠ WARNING

The pump components and piping may contain sharp edges. Handle the rotors carefully because edges may be sharp. Wear gloves while installing and servicing the pump to help avoid injuries from these hazards.

Remove the rotors by hand. Place the rotors on a protected surface to prevent damage to close-tolerance parts.

NOTE: Mechanical seal is shown in Figure 40.

For mechanical seals, continue.



For O-ring seals, skip to page 98.

Generation 2 Seal

Change Product Side Seal

Remove Product-Side Rotary and Stationary Seal

1. Remove the rotary seal from the rotor.



Figure 41 Remove rotary seal

2. Remove the rotary seal from the rotor.



Figure 42 Remove seal O-ring

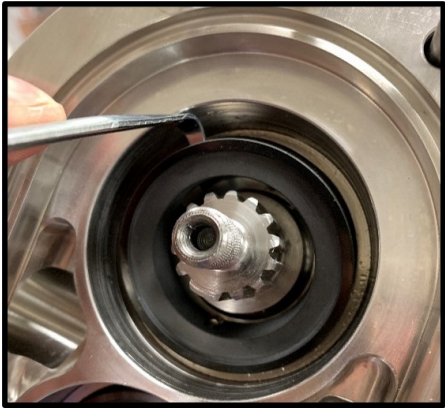


Figure 43 Remove stationary seal

Remove the stationary seal from the pump body.



Figure 44 Remove stationary seal O-ring

1. Remove the stationary seal O-ring from the pump body.

NOTE: The O-ring can come out with the stationary seal.



Figure 45 Remove stationary seal wave spring

2. Remove the wave spring from the pump body.



The product-side seals and O-rings in a U3 mechanical seal can be replaced without removing the pump body. To replace or service these components only, skip to “Install Product-Side Rotary and Stationary Seal” on page 95.

Generation 2 Seal

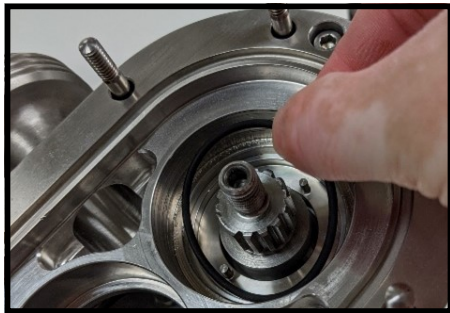


Figure 46 Install stationary O-ring



Figure 47 Install stationary wave spring



Figure 48 Install stationary seal

Install Product-Side Rotary and Stationary Seal

1. Install stationary O-ring into rotor seal bore outside wave spring area.

2. Install wave spring outside stationary seal drive pins.

Recommendation: install O-ring first to help retain wave spring.

3. Install stationary seal. Align the notches in the seal with the drive pins on the seal housing. Push the seal into the pump so that the O-ring can seat in the bore and hold the seal in place.

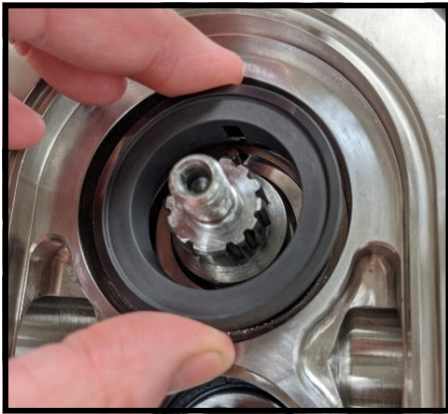


Figure 49 Push stationary seal

4. After installing the stationary seal, push on it and it should spring back freely. If it does not spring back, check the seal installation.



Figure 50 Install seal O-ring

5. Install the seal o-ring.



Figure 51 Install rotary seal

6. Install rotary seal, ensuring the notches are aligned.

Generation 2 Seal



Figure 52 Remove rotary seal



Figure 53 Remove seal O-ring

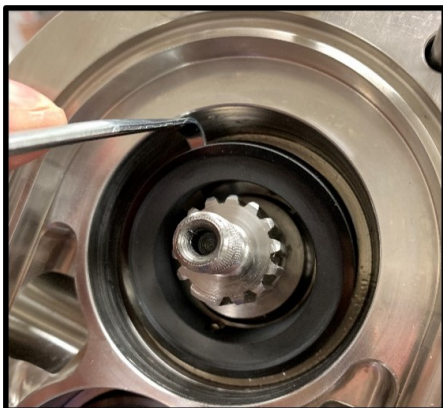


Figure 54 Remove stationary seal

Single Mechanical Seal

Remove Product-Side Rotary and Stationary Seal

1. Remove the rotary seal from the rotor.
2. Remove the rotary seal O-ring from the rotor.
3. Remove the stationary seal from the pump body.



Figure 55 Remove stationary seal O-ring



Figure 56 Remove stationary seal wave spring

Generation 2 Seal




Figure 57 Remove body retaining screws

- 4. Remove the stationary seal O-ring from the pump body.

NOTE: The O-ring can come out with the stationary seal

- 5. Remove the wave spring from the pump body.

 The product-side seals and O-rings in a U3 mechanical seal can be replaced without removing the pump body. To replace or service these components only, skip to “Install Product-Side Rotary and Stationary Seal” on page 95.

Remove Pump Body

- 1. Remove the two body retaining cap screws.

Table 6: Body Retaining Screws Wrench Size

Model	Wrench Size
006, 014, 015, 018, 030, 034, 040	3/16"
045, 060, 064, 063, 130, 133, 134	1/4"
180, 184, 220, 224, 223, 210, 214, 320, 324	5/16"

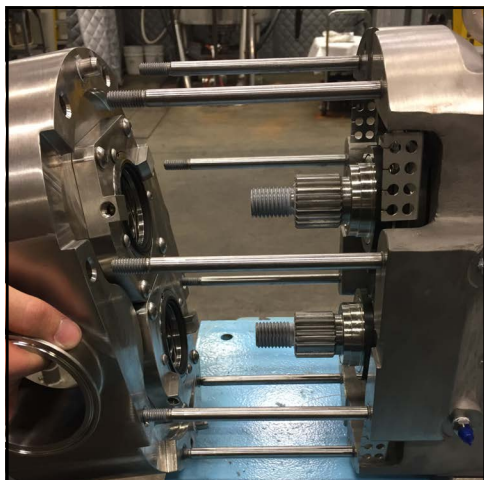


Figure 58 - Remove pump body

2. Remove the body from the gear case. If needed, use a plastic mallet to tap the body away from the gear case, until the dowel pins are dislodged from the bushings.
3. Slide the body straight off the body studs to prevent damaging the mechanical seal parts.

⚠ CAUTION

To lift the body of a 130, 133, 134, 180, 184, 210, 214, 220, 223, 224, 320, or 324-U3, use a lifting strap threaded through the ports on either side of the body.

4. Place the body on a protected surface with the seals facing up to protect the seals.

Generation 2 Seal

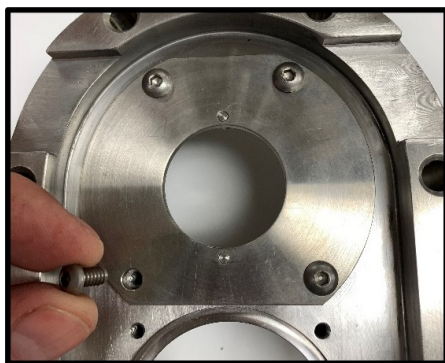


Figure 59 Remove seal housing bolts



Figure 60 Remove seal housing

Remove Seal Components

NOTE: For double mechanical seal, see page 50.

1. Remove the seal housing bolts.
2. Remove the seal housing.
3. Repeat steps for second seal.

Generation 2 Seal

NOTE: SPX FLOW recommends replacing elastomers every time the pump is serviced.

Install Seal Components

1. Lay out the required parts for each seal.



Figure 61 Single Mechanical Seal (006U3 shown)

2. Install the seal housing.

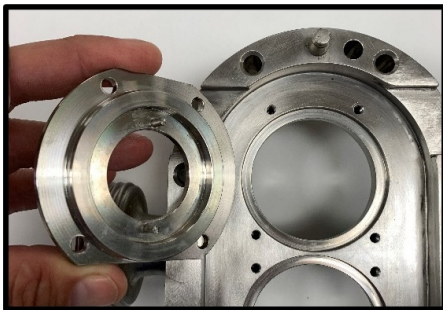


Figure 62 Install seal housing

3. Lubricate the threads of the seal housing bolts with food grade anti-seize and install the 4 seal housing bolts.



Figure 63 Install seal housing bolts

4. Torque the bolts to the specified torque values:

Table 7: Seal Housing Bolt Torque

U3 Model	Seal Housing Bolt Torque
006, 014, 015, 018	7.4 ft-lb / 10 N·m
030, 034, 040, 045, 060, 063, 064, 130, 133, 134, 180, 184, 220, 223, 224, 210, 214, 320, 324	14.8 ft-lb / 20 N·m

5. Repeat steps for second seal.
6. Figure 64 shows both seal housings installed.

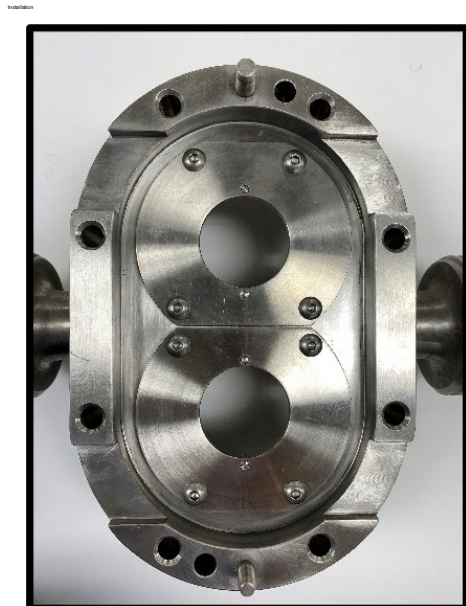


Figure 64 Seal housings installed

Generation 2 Seal

Install Pump Body

⚠ CAUTION

Make sure the pump is securely bolted or clamped down prior to performing any maintenance work. The pump center of gravity changes as parts are added or removed, and could result in tipping of an unsecured pump.

⚠ CAUTION

To lift the body of a 130, 133, 134, 180, 184, 210, 214, 220, 223, 224, 320, or 324-U3, use a lifting strap threaded through the port on either side of the body

1. Install the pump body onto the gear case. Confirm that the pump body dowel pins align with the correct size bushing on the gear case.

NOTE: Double mechanical seal shown.

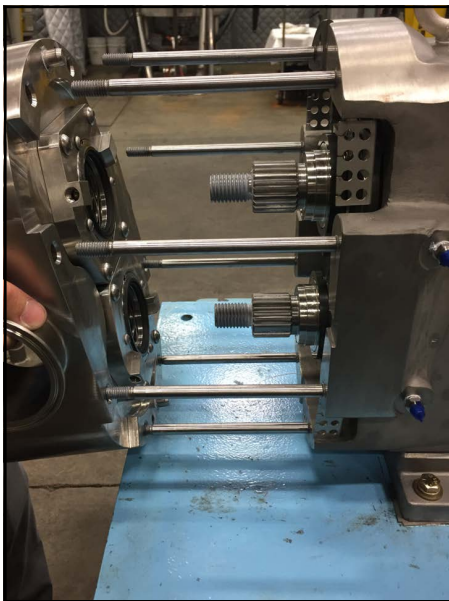


Figure 65 - Install pump body

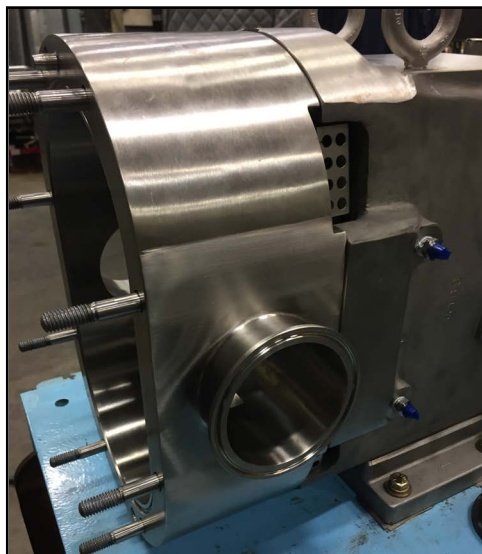


Figure 66 - Pump body installed

2. Figure 66 shows the pump body installed on the gear case.



Figure 67 - Install body retaining screws

3. Install the body retaining screws. Lubricate the thread with food-grade anti-seize. Lightly hand-tighten the screws, so the pump body is securely seated against the gear case.

Generation 2 Seal

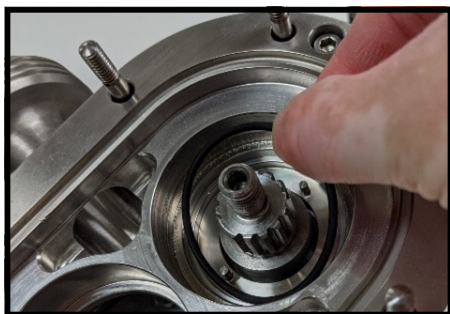


Figure 68 Install stationary O-ring

1. Install stationary O-ring into rotor seal bore outside wave spring area.



Figure 69 Install stationary wave spring

2. Install wave spring outside stationary seal drive pins.

Recommendation: Install O-ring first to help retain wave spring.



Figure 70 Install stationary seal

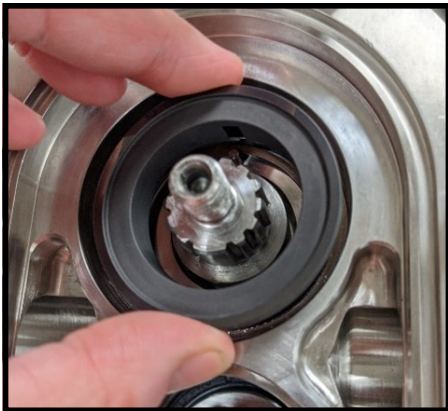


Figure 71 Push stationary seal



Figure 72 Install seal O-ring

3. Install stationary seal. Align the notches in the seal with the drive pins on the seal housing. Push the seal into the pump so that the O-ring can seat in the bore and hold the seal in place.
4. After installing the stationary seal, push on it and it should spring back freely. If it does not spring back, check the seal installation.
5. Install the seal o-ring.

6. Install rotary seal, ensuring the notches are aligned.



Figure 73 *Install rotary seal*



Skip to “Install Rotors” on page 107.

Generation 2 Seal

Double Mechanical Seal

Remove Product-Side Rotary and Stationary Seal

1. Remove the rotary seal from the rotor.



Figure 74 *Remove rotary seal*

2. Remove the rotary seal O-ring from the rotor.



Figure 75 *Remove seal O-ring*

3. Remove the stationary seal from the pump body.

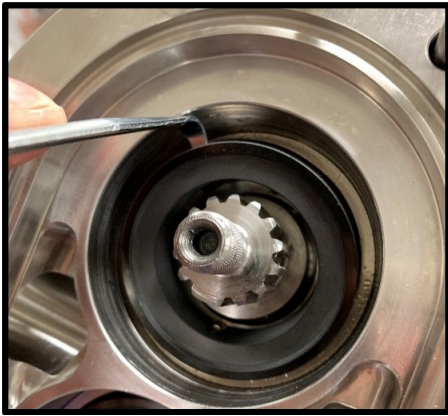


Figure 76 Remove stationary seal

4. Remove the stationary seal O-ring from the pump body.

NOTE: The O-ring can come out with the stationary seal.



Figure 77 Remove stationary seal O-ring

5. Remove the wave spring from the pump body.



The product-side seals and O-rings in a U3 mechanical seal can be replaced without removing the pump body. To replace or service these components only, skip to “Install Product-Side Rotary and Stationary Seal” on page 95.



Figure 78 Remove stationary seal wave spring

Generation 2 Seal



Figure 79 Remove body retaining screws

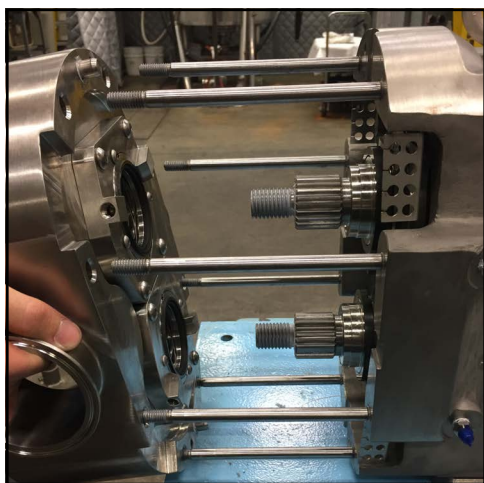


Figure 80 - Remove pump body

Remove Pump Body

1. Remove the two body retaining cap screws.

Table 8: Body Retaining Screws Wrench Size

Model	Wrench Size
006, 014, 015, 018, 030, 034, 040	3/16"
045, 060, 063, 064, 130, 133, 134	1/4"
180, 184, 220, 223, 224, 210, 214, 320, 324	5/16"

2. Remove the body from the gear case. If needed, use a plastic mallet to tap the body away from the gear case, until the dowel pins are dislodged from the bushings.
3. Slide the body straight off the body studs to prevent damaging the mechanical seal parts.

⚠ CAUTION

To lift the body of a 130, 133, 134, 180, 184, 210, 214, 220, 223, 224, 320, or 324-U3, use a lifting strap threaded through the ports on either side of the body.

4. Place the body on a protected surface with the seals facing up to protect the seals.

NOTE: For single mechanical seal, continue. For double mechanical seal, page 74.

Generation 2 Seal

Remove Flush-Side Seal Components

NOTE: For single mechanical seal, see page 42. For O-ring seals, see page 99.

1. Remove the flush side rotary seal and adjusting ring from each shaft.

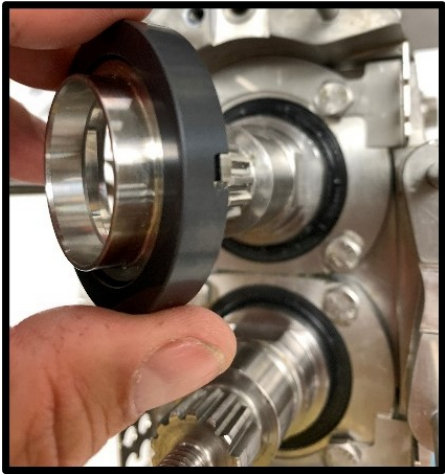


Figure 81 Remove flush-side rotary seal

2. Remove the seal and O-ring from the adjusting ring.



Figure 82 Remove flush side rotary seal and O-ring

3. Remove the O-ring from the seal.



Figure 83 Remove O-ring

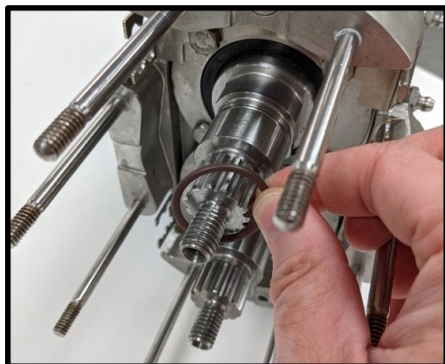


Figure 84 Remove O-ring

4. Remove the adjusting ring O-ring from the shaft groove on each shaft.

NOTE: Before installing the new O-rings, inspect the shaft O-ring groove(s) for damage, and repair or replace the shafts if required.

NOTE: Inspect the flats on the shaft shoulder and repair or replace the shafts if required.



Figure 85 Remove stationary seal

5. Remove flush side stationary seal.

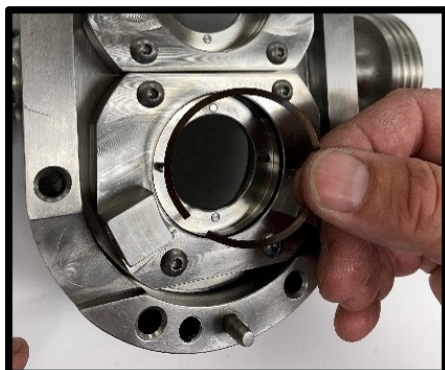


Figure 86 Remove stationary seal wave spring

6. Remove stationary seal wave spring.

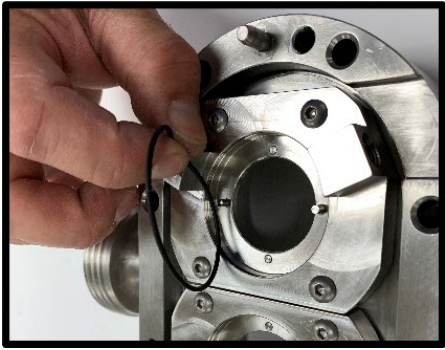


Figure 87 Remove stationary seal O-ring

7. Remove stationary seal O-ring.

NOTE: O-ring removal tool may be necessary.

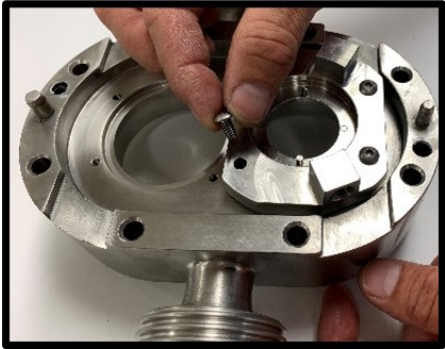


Figure 88 Remove seal housing bolts

8. Remove seal housing bolts.



Figure 89 Remove seal housing

9. Remove seal housing.

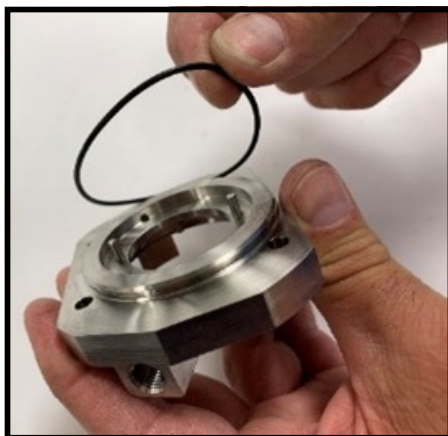


Figure 90 Remove seal housing O-ring

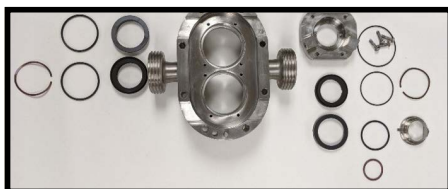


Figure 91 Double Mechanical Seal



Figure 92 Install the seal housing O-ring

10. Remove seal housing O-ring.

11. Repeat for second shaft.

12. Lay out the required part for each seal (006U3 shown).

13. Install the seal housing O-ring for 006U3-134U3. See Figure 92

- A. Install the seal housing O-ring for 180U3-324U3. See Figure 93



Figure 93 Install the seal housing O-ring

- 14. Install seal housing.



Figure 94 Install seal housing

- 15. Install the 4 seal housing bolts. Torque to the specified torque value:

Table 9: Seal Housing Bolt Torque

U3 Model	Seal Housing Bolt Torque
006, 014, 015, 018	7.4 ft-lb / 10 N·m
030, 034, 040, 045, 060, 063, 064, 130, 133, 134, 180, 184, 220, 223, 224, 210, 214, 320, 324	14.8 ft-lb / 20 N·m

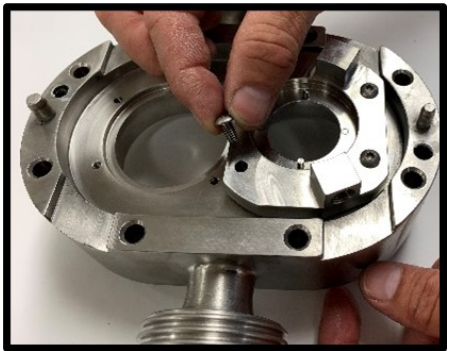


Figure 95 Install seal housing bolts



Figure 96 Seal housing installed

Figure 96 (the one to the left) show the seal housing install. Note the orientation of the flush ports.

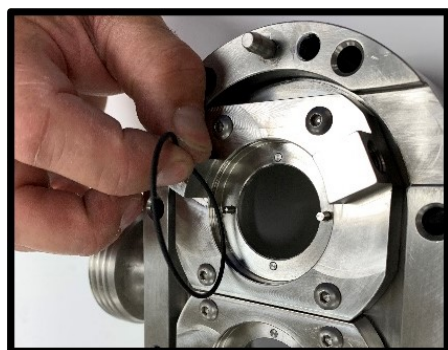


Figure 97 Install stationary seal O-ring

1. Install the lubricated stationary seal O-ring.

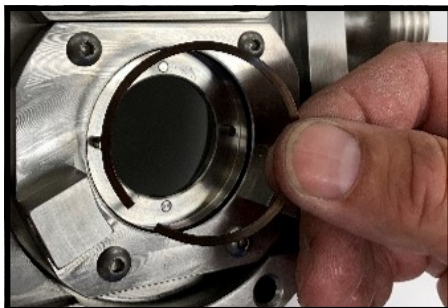


Figure 98 Install stationary seal wave spring

2. Install the wave spring for the stationary seal.



Figure 99 Install stationary seal

3. Install stationary seal. Align notches to seal drive pins. Press down lightly, confirm movement. If the seal does not move, reassemble, and re-confirm.
4. Repeat for second shaft.

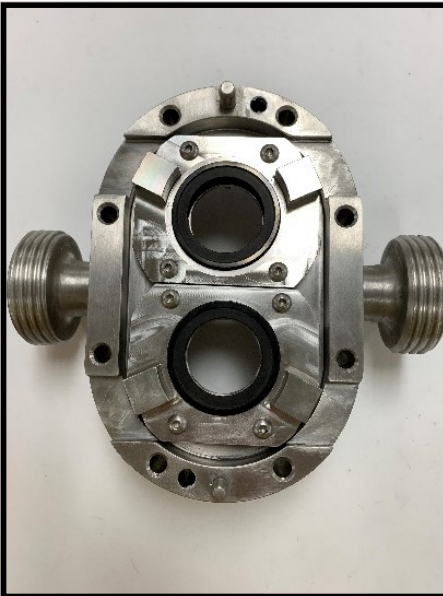


Figure 100 Seals installed

5. Figure 100 (left again) shows both seals installed.

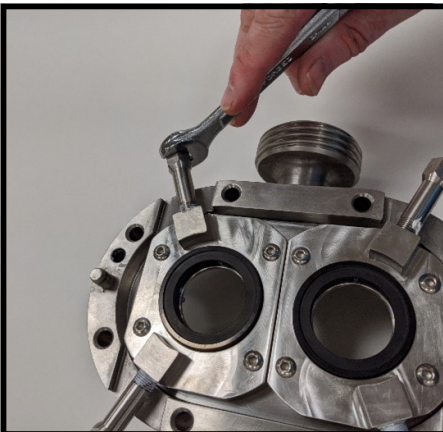


Figure 101 Installing flush port extensions

6. Install flush port extensions (if not previously completed or changes made). Apply Teflon pipe sealant to threads of flush port extensions.

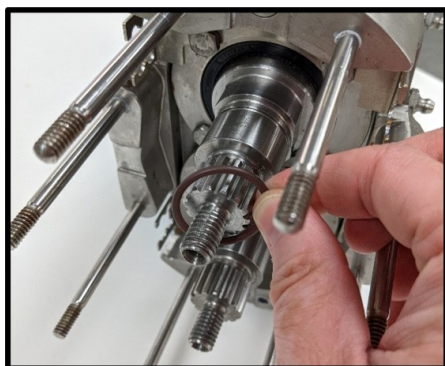


Figure 102 Install O-ring



Figure 103 Install flush side rotary O-ring



Figure 104 Install flush side rotary seal

7. Install adjusting ring O-ring onto shaft O-ring groove.

8. Install O-ring into flush side rotary seal.

9. Install flush side rotary seal with O-ring onto the adjusting ring, aligning the tabs with the notches on the seal.

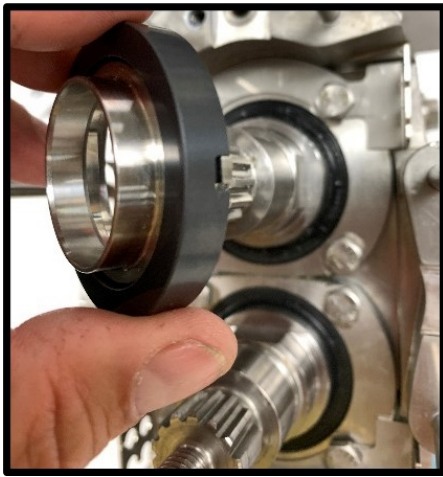


Figure 105 *Install flush side rotary seal onto shaft*

10. Install the flush side rotary seal onto the shaft aligning the flats on the shaft to those on the adjusting ring.



Figure 106 *Break tab off finger guard*

11. If necessary, break tab off finger guard to allow room for flush extensions.

Generation 2 Seal

Install Pump Body

⚠ CAUTION

Make sure the pump is securely bolted or clamped down prior to performing any maintenance work. The pump center of gravity changes as parts are added or removed, and could result in tipping of an unsecured pump.

⚠ CAUTION

To lift the body of a 130, 133, 134, 180, 184, 210, 214, 220, 223, 224, 320, or 324-U3, use a lifting strap threaded through the ports on either side of the body.

1. Install the pump body onto the gear case. Confirm that the pump body dowel pins align with the correct size bushing on the gear case.

NOTE: Double mechanical seal shown.

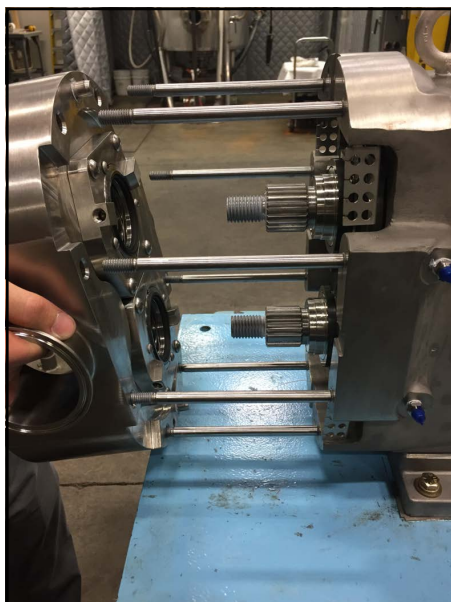


Figure 107 - Install pump body



Figure 108 - Pump body installed

2. Figure 108 shows the pump body installed on the gear case.



Figure 109 - Install body retaining screws

3. Install the body retaining screws. Lubricate the thread with food-grade anti-seize. Lightly hand-tighten the screws, so the pump body is securely seated against the gear case.

Generation 2 Seal

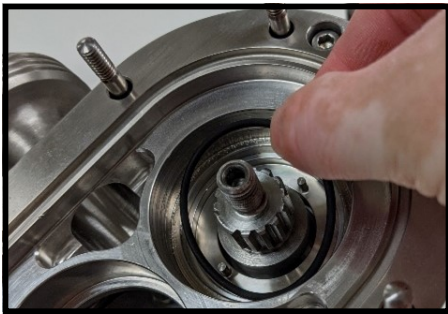


Figure 110 Install stationary O-ring

Install Product Side Rotary and Stationary Seal

1. Install stationary O-ring into rotor seal bore outside wave spring area.



Figure 111 Install stationary wave spring

2. Install wave spring outside stationary seal drive pins.

Recommendation: install O-ring first to help retain wave spring.



Figure 112 Install stationary seal

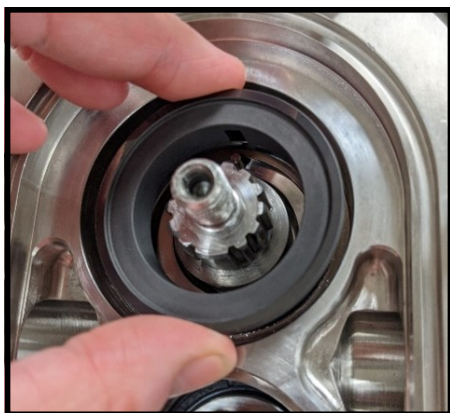


Figure 113 Push stationary seal



Figure 114 Install seal O-ring

3. Install stationary seal. Align the notches in the seal with the drive pins on the seal housing. Push the seal into the pump so that the O-ring can seat in the bore and hold the seal in place.
4. After installing the stationary seal, push on it and it should spring back freely. If it does not spring back, check the seal installation.
5. Install the seal o-ring.

6. Install rotary seal, ensuring the notches are aligned.



Skip to “Install Rotors” on page 107.

Figure 115 Install rotary seal

Generation 1 Seal

Single and Double Mechanical Seal

Remove Product-Side Rotary and Stationary Seal

1. Remove the rotary seal from the rotor.



Figure 116 - Remove rotary seal

2. Remove the rotary seal O-ring from the rotor.



Figure 117 - Remove seal O-ring

3. Remove the stationary seal from the pump body.

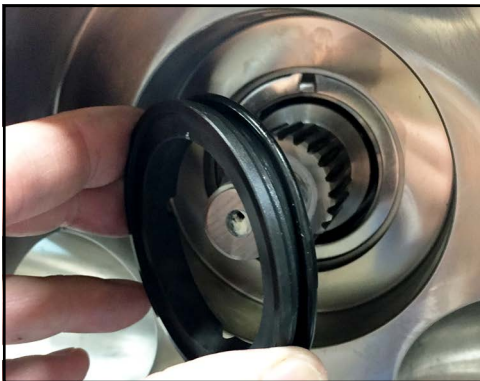


Figure 118 - Remove stationary seal



Figure 119 - Remove stationary seal O-ring

1. Remove the stationary seal O-ring from the stationary seal.

NOTE: The O-ring usually comes off with the seal in step 3.



The product-side seals and O-rings in a U3 mechanical seal can be replaced without removing the pump body. To replace or service these components only, skip to "Install Product-Side Rotary and Stationary Seal" on page 95.

Generation 1 Seal



Figure 120

Remove Pump Body

1. Remove the two body retaining cap screws.

Table 10: Body Retaining Screws Wrench Size

Model	Wrench Size
006, 014, 015, 018, 030, 034, 040	3/16"
045, 060, 063, 064, 130, 133, 134	1/4"
180, 184, 220, 223, 224, 210, 214, 320, 324	5/16"

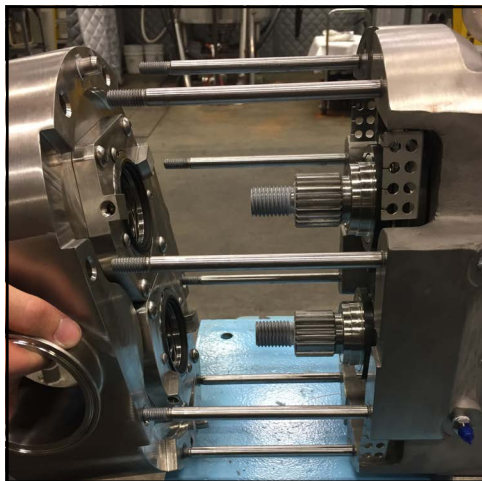


Figure 121 - Remove pump body

2. Remove the body from the gear case. If needed, use a plastic mallet to tap the body away from the gear case, until the dowel pins are dislodged from the bushings.
3. Slide the body straight off the body studs to prevent damaging the mechanical seal parts.

⚠ CAUTION

To lift the body of a 130, 133, 134, 180, 184, 210, 214, 220, 223, 224, 320, or 324-U3, use a lifting strap threaded through the ports on either side of the body.

4. Place the body on a protected surface with the seals facing up to protect the seals.

NOTE: For single mechanical seal, continue. For double mechanical seal, see page 74.

Generation 1 Seal

Single Mechanical Seal

Remove Seal Components

NOTE: For double mechanical seal, see page 74.

1. Remove the seal housing bolts.



Figure 122 - Remove seal housing bolts

2. Remove the seal housing. Figure 123 shows the design for 134-U3 and smaller sizes. See Figure 124 for 180-U3 and larger sizes.



Figure 123 - Remove seal housing

3. Figure 124 shows the design for 180-U3 and larger sizes. See Figure 123 for 134-U3 and smaller sizes.



Figure 124 - Remove seal housing

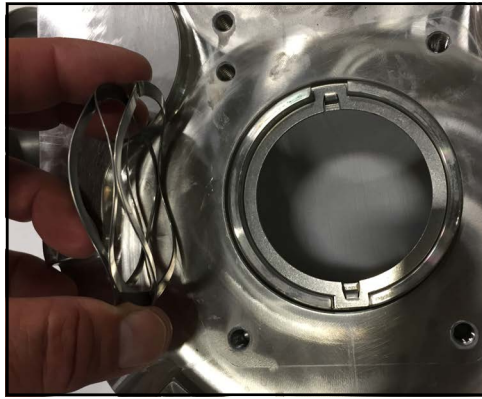


Figure 125 - Remove wave spring

4. Remove the wave spring (040-U3 pictured).

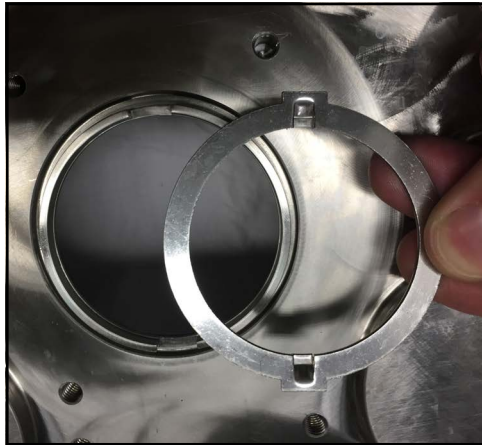


Figure 126 - Remove drive ring

5. Remove the drive ring (040-U3 pictured).



Figure 127 - Remove shaft ring

6. 134-U3 and smaller pumps only: Remove the shaft ring. (180-U3 and larger sizes do not have a shaft ring.)

NOTE: To assemble a single mechanical seal for 134-U3 and smaller pumps, continue. For 180-U3 and larger pumps, see page 72.

Generation 1 Seal

NOTE: SPX FLOW recommends replacing elastomers every time the pump is serviced.

134-U3 and smaller pumps: Install Seal Components (single mechanical seal)

NOTE: For single mechanical seal on 180-U3 and larger pumps, see page 72. For double mechanical seal, see page 74.



Figure 128 - Single Mechanical Seal (040-U3 shown)

1. Lay out the required parts for each seal (040-U3 shown).

⚠ CAUTION

To lift the body of a 130, 133, 134, 180, 184, 210, 214, 220, 223, 224, 320, or 324-U3, use a lifting strap threaded through the ports on either side of the body.



Figure 129 - Install shaft ring

2. Install the shaft ring with the notch openings facing toward you as shown in Figure 129.

NOTE: Make sure the notch openings in the shaft ring are perpendicular to the ports, and in line with the bores. See Figure 135 on page 72



Figure 130 - Ring installed

3. Figure 130 shows the shaft ring installed.



Figure 131 - Install drive ring

4. Install the drive ring with the tab protrusions facing the pump body.

NOTE: The side of the drive ring tab that protrudes, faces the body; the flat side of the tab faces up. (The flat side of the tab is facing the camera in Figure 131 and Figure 132.)



Figure 132 - drive ring installed (134-U3 and smaller

5. Figure 132 shows the drive ring installed.



Figure 133 - Install wave spring

6. Install the wave spring, centering it on the drive ring.



Figure 134 - Wave spring installed

7. Figure 134 shows the wave spring installed.



Figure 135 - Install seal housing

8. Install the seal housing, as shown in Figure 135.

NOTE: Note the alignment of the drive ring tabs and shaft ring.



Figure 136 - Install seal housing bolts

9. Lubricate the threads of the seal housing bolts with food grade anti-seize. Push down on the seal housing to compress the seal spring, and install the 4 seal housing bolts.

10. Torque the bolts to the specified torque value:

Table 11: Seal Housing Bolt Torque

U3 Model	Seal Housing Bolt Torque
006, 014, 015, 018	7.4 ft-lb / 10 N·m
030, 034, 040, 045, 060, 063, 064, 130, 133, 134, 180, 184, 220, 223, 224, 210, 214, 320, 324	14.8 ft-lb / 20 N·m

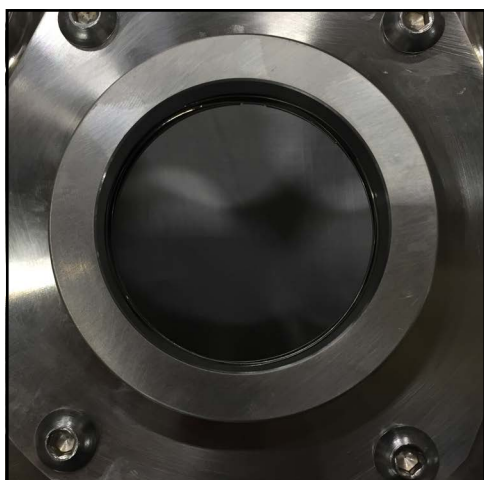


Figure 137 - Seal housing installed

11. Figure 137 shows the seal housing installed.

12. Repeat these steps for the second seal.



Skip to "Install Pump Body" on page 94.

Generation 1 Seal

NOTE: SPX FLOW recommends replacing elastomers every time the pump is serviced.

180-U3 and larger pumps: Install Seal Components (single mechanical seal)

NOTE: For single mechanical seal on 134-U3 and smaller pumps, see page 69. For double mechanical seal, see page 78.

1. Lay out the required parts for each seal.

⚠ CAUTION

To lift the body of a 130, 133, 134, 180, 184, 210, 214, 220, 223, 224, 320, or 324-U3, use a lifting strap threaded through the ports on either side of the body.



Figure 138 - Install drive ring

2. Install the drive ring as shown in Figure 138. The side of the drive ring tab that protrudes, faces the body; the flat side of the tab faces up. (The flat side of the tab is facing the camera in Figure 138 and Figure 139.)

NOTE: See also the exploded-view drawing of the seals on page 96.



Figure 139 - Drive ring installed

3. Figure 139 shows the drive ring installed.

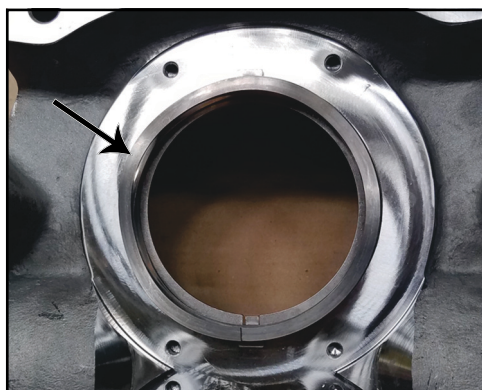


Figure 140 - Wave spring installed

4. Install the wave spring, centering it on the drive ring. Figure 140 shows the wave spring installed.



Figure 141 - Install seal housing



Figure 142 - Install seal housing bolts

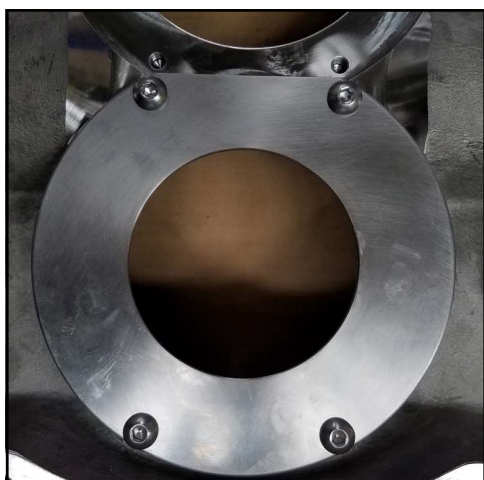


Figure 143 - Seal housing installed

5. Install the seal housing as shown in Figure 141. Align the notches in the seal housing with the tabs on the drive ring (installed in step 3 on page 73). Make sure the flat side of the seal housing is positioned between the bores (shown installed in Figure 143).

6. Lubricate the threads of the seal housing bolts with food grade anti-seize. Push down on the seal housing to compress the seal spring, and install the 4 seal housing bolts.
7. Torque the bolts to the specified torque value:

Table 12: Seal Housing Bolt Torque

U3 Model	Seal Housing Bolt Torque
006, 014, 015, 018	7.4 ft-lb / 10 N·m
030, 034, 040, 045, 060, 063, 064, 130, 133, 134, 180, 184, 220, 223, 224, 210, 214, 320, 324	14.8 ft-lb / 20 N·m

8. Figure 143 shows the seal housing installed.
9. Repeat these steps for the second seal.



Skip to "Install Pump Body" on page 94.

Generation 1 Seal

Double Mechanical Seal

Remove Flush-Side Seal Components

NOTE: For single mechanical seal, see page 67. For O-ring seals, see page 100.

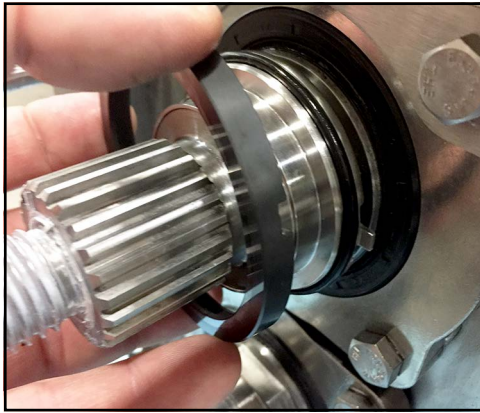


Figure 144 - Remove flush-side rotary seal

1. Remove the flush-side rotary seal from each shaft. Use caution not to damage the seals during removal.

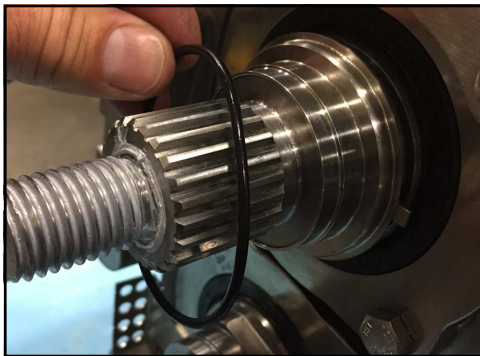


Figure 145 - Remove O-ring

2. Remove the flush-side rotary seal O-ring from each shaft.

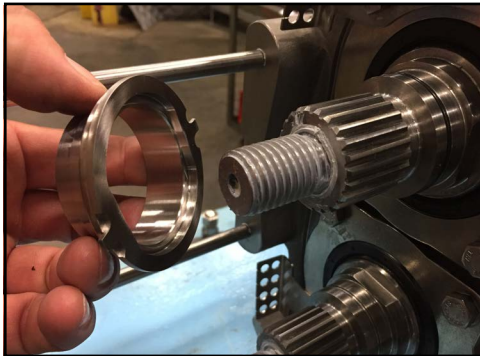


Figure 146 - Remove adjusting ring

3. Remove the adjusting ring from each pump shaft.



Figure 147 - Adjusting ring O-ring

4. Remove the adjusting ring O-ring from the shaft groove on each shaft.

NOTE: Before installing the new O-rings, inspect the shaft O-ring groove(s) for damage, and repair or replace the shafts if required.

NOTE: Inspect the flats on the shaft shoulder and repair or replace the shafts if required.



Figure 148 - Remove seal retaining bolts

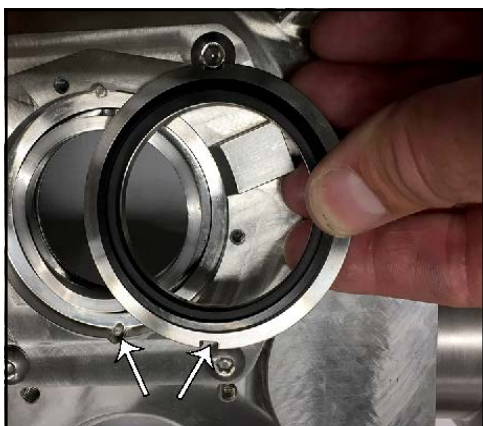


Figure 149 - Remove stationary seal



Figure 150 - Remove wave spring

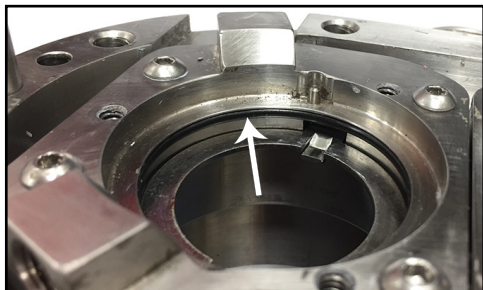


Figure 151 - Seal O-ring location

5. Remove the 3 stationary seal retaining bolts from each seal housing (040-U3 pictured).

NOTE: The seal may be removed by loosening 2 screws and removing the 3rd screw.

6. Remove the flush-side stationary seal (040-U3 pictured).
7. Inspect the seal housing pins for damage, and repair or replace them as necessary. If the pins are loose, replace them with new ones.

8. Remove the wave spring (040-U3 pictured).

9. Remove the stationary seal O-ring (040-U3 pictured).

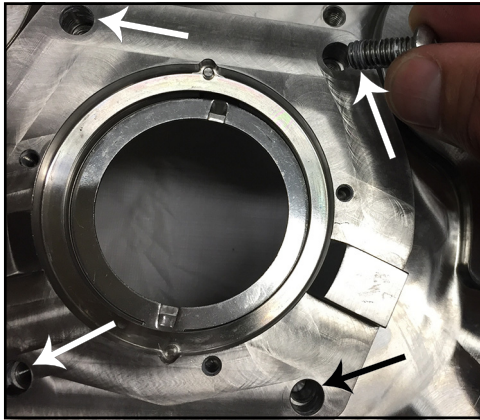


Figure 152 - Seal housing bolts

10. Remove the 4 seal housing bolts (040-U3 pictured).

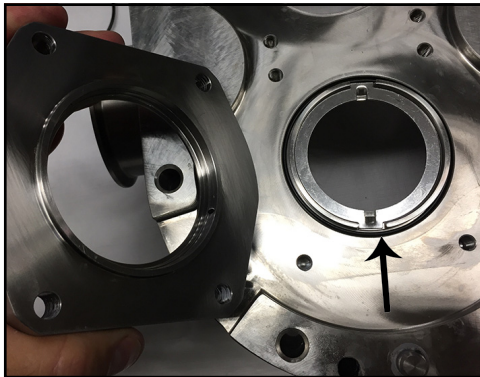


Figure 153 - Remove seal housing

11. Remove the seal housing (040-U3 pictured). The arrow in Figure 153 shows the seal housing O-ring location on pump sizes 134-U3 and smaller.



Figure 154 - Remove seal housing O-ring

12. (134-U3 and smaller) Remove the seal housing O-ring from around the shaft ring. See Figure 153 for the seal housing O-ring location.



Figure 155 - Remove seal housing O-ring

13. (180-U3 pumps and larger) Remove the seal housing O-ring from the seal housing.

NOTE: On the 180-U3 pumps and larger, the seal housing O-ring is installed on the seal housing.



Figure 156 - Remove drive ring

14. Remove the drive ring. (040-U3 pictured.)



Figure 157 - Remove shaft ring

Remove the shaft ring. (Applies to pump sizes 134-U3 and smaller only. 180-U3 and larger pumps do not have a shaft ring.)

1. Repeat for the second seal.

NOTE: To assemble a double mechanical seal for pump sizes 134-U3 and smaller, continue. For 180-U3 pumps and larger, see page 87.

Generation 1 Seal

134-U3 and smaller pumps: Install Seal Components (double mechanical seal)

NOTE: For double mechanical seal on 180-U3 and larger pumps, see page 87. For single mechanical seal, see page 72.



**Figure 158 - Double Mechanical Seal
(040-U3 shown)**

1. Lay out the required parts for each seal (Figure 158 shows parts for one seal, on a 040-U3 size pump).

⚠ CAUTION

To lift the body of a 130, 133, 134, 180, 184, 210, 214, 220, 223, 224, 320, or 324-U3, use a lifting strap threaded through the ports on either side of the body.



Figure 159 - Install shaft ring

2. Install the shaft ring with the notch openings facing toward you as shown in Figure 159.

NOTE: *Make sure the notch openings in the shaft ring are perpendicular to the ports, and in line with the bores. See Figure 165 on page 81.*



Figure 160 - Shaft ring installed

3. Figure 160 shows the shaft ring installed.



Figure 161 - Install drive ring



Figure 162 - Drive ring installed



Figure 163 - Install seal housing O-ring

4. Install the drive ring as shown in Figure 161. The side of the drive ring tab that protrudes, faces the body; the flat side of the tab faces up. (The flat side of the tab is facing the camera in Figure 161 and Figure 162.)
5. Note the orientation of the tabs; for pumps 134-U3 and smaller, the tabs of the drive ring are perpendicular to the side ports of the body. See Figure 165 on page 81 for the orientation as installed.
6. Figure 162 shows the drive ring installed.
7. Install the seal housing O-ring. The O-ring fits in the body, around the shaft ring. See Figure 164.

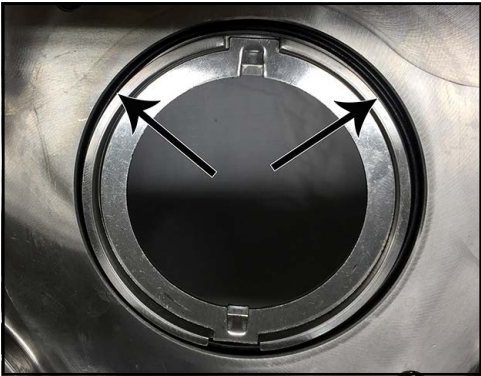


Figure 164 - Seal housing O-ring installed

8. Figure 164 shows the seal housing O-ring installed.



Figure 165 - Install seal housing

9. Install the seal housing.



Figure 166 - Seal housing bolts

10. Install the 4 seal housing bolts. Torque the bolts to the specified torque value:

Table 13: Seal Housing Bolt Torque

U3 Model	Seal Housing Bolt Torque
006, 014, 015, 018	7.4 ft-lb / 10 N·m
030, 033, 034, 040, 045, 060, 063, 064, 130, 133, 134, 180, 184, 220, 223, 224, 210, 214, 320, 324	14.8 ft-lb / 20 N·m

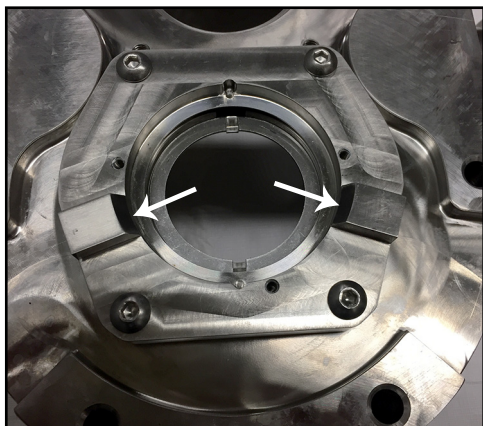


Figure 167 - Seal housing installed

11. Figure 167 shows the seal housing installed. Note the orientation of the flush ports (arrows).



Figure 168 - Install seal O-ring

12. Install the lubricated stationary seal O-ring as shown in Figure 168.

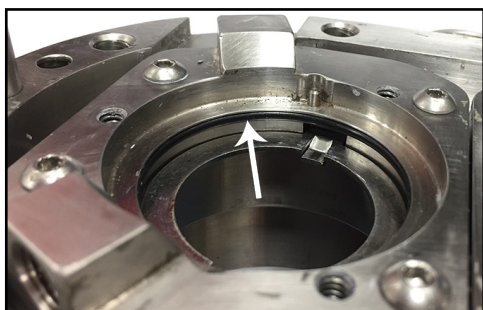


Figure 169 - Seal O-ring location

13. The stationary seal O-ring is located between the seal housing and the drive ring.



Figure 170 - Install wave spring

14. Install the wave spring.



Figure 171 - Wave spring installed

15. Figure 171 shows the wave spring installed.



Figure 172 - Install flush-side stationary seal

16. Install the flush-side stationary seal, making sure to line up the notches on the seal to the seal housing pins.

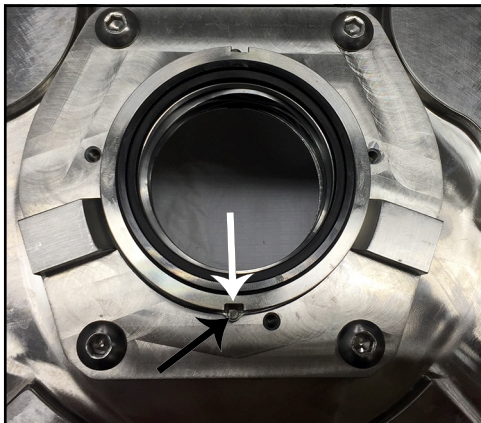


Figure 173 - Flush-side stationary seal installed

17. Figure 173 shows the flush-side stationary seal installed. Note the notches (white arrow) lined up with the seal housing pins (black arrow).



Figure 174 - Install seal retaining bolts



Figure 175 - Seals installed

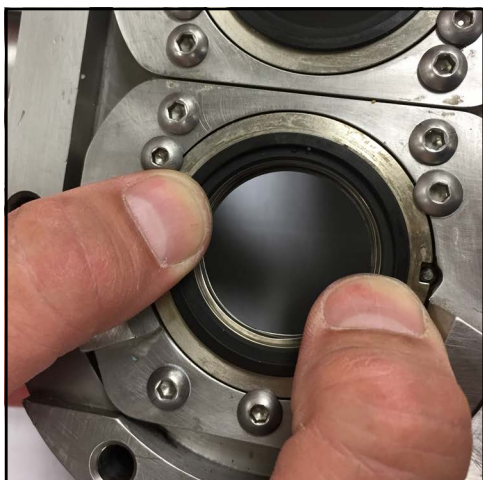


Figure 176 - Apply finger pressure

18. Install the 3 seal retaining bolts. Hand-tighten the bolts until snug.

19. Repeat these steps to install the second seal.

20. Figure 175 shows both seals installed.

21. Confirm that each seal moves easily in and out by applying finger pressure to the seal. If the seal does not move, reassemble the seal and re-confirm.



Figure 177 - Install O-ring

22. Install the lubricated adjusting ring O-ring onto the shaft groove.

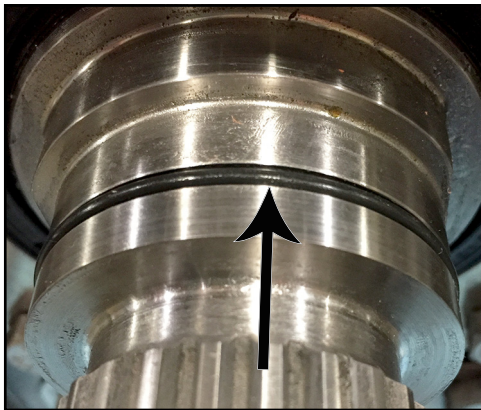


Figure 178 - O-ring installed

23. Figure 178 shows the O-ring installed in the shaft groove.

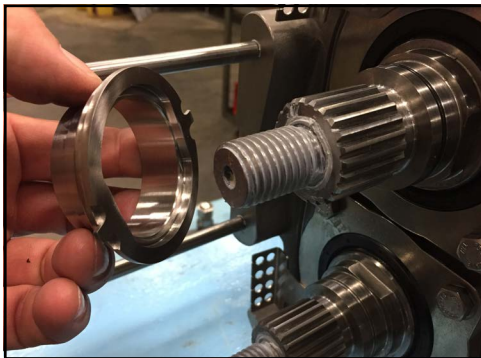


Figure 179 - Install adjusting ring

24. Install the adjusting ring onto each pump shaft. Make sure to align the flats on the adjusting ring to the flats on the drive shafts.

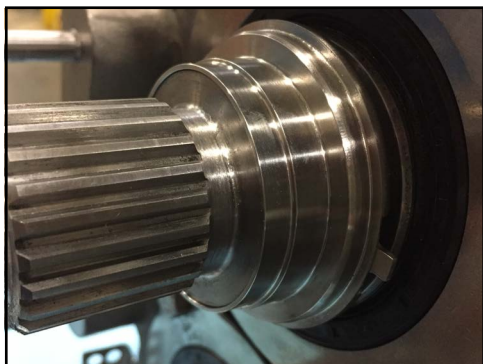


Figure 180 - Adjusting ring installed

25. Figure 180 shows the adjusting ring installed.

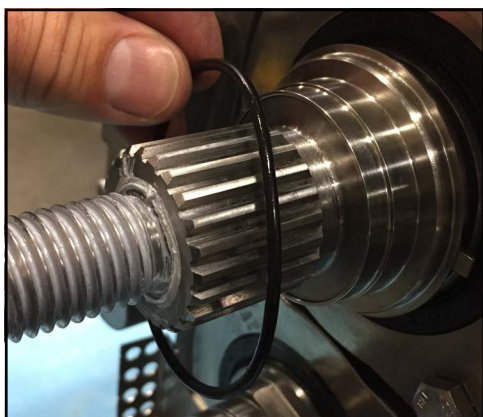


Figure 181 - Install O-ring

26. Install the rotary seal O-ring on each shaft.

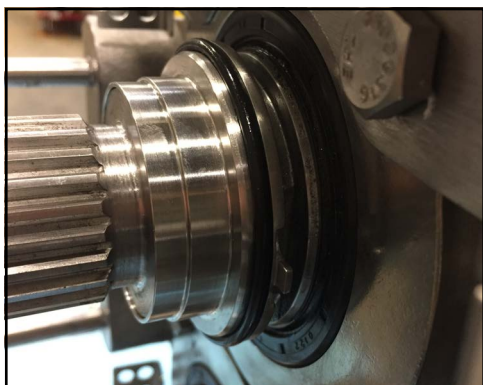


Figure 182 - O-ring installed

27. Figure 182 shows the rotary seal O-ring installed on the shaft.

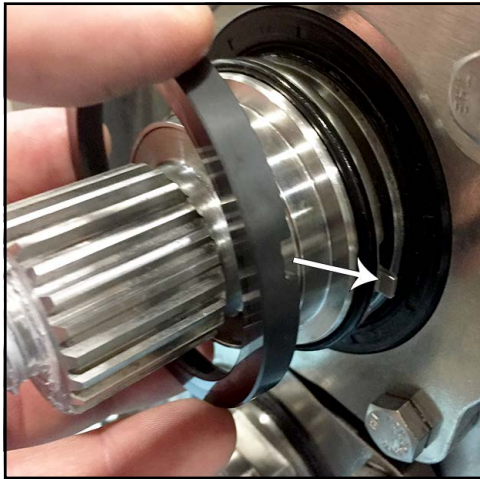


Figure 183 - Install flush-side rotary seal

28. Install the flush-side rotary seal onto the shaft, aligning the tab with the notch on the seal.

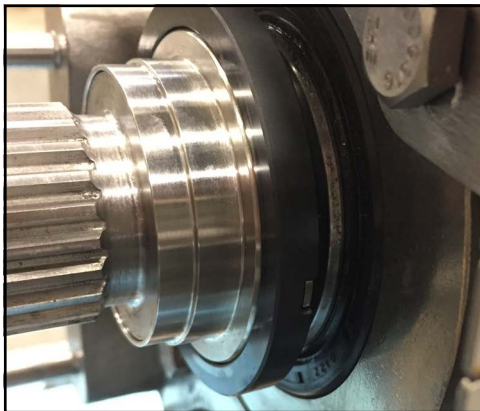


Figure 184 - Rotary seal installed

29. Figure 184 shows the seal installed.



Skip to "Install pump body" on page 94.

Generation 1 Seal

180-U3 and larger pumps: Install Seal Components (double mechanical seal)

NOTE: For 134-U3 and smaller pumps, see page 78. For single mechanical seal, see page 72.

1. Lay out the required parts for each seal.

⚠ CAUTION

To lift the body of a 130, 133, 134, 180, 184, 210, 214, 220, 223, 224, 320, or 324-U3, use a lifting strap threaded through the ports on either side of the body.



Figure 185 - Install drive ring



Figure 186 - Drive ring installed

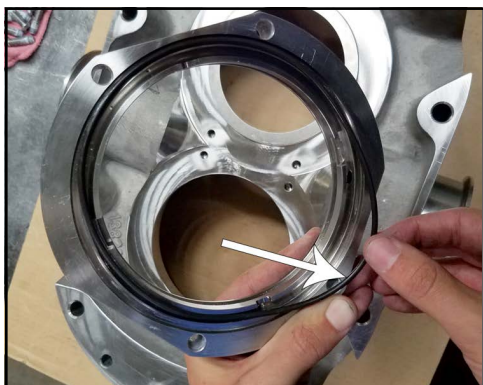


Figure 187 - Install seal housing O-ring

2. Install the drive ring as shown in Figure 185. The side of the drive ring tab that protrudes, faces the body; the flat side of the tab faces up. (The flat side of the tab is facing the camera in Figure 185 and Figure 186.)
3. Note the orientation of the tabs; for pumps 180-U3 and larger, the tabs of the drive ring are parallel to the side ports of the body as shown in Figure 185 and Figure 186.
4. Figure 186 shows the drive ring installed.
5. Install the seal housing O-ring on the seal housing.



Figure 188 - Seal housing O-ring installed

6. Install the seal housing. Align the drive ring tabs with the notches in the seal housing.



Figure 189 - Seal housing in place

7. Figure 189 shows the 180-U3 seal housing in place. Note the orientation of the flat (arrow), facing the center of the pump body.

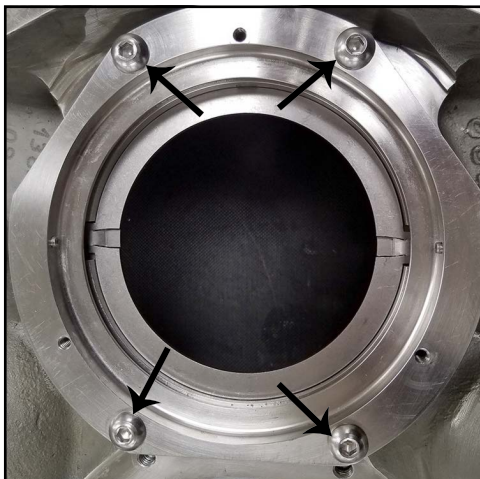


Figure 190 - Seal housing bolts

8. Install the 4 seal housing bolts. Torque the bolts to the specified torque value:

Table 14: Seal Housing Bolt Torque

U3 Model	Seal Housing Bolt Torque
006, 014, 015, 018	7.4 ft-lb / 10 N·m
030, 034, 040, 045, 060, 063, 064, 130, 133, 134, 180, 184, 220, 223, 224, 210, 214, 320, 324	14.8 ft-lb / 20 N·m



Figure 191 - Install seal O-ring

9. Install the lubricated stationary seal O-ring as shown in Figure 191.



Figure 192 - Seal O-ring location

10. The stationary seal O-ring is located between the seal housing and the drive ring.

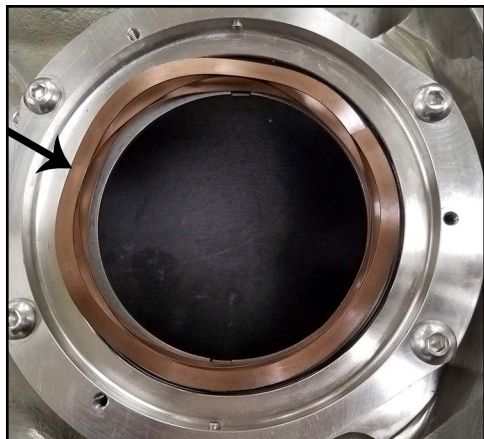


Figure 193 - Wave spring installed

11. Install the wave spring.

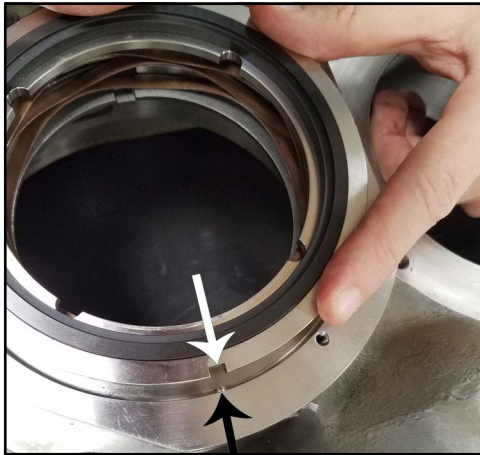


Figure 194 - Install flush-side stationary seal

12. Install the flush-side stationary seal, making sure to line up the notches on the seal (white arrow) to the seal housing pins (black arrow).



Figure 195 - Install seal retaining bolts

13. Install the 3 seal retaining bolts. Hand-tighten the bolts until snug.



Figure 196 - Apply finger pressure

14. Confirm that the seal moves easily in and out by applying finger pressure to the seal. If the seal does not move, reassemble the seal and re-confirm.
15. Repeat these steps to install the second seal.

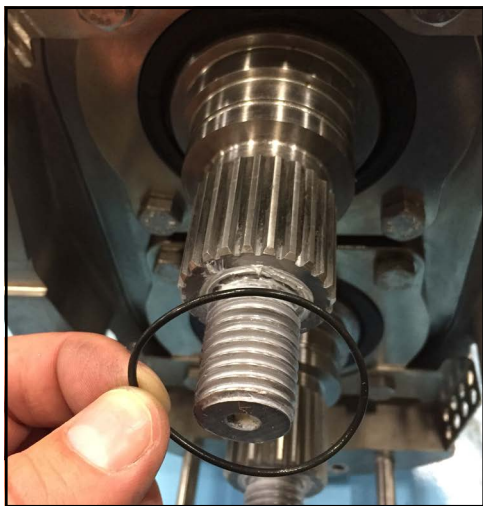


Figure 197 - Install O-ring

16. Install the lubricated adjusting ring O-ring onto the shaft groove.

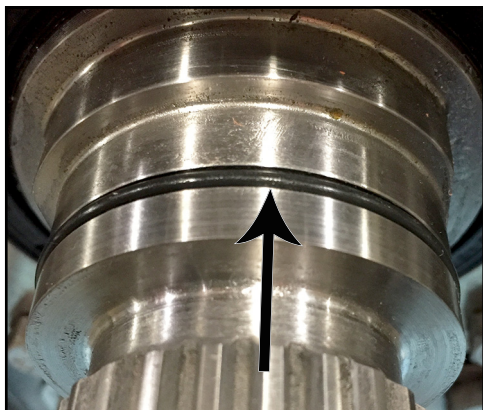


Figure 198 - O-ring installed

17. Figure 198 shows the O-ring installed in the shaft groove.

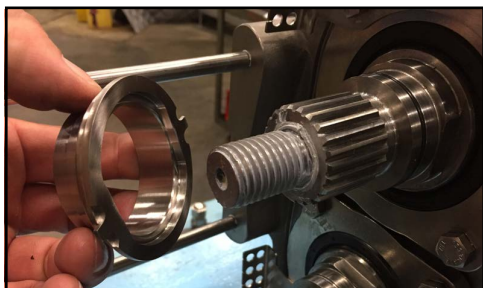


Figure 199 - Install adjusting ring

18. Install the adjusting ring onto each pump shaft. Make sure to align the flats on the adjusting ring to the flats on the drive shafts.

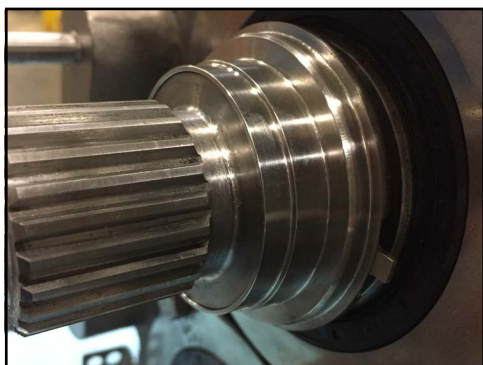


Figure 200 - Adjusting ring installed

19. Figure 200 shows the adjusting ring installed.

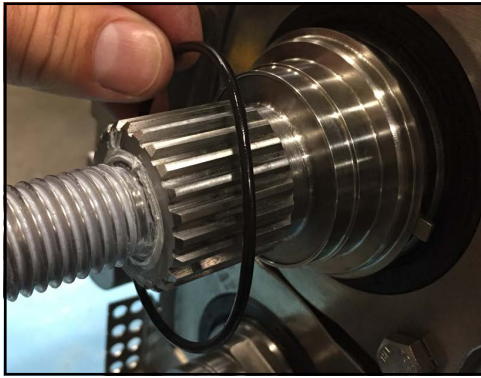


Figure 201 - Install O-ring

20. Install the rotary seal O-ring on each shaft.

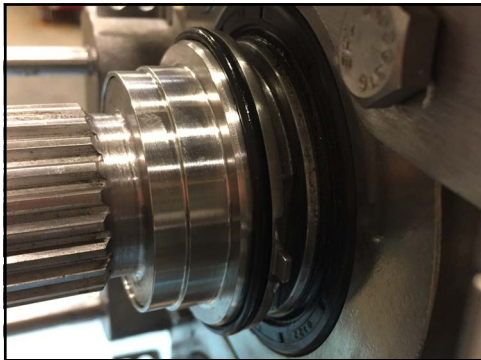


Figure 202 - O-ring installed

21. Figure 202 shows the rotary seal O-ring installed on the shaft.

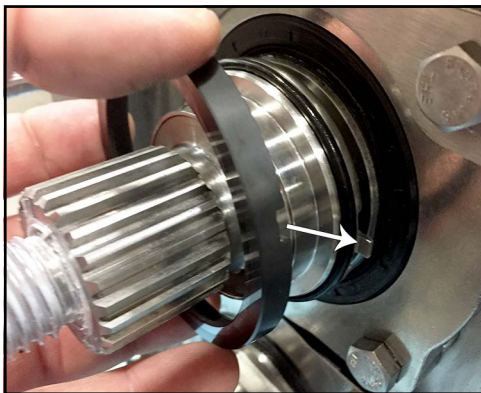


Figure 203 - Install flush-side rotary seal

22. Install the flush-side rotary seal onto the shaft, aligning the tab with the notch on the seal.

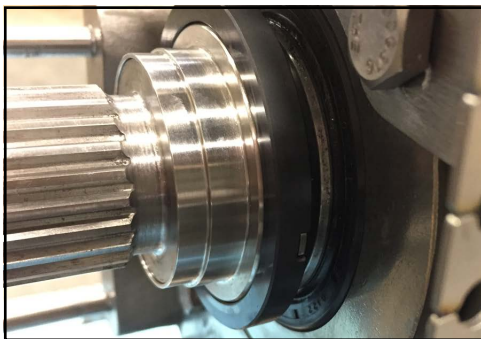


Figure 204 - Rotary seal installed

23. Figure 204 shows the seal installed.

Generation 1 Seal

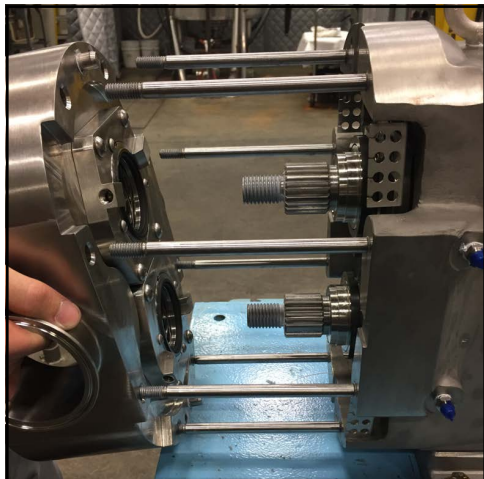


Figure 205 - Install pump body

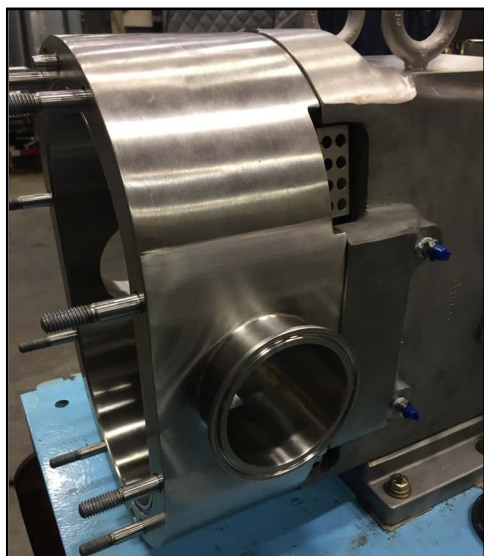


Figure 206 - Pump body installed



Figure 207 - Install body retaining screws

Single and Double Mechanical Seal

Install Pump Body

⚠ CAUTION

Make sure the pump is securely bolted or clamped down prior to performing any maintenance work. The pump center of gravity changes as parts are added or removed, and could result in tipping of an unsecured pump.

⚠ CAUTION

To lift the body of a 130, 133, 134, 180, 184, 210, 214, 220, 223, 224, 320, or 324-U3, use a lifting strap threaded through the ports on either side of the body.

1. Install the pump body onto the gear case. Confirm that the pump body dowel pins align with the correct size bushing on the gear case.

NOTE: Double mechanical seal shown.

2. Figure 206 shows the pump body installed on the gear case.

3. Install the body retaining screws. Lubricate the thread with food-grade anti-seize. Lightly hand-tighten the screws, so the pump body is securely seated against the gear case.

Generation 1 Seal

Install Product-Side Rotary and Stationary Seal

NOTE: Applies to both single and double mechanical seal.

1. Install the lubricated stationary seal O-ring onto the stationary seal.



Figure 208 - Install seal O-ring



Figure 209 - Seal O-ring installed

2. Figure 209 shows the O-ring installed on the stationary seal.



Figure 210 - Install stationary seal

3. Install the stationary seal into the pump body. Align the notches in the seal with the tabs on the drive ring (see arrow in Figure 210). Push the seal into the pump so that the O-ring can seat in the bore and hold the seal in place.



Figure 211 - Push on stationary seal

4. After installing the stationary seal, push on it and it should spring back freely. If it does not spring back, check the seal installation.



Figure 212 - Stationary seal installed

5. Figure 212 shows the stationary seal installed.



Figure 213 - Install seal O-ring

6. Install the lubricated rotary seal O-ring into the rotor.



Figure 214 - Seal O-ring installed

7. Figure 214 shows the O-ring installed.



Figure 215 - Install rotary seal

8. Install the rotary seal into the rotor. Align the notches in the seal to the drive pins on the rotor.



Figure 216 - Rotary seal installed

9. After installing the rotary seal, it should fit solidly in the rotor as shown in Figure 216.

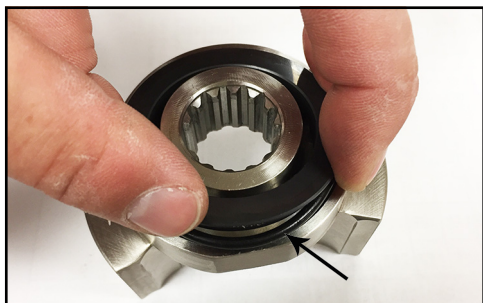


Figure 217 - Seal O-ring pinched

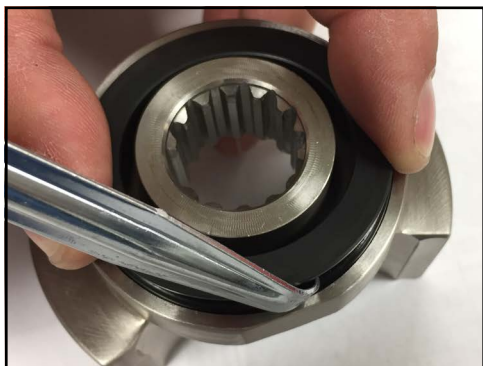


Figure 218 - Push in O-ring

10. Make sure the seal O-ring is not pinched.

11. If the O-ring is pinched as shown in Figure 217, push in the O-ring with the O-ring removal tool while inserting the seal. (For part number, see "O-ring Removal Tools" on page 122.)



Skip to "Install Rotors" on page 107.

O-ring Seal

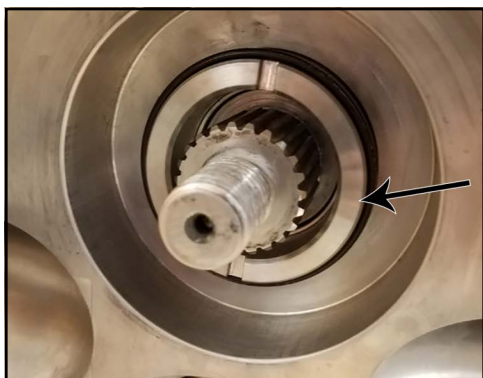


Figure 219 - Sleeve remaining after rotor removal

Remove Product-Side Seal Components

NOTE: Removing the rotor normally does not remove the sleeve; the sleeve must be removed separately. Figure 219 shows the sleeve remaining after the rotor has been removed.



Figure 220 - Remove sleeve, O-ring

1. Grasp the sleeve with your fingers and pull it out of the seal housing.
2. Remove the sleeve front O-ring (indicated by the arrow in Figure 220) from the sleeve and discard it.



Figure 221 - Remove O-ring

Removing a single O-ring or the front O-ring of a double O-ring seal

1. Remove the front O-ring using either the Standard O-ring removal tool (part no. AD0096001, shown) or U3 Double O-Ring Seal Removal Tool (part no. 140062+, pictured in Figure 222).
2. Discard the used O-ring.



Figure 222 - Remove O-ring

Removing the back O-ring of a double O-ring seal

1. Use the U3 Double O-Ring Seal Removal Tool, part no. 140062+.



Figure 223 - Remove O-ring

2. The O-ring fits into a groove on the seal housing. With the hook on the tool facing down (facing the groove), slide the tool between the O-ring and the groove to dislodge the O-ring.



Figure 224 - Remove O-ring

3. Then twist the tool so the hook faces the opposite direction (toward the shaft), and pull the O-ring out of the seal housing.
4. Discard the used O-ring.



The seal sleeve and O-rings in a U3 O-ring seal can be replaced without removing the pump body. To replace or service these components only, skip to "Install Seal O-ring" on page 105.



Figure 225 - Remove body retaining screws

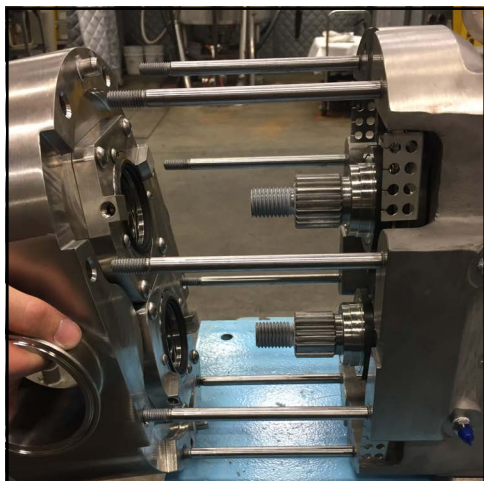


Figure 226 - Remove pump body



Figure 227 - Remove bolts



Figure 228 - Remove seal housing

Remove Pump Body

1. Remove the two body retaining cap screws.

Table 15: Body Retaining Screws Wrench Size

Model	Wrench Size
006, 014, 015, 018, 030, 034, 040	3/16"
045, 060, 063, 064, 130, 133, 134	1/4"
180, 184, 220, 223, 224, 210, 214, 320, 324	5/16"

2. Remove the body from the gear case. If needed, use a plastic mallet to tap the body away from the gear case, until the dowel pins are dislodged from the bushings.
3. Slide the body straight off the body studs to prevent damaging the mechanical seal parts.

CAUTION

To lift the body of a 130, 133, 134, 180, 184, 210, 214, 220, 223, 224, 320, or 324-U3, use a lifting strap threaded through the ports on either side of the body.

4. Place the body on a protected surface with the seals facing up to protect the seals.

Remove Flush-Side Seal Components

1. Using an Allen wrench, remove the bolts.

2. Remove the seal housing.



Figure 229 - Remove O-ring

3. Remove the seal housing O-ring and discard it.



Figure 230 - Remove wave spring

4. Remove the wave spring from the shaft.



Figure 231 - Remove seal seat

5. Remove the seal seat from the shaft.



Figure 232 - Remove O-ring

6. Remove the sleeve back O-ring from the groove on the shaft and discard it.

Install Body Seal Components



Figure 233 - Seal housing O-ring installed

1. Place the body on a protected surface. Lubricate and install the seal housing O-ring. Figure 233 shows the seal housing O-ring installed.



Figure 234 - Line up bolt holes

2. Line up the bolt holes of the O-ring seal housing with the holes on the body.

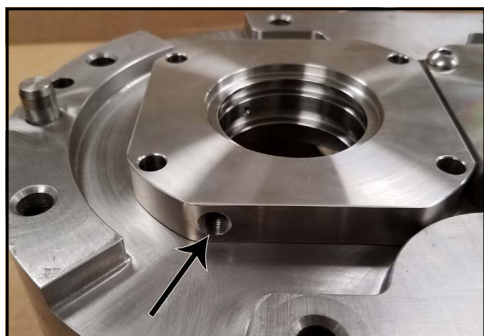


Figure 235 - Flush hole location

3. For a double O-ring seal, position the housing so that the flush holes are located toward the outer edge of the body, not toward the middle.

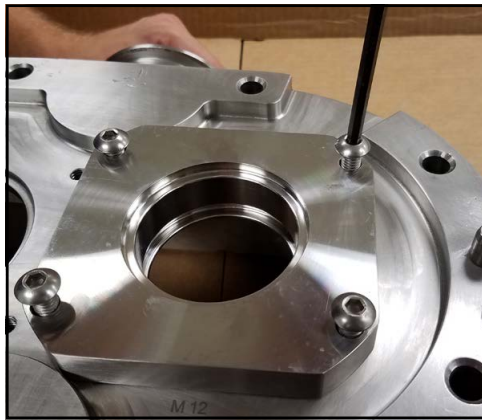


Figure 236 - Install bolts

4. Lubricate the threads of the seal housing bolts with food grade anti-seize. Using an Allen wrench, install the 4 seal housing bolts.
5. Torque the bolts to the specified torque value:

Table 16: Seal Housing Bolt Torque

U3 Model	Seal Housing Bolt Torque
006, 014, 015, 018	7.4 ft-lb / 10 N·m
030, 034, 040, 045, 060, 063, 064, 130, 133, 134, 180, 184, 220, 223, 224, 210, 214, 320, 324	14.8 ft-lb / 20 N·m



Figure 237 - Seal housings installed

6. Repeat for the second seal housing. Figure 237 shows the seal housings installed.

Install O-ring Seal

1. Lubricate the sleeve back O-ring and install it in the groove on the shaft.



Figure 238 - Lubricate and install O-ring

2. Figure 239 shows the O-ring installed on the shaft.



Figure 239 - O-ring installed



Figure 240 - Install seal seat



Figure 241 - Seal seat installed



Figure 242 - Install wave spring

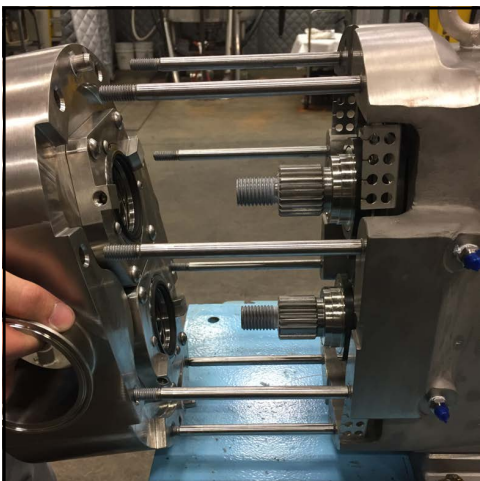


Figure 243 - Install pump body

3. Make sure the flats of the seal seat are aligned with the flats on the shaft and place the seal seat on the shaft.

4. Figure 241 shows the seal seat installed on the shaft.

5. Install the wave spring on the shaft.

Install Pump Body

⚠ CAUTION

Make sure the pump is securely bolted or clamped down prior to performing any maintenance work. The pump center of gravity changes as parts are added or removed, and could result in tipping of an unsecured pump.

⚠ CAUTION

To lift the body of a 130, 133, 134, 180, 184, 210, 214, 220, 223, 224, 320, or 324-U3, use a lifting strap threaded through the ports on either side of the body.

1. Install the pump body onto the gear case. Confirm that the pump body dowel pins align with the correct size bushing on the gear case.

NOTE: Double mechanical seal shown.



Figure 244 - Pump body installed

2. Figure 244 shows the pump body installed on the gear case.



Figure 245 - Install body retaining screws

3. Install the body retaining screws. Lubricate the thread with food-grade anti-seize. Lightly hand-tighten the screws, so the pump body is securely seated against the gear case.

Install Seal O-ring

NOTE: Do not lubricate the seal O-ring.

1. For a single O-ring seal, install the seal O-ring in the front groove in the seal housing.
2. For a double O-ring seal, install the back O-ring first, then install the front O-ring. The O-rings fit into the grooves in the seal housing.



Figure 246 - Install seal O-ring

Install Rotary Seal Components

1. Lubricate and install the sleeve front O-ring on the rotor.



Figure 247 - Install sleeve front O-ring

2. Figure 248 shows the sleeve front O-ring installed.

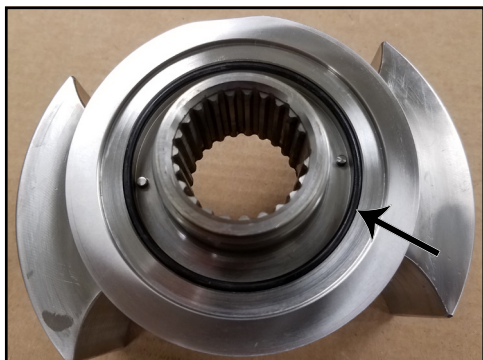


Figure 248 - Sleeve front O-ring

3. Line up the notch (white arrow) in the O-ring seal sleeve with the pin (black arrow) on the rotor.



Figure 249 - Line up notch and pin

4. Press the sleeve into place on the rotor.



Figure 250 - Press sleeve into place



Figure 251 - Seal sleeve installed

5. Figure 251 shows the seal sleeve installed on the rotor.



Figure 252 - Lubricate seal sleeve

6. Lubricate the outer surface of the seal sleeve.
7. Continue to install the rotors.

NOTE: Mechanical seals are shown in the “Install Rotors” section, but the instructions apply to the O-ring seal as well.

Fluid Head Assembly - Rotors and Cover

Install Rotors

NOTE: Mechanical seals are shown in this section, but the instructions apply to the O-ring seal as well.

1. Align the timing spline of the rotor and the pump shaft.

NOTE: Mechanical seal shown.

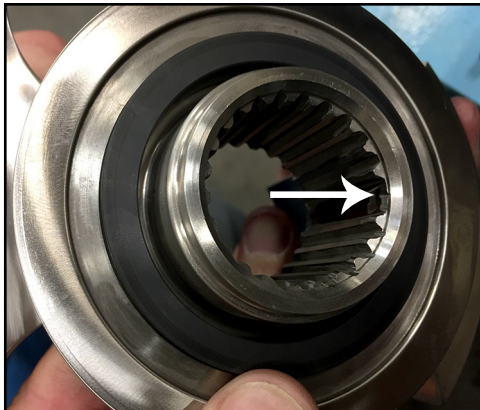


Figure 253 - Timing spline of rotor

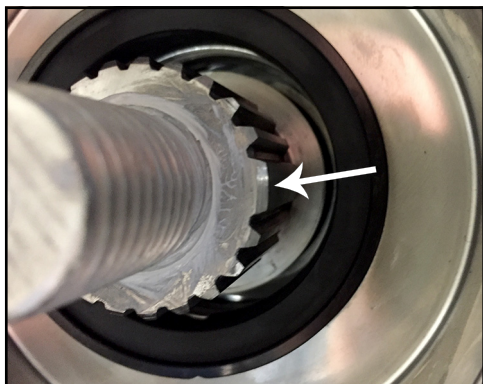


Figure 254 - Timing spline of shaft

2. Figure 254 shows the timing spline of the shaft.

NOTE: Mechanical seal shown.



Figure 255 - Push rotor on shaft

3. Push the rotor onto the shaft.

NOTE: When you push on the rotor, you should feel pressure from the seal spring. (With the O-ring seal, you should feel a little pressure from the spring, but not as much as from the mechanical seal.)

NOTE: Mechanical seal shown.



Figure 256 - Rotor installed

4. Figure 256 shows the rotor installed. Repeat these steps to install the second rotor.



Figure 257 - Install O-ring

Install Rotor Nuts

1. Install the lubricated rotor nut O-ring onto the rotor nut.



Figure 258 - O-ring installed

2. Figure 258 shows the rotor nut O-ring installed.



Figure 259 - Install rotor nut

3. Apply a small amount of anti-seize to the shaft threads, then install the rotor nut.
4. Repeat these steps for the second rotor.

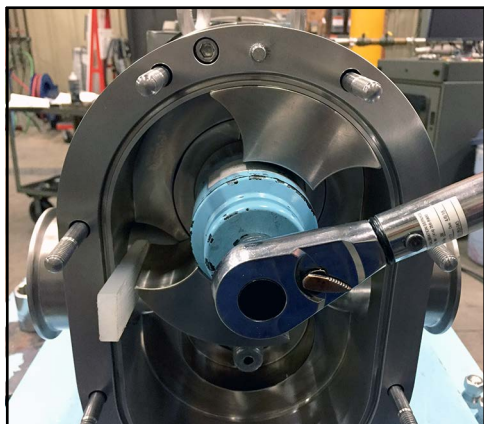


Figure 260 - Torque rotor nut

Table 18: Rotor Nut Torque

U3 Model	Rotor Nut Torque
006, 014, 015, 018	50 ft-lb (68 N·m)
030, 034, 040	120 ft-lb (163 N·m)
045, 060, 063, 064, 130, 133, 134	250 ft-lb (339 N·m)
180, 184, 220, 223, 224	325 ft-lb (441 N·m)
210, 214, 320, 324	375 ft-lb (508 N·m)

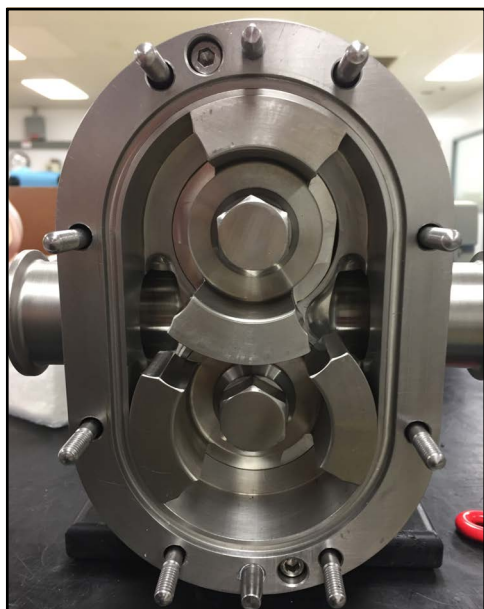


Figure 261 - Rotors installed

- Insert the rotor blocking tool (part number 139790+) to keep the rotors from turning when installing the rotor nuts.

NOTE: When working on a rotor, always block the rotor against the body, not against the other rotor. See Figure 260.

NOTE: SPX FLOW recommends using the Non-Marring Socket Tool for Rotor Nuts (see below) to protect the rotor nut when torquing.

Table 17: Rotor Nut Wrench Size and Socket Tool

U3 Model	Wrench Size	Socket Tool
006, 014, 015, 018	15/16"	140074+
030, 034, 040	1-1/4"	139795+
045, 060, 063, 064, 130, 133, 134	1-5/8"	139796+
180, 184, 220, 223, 224	2-1/4"	139797+
210, 214, 320, 324	2-3/8"	126536+

- Torque the rotor nuts to the specified torque (see Table 18). Remove the rotor blocking tool after torquing.

CAUTION

Use a torque wrench to tighten the rotor nuts to the proper torque. Failure to tighten the nuts properly could result in the nuts loosening during operation, causing damage to the pump.

- Figure 262 shows the rotors installed.
- Double Mechanical Seal only: Turn on the flush and make sure there are no leaks. If there are leaks, check for pinched O-rings or cracked seals.



Figure 262 - Install cover gasket

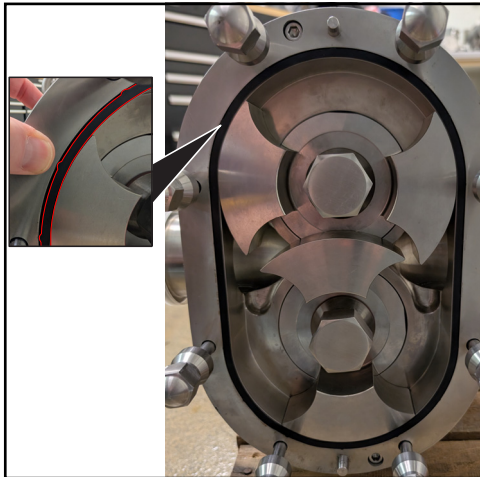


Figure 263 - Cover gasket installed



Figure 264 - Install cover

Install Cover

1. Install the cover gasket into the groove on the pump body.

NOTE: Press on hump with fingers firmly and evenly into place.

2. Figure 263 shows the cover gasket installed. Apply an anti-seize compound compatible with the product to the threads of the body studs.

3. Align the pump body studs with the cover holes and install the cover on the pump body.

⚠ CAUTION

To lift the cover on a 210, 214, 320, or 324-U3, attach an eye bolt to the threaded hole in the cover and attach lifting straps or chains to the eye bolt.



Figure 265 - Install cover nuts

4. Install the cover nuts by hand, then torque the cover nuts to the correct torque.

⚠ CAUTION

Failure to tighten the cover nuts to the proper torque could cause the body studs to fail prematurely under high pressure.

Table 19: Cover Nut Torque

U3 Model	Cover Nut Torque
006, 014, 015, 018	7 ft-lb / 10 N·m
030, 034, 040	11 ft-lb / 15 N·m
045, 060, 063, 064	56 ft-lb / 76 N·m
130, 133, 134	25 ft-lb / 34 N·m
180, 184, 220, 223, 224	110 ft-lb / 149 N·m
210, 214, 320, 324	158 ft-lb / 214 N·m

5. Figure 266 shows the cover installed.

⚠ CAUTION

If a double seal arrangement is used, the seals must be provided with a clean, compatible barrier fluid. Make certain that the flush ports in the pump body are clean and clear.

⚠ WARNING

Do not start a pump with seal flush unless the seal flush is installed and turned on.



Figure 266 - Cover installed

Gear Case

⚠ DANGER

The pump contains internal moving parts. **DO NOT** put hands or fingers into the pump body ports or drive area at any time during operation. To avoid serious injury, **DO NOT** install, clean, service, or repair the pump unless all power is off and locked out and the pump is de-pressurized.

⚠ DANGER

To avoid serious injury, shut off and drain product from the pump prior to disconnecting piping.

⚠ CAUTION

To lift the gear case assembly on pumps larger than 018-U3, attach lifting straps/chains to the two eye bolts on the top of the gear case.

⚠ CAUTION

Make sure the pump is securely bolted or clamped down prior to performing any maintenance work. The pump center of gravity changes as parts are added or removed, and could result in tipping of an unsecured pump.

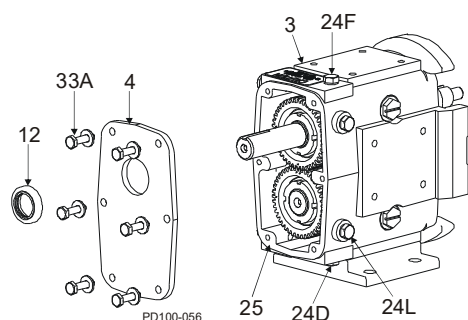


Figure 267 - Remove Gear Case Cover

- 3. Gear Case
- 4. Gear Case Cover
- 12. Oil Seal
- 24D. Oil Drain Plug
- 24F. Oil Fill Plug
- 24L. Oil Level Check Plug, Sight glass
- 25. Silicone Sealant
- 33A. Cap Screw

Remove Gear Case Cover

1. Remove the oil drain plug (Figure 267, item 24D); drain the oil.
2. Remove the cap screws from the gear case (Figure 267, item 33A).
3. Pull the cover (item 4) off the shaft extension. If the cover sticks, use a soft hammer to loosen it.
4. Remove the silicone sealant (item 25) from the gear case and cover.
5. Using an arbor press, remove the oil seal (item 12) from the cover. Discard the used oil seal.

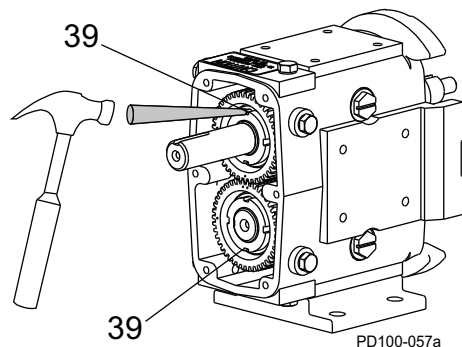


Figure 268 - Straighten Lock Tab on Lock Washers

Remove Shaft

1. Straighten the tab on the lock washers (Figure 268, item 39).

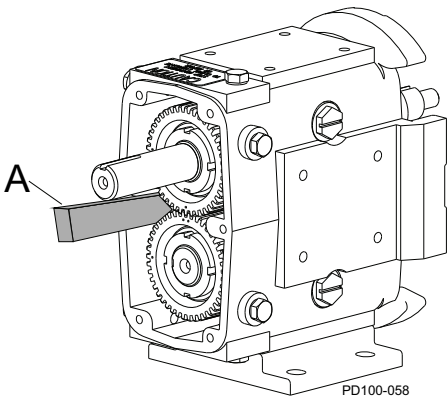


Figure 269 - Block Shaft Rotation

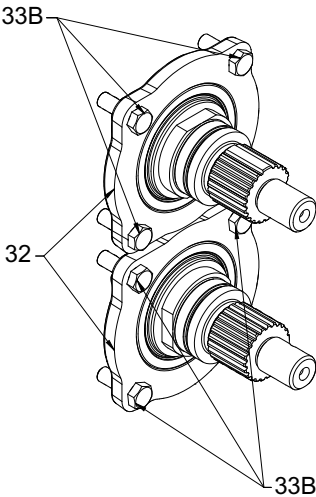


Figure 270 - Remove Bearing Retainers

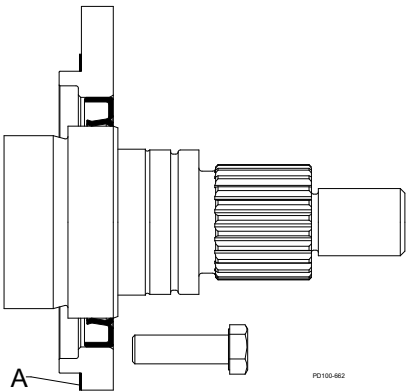


Figure 271 - Remove Sealant from Retainer

2. Prevent the shafts from turning by placing a wedge or soft dowel between the gears (Figure 269, item A). Use a gear nut driver tool (see below) to remove the gear locknut. The gears will be removed later.

Table 20: Gear Nut Driver Tool

Model U3 Pumps	Part Number
006, 014, 015, 018	109281+
030, 034, 040	109282+
045, 060, 063, 064, 130, 133, 134	109283+
180, 184, 220, 223, 224	110304+
210, 214, 320, 324	114702+

3. Remove the front bearing retainer screws (Figure 270, item 33B) and pull off the bearing retainers (item 32). (If a retainer is stuck, leave it in place; it will press out when the shaft is removed.)

4. Remove the silicone sealant (Figure 271, item A) from the bearing retainer and gear case.

NOTE: Protect the liquid end of the shafts by wrapping them with tape.

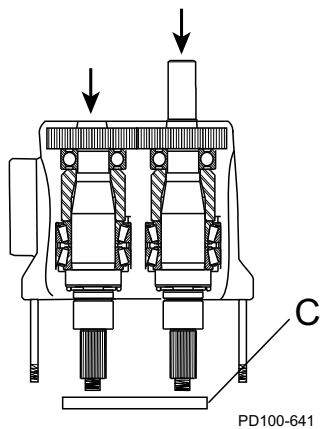


Figure 272 - Press Shafts from Gear Case

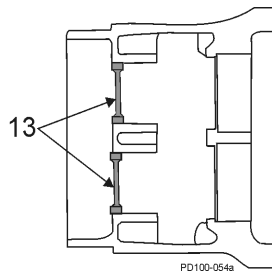


Figure 273 - Remove Rear Oil Seals

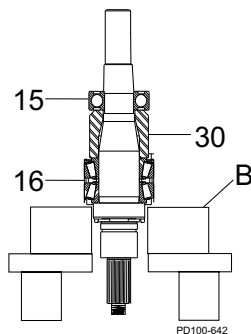


Figure 274 - Remove Bearings From Shaft

⚠ CAUTION

To lift the gear case assembly on pumps larger than 018-U3, attach lifting straps/chains to the two eye bolts on the top of the gear case.

5. Place the gear case on an arbor press with the liquid end facing down. Protect the shaft ends with a wood or plastic block (Figure 272, item C) and press the shafts out of the gear case.
6. Remove the gear spacers and gear keys from the shafts.
7. Remove the gears from the gear case.
8. Press out and discard the front bearing seals from the front bearing retainers. Clean and reuse the bearing isolators, if installed.
9. Remove the shims. If the shafts and bearings will be reused, identify the shims and bearings that belong with each shaft.
10. Press out and discard both rear oil seals in the gear case (Figure 273, item 13).

11. Use a hydraulic press and V-blocks (Figure 274, item B) to remove the bearings (items 15 and 16) and spacer (item 30).

NOTE: Make sure both ends of the shaft are protected when removing the shaft.

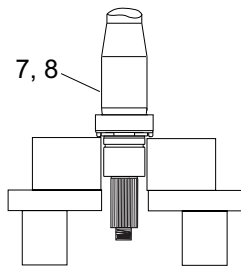


Figure 275 - Grease Shaft

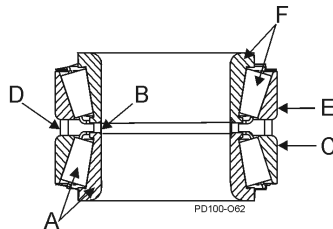


Figure 276 - Bearing assembly

- A. Lower Cone / Roller Assembly
- B. Inner Spacer
- C. Lower Cup
- D. Outer Spacer
- E. Upper Cup
- F. Upper Cone / Roller Assembly

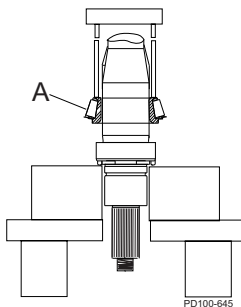


Figure 277 - Press Lower Cone onto Shaft

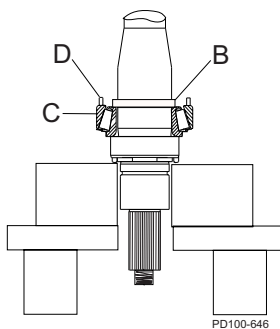


Figure 278 - Install Inner & Outer Spacer and Lower Cup

Front Bearing Assembly

SPX FLOW PD Precision Pumps require bearing assemblies with very tight internal tolerances. In fact, the internal tolerances of “off-the-shelf” bearings can be many times larger than required. Although they are considered in-spec in the bearing industry, they can cause internal damage within an SPX FLOW PD Pump.

SPX FLOW’s proprietary bearing “MATCHING” process starts with top quality bearing assemblies, then sorts, measures, pairs, grinds and adds spacers to them to ensure the matched bearing sets meet the required tight internal tolerances.

SPX FLOW bearings can be cross-referenced and appear to be the same, but competitive bearings are omitting the Matching process, which is imperative to achieve the required internal tolerances. Once a bearing set is matched, it must remain together as a set for the life of the pump, in order to maintain the tight internal tolerances.

NOTE: The following instructions cover the assembly of a six-piece front bearing assembly. For a four-piece assembly, only one spacer and cup is used.

1. Lubricate the front bearing area of the shaft (Figure 275, item 7, 8) with anti-seize. Place it upright in a hydraulic press with the liquid end down.
2. Unwrap the front bearing assembly.

NOTE: DO NOT interchange the parts of one bearing assembly with another. The parts are precisely matched during manufacturing and must be installed as a matched assembly. See Figure 276.

3. Lift the lower cone and roller assembly (Figure 277, item A) out of the bearing stack and place it on the shaft with the radius facing down. Press it onto the shaft until it is seated against the shaft shoulder. **Press only on the inner cone.**
4. Place the inner spacer (Figure 278, item B) over the shaft onto the lower cone and roller assembly.
5. Place the lower cup (item C) over the lower cone and roller assembly, keeping the cup opening toward the assembly.
6. Place the outer spacer (item D) over the shaft and onto the lower cup.

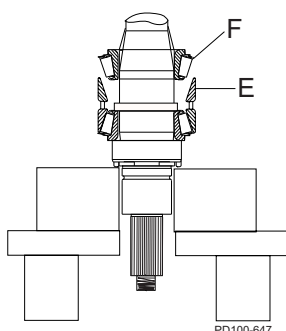


Figure 279 - Install Upper Cup & Upper Cone

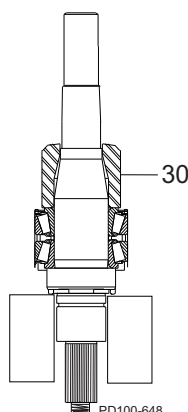


Figure 280 - Install Bearing Spacer

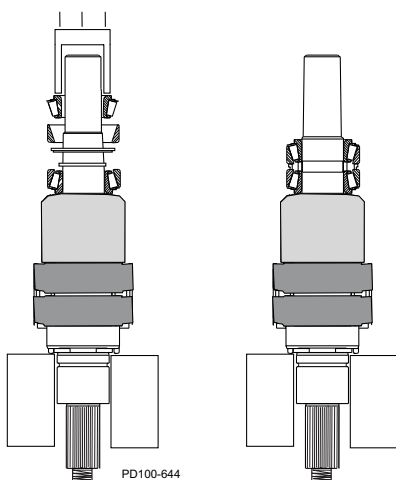


Figure 281 - Rear Tapered Roller Bearing Assembly

7. Place the upper cup (Figure 279, item E) on top of the outer spacer.
8. Lubricate the front bearing area of the shaft with anti-seize, and slip the bearing over the shaft with the roller radius facing up (Figure 279, item F). Press it onto the shaft and into the upper cup (Figure 279, item E).

NOTE: Make sure all components are aligned before pressing. **Press only on the inner cone.**

9. Install the bearing spacer (Figure 280, item 30).

Rear Bearing Assembly

Models 006, 014, 015, 018, 030, 034, and 040 use a single ball bearing assembly for the rear bearing. All other models use a tapered roller bearing assembly similar to the front bearings.

1. Unwrap the rear bearing assembly.

NOTE: DO NOT interchange the parts of one bearing assembly with another. These parts are precisely matched during manufacturing and must be installed as a matched assembly.

- **For models with ball bearing assemblies:** Lubricate the shaft bearing area with anti-seize, then press the bearing into place. The shielded side of the bearing fits against the bearing spacer. Press only on the inner race.
- **For models with tapered roller bearing assemblies:** Lubricate the shaft bearing area with anti-seize. Follow the “” procedures starting on page 116.

NOTE: Heating the bearings is **NOT** recommended. If bearings are heated, do not exceed 300°F (149°C).

⚠ DANGER

The pump contains internal moving parts. **DO NOT** put hands or fingers into the pump body ports or drive area at any time during operation. To avoid serious injury, **DO NOT** install, clean, service, or repair the pump unless all power is off and locked out and the pump is de-pressurized. Shut off and drain product from the pump prior to disconnecting the piping.

Shimming

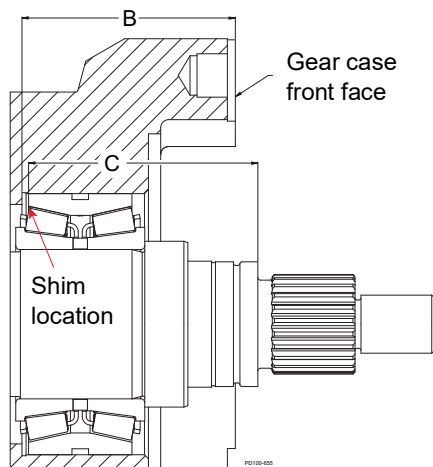


Figure 282 - Measure B & C

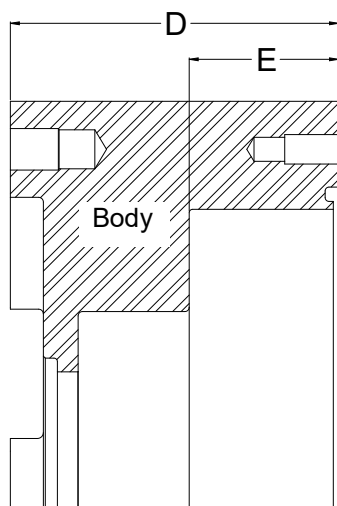


Figure 283 - Measure D & E

- B. Front face of gear case to back of bearing bore
- C. Shaft shoulder to back of bearing race
- D. Body thickness
- E. Depth of rotor cavity

NOTE: Arrange with thicker shims on outside of the shim pack.

CAUTION

Make sure the pump is securely bolted or clamped down prior to performing any maintenance work. The pump center of gravity changes as parts are added or removed, and could result in tipping of an unsecured pump.

- When installing the shafts in the gear case, shim behind the front bearing to achieve the proper backface clearance between the back of the rotors and the body. (See Figure 282.) The backface clearance must be equal for both rotors to prevent the rotors from hitting each other during operation.

Suggested Shims

U3 Model	Standard Shaft	Replacement Shaft	Shim kit
006, 014, 015, 018	.113 in (2.87 mm)	.110 in (2.79 mm)	117889+
030, 034, 040	.105 in (2.27 mm)	.102 in (2.59 mm)	117890+
045, 060, 063, 064, 130, 133, 134	.093 in (2.36 mm)	.088 in (2.24 mm)	117891+
180, 184, 220, 223, 224	.115 in (2.92 mm)	.110 in (2.79 mm)	117892+
210, 214, 320, 324	.125 in (3.18 mm)	.120 in (3.05 mm)	117893+

NOTE: Do not install bearing retainer sealant, gears, or gear locknuts until the correct shimming has been verified.

- If the shafts and/or bearings do not need to be replaced and the shims are marked indicating the shaft and bearing they are matched with, a shim adjustment probably will not be necessary. Reuse the existing tagged shims, shafts and bearings in the same gear case bores.
- If existing shims are lost and/or a standard shaft is used, determine the required shims from the chart.
- If it is necessary to calculate the required shims for replacement shafts, bearings or both, refer to Figure 282 and Figure 283; carry measurements and calculations to three decimal places (e.g. 0.059).
- Determine the shim thickness required for the front bearing:
 - Measure "B" in the gear case and "C" on the shaft (Figure 282).
 - Measure "D" and "E" on the body (Figure 283).
 - Determine the proper backface clearance. Refer to Table 22, "Rotor Clearances," on page 122.
 - Required Shims = Backface clearance - C + B + D - E.
- Place the shims in the gear case, resting against the shoulder in the front bearing bore. (See Figure 282.)

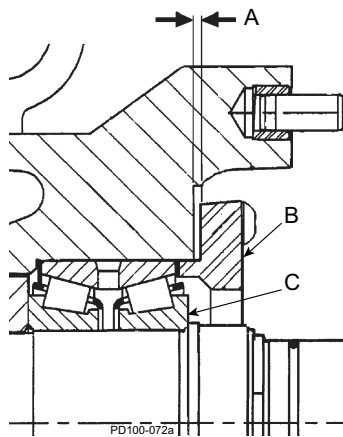


Figure 284 - Bearing Retainer Clearance

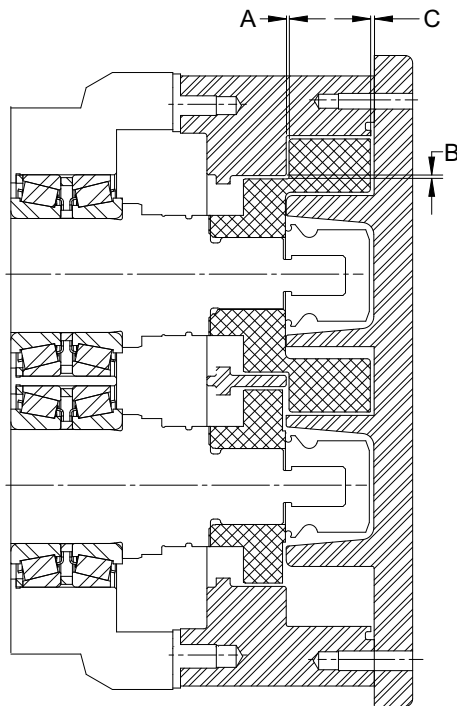


Figure 285 - Measure Clearance

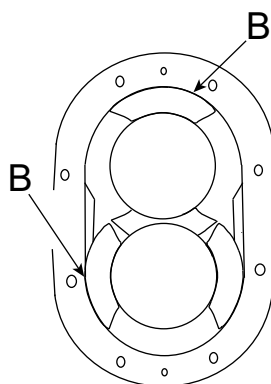


Figure 286 - Measure Clearance

Install Shaft

1. With the shims in place, install the shaft assembly in the front bearing bore with the fluid end facing up. Ensure that the shaft is installed in its original location.

NOTE: The shafts may need to be removed for a final shim adjustment.

2. Lubricate the outside diameter of the bearing.
3. Press the shaft into place until it is seated against the shim pack. **Press only against the outer race of the bearing.**

NOTE: A tube of the same diameter as the outer race of the bearing also can be used to press the shaft into place.

4. Temporarily secure the shaft/bearing in place with bearing retainers to aid in checking the clearances. **DO NOT** install silicone sealant at this time.
5. The bearing retainer (Figure 284, item B) must rest firmly against the bearing. Leave a 0.010 to 0.050 in (0.25 to 1.25 mm) clearance between the back of the bearing retainer and the front of the gear case (Figure 284, item A). If this clearance is not met, place shims between the bearing (Figure 284, item C) and retainer.
6. Temporarily mount the body on the gear case.
7. Secure the body to the gear case using the body retaining screws.
8. Install the rotors and rotor nuts. Rotor nut O-rings and retainer O-rings are not required at this time.
9. Measure the rotor backface clearance (Figure 285, item A) through the port or from the front. The backface clearance for both rotors must be the same to prevent rotor crossover contact and must be ± 0.0005 " of the value found in Table 22, "Rotor Clearances," on page 122.
10. Check the rotor front face clearance (Figure 285, item C).
11. Check the rotor to body clearance (Figure 285 and Figure 286, item B).
12. Check the clearances against Table 22, "Rotor Clearances," on page 122. For other non-standard rotors, check with customer service.

NOTE: If the process uses special clearance rotors, contact customer service with the serial number of the pump for clearance tolerance values.

NOTE: "B" dimension is below the face of the casing.

13. If the backface clearance is not met, disassemble the pump and adjust the shimming to achieve the correct backface clearance.
14. If the rotor to body clearance is not met or is uneven, contact SPX FLOW Application Engineering for proper adjustment procedures.
15. After obtaining proper clearance, remove the rotor nuts, rotors, body, and bearing retainers.

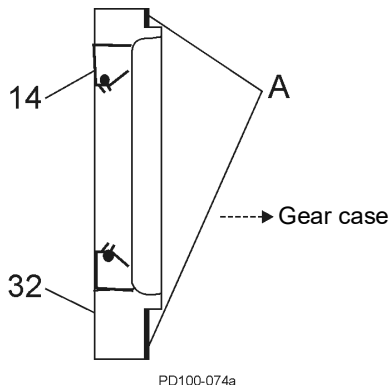


Figure 287 - Install Bearing Retainer

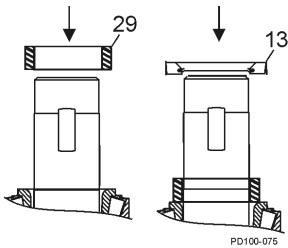


Figure 288 - Install Rear Seal

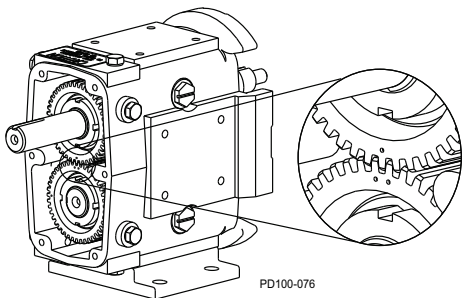


Figure 289 - Timing Gear Marks

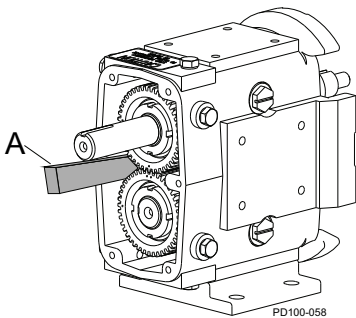


Figure 290 - Block Shaft Rotation

16. Grease the front and rear bearing through the grease fittings until grease is visible around the bearing assemblies. The amount of grease required is listed in "Grease Quantity (per Bearing)" on page 31. Rotate the shafts while greasing to disperse the grease.
17. Lubricate the seal lips and install the grease seals in the bearing retainers (compression spring on inside).
18. Coat the retainer flanges with silicone sealant (Figure 287, item A). (Gore-Tex® sealing tape can be used on silicone free models.) The grease seal (item 14) will be flush with the front of the bearing retainer. On 030 models, the grease seal will be against the step on the inside diameter of the retainer.
19. Install the bearing retainers (Figure 287, item 32).

Install Rear Seal Assembly

NOTE: Place tape or other material over the shaft end to prevent cutting the seal during installation.

1. Install the gear spacers (Figure 288, item 29).
2. Lubricate the inside and outside diameters of the oil seals with oil or grease.
3. Install the oil seals with the spring facing out (Figure 288, item 13).

Install Timing Gears

1. Place the gear keys into the shaft key slots. Angle the keys out for easier installation of the gears.

NOTE: To aid in timing setup, rotate the rotors until they are at right angles to each other before installing the gears.

2. Slide the spur drive gear onto the drive shaft. The spur drive gear has one punch mark on the gear.
3. Slide the short shaft gear onto the short shaft. The short shaft gear has two punch marks on the gear. Straddle the single punch mark of the spur drive gear with the two punch marks on the short shaft gear (Figure 289).
4. Use a wood or nylon block (Figure 290, item A) to keep the shafts from turning. If a block is not available, use rags to block the gears, or with one rotor on the shaft, block the rotor with a nylon dowel.
5. Slide the lock washers onto the shaft. Lubricate the threaded area on the shafts and face of the locknuts with oil or grease.

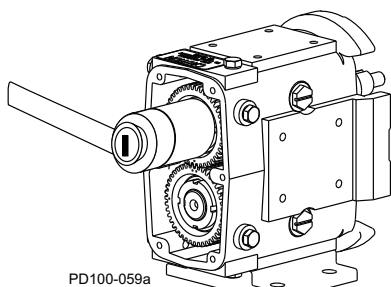


Figure 291 - Install Gear Locknuts

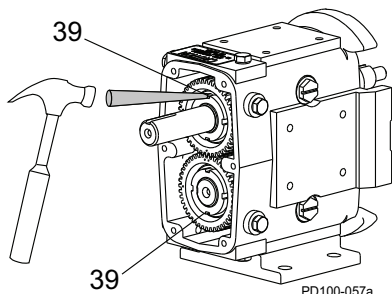


Figure 292 - Bend Locking Tab

NOTE: It is generally best to keep backface clearance to a minimum.

CAUTION

Backface clearance for both rotors must be equal to avoid crossover interference with the adjacent rotor hub.

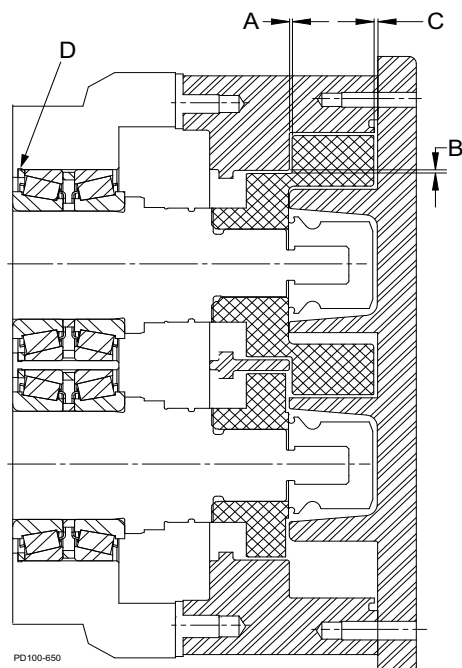


Figure 293 - Clearance Measurements

- Tighten the gear locknuts to the specified torque, using a gear nut driver tool.

Table 21: Torque Values and Gear Nut Driver Tool

Model U3 Pumps	Gear Nut Torque	Tool Part Number
006, 014, 015, 018	120 ft-lb (163 N·m)	109281+
030, 034, 040		109282+
045, 060, 063, 064, 130, 133, 134	140 ft-lb (190 N·m)	109283+
180, 184, 220, 223, 224	230 ft-lb (312 N·m)	110304+
210, 214, 320, 324	320 ft-lb (434 N·m)	114702+

- Bend the locking tab on the lock washers into the locking nut slots, securing the gear locknut into place (Figure 292).

Checking for Proper Clearance

Waukesha Cherry-Burrell brand pumps are designed with close running clearances. Backface clearances are set with shims during assembly.

Shafts are positioned with shims behind the front bearing and locked into gear case with the bearing retainers. Rotors lock against the shaft shoulder. Clearance between the body backface and the back of the rotor wing is called backface clearance.

- To check backface clearance, first mount the body (less seals) onto the housing. Assemble the rotors and secure them with rotor jam nuts.
- With feeler gauges, measure the rotor backface clearance (Figure 293, item A), through the port or from the front.
- Measure the rotor front face clearance (Figure 293, item C).
- Measure the rotor to body clearance (Figure 293, item B).
- Check the measured clearances against Table 22, "Rotor Clearances," on page 122.
- Make corrections as required and follow examples in Table 23, "Backface Clearance Corrections," on page 122, to determine the exact adjustment to make and to avoid unnecessary assembly/disassembly.
- To make shim adjustments, first remove the rotors, body and shafts. Make the required shim adjustment and reassemble. (Figure 293, item D is the front bearing rear shim.)
- Re-check the backface clearances. Be sure both rotors have the same clearance to avoid crossover interference with the adjacent rotor hub.

Table 22: Rotor Clearances

Universal 3 Model	A - Back Face in (mm)		B - Rotor to Body in (mm)		C - Front Face in (mm)	
Rotor Type	Low Viscosity	Standard	Low Viscosity	Standard	Low Viscosity	Standard
006	0.0025 - 0.004 (0.06 - 0.10)	0.0035 - 0.005 (0.09 - 0.13)	0.001 - 0.004 (0.03 - 0.10)	0.0025 - 0.0055 (0.06 - 0.14)	0.004 - 0.005 (0.10 - 0.13)	0.0045 - 0.0055 (0.11 - 0.14)
015, 014, 018	0.0025 - 0.0045 (0.06 - 0.11)	0.003 - 0.005 (0.08 - 0.013)	0.001 - 0.004 (0.03 - 0.10)	0.0025 - 0.0055 (0.06 - 0.14)	0.004 - 0.005 (0.10 - 0.13)	0.0055 - 0.0065 (0.14 - 0.17)
030, 034, 040	0.002 - 0.004 (0.05 - 0.10)	0.0035 - 0.0055 (0.09 - 0.14)	0.001 - 0.005 (0.03 - 0.13)	0.0025 - 0.006 (0.06 - 0.15)	0.0045 - 0.0055 (0.11 - 0.14)	0.006 - 0.007 (0.15 - 0.18)
045, 060, 063 064	0.003 - 0.007 (0.08 - 0.18)	0.004 - 0.008 (0.10 - 0.20)	0.003 - 0.0075 (0.08 - 0.19)	0.005 - 0.010 (0.13 - 0.25)	0.0055 - 0.0075 (0.14 - 0.19)	0.0085 - 0.0105 (0.22 - 0.27)
130, 133, 134	0.003 - 0.007 (0.08 - 0.18)	0.004 - 0.008 (0.10 - 0.20)	0.0035 - 0.0075 (0.09 - 0.19)	0.0055 - 0.0095 (0.14 - 0.24)	0.006 - 0.007 (0.15 - 0.18)	0.009 - 0.0115 (0.23 - 0.29)
180, 184, 220, 223, 224	0.004 - 0.008 (0.10 - 0.20)	0.005 - 0.009 (0.13 - 0.23)	0.0055 - 0.0095 (0.14 - 0.24)	0.009 - 0.013 (0.23 - 0.33)	0.006 - 0.008 (0.15 - 0.20)	0.010 - 0.012 (0.25 - 0.30)
210, 214, 320, 324	0.005 - 0.009 (0.13 - 0.23)	0.007 - 0.011 (0.18 - 0.28)	0.008 - 0.012 (0.20 - 0.30)	0.010 - 0.014 (0.25 - 0.36)	0.008 - 0.010 (0.20 - 0.25)	0.012 - 0.014 (0.30 - 0.36)

Low Viscosity Rotors: -40°F (-40°C) to 180°F (82°C); Standard Clearance Rotors: -40°F (-40°C) to 300°F (149°C). Contact SPX FLOW Application Engineering if alternate rotors are needed.

NOTE: The assembly clearances stated in Table 22 are for reference only. Actual pump clearances may vary based on pump performance testing.

Table 23: Backface Clearance Corrections

Problem	Condition	Correction
Too Much Backface Clearance (A)	Dimension A is greater than the value in Table 22.	A (measured) minus Column A (Table 22) = shims to remove from the rear outer race of the front bearing
	Rotor wing face projects past the body front face	C (measured with depth micrometer) plus C (Table 22) = shims to remove from the rear of the front bearing
Not Enough Backface Clearance (A)	Dimension A is less than the value in Table 22.	Column A (Table 22) minus A (measured) = shims to add to the rear outer race of the front bearing

NOTE: If the clearance corrections in Table 23 have been performed and desired performance is not achieved, contact SPX FLOW technical services for guidance.

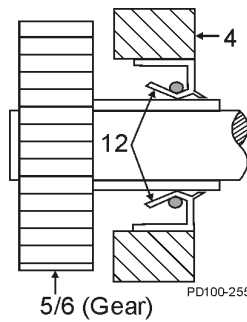


Figure 294 - Orientation of Oil Seal

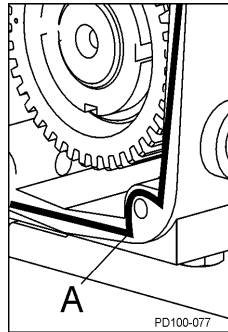


Figure 295 Sealant Placement

Install Gear Case Cover

1. Lubricate the inside diameter of a new oil seal.
2. Press the new oil seal (Figure 294, item 12) into the gear case cover (item 4) flush with the outside face, with the spring facing in.

3. Apply silicone sealant to the back of the gear case. (Gore-Tex® sealing tape can be used on silicone-free models.) Place tape on the inside of the screw holes. (Figure 295, item A).
4. Tape the shaft end to prevent cutting the seal on the keyway. Mount the cover assembly on the gear case. Secure it with cap screws and washers.
5. Remove the tape from the shaft end.

NOTE: Make sure that the shaft is centered in the lip seal before securing the cap screws.

6. Install the oil drain plug.
7. Fill gear case with gear oil to the proper level. Refer to "Lubrication" on page 31.

Jacketed Cover

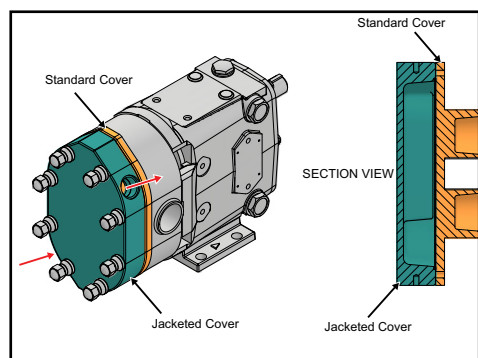


Figure 296 - Jacketed Cover

Available on Models 006, 015, 018, 030, 040, 045, 060, 130, 180, 220, 210, and 320.

The jacketed cover is designed to allow circulation of a heating or cooling medium. The purpose is to help preheat or cool the pumping head and sustain operating temperature during short shut down periods. It should not be used as a heat exchanger to control pumping temperature during operation.

NOTE:

1. Pressure limit for cover media is 60 PSI.
2. Jacketed covers require longer mounting studs in the gear case.

Pump Jackets

The redesigned Stainless Steel Jacket cover is an add-on part that attaches to the end of the pump cover, see Figure 296. It maintains the original design's configuration, including the same size ports and interface, but features an updated separable jacket for easier cleaning & maintenance.

Detachable jacket with pipe passages are available for higher pressure and temperature. Consult SPX Flow Application Engineering for recommendations.

Jacketed Cover Disassembly

⚠ WARNING

When disassembling the jacketed cover assembly, be cautious as hot or cold water gets trapped inside. If the water is released, it can cause burns or other injuries. Always wear protective gloves to shield your hands and body from potential harm.

1. Remove the cap screw (75) from the cover (2B).
2. Place the cover (2B) on a protected surface with the finished surfaces facing up.

⚠ CAUTION

To lift the cover on a 210, 320-U3, attach an eye bolt to the threaded hole in the cover and attach lifting straps or chains to the eye bolt.

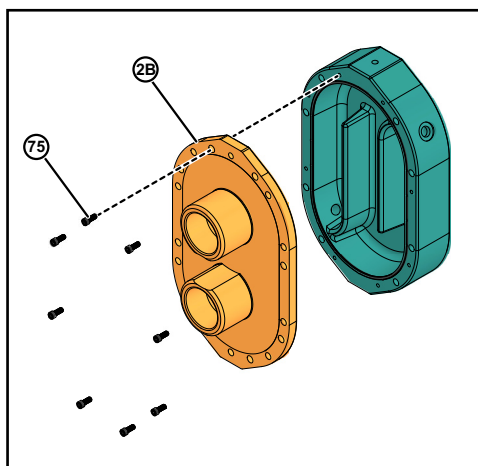


Figure 297 - Remove Cap Screw and Cover

3. Remove and inspect the Jacketed cover gasket (36C).

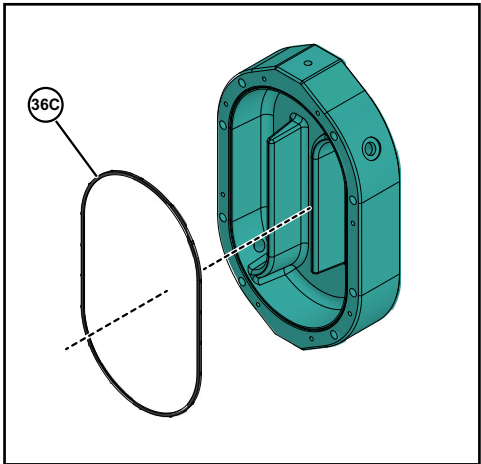


Figure 298 - Remove Gasket

Jacketed Cover Assembly

1. Install the Jacketed cover gasket (36C) into the groove on the Jacketed cover.

NOTE: Press on hump with fingers firmly and evenly into place.

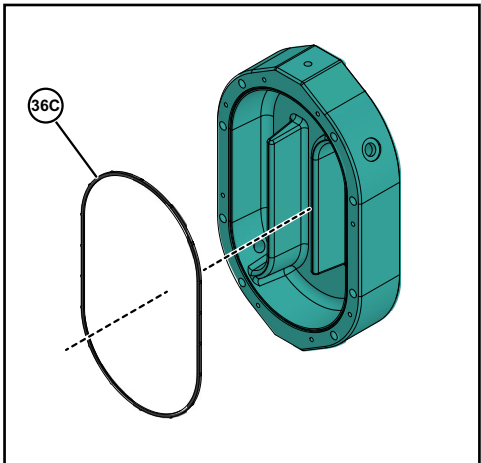


Figure 299 - Install Gasket

2. Assemble the cover (2B) and jacketed cover (2A) using cap screws (75).

Table 24: Cover Cap Screw Torque

U3 Model	Cover Cap Screw Torque
006, 015, 018	1.4 ft-lb / 1.9 N·m
030, 040, 045, 060, 130, 180, 220, 210, 320	9.33 ft-lb / 12.6 N·m

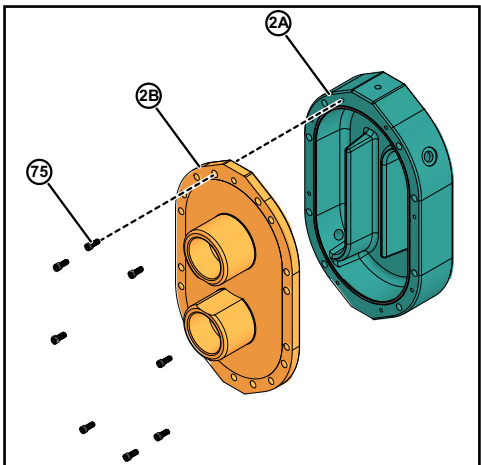





Figure 300 - Attach cover and jacketed cover

NOTE: For the Jacketed Cover Kit, see 168.

Table 25: Standard O-Ring Selections, Descriptions and Color Codes for U3 Pumps

Ethylene Propylene Diene Rubber (EPDM) Compound Color: Black or Purple Color Code: Green FDA Compliant to 21CFR177.2600		Perfluoroelastomer (FFKM) Compound Color: Black Color Code: None Individually packaged with size and material noted.	
Fluorocarbon Rubber (FKM) Compound Color: Rust, Brown or Black Color Code: White FDA Compliant to 21CFR177.2600 3-A Sanitary			

Reference Tables

Table 26: Universal 3 Wrench Size				Gear Nut Driver Tool
Model	Rotor Nut	Body Retaining Cap Screw	Cover Nut	
006, 014, 015, 018	15/16"	3/16"	5/8"	109281+
030, 034, 040	1-1/4"			109282+
045, 060, 063, 064	1-5/8"	1/4"	7/8"	109283+
130, 133, 134	2-1/4"	5/16"		110304+
180, 184, 220, 223, 224	2-3/8"		1"	114702+

Table 27: Torque Values				
Model	Gear Nut	Rotor Nut	Cover Nut	Seal Housing Bolt
006, 014, 015, 018	120 ft-lb 163 N·m	50 ft-lb 68 N·m	7 ft-lb 10 N·m	7.4 ft-lb 10 N·m
030, 034, 040		120 ft-lb 163 N·m	11 ft-lb 15 N·m	14.8 ft-lb 20 N·m
045, 060, 063, 064	140 ft-lb 190 N·m	250 ft-lb 339 N·m	56 ft-lb 76 N·m	
130, 133, 134			25 ft-lb 34 N·m	
180, 184, 220, 223, 224	230 ft-lb 312 N·m	325 ft-lb 441 N·m	110 ft-lb 149 N·m	
210, 214, 320, 324	320 ft-lb 434 N·m	375 ft-lb 508 N·m	158 ft-lb 214 N·m	

Table 28: Jacketed Cover Cap Screw Torque Values	
Model	Jacketed Cover Cap Screw Torque
006, 015, 018	1.4 ft-lb / 1.9 N·m
030, 040, 045, 060, 130, 180, 220, 210, 320	9.33 ft-lb / 12.6 N·m

Table 29: Arbor or Hydraulic Press Tonnage (Approximate)						
Model	Shaft		Front Bearing		Rear Bearing	
	IN	OUT	ON	OFF	ON	OFF
006, 014, 015, 018	.25	.50	.50	1.00	.50	1.00
030, 034, 040	.25	1.00	.50	1.00	.50	1.00
045, 060, 063, 064	.50	1.00	2.00	5.00	3.00	5.00
130, 133, 134	.50	1.00	5.00	15.00	5.00	15.00
180, 184, 220, 223, 224	.50	1.00	5.00	2.00	5.00	2.00

Troubleshooting

PROBLEM	POSSIBLE CAUSE	SUGGESTED ACTION
No flow, pump rotors are not turning	Drive motor not running.	Check resets, fuses, circuit breakers.
	Keys sheared or missing.	Replace.
	Drive belts, power transmission components slipping or broken.	Replace or adjust.
	Pump shaft or gears sheared.	Inspect: and replace parts as necessary.
No flow, pump rotors are turning	Rotors turn in the wrong direction.	Check motor hookup to reverse motor rotation.
	Relief valve not properly adjusted, or held open by foreign material.	Adjust or clear valve.
	Suction port is blocked, not allowing flow to the pump.	Check all inlet valves, strainers, tank outlet ports.
No flow, pump not priming	Valve closed in inlet line.	Open valve.
	Inlet line clogged or restricted.	Clear line, clean filters, etc.
	Air leaks due to bad gaskets or pipe connections.	Replace gaskets; check lines for leakage (can be done by air pressure or by filling with liquid and pressurizing with air).
	Pump speed too slow.	Increase pump speed.
	Pump speed too fast for high-viscosity liquid.	Decrease pump speed.
	Liquid drains or siphons from system during off periods.	Use foot valve or check valves. Filling inlet lines with material before startup may solve startup priming problems due to no material in system.
	"Air" lock caused by fluids which "gas off", or vaporize, or allow gas to come out of solution during off periods.	Install and use a manual or automatic air bleed from pump or lines near pump.
	Extra clearance on rotors, worn pump.	Increase pump speed, use foot valve to improve priming. Replace worn rotors.
	Net inlet pressure available too low.	Check Net Inlet Pressure Available & Net Inlet Pressure Required. Change inlet system as needed.
	On "Vacuum" inlet system: On initial start-up, atmospheric "blow back" prevents pump from developing enough differential pressure to start flow.	Install check valve in discharge line.

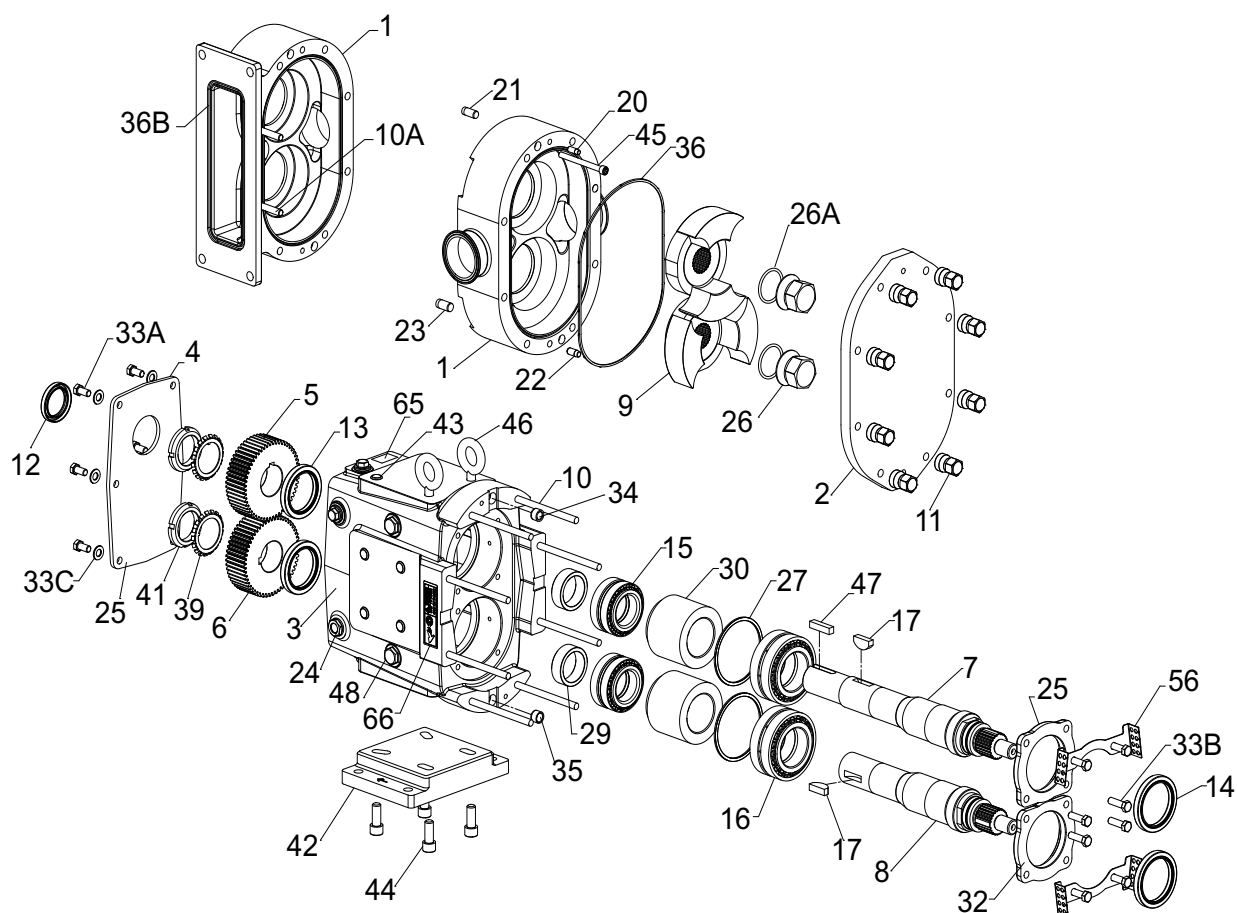
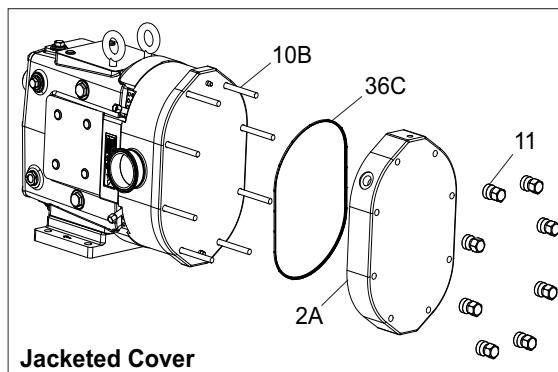
PROBLEM	POSSIBLE CAUSE	SUGGESTED ACTION
Insufficient flow	Speed too low or too high to obtain desired flow.	Check flow-speed curve (available from SPX FLOW website) and adjust as necessary.
	Air leak due to bad seals, pipe connections, or other equipment.	Replace seals, check inlet fittings.
Insufficient flow—flow being bypassed somewhere	Flow diverted in branch line, open valve, etc.	Check system and controls
	Relief valve not adjusted or jammed.	Clear or adjust valve.
Insufficient flow—high slip	Standard clearance rotors on "cold" fluid and/or low viscosity fluid.	Replace with low viscosity rotors.
	Worn pump.	Increase pump speed (within limits). Replace rotors
	High pressure.	Reduce pressure by adjusting system settings or hardware.
Fluid vaporization ("starved" pump inlet)	Strainers, foot valves, inlet fittings or lines clogged.	Clear lines. If problem continues, inlet system may require changing.
	Inlet line size too small, inlet line too long. Too many fittings or valves. Foot valve, strainers too small.	Increase inlet line size. Reduce length, minimize direction and size changes, reduce number of fittings.
	NIPA - Net Inlet Pressure Available at Pump is too low.	Raise liquid level in source tank to increase Net Inlet Pressure (NIPA). Increase Net Inlet Pressure Available at Pump by raising or pressurizing source tank. Select larger pump size with lower Net Inlet Pressure Required.
	Fluid viscosity greater than expected.	Reduce pump speed and accept lower flow, or change system to reduce line losses. Change temperature of product to reduce viscosity.
	Fluid temperature higher than expected (vapor pressure higher).	Reduce temperature, reduce speed and accept lower flow or change system to increase Net Inlet Pressure Available.

PROBLEM	POSSIBLE CAUSE	SUGGESTED ACTION
Noisy operation	Cavitation	
	High fluid viscosity. High vapor pressure fluid. High temperature.	Slow down pump, reduce temperature, change system setup.
	Net Inlet Pressure Available less than Net Inlet Pressure Required.	Increase NIPA - Net Inlet Pressure Available or reduce NIPR - Net Inlet Pressure Required. Contact SPX FLOW if necessary.
	Air or gas in fluid	
	Leaks in the pump or piping. Dissolved gas or naturally aerated products.	Correct leaks. Minimize discharge pressure (also see "Cavitation," above).
Noisy operation caused by mechanical problems	Rotor to body contact	
	Improper assembly of pump.	Check clearances and adjust shimming.
	Distortion of pump due to improper piping installation.	Change piping installation to eliminate piping stress and distortion on body.
	Pressures required higher than the pump is rated for.	Reduce discharge pressure required.
	Worn bearings.	Rebuild with new bearings and lubricate regularly.
	Rotor to Rotor Contact	
	Loose or incorrectly-timed gears. Worn gear splines.	This has caused severe damage to components - rebuild with new parts. This has caused severe damage to components - rebuild with new parts.
Pump requires excessive power (overheats, stalls, high current draw, breakers trip)	Drive noise caused by gear trains, chains, couplings, bearings.	Repair or replace drive parts. Check bearings for damage and replace as necessary.
	Higher than expected viscosity losses.	If within pump rating, increase drive size.
	Higher than expected pressures.	Reduce pump speed. Increase line sizes.
	Fluid is colder with a higher viscosity than expected.	Heat fluid, insulate lines or heat trace lines. Increase line sizes.

PROBLEM	POSSIBLE CAUSE	SUGGESTED ACTION
Pump requires excessive power (overheats, stalls, high current draw, breakers trip)	Fluid sets in line and pump during shutdown.	Insulate lines or heat trace lines. Install a "soft start" drive. Install a recirculating bypass system. Flush system with a nonsetting fluid.
	Fluid builds up on pump surfaces.	Replace the pump with more running clearances.
Short pump service life	Pumping abrasives	Larger pumps at slower speeds.
	Speeds and pressures higher than rated.	Reduce speeds and pressures by making changes in the system. Replace pump with a larger model with higher pressure ratings.
	Worn bearings and gears due to lack of lubrication.	Check and replace bearing and gears as necessary. Adjust lubrication schedule to decrease time between lubrication. Modify external wash down method to reduce water entering into gear case.
	Misalignment of drive and piping. (Excessive overhung load or misaligned couplings.)	Check alignment of piping and drive. Adjust as necessary.

Parts List

006, 014, 015, 018-U3 Parts



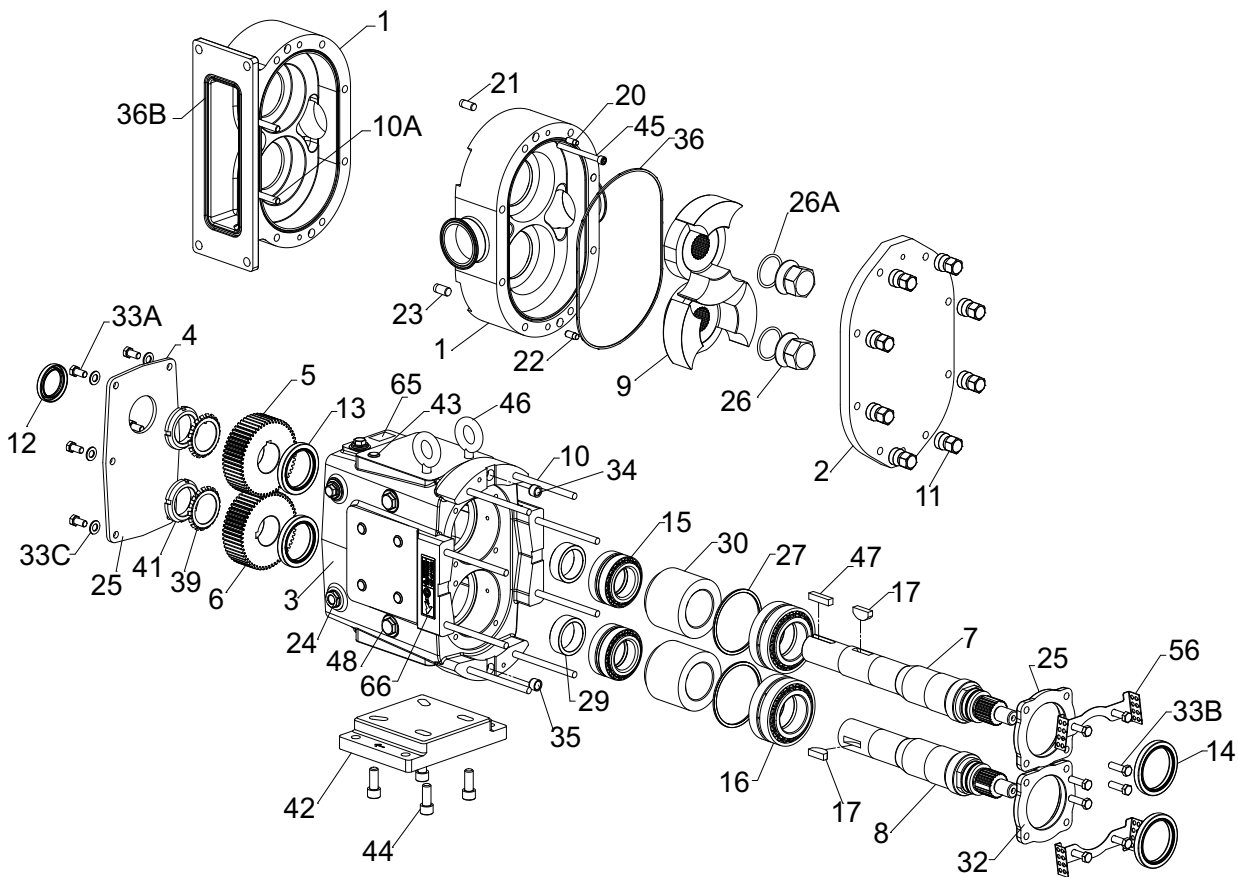
006, 014, 015, 018-U3 Parts

ITEM NO.	DESCRIPTION	QTY. PER PUMP	PART NO.	NOTES
1	Pump Body	1	See Note	1
2	006-U3 Pump Cover	1	138283+	
	014-015-U3 Pump Cover	1	138242+	
	018-U3 Pump Cover	1	138284+	
2A	006-U3 Pump Cover, Jacketed	1	141280+	6
	014-015-U3 Pump Cover, Jacketed	1	141281+	6
	018-U3 Pump Cover, Jacketed	1	141282+	6
3	Gear Case, SS, Model 006, 014, 015, 018	1	138116+	
4	Gear Case Cover, SS	1	102280+	
5	Gear, Drive Shaft, Spur	1	107997+	
6	Gear, Short Shaft, Spur	1	107997+	
7	006-014-015-018-U3 Drive Shaft	1	138240+	3
8	006-014-015-018-U3 Short Shaft	1	138239+	3
9	006-U3 Rotor, Twin Wing, Alloy 88, Std. Clearance	2	138255+	2
	006-U3 Rotor, Twin Wing, 316SS, Std. Clearance	2	138258+	2
	014-015-U3 Rotor, Twin Wing, Alloy 88, Std. Cl.	2	138265+	2
	014-015-U3 Rotor, Twin Wing, 316SS, Std. Cl.	2	138268+	2
	018-U3 Rotor, Twin Wing, Alloy 88, Std. Cl.	2	138275+	2
	018-U3 Rotor, Twin Wing, 316SS, Std. Cl.	2	138278+	2
9A	Rotor drive pin (not shown)	2	138646+	2
10	006-U3 Stud	8	138290+	
	015-U3 Stud	8	138291+	
	018-U3 Stud	8	138292+	
	014-U3 Stud	6	138291+	
10A	014-U3 Stud, Short	2	141491+	
	014-U3 Stud, Short, Jacketed Cover	2	141492+	
10B	006-U3 Stud, Jacketed	8	141465+	
	015-U3 Stud, Jacketed	8	141466+	
	018-U3 Stud, Jacketed	8	141467+	
	014-U3 Stud, Jacketed	6	141466+	
11	Hex Nut	8	108369+	
12	Oil Seal, Gear Case Cover	1	000030016+	
13	Oil Seal, Gear Case Rear	2	000030017+	
14	Grease Seal, Bearing Retainer	2	121679+	
15	Bearing, Rear	2	015035000+	
16	Bearing, Front	2	101714+	
17	Key, Gear	2	015037000+	
20	Dowel Pin, Cover Side, .245" x .85"	1	137001+	4
21	Dowel Pin, Gear Case Side, .245" x 1.0"	1	124581+	5
22	Dowel Pin, Cover Side, .308" x .85"	1	137002+	4
23	Dowel Pin, Gear Case Side, .308" x 1.0"	1	124582+	5

Notes:

1. Contact customer service with Serial Number of pump for Part Number.
2. See page 169 for additional rotors. Contact customer service for optional clearances and finishes. All rotors include rotor drive pins installed. For replacement pin, see item 9A (not shown).
3. Tru-Fit drive shaft is longer than the standard drive shaft listed here. See page 171.
4. Exposed length of dowel pin: .444" (11.3 mm).
5. Exposed length of dowel pin: .563" (14.3 mm).
6. For the Jacketed Cover Kit, see page 168.

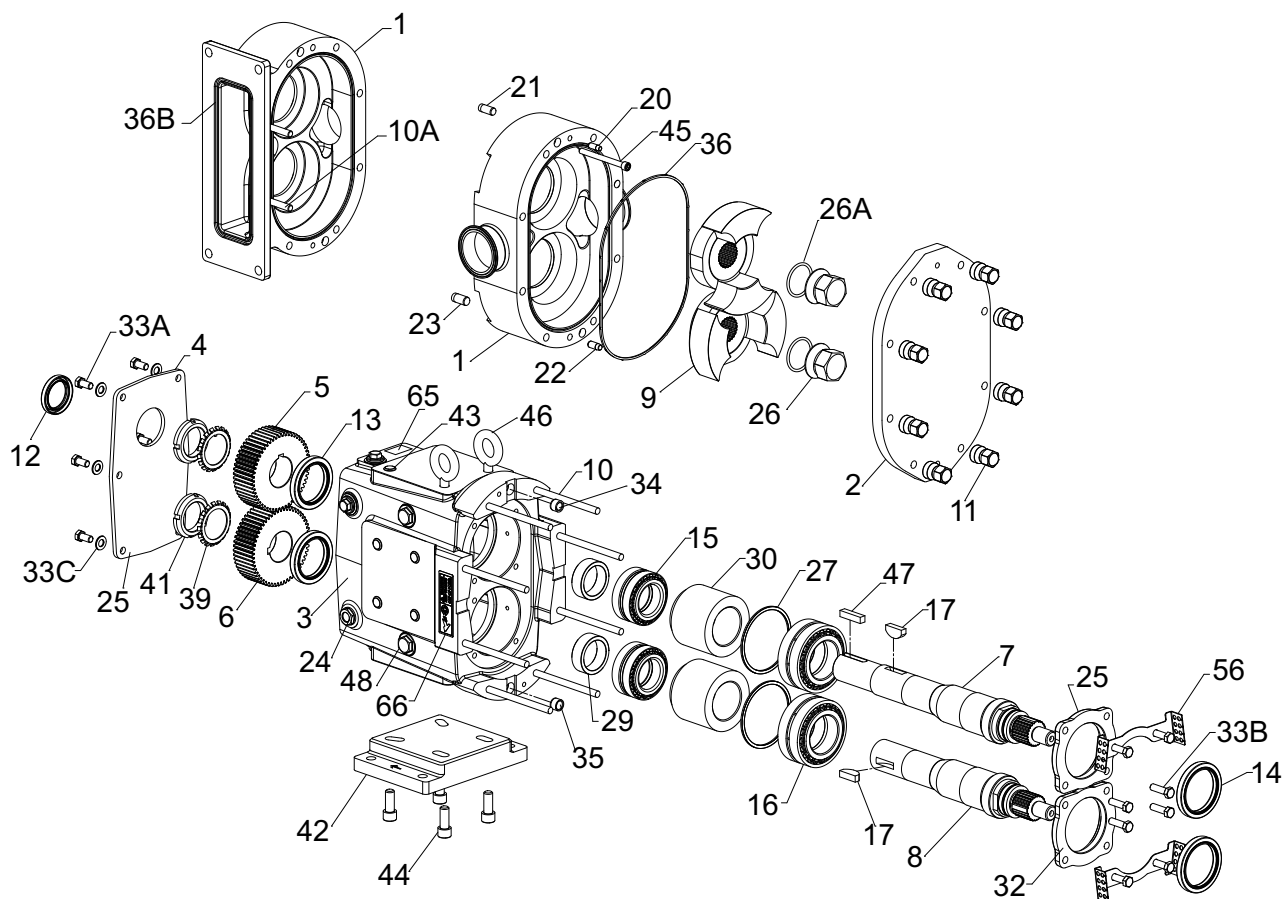
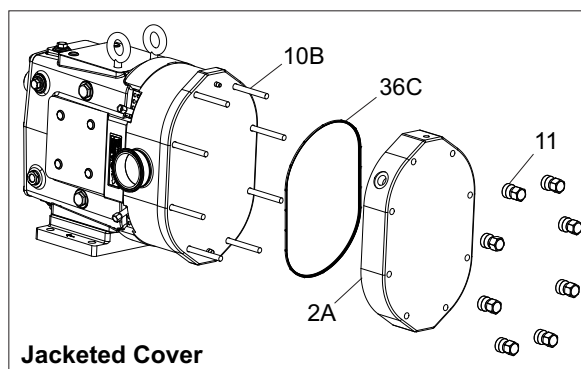
006, 014, 015, 018-U3 Parts



006, 014, 015, 018-U3 Parts

ITEM NO.	DESCRIPTION	QTY. PER PUMP	PART NO.	NOTES
24	Oil Plug, M20 x 1.5"	5	137169+	1
	O-Ring, Buna (for oil plug)	5	N70114	
	Oil Level Indicator, M20 x 1.5"	1	137435+	
25	Silicone Sealant (Not shown)	1	000142301+	
26	Nut, Rotor	2	138243+	
*26A	O-Ring, Rotor Nut, EPDM	2	E70121	
	O-Ring, Rotor Nut, FKM	2	V70121	
	O-Ring, Rotor Nut, FFKM	2	K70121	
27	Shim Kit	2	117889+	
29	Spacer, Gear to Rear Bearing	2	015055000+	
30	Bearing Spacer	2	101814+	
32	Bearing Retainer, Front	2	120332+	
33A	1/4-20 x 3/4" HHCS, Gear Case Cover	6	30-58	
33B	1/4-20 x 3/4" HHCS, SS Bearing Retainer	8	30-58	
33C	1/4" Flat Washer	6	43-27	
34	Dowel Bushing, Upper	1	AD0116000	
35	Dowel Bushing, Lower	1	AD0116100	
*36	006-014-015-018-U3 Cover Gasket, EPDM	1	137424+	
	006-014-015-018-U3 Cover Gasket, EPDM	1	309020E	3
	006-014-015-018-U3 Cover Gasket, FKM	1	137422+	
	006-014-015-018-U3 Cover Gasket, FKM	1	309020V	3
	006-014-015-018-U3 Cover Gasket, FFKM	1	137423+	
	006-014-015-018-U3 Cover Gasket, FFKM	1	309020K	3
*36B	014-U3 O-Ring, Rectangular Flange, EPDM	1	E70239	
	014-U3 O-Ring, Rectangular Flange, FKM	1	V70239	
	014-U3 O-Ring, Rectangular Flange, FFKM	1	K70239	
*36C	006-014-015-018-U3 Cover Gasket, Jacketed, EPDM		137424+	
	006-014-015-018-U3 Cover Gasket, Jacketed, EPDM	1	309020E	3
	006-014-015-018-U3 Cover Gasket, Jacketed, FKM		137422+	
	006-014-015-018-U3 Cover Gasket, Jacketed, FKM	1	309020V	3
	006-014-015-018-U3 Cover Gasket, Jacketed, FFKM		137423+	
	006-014-015-018-U3 Cover Gasket, Jacketed, FFKM	1	309020K	3
39	Lock washer, Gear	2	STD136005	
41	Locknut, Gear	2	STD236005	
42	Mounting Foot 006-014-015-018-U3 SS	1	102284+	
43	Plastic Cap Plug	6	000121003+	
44	5/16-18 x 1" SHCS, SS	4	30-525	
45	006-U3 Body Retaining Screw	2	30-211	
	014-015-U3 Body Retaining Screw	2	30-543	
	018-U3 Body Retaining Screw	2	30-613	
46	Eye Bolt, 5/16-18 x 1/2" SS	2	30-719	
47	Key, Coupling - 3/16 X 3/16 X 1-1/8"	1	000037001+	
	Key, Coupling - Tru-Fit	1	119714+	
48	Cleanout Plug, SS	2	102298+	
56	006-014-015-018-U3 Seal Guard	2	138896+	
62	#2 x .187" RHDS (Not shown)	4	30-355	
65	Caution Plate	2	121694+	2
66	Warning Label	2	33-63	2
67	Grease Fitting, 1/8"	4	LL118404	
68	Plastic Cap, Grease Fitting	4	BD0093000	
69	Name Plate, Sanitary (Not shown)	1	135623+	2

Notes: See "Notes" on page 136

030, 034, 040-U3 Parts**Notes: (See "Notes" column on page 135)**

* Recommended spare parts

For standard seals, see page 159. For O-ring seals, see page 167. For mechanical seal kits, see page 166.

1. The oil plug requires O-ring N70114.

2. See "Replacement Labels" on page 12 for label detail.

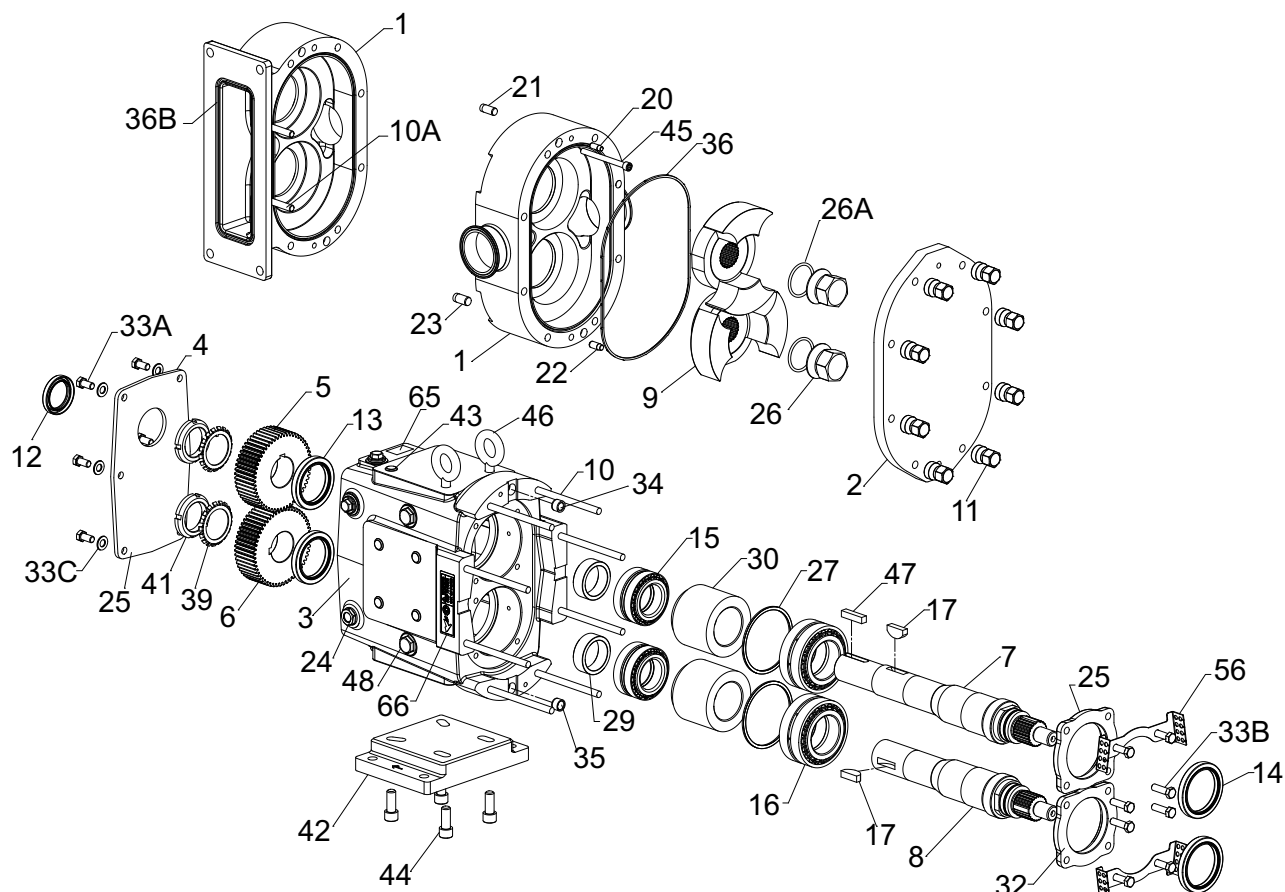
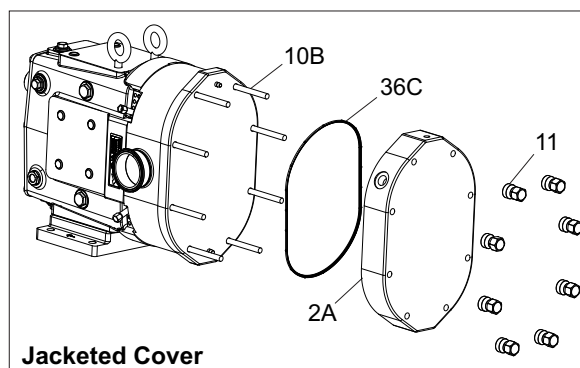
3. Cover gasket for pumps shipped starting November 2024.

030, 034, 040-U3 Parts

ITEM NO.	DESCRIPTION	QTY. PER PUMP	PART NO.	NOTES
1	Pump Body	1	See Note 1	1
2	030-034-U3 Pump Cover	1	133424+	
	040-U3 Pump Cover	1	137948+	
	030-034-040-U3 Pump Cover, Jacketed	1	141283+	6
3	Gear Case, SS, Model 030, 034, 040	1	138122+	
4	Gear Case Cover, SS	1	102281+	
5	Gear, Drive Shaft, Spur	1	107999+	
6	Gear, Short Shaft, Spur	1	107999+	
7	030-034-040-U3 Drive Shaft	1	133419+	3
8	030-034-040-U3 Short Shaft	1	133420+	3
9	030-034-U3 Rotor, Twin Wing, Alloy 88, Std. Cl.	2	137961+	2
	030-034-U3 Rotor, Twin Wing, 316SS, Std. Cl.	2	137965+	2
	040-U3 Rotor, Twin Wing, Alloy 88, Std. Clearance	2	137970+	2
	040-U3 Rotor, Twin Wing, 316SS, Std. Clearance	2	137974+	2
9A	Rotor drive pin (not shown)	2	137985+	2
10	030-U3 Stud	8	109865+	
	040-U3 Stud	8	138604+	
	034-U3 Stud	6	109865+	
10A	034-U3 Stud, Short	2	141493+	
	034-U3 Stud, Short, Jacketed	2	141494+	
10B	030-U3 Stud, Jacketed	8	141269+	
	040-U3 Stud, Jacketed	8	141270+	
	034-U3 Stud, Jacketed	6	141269+	
11	Hex Nut	8	108370+	
12	Oil Seal, Gear Case Cover	1	000030013+	
13	Oil Seal, Gear Case Rear	2	000030014+	
14	Grease Seal, Bearing Retainer	2	121680+	
15	Bearing, Rear	2	030035000+	
16	Bearing, Front	2	101715+	
17	Key, Gear	2	BD0037000	
20	Dowel Pin, Cover Side, .245" x .85"	1	137001+	4
21	Dowel Pin, Gear Case Side, .308" x 1.0"	1	124582+	5
22	Dowel Pin, Cover Side, .308" x .85"	1	137002+	4
23	Dowel Pin, Gear Case Side, .370" x 1.0"	1	124583+	5

Notes:

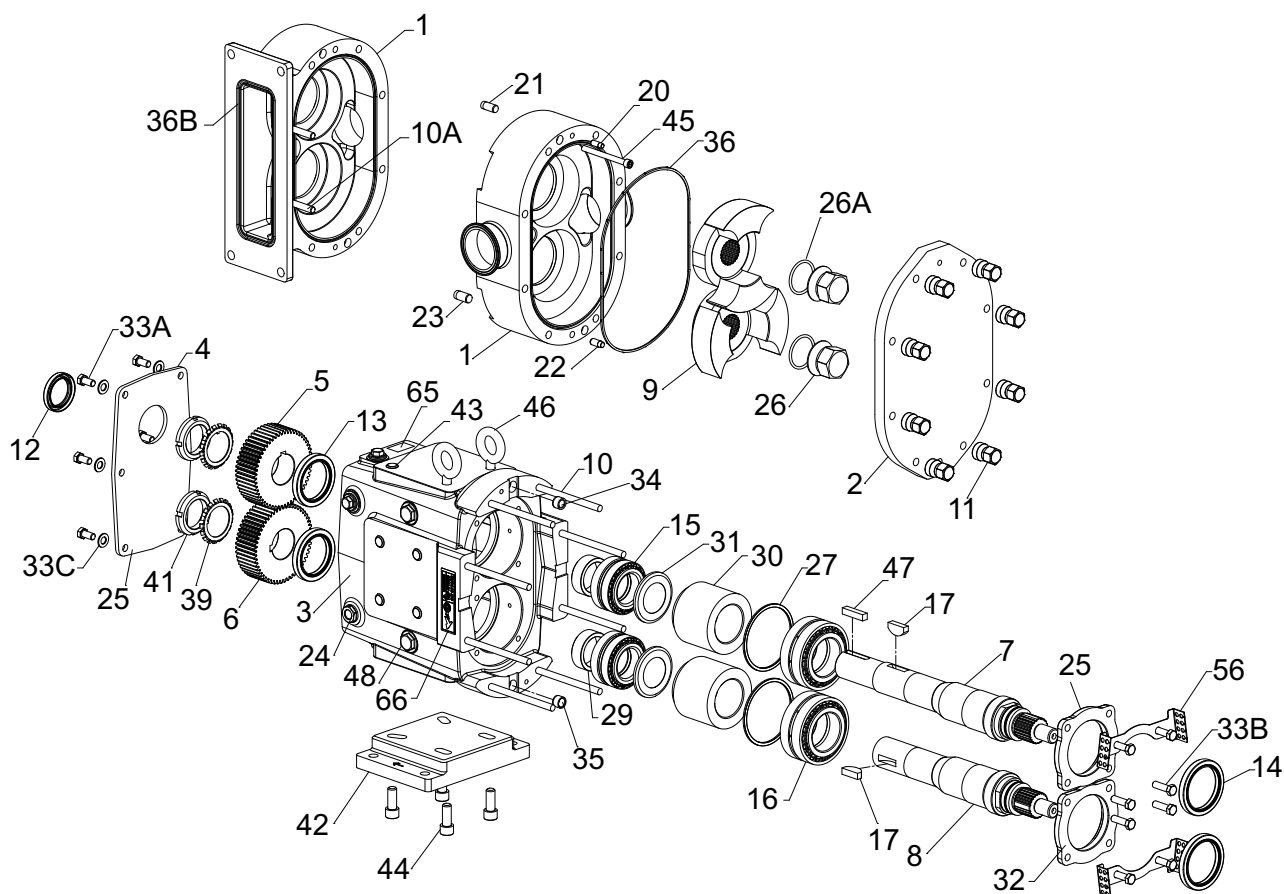
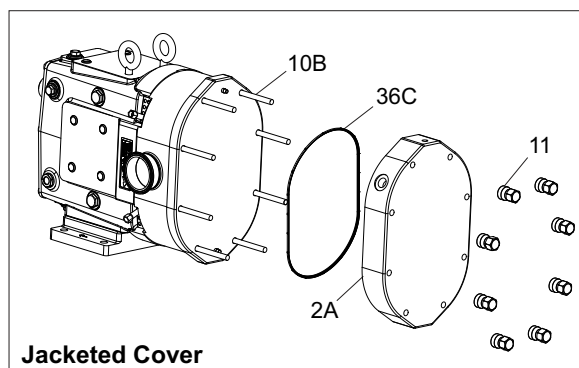
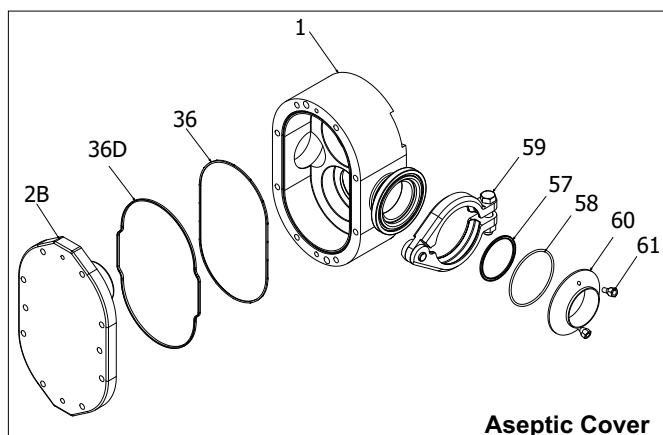
1. Contact customer service with Serial Number of pump for Part Number.
2. See page 169 for additional rotors. Contact customer service for optional clearances and finishes. All rotors include rotor drive pins installed. For replacement pin, see item 9A (not shown).
3. Tru-Fit drive shaft is longer than the standard drive shaft listed here. See page 171.
4. Exposed length of dowel pin: .444" (11.3 mm)
5. Exposed length of dowel pin: .563" (14.3 mm)
6. For the Jacketed Cover Kit, see page 168.

030, 034, 040-U3 Parts

030, 034, 040-U3 Parts

ITEM NO.	DESCRIPTION	QTY. PER PUMP	PART NO.	NOTES
24	Oil Plug, M20 x 1.5"	5	137169+	2
	O-Ring, Buna (for oil plug)	5	N70114	
	Oil Level Indicator, M20 x 1.5"	1	137435+	
25	Silicone Sealant	1	000142301+	
26	Nut, Rotor	2	137947+	
*26A	O-Ring, Rotor Nut, EPDM	2	E70126	
	O-Ring, Rotor Nut, FKM	2	V70126	
	O-Ring, Rotor Nut, FFKM	2	K70126	
27	Shim Kit	2	117890+	
29	Spacer, Gear to Rear Bearing	2	0300055000+	
30	Bearing Spacer	2	101815	
32	Bearing Retainer, Front	2	120333+	
33A	5/16-18 X 3/4" HHCS, Gear Case Cover	6	30-623	
33B	5/16-18 X 3/4" SHCS, SS Bearing Retainer	8	30-296	
33C	5/16" Flat Washer	6	43-246	
34	Dowel Bushing, Upper	1	BD0116000	
35	Dowel Bushing, Lower	1	BD0116100	
*36	030-040-U3 Cover Gasket, EPDM	1	137245+	
	030-040-U3 Cover Gasket, EPDM	1	309021E	3
	030-040-U3 Cover Gasket, FKM	1	130296+	
	030-040-U3 Cover Gasket, FKM	1	309021V	3
	030-040-U3 Cover Gasket, FFKM	1	137240+	
	030-040-U3 Cover Gasket, FFKM	1	309021K	3
*36B	034-U3 O-Ring, Rectangular Flange, EPDM	1	E70356	
	034-U3 O-Ring, Rectangular Flange, FKM	1	V70356	
	034-U3 O-Ring, Rectangular Flange, FFKM	1	K70356	
*36C	030-040-U3 Cover Gasket, Jacketed, EPDM	1	137245+	
	030-040-U3 Cover Gasket, Jacketed, EPDM	1	309021E	3
	030-040-U3 Cover Gasket, Jacketed, FKM	1	130296+	
	030-040-U3 Cover Gasket, Jacketed, FKM	1	309021V	3
	030-040-U3 Cover Gasket, Jacketed, FFKM	1	137240+	
	030-040-U3 Cover Gasket, Jacketed, FFKM	1	309021K	3
39	Lockwasher, Gear	2	CD0036W00	
41	Locknut, Gear	2	CD0036N00	
42	Mounting Foot 030-034-040-U3 SS	1	102285+	
43	Plastic Cap Plug	6	000121002+	
44	3/8-16 X 1" SHCS	4	30-189	
45	030-U3 Body Retaining Screw	2	30-613	
	040-U3 Body Retaining Screw	2	30-740	
46	Eye Bolt, 3/8-16 X 9/16" SS	1	30-720	
47	Key, Coupling - 1/4 x 1/4 x 1-3/4"	1	000037002+	
	Key, Coupling - Tru-Fit	1	119715+	
48	Cleanout Plug, SS	2	102297+	
56	030-034-040-U3 Seal Guard	2	138897+	
62	#2x .187" RHDS (Not shown)	4	30-355	
65	Caution Plate	2	121694+	
66	Warning Label	2	33-63	1
67	Grease Fitting, 1/8"	4	LL118404	
68	Plastic Cap. Grease Fitting	4	BD0093000	
69	Name Plate, Sanitary (Not shown)	1	135624+	1

Notes: See "Notes" on page 140

045, 060, 063, 064, 130, 133, 134-U3 Parts

Notes: (See "Notes" column on page 139)

*** Recommended spare parts**

For standard seals, see page 159. For O-ring seals, see page 167. For mechanical seal kits, see page 166.

1. See "Replacement Labels" on page 12 for label detail.

2. The oil plug requires O-ring N70114.

3. Cover gasket for pumps shipped starting November 2024.

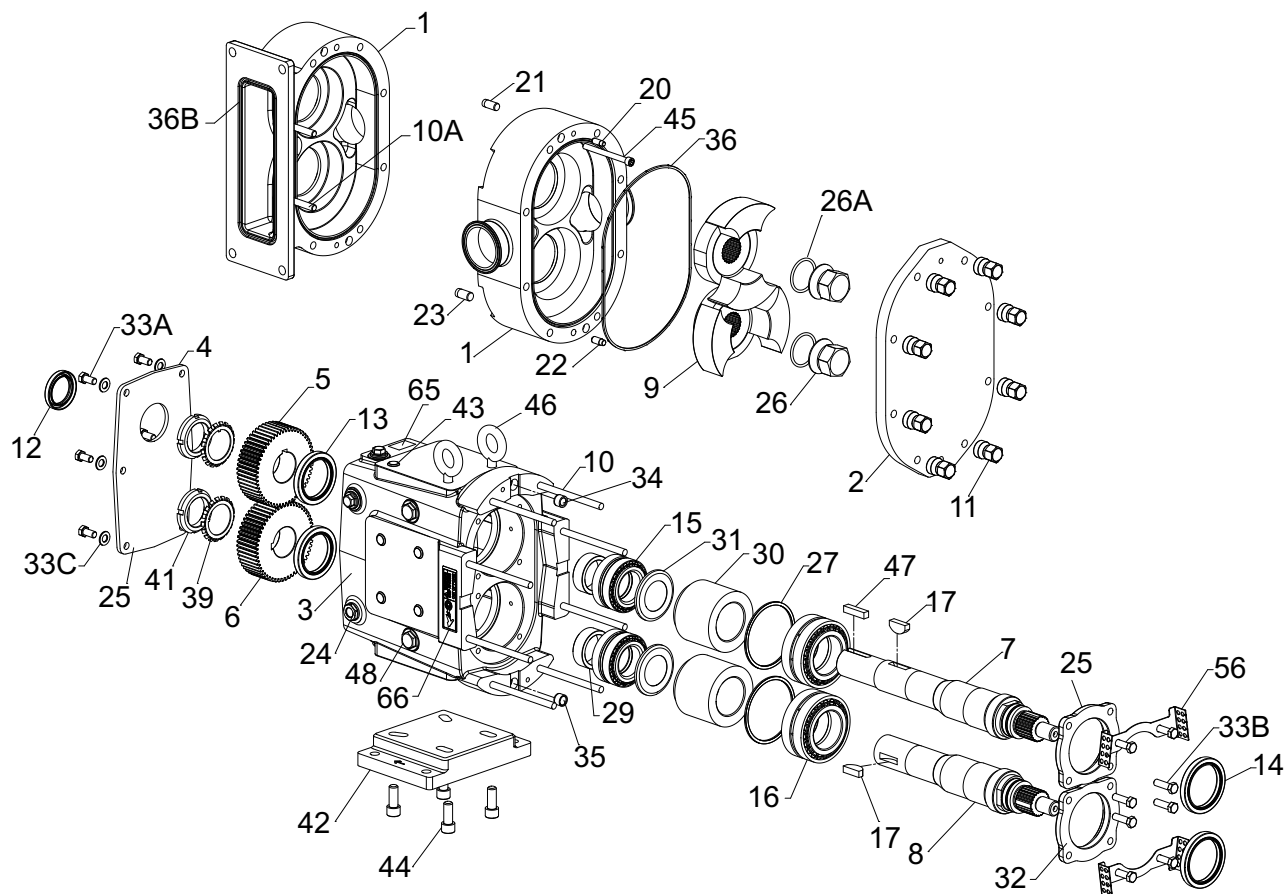
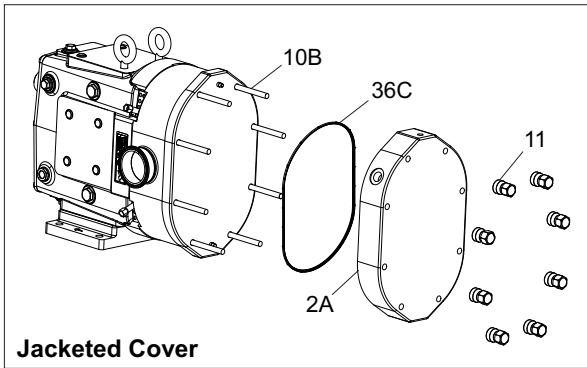
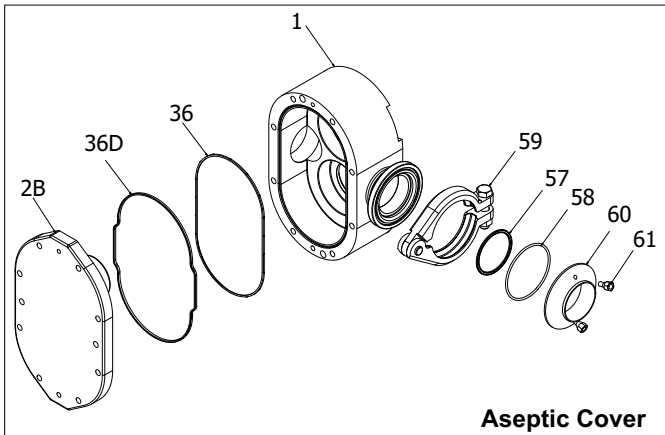
045, 060, 063, 064, 130, 133, 134-U3 Parts

ITEM NO.	DESCRIPTION	QTY. PER PUMP	PART NO.	NOTES
1	Pump Body	1	See Note 1	1
2	045-U3 Pump Cover	1	138049+	
	060-064-U3 Pump Cover	1	138048+	
	130-134-U3 Pump Cover	1	138031+	
2A	045-U3 Pump Cover, Jacketed	1	141405+	6
	060-064-130-134-U3 Pump Cover, Jacketed	1	141406+	6
2B	063-U3 Pump cover, Aseptic	1	142031+	
	133-U3 Pump cover, Aseptic	1	142032+	
3	Gear Case, SS, Model 045, 060, 130	1	138131+	
4	Gear Case Cover, SS	1	102282+	
5	Gear, Drive Shaft, Spur	1	107404+	
6	Gear, Short Shaft, Spur	1	107404+	
7	045-060-064-130-134-U3 Drive Shaft	1	138042+	3
8	045-060-064-130-134-U3 Short Shaft	1	138043+	3
9	045-U3 Rotor, Twin Wing, Alloy 88, Std. Clearance	2	138053+	2
	045-U3 Rotor, Twin Wing, 316SS, Std. Clearance	2	138056+	2
	060-064-U3 Rotor, Twin Wing, Alloy 88, Std. Cl.	2	138061+	2
	060-064-U3 Rotor, Twin Wing, 316SS, Std. Cl.	2	138064+	2
	130-134-U3 Rotor, Twin Wing, Alloy 88, Std. Cl.	2	138068+	2
	130-134-U3 Rotor, Twin Wing, 316SS, Std. Cl.	2	138071+	2
9A	Rotor drive pin (not shown)	2	137985+	2
10	045-U3 Stud	8	108843+	
	060-U3 Stud	8	138611+	
	130-U3 Stud	8	138612+	
	064-U3 Stud	6	138611+	
	134-U3 Stud	6	138612+	
10A	064-134-U3 Stud, Short	2	141495+	
	064-134-U3 Stud, Short, Jacketed	2	141496+	
10B	045-U3 Stud, Jacketed	8	141271+	
	060-U3 Stud, Jacketed	8	141272+	
	064-U3 Stud, Jacketed	6	141272+	
	130-U3 Stud, Jacketed	8	141273+	
	134-U3 Stud, Jacketed	6	141273+	
11	Hex Nut	8	108371+	
12	Oil Seal, Gear Case Cover	1	000030012+	
13	Oil Seal, Gear Case Rear	2	000030011+	
14	Grease Seal, Bearing Retainer	2	101829+	
15	Bearing, Rear	2	107186+	
16	Bearing, Front	2	060036000+	
17	Key, Gear	2	060037000+	
20	Dowel Pin, Cover Side, .308" x .85"	1	137002+	4
21	Dowel Pin, Gear Case Side, .433" x 1.0"	1	124584+	5
22	Dowel Pin, Cover Side, .370" x .85"	1	137003+	4
23	Dowel Pin, Gear Case Side, .495" x 1.0"	1	124586+	5

Notes:

1. Contact customer service with Serial Number of pump for Part Number.
2. See page 169 for additional rotors. Contact customer service for optional clearances and finishes. All rotors include rotor drive pins installed. For replacement pin, see item 9A (not shown).
3. Tru-Fit drive shaft is longer than the standard drive shaft listed here. See page 171.
4. Exposed length of dowel pin: .444" (11.3 mm).
5. Exposed length of dowel pin: .563" (14.3 mm).
6. For the Jacketed Cover Kit, see page 168.

045, 060, 063, 064, 130, 133, 134-U3 Parts



045, 060, 063, 064, 130, 133, 134-U3 Parts

ITEM NO.	DESCRIPTION	QTY. PER PUMP	PART NO.	NOTES
24	Oil Plug, M20 x 1.5"	5	137169+	1
	O-Ring, Buna (for oil plug)	5	N70114	
	Oil Level Indicator, M20 x 1.5"	1	137435+	
25	Silicone Sealant (Not shown)	1	000142301+	
26	Nut, Rotor	2	138044+	
*26A	O-Ring, Rotor Nut, EPDM	2	E70224	
	O-Ring, Rotor Nut, FKM	2	V70224	
	O-Ring, Rotor Nut, FFKM	2	K70224	
27	Shim Kit	2	117891+	
29	Spacer, Gear to Rear Bearing	2	107187+	
30	Bearing Spacer	2	060055003+	
31	Retainer, Grease	2	STD091002	
32	Bearing Retainer, Front	2	121828+	
33A	3/8-16 x 3/4" HHCS Gear Case Cover	6	30-50	
33B	3/8-16 x 1-1/4" HHCS, SS Bearing Retainer	8	30-60	
33C	3/8" Flat Washer, Gear Case Cover	6	43-30	
34	Dowel Bushing, Upper	1	CD0116000	
35	Dowel Bushing, Lower	1	CD0116100	
*36	045-060-130-U3 Cover Gasket, EPDM	1	137246+	
	045-060-130-U3 Cover Gasket, EPDM	1	309022E	2
	045-060-130-U3 Cover Gasket, FKM	1	133633+	
	045-060-130-U3 Cover Gasket, FKM	1	309022V	2
	045-060-130-U3 Cover Gasket, FFKM	1	137241+	
	045-060-130-U3 Cover Gasket, FFKM	1	309022K	2
*36B	064-U3 O-Ring, Rectangular Flange, EPDM	1	E70366	
	064-U3 O-Ring, Rectangular Flange, FKM	1	V70366	
	064-U3 O-Ring, Rectangular Flange, FFKM	1	K70366	
	134-U3 O-Ring, Rectangular Flange, EPDM	1	E70369	
	134-U3 O-Ring, Rectangular Flange, FKM	1	V70369	
	134-U3 O-Ring, Rectangular Flange, FFKM	1	K70369	
*36C	045-060-130-U3 Cover Gasket, Jacketed, EPDM		137246+	
	045-060-130-U3 Cover Gasket, Jacketed, EPDM	1	309022E	2
	045-060-130-U3 Cover Gasket, Jacketed, FKM		133633+	
	045-060-130-U3 Cover Gasket, Jacketed, FKM	1	309022V	2
	045-060-130-U3 Cover Gasket, Jacketed, FFKM		137241+	
	045-060-130-U3 Cover Gasket, Jacketed, FFKM	1	309022K	2
*36D	063-133-U3 Cover Gasket, Outer	1	142004+	

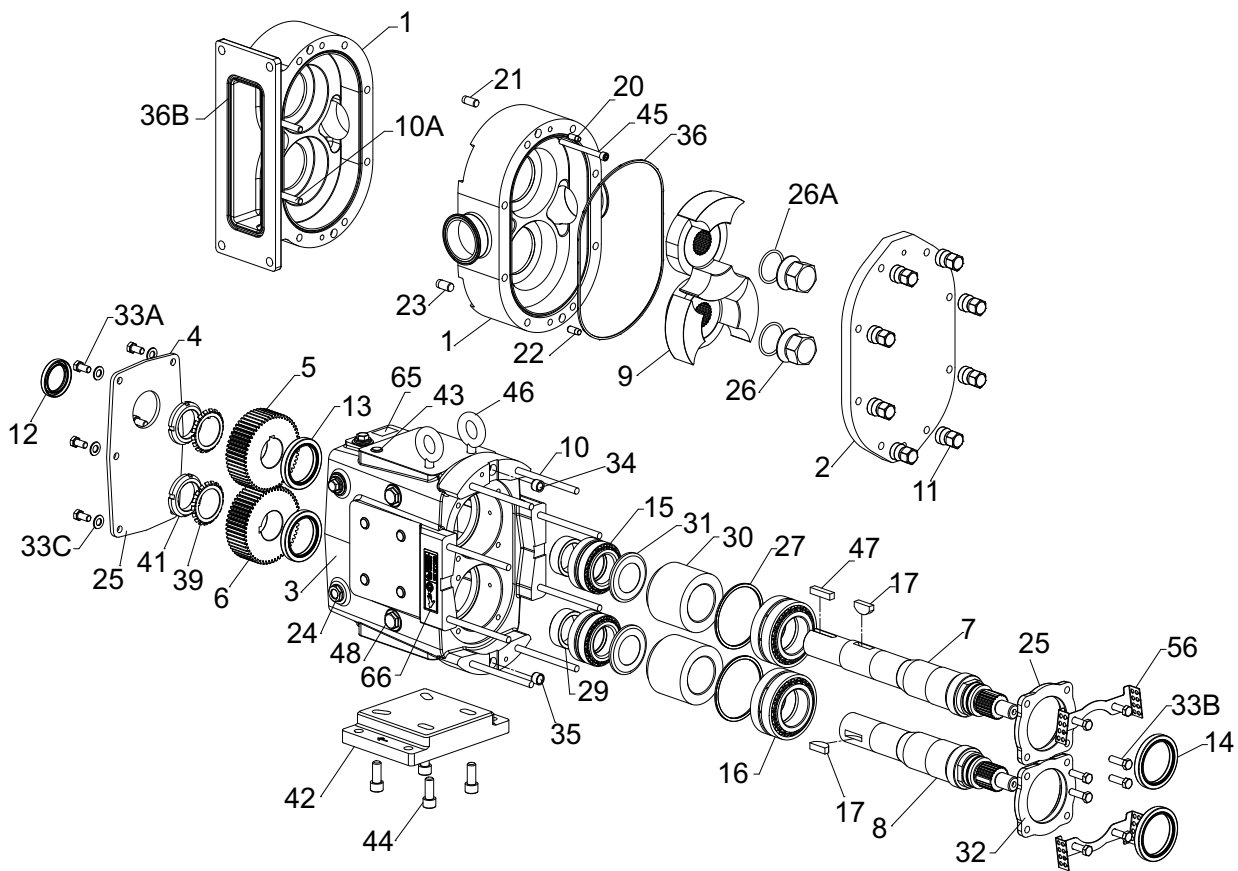
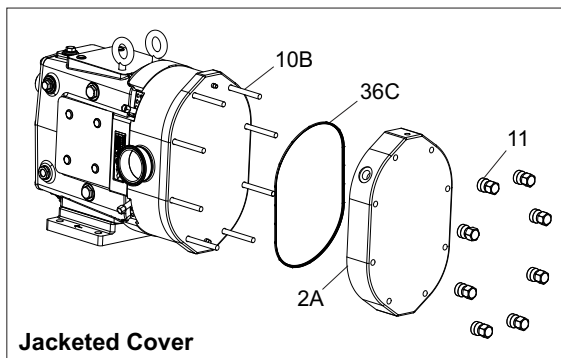
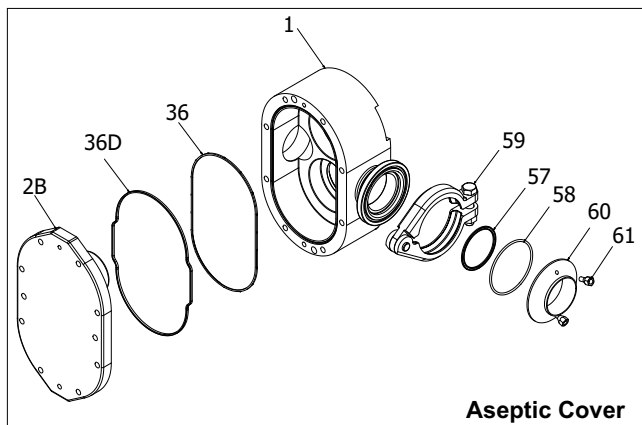
Notes:*** Recommended spare parts**

For standard seals, see page 159. For O-ring seals, see page 167. For mechanical seal kits, see page 166.

1. The oil plug requires O-ring N70114.

2. Cover gasket for pumps shipped starting November 2024.

045, 060, 063, 064, 130, 133, 134-U3 Parts



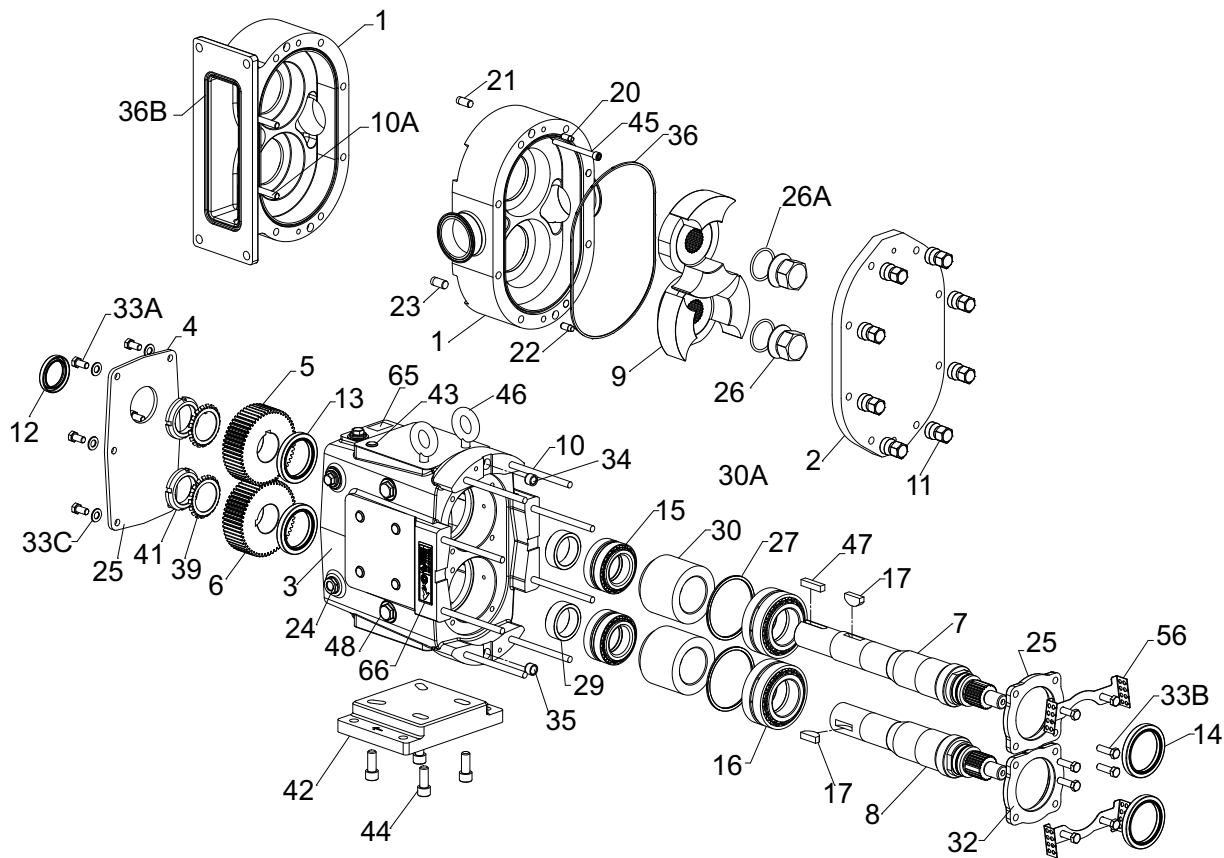
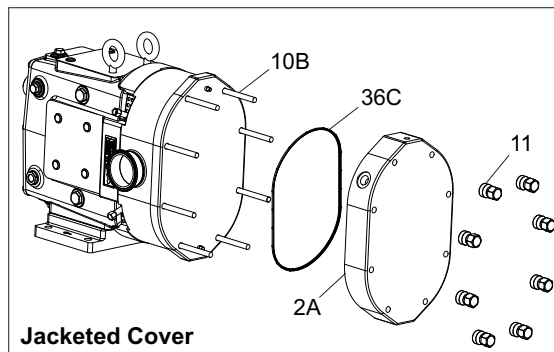
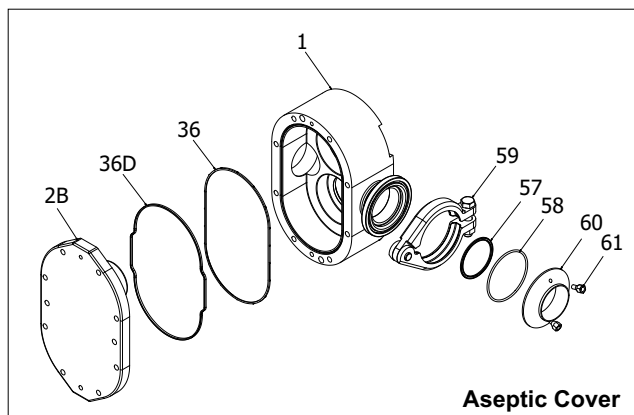
045, 060, 063, 064, 130, 133, 134-U3 Parts

ITEM NO.	DESCRIPTION	QTY. PER PUMP	PART NO.	NOTES
39	Lockwasher, Gear	2	STD136009	
41	Locknut, Gear	2	STD236009	
42	Mounting Foot 045-060-064-130-134-U3 SS	1	102286+	
43	Plastic Cap Plug	6	000121001+	
44	1/2-13 x 1-1/4" SS SHCS	4	30-503	
45	045-U3 Body Retaining Screw	2	30-319	
	060-U3 Body Retaining Screw	2	30-760	
	130-U3 Body Retaining Screw	2	30-761	
46	Eye Bolt, 1/2-13 x 3/4"	2	30-721	
47	Key, Coupling - 3/8 x 3/8 x 1-5/8"	1	000037003+	
	Key, Coupling - Tru-Fit	1	119716+	
48	Cleanout Plug, SS	2	102297+	
56	045-060-130-U3 Seal Guard	2	138898+	
*57	063-U3 2.5" 401V Gasket FKM	2	20-106V	
	133-U3 3.0" 401V Gasket FKM	2	20-107V	
*58	063-U3 O-Ring Port FKM	2	V70236	
	133-U3 O-Ring Port FKM	2	V70242	
59	063-U3 2.5" 131"1" Line Clamp	2	0345223+	
	133-U3 3" 131"1" Line Clamp	2	0346223+	
60	063-U3 2.5" 141"1" Line Ferrule	2	124395+	
	133-U3 3.0" 141"1" Line Ferrule	2	29-998X	
61	Adapter-Reducing AO Fittings	1	78-71	
62	#2 x .187" RHDS (Not shown)	4	30-355	
65	Caution Plate	2	121694+	1
66	Warning Label	2	33-60	1
67	Grease Fitting, 1/8"	4	LL118404	
68	Plastic Cap, Grease Fitting	4	BD0093000	
69	Name Plate, Sanitary (Not shown)	4	135624+	1

Notes:*** Recommended spare parts**

1. See "Replacement Labels" on page 12 for label detail.

180, 184, 220, 223, 223, 224-U3 Parts



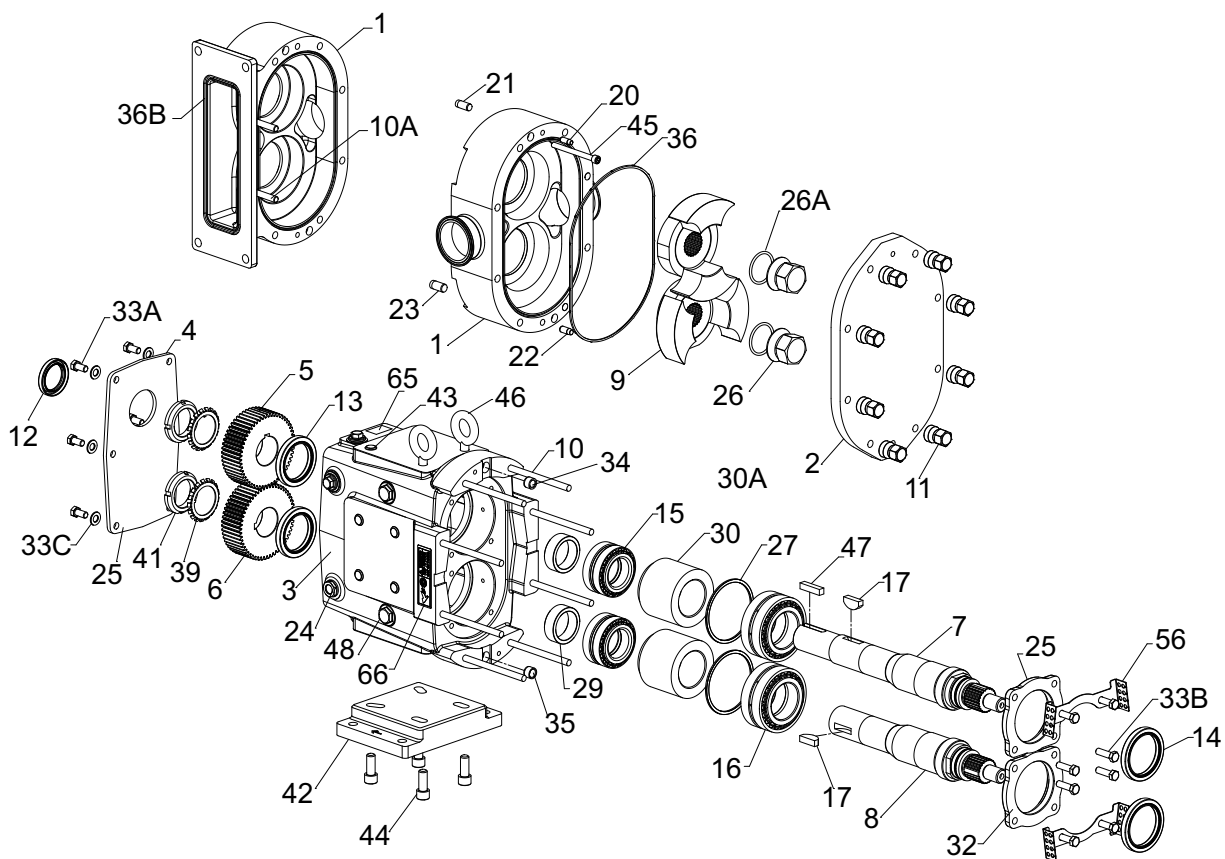
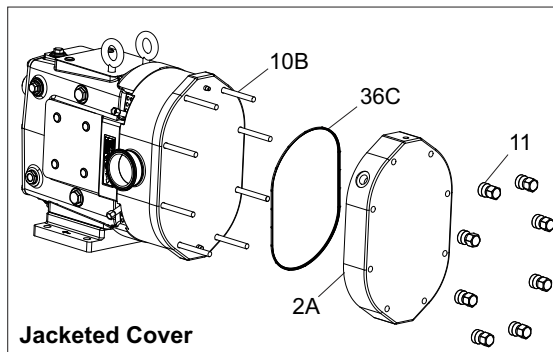
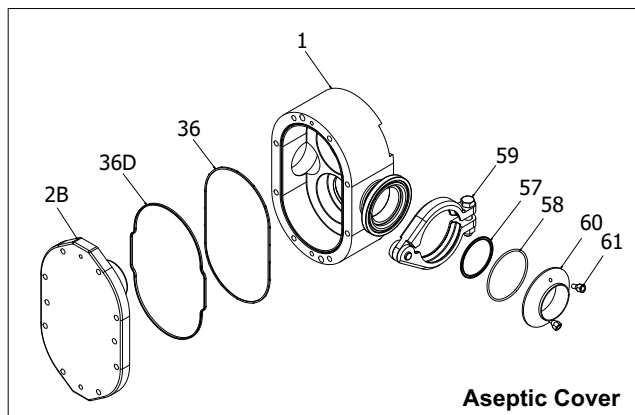
180, 184, 220, 223, 223, 224-U3 Parts

ITEM NO.	DESCRIPTION	QTY. PER PUMP	PART NO.	NOTES
1	Pump Body	1	See Note 1	1
2	180-184-U3 Pump Cover	1	138189+	
	220-224-U3 Pump Cover	1	138190+	
2A	180-184-U3 Pump Cover, Jacketed	1	141284+	6
	220-224-U3 Pump Cover, Jacketed	1	141285+	6
2B	223-U3 Pump Cover, Aseptic	1	142033+	
3	Gear Case, SS, Model 180, 184, 220, 224	1	138143+	
4	Gear Case Cover, SS	1	102283+	
5	Gear, Drive Shaft, Spur	1	110932+	
6	Gear, Short Shaft, Spur	1	110932+	
7	180-184-220-224-U3 Drive Shaft	1	138107+	3
8	180-184-220-224-U3 Short Shaft	1	138108+	3
9	180-184-U3 Rotor, Twin Wing, Alloy 88, Std. Cl.	2	138161+	2
	180-184-U3 Rotor, Twin Wing, 316SS, Std. Cl.	2	138164+	2
	220-224-U3 Rotor, Twin Wing, Alloy 88, Std. Cl.	2	138172+	2
	220-224-U3 Rotor, Twin Wing, 316SS, Std. Cl.	2	138175+	2
9A	Rotor drive pin (not shown)	2	M525S1670X	2
10	180-U3 Stud	8	138628+	
	184-U3 Stud	6	138628+	
	220-U3 Stud	8	138626+	
	224-U3 Stud	6	138626+	
10A	184-224-U3 Stud, Short	2	141497+	
	184-224-U3 Stud, Short, Jacketed	2	141498+	
10B	180-U3 Stud, Jacketed	8	141274+	
	184-U3 Stud, Jacketed	6	141274+	
	220-U3 Stud, Jacketed	8	141275+	
	224-U3 Stud, Jacketed	6	141275+	
11	Hex Nut	8	108372+	
12	Oil Seal, Gear Case Cover	1	STD030006	
13	Oil Seal, Gear Case Rear	2	STD119002	
14	Grease Seal, Bearing Retainer	2	121681+	
15	Bearing, Rear	2	300035000+	
16	Bearing, Front	2	200036000+	
17	Key, Gear	2	200037000+	
20	Dowel Pin, Cover Side, .433" x .85"	1	137004+	4
21	Dowel Pin, Gear Case Side, .433" x 1.0"	1	124584+	5
22	Dowel Pin, Cover Side, .495" x .85"	1	137005+	4
23	Dowel Pin, Gear Case Side, .433" x 1.0"	1	124586+	5

Notes:

1. Contact customer service with Serial Number of pump for Part Number.
2. See page 169 for additional rotors. Contact customer service for optional clearances and finishes. All rotors include rotor drive pins installed. For replacement pin, see item 9A (not shown).
3. Tru-Fit drive shaft is longer than the standard drive shaft listed here. See page 171.
4. Exposed length of dowel pin: .444" (11.3 mm).
5. Exposed length of dowel pin: .563" (14.3 mm).
6. For the Jacketed Cover Kit, see page 168.

180, 184, 220, 223, 224-U3 Parts



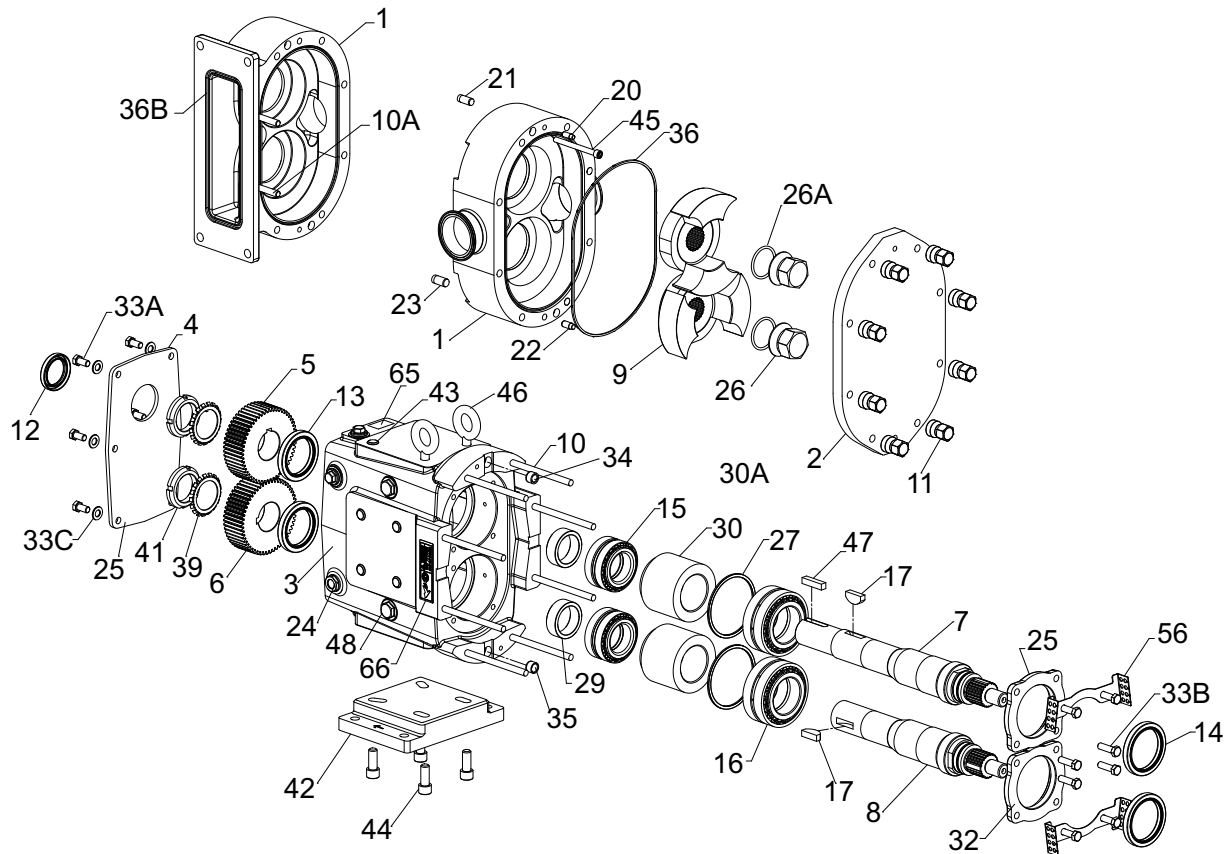
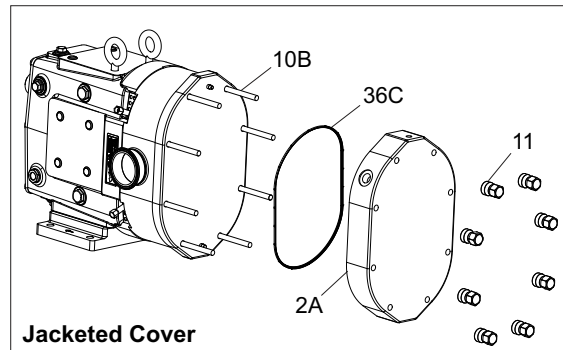
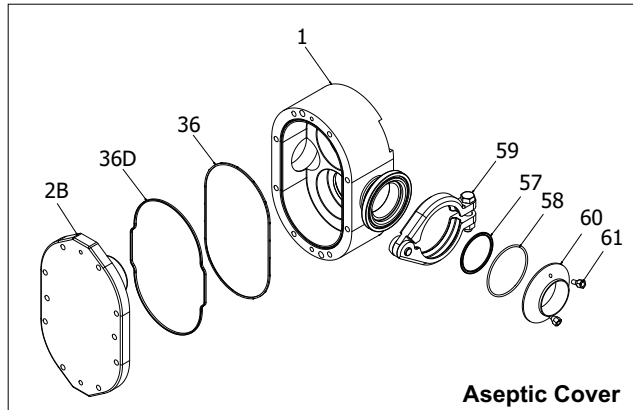
180, 184, 220, 223, 224-U3 Parts

ITEM NO.	DESCRIPTION	QTY. PER PUMP	PART NO.	NOTES
*24	Oil Plug, M20 x 1.5"	5	137169+	1
	O-Ring, Buna (for oil plug)	5	N70114	
	Oil Level Indicator, M20 x 1.5"	1	137435+	
25	Silicone Sealant (Not shown)	1	000142301+	
26	Nut, Rotor	2	138112+	
*26A	O-Ring, Rotor Nut, EPDM	2	E70228	
	O-Ring, Rotor Nut, FKM	2	V70228	
	O-Ring, Rotor Nut, FFKM	2	K70228	
27	Shim Kit	2	117892+	
29	Spacer, Gear to Rear Bearing	2	40878+	
30	Bearing Spacer	2	40752+	
32	Bearing Retainer, Front	2	121829+	
33A	3/8-16 x 1-1/4" HHCS, SS Gear Case Cover	8	30-60	
33B	3/8-16 x 1-1/4" HHCS, SS Bearing Retainer	8	30-769	
33C	3/8" Flat Washer, Gear Case Cover	8	43-30	
34	Dowel Bushing, Upper	1	CD0116000	
35	Dowel Bushing, Lower	1	CD0116100	
*36	180-220-U3 Cover Gasket, EPDM	1	137433+	
	180-220-U3 Cover Gasket, EPDM	1	309023E	2
	180-220-U3 Cover Gasket, FKM	1	137431+	
	180-220-U3 Cover Gasket, FKM	1	309023V	2
	180-220-U3 Cover Gasket, FFKM	1	137432+	
	180-220-U3 Cover Gasket, FFKM	1	309023K	2
*36B	184-U3 O-Ring, Rectangular Flange, EPDM	1	E70374	
	184-U3 O-Ring, Rectangular Flange, FKM	1	V70374	
	184-U3 O-Ring, Rectangular Flange, FFKM	1	K70374	
	224-U3 O-Ring, Rectangular Flange, EPDM	1	E70376	
	224-U3 O-Ring, Rectangular Flange, FKM	1	V70376	
	224-U3 O-Ring, Rectangular Flange, FFKM	1	K70376	
*36C	180-220-U3 Cover Gasket, Jacketed, EPDM	1	137433+	
	180-220-U3 Cover Gasket, Jacketed, EPDM	1	309023E	2
	180-220-U3 Cover Gasket, Jacketed, FKM	1	137431+	
	180-220-U3 Cover Gasket, Jacketed, FKM	1	309023V	2
	180-220-U3 Cover Gasket, Jacketed, FFKM	1	137432+	
	180-220-U3 Cover Gasket, Jacketed, FFKM	1	309023K	2
*36D	223-U3 Cover Gasket, EPDM	1	142034+	

Notes:*** Recommended spare parts**

For standard seals, see page 159. For O-ring seals, see page 167. For mechanical seal kits, see page 166.

1. The oil plug requires O-ring N70114.
2. Cover gasket for pumps shipped starting November 2024.

180, 184, 220, 223, 224-U3 Parts

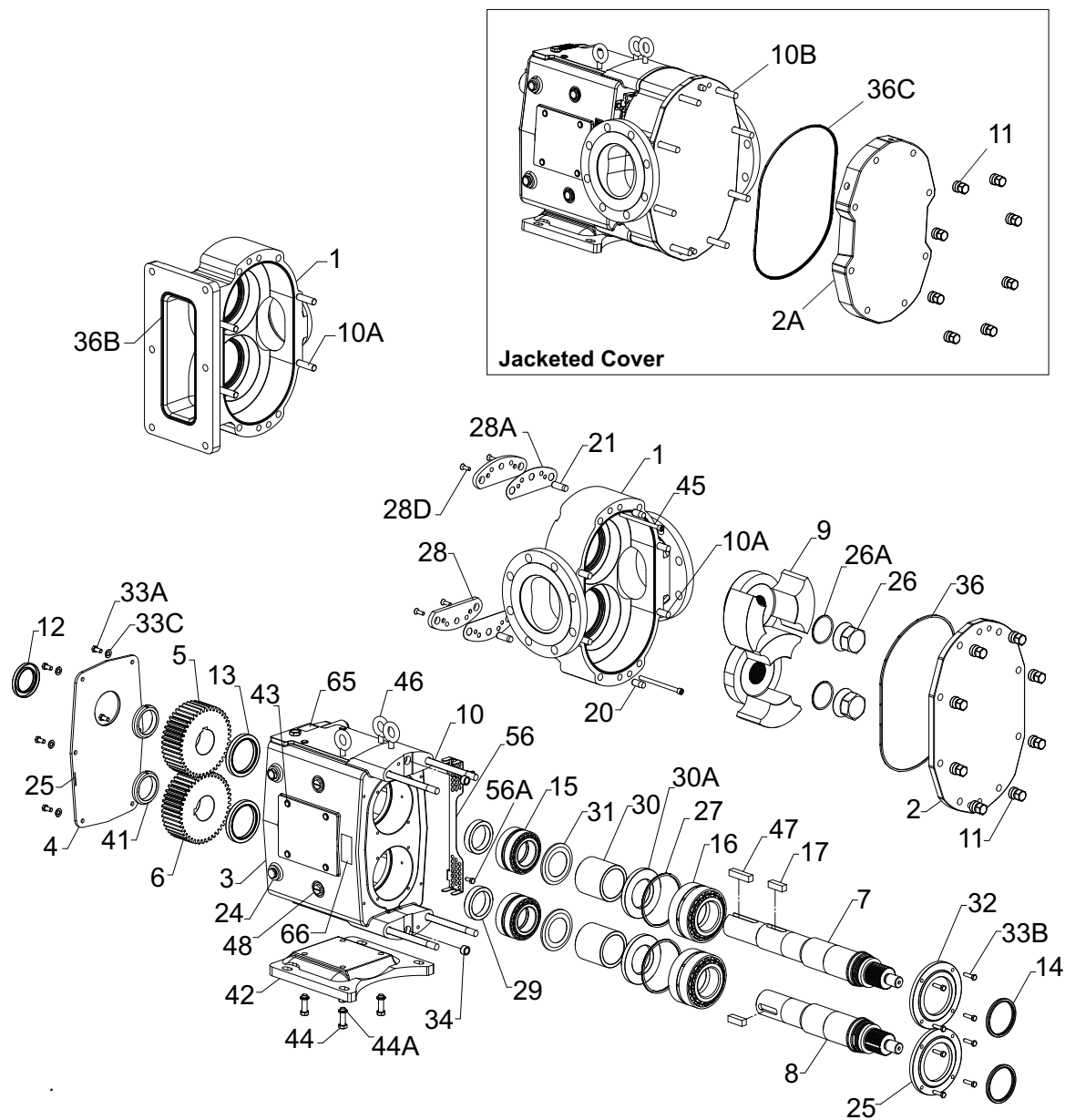
180, 184, 220, 223, 224-U3 Parts

ITEM NO.	DESCRIPTION	QTY. PER PUMP	PART NO.	NOTES
39	Lockwasher, Gear	2	STD136011	
41	Locknut, Gear	2	STD236011	
42	Mounting Foot 180-184-220-224-U3 SS	1	102287+	
43	Plastic Cap Plug	6	000121001+	
44	1/2-13 x 1-1/4" SS SHCS	4	30-503	
45	180-184-U3 Body Retaining Screw	2	30-766	
	220-224-U3 Body Retaining Screw	2	30-717	
46	Eye Bolt, 1/2-13 x 3/4"	2	30-721	
47	Key, Coupling - 1/2 x 1/2 x 1-7/8"	1	000037004+	
	Key, Coupling - Tru-Fit	1	119717+	
48	Cleanout Plug, SS	2	102297+	
56	180-220-U3 Seal Guard	2	138899+	
*57	223-U3 4.0" 401V Gasket FKM	2	20-108V	
*58	223-U3 O-Ring Port FKM	2	V70250	
59	223-U3 4" 131"1" Line Clamp	2	0546223+	
60	223-U3 4.0" 141"1" Line Ferrule	2	29-999X	
61	Adapter-Reducing AO Fittings	1	78-71	
62	#2 x .187" RHDS (Not shown)	4	30-355	
65	Caution Plate	2	121694+	1
66	Warning Label	2	33-60	1
67	Grease Fitting, 1/8"	4	LL118404	
68	Plastic Cap, Grease Fitting	4	BD0093000	
69	Name Plate, Sanitary (Not shown)	1	135624+	1

Notes:*** Recommended spare parts**

For standard seals, see page 159. For O-ring seals, see page 167. For mechanical seal kits, see page 166.

1. See "Replacement Labels" on page 12 for label detail.

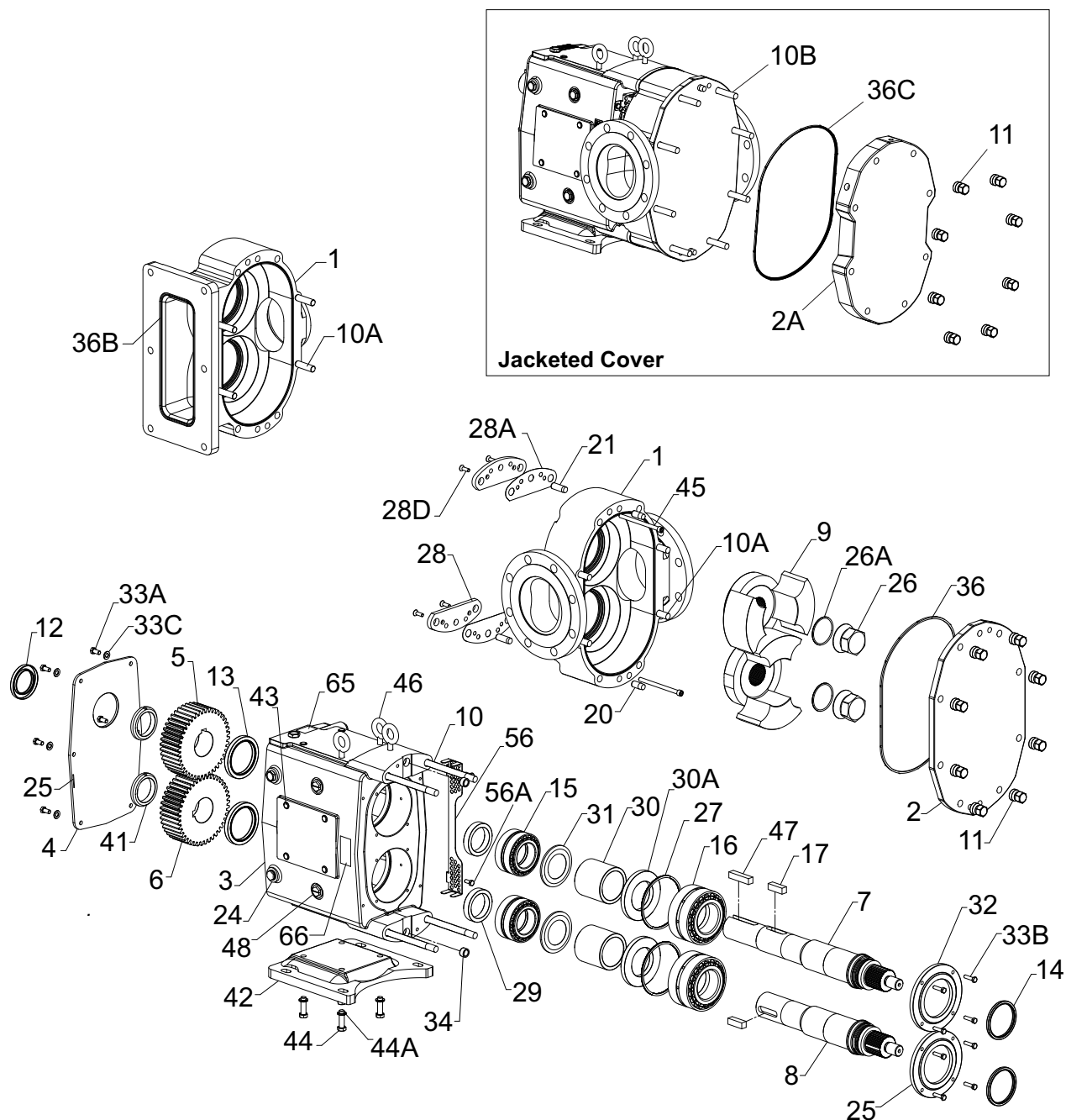
210, 214, 320, 324-U3 Parts

210, 214, 320, 324-U3 Parts

ITEM NO.	DESCRIPTION	QTY. PER PUMP	PART NO.	NOTES
1	Pump Body	1	See Note 1	1
2	210-214-U3 Pump Cover	1	138286+	
	320-324-U3 Pump Cover	1	138285+	
2A	210-214-320-324-U3 Pump Cover, Jacketed	1	141286+	6
3	Gear Case, SS, Model 210-214-320-324	1	138149+	
4	Gear Case Cover, SS	1	135851+	
5	Gear, Drive Shaft, Spur	1	102470+	
6	Gear, Short Shaft, Sput	1	102470+	
7	210-214-320-324-U3 Drive Shaft	1	138281+	3
8	210-214-320-324-U3 Short Shaft	1	138282+	3
9	210-214-U3 Rotor, Twin Wing, Alloy 88, Std. Cl.	2	138334+	2
	210-214-U3 Rotor, Twin Wing, 316SS, Std. Cl.	2	138337+	2
	320-324-U3 Rotor, Twin Wing, Alloy 88, Std. Cl.	2	138302+	2
	320-324-U3 Rotor, Twin Wing, 316SS, Std. Cl.	2	138305+	2
9A	Rotor drive pin (not shown)	2	M525S1670X	2
10	210-214-U3 Stud, Long	4	138340+	
	320-324-U3 Stud, Long	4	138341+	
10A	210-320-U3 Stud, Short	4	111292+	
	210-320-U3 Stud, Short, Jacketed	4	141500+	
	214-324-U3 Stud, Short	2	111292+	
		2	141501+	
	214-324-U3 Stud, Short, Jacketed	2	141500+	
		2	141502+	
10B	210-214-U3 Stud, Long, Jacketed	4	141276+	
	320-324-U3 Stud, Long, Jacketed	4	141277+	
11	Hex Nut	8	108373+	
12	Oil Seal, Gear Case Cover	1	STD030004	
13	Oil Seal, Gear Case Rear	2	102475+	
14	Grease Seal, Bearing Retainer	2	121681+	
15	Bearing, Rear	2	0H1036000	
16	Bearing, Front	2	0H1036003	
17	Key, Gear	2	0H1037000	
20	Dowel Pins, Cover Side, 1.38" x .616"	2	0H1040000	4
21	Dowel Pins, Gear Case Side, 1.88" x .616"	2	105871+	5

Notes:

1. Contact customer service with Serial Number of pump for Part Number.
2. See page 169 for additional rotors. Contact customer service for optional clearances and finishes. All rotors include rotor drive pins installed. For replacement pin, see item 9A (not shown).
3. Tru-Fit drive shaft is longer than the standard drive shaft listed here. See page 171.
4. Exposed length of dowel pin: .75" (19 mm).
5. Exposed length of dowel pin: 1.125" (28.6 mm).
6. For the Jacketed Cover Kit, see page 168.

210, 214, 320, 324-U3 Parts

210, 214, 320, 324-U3 Parts

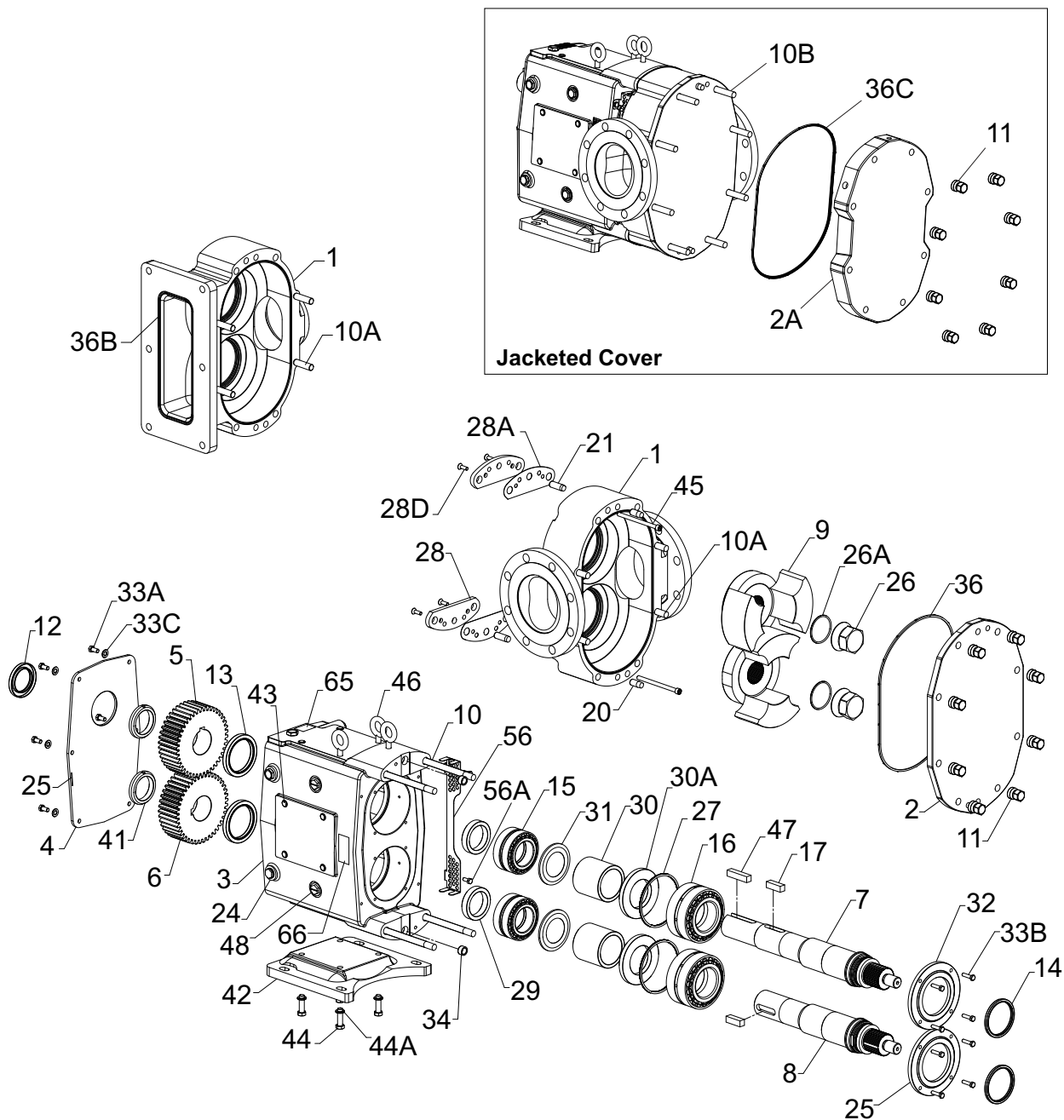
ITEM NO.	DESCRIPTION	QTY. PER PUMP	PART NO.	NOTES
24	Oil Plug, M20 x 1.5"	5	137169+	1
	O-Ring, Buna (for oil plug)	5	N70114	
	Oil Level Indicator, M20 x 1.5"	1	137435+	
25	Silicone Sealant (Not shown)	1	000142301+	
26	Nut, Rotor	2	138288+	
*26A	O-Ring, Rotor Nut, EPDM	2	E70231	
	O-Ring, Rotor Nut, FKM	2	V70231	
	O-Ring, Rotor Nut, FFKM	2	K70231	
27	Shim Kit	2	117893+	
28	Shim Plate	2	134506+	
28A	Shims, Body, .002	AR	134507+	
	Shims, Body, .003	AR	134508+	
	Shims, Body, .005	AR	134509+	
	Shims, Body, .010	AR	134510+	
	Shims, Body, .020	AR	134511+	
28D	5/16-18 x 1" FHSCS	4	30-612	
29	Spacer, Gear to Rear Bearing	2	102474+	
30	Bearing Spacer	2	102472+	
30A	Spacer Seal	2	102473+	
31	Retainer, Grease	2	STD091000	
32	Bearing Retainer, Front	2	123533+	
33A	3/8-16 x .75" HHCS	6	30-50	
33B	5/16-18 x 1.125" BSHCS	8	30-742	
33C	3/8" Flat Washer	6	43-30	
34	Dowel Bushings	2	0H1116000	
*36	210-U3 Cover Gasket, EPDM		139752+	
	210-U3 Cover Gasket, EPDM	1	309024E	2
	210-U3 Cover Gasket, FKM		139750+	
	210-U3 Cover Gasket, FKM	1	309024V	2
	210-U3 Cover Gasket, FFKM		139751+	
	210-U3 Cover Gasket, FFKM	1	309024K	2
	320-U3 Cover Gasket, EPDM		137248+	
	320-U3 Cover Gasket, EPDM	1	309025E	2
	320-U3 Cover Gasket, FKM		133636+	
	320-U3 Cover Gasket, FKM	1	309025V	2
	320-U3 Cover Gasket, FFKM		137243+	
	320-U3 Cover Gasket, FFKM	1	309025K	2

Notes:*** Recommended spare parts**

1. The oil plug requires O-ring N70114.

For standard seals, see page 159. For O-ring seals, see page 167. For mechanical seal kits, see page 166.

2. Cover gasket for pumps shipped starting November 2024.

210, 214, 320, 324-U3 Parts

210, 214, 320, 324-U3 Parts

ITEM NO.	DESCRIPTION	QTY. PER PUMP	PART NO.	NOTES
*36B	214-U3 O-Ring, Rectangular Flange, EPDM	1	E70377	
	214-U3 O-Ring, Rectangular Flange, FKM	1	V70377	
	214-U3 O-Ring, Rectangular Flange, FFKM	1	K70377	
	324-U3 O-Ring, Rectangular Flange, EPDM	1	E70378	
	324-U3 O-Ring, Rectangular Flange, FKM	1	V70378	
	324-U3 O-Ring, Rectangular Flange, FFKM	1	K70378	
*36C	210-U3 Cover Gasket, Jacketed, EPDM	1	139752+	
	210-U3 Cover Gasket, Jacketed, EPDM	1	309024E	2
	210-U3 Cover Gasket, Jacketed, FKM	1	139750+	
	210-U3 Cover Gasket, Jacketed, FFKM	1	309024V	2
	210-U3 Cover Gasket, Jacketed, FFKM	1	139751+	
	210-U3 Cover Gasket, Jacketed, FFKM	1	309024K	2
	320-U3 Cover Gasket, Jacketed, EPDM	1	137248+	
	320-U3 Cover Gasket, Jacketed, EPDM	1	309025E	2
	320-U3 Cover Gasket, Jacketed, FKM	1	133636+	
	320-U3 Cover Gasket, Jacketed, FKM	1	309025V	2
	320-U3 Cover Gasket, Jacketed, FFKM	1	137243+	
	320-U3 Cover Gasket, Jacketed, FFKM	1	309025K	2
41	Locknut, Gear	2	105697+	
42	Mounting Foot 210-214-320-324-U3 SS	1	130748+	
43	Plastic Cap Plug	8	000121001+	
44	1/2-13 x 1-3/4" HHCS	4	30-127X	
44A	Lock Washer, 1/2"	4	43-16	
45	210-214-U3 Body Retaining Screws	2	30-766	
	320-324-U3 Body Retaining Screws	2	30-766	
46	Eye Bolt	3	30-721	
47	Key, Coupling - 5/8 x 5/8 x 2-3/4"	1	000037005+	
	Key, Coupling - Tru-Fit	1	119718+	
48	Cleanout Plug, SS	2	102297+	
56	210-214-320-324-U3 Seal Guard	2	113504+	
56A	5/16-18 x .75" HHCS	4	30-623	
60A	1/8-27 Aseptic Connection Pipe Plugs	10	STD128500	
62	#2 x .187" RHDS (Not shown)	4	30-355	
65	Caution Plate	2	121694+	1
66	Warning Label	2	33-60	1
67	Grease Fitting, 1/8"	4	LL118404	
68	Plastic Cap, Grease Fitting	4	BD0093000	
69	Name Plate, Sanitary (Not shown)	1	135624+	1

Notes:*** Recommended spare parts**

1. See "Replacement Labels" on page 12 for detail.
2. Cover gasket for pumps shipped starting November 2024.

Universal 3 Mechanical Seal Generation 2

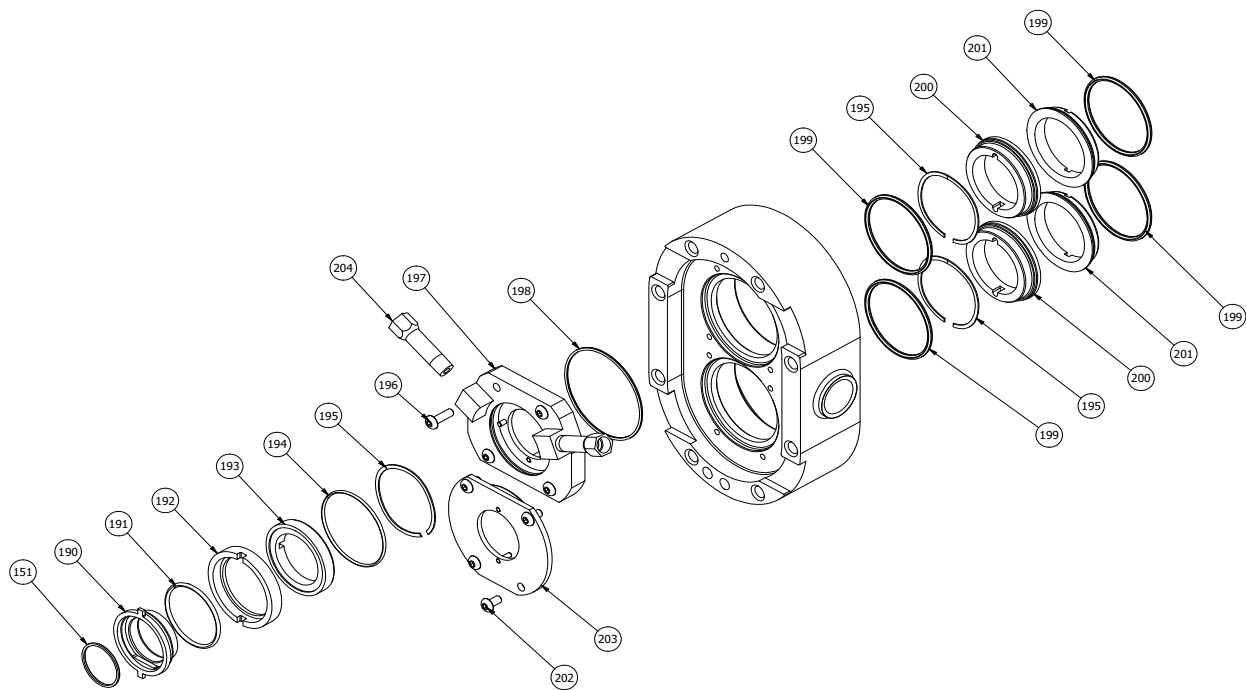


Figure 301

Universal 3 Standard Mechanical Seal Generation 2

Item No.	Description		Qty. per Pump		Part Number by Model				
			Mechanical Seal		006, 014, 015, 018 U3	030, 034, 040 U3	045, 060, 063, 064, 130, 133, 134 U3	180, 183, 184, 220, 223, 224 U3	210, 214, 320, 324 U3
			Single	Double					
*151	O-Ring, Adjusting Ring	EPDM	N/A	2	E70023	E70031		E70149	
		FKM		2	V70023	V70031		V70149	
190	Adjusting Ring		N/A	2	141988+	142473+		142489+	
*191	O-Ring, Adjusting Ring	EPDM	N/A	2	E70130	E70141		E70243	
		FKM		2	V70130	V70141		V70243	
192	Flush Side Rotary Seal	SC	N/A	2	141989+	142474+		142490+	
193	Flush Side Staionary Seal	C		2	141990+	142475+		142491+	
*194	O-Ring, Flush Side Stationary	EPDM	N/A	2	E70033	E70147		E70158	
		FKM		2	V70033	V70147		V70158	
195	Wave Spring		2	4	142102+	142484+		142500+	
196	Seal Housing Bolt DM		N/A	8	30-26	30-745	30-725	30-743	30-725
197	Seal Housing DM		N/A	2	141991+	142485+	142487+	142501+	142503+
*198	O-Ring Seal Housing	EPDM	N/A	2	E70036	E70041		E70249	
		FKM		2	V70036	V70041		V70249	
*199	O-Ring Product Side	EPDM	4	4	E70135	E70147		E70248	
		FKM		4	V70135	V70147		V70248	
200	Product Side Stationary Seal	C	2	2	141992+	142476+		142492+	
		SC			141993+	142477+		142493+	
		TC			141994+	142478+		142494+	
		SC NF			141996+	142480+		142496+	
		TC NF			141997+	142481+		142497+	
201	Product Side Rotary Seal	SC	2	2	141998+	142482+		142498+	
		TC			141999+	142483+		142499+	
202	Seal Housing Bolt SM		8	N/A	30-546	30-741		30-296	30-775
203	Seal Housing SM		2	N/A	142000+	142486+	142488+	142502+	142504+
204	Flush Extension	NPT	N/A	4	141189+		141190+		
		BSP			141191+		141192+		

Notes:

* Recommended spare part

NOTE: Generation 2 seals are available from September 23, 2021. See "Generation 2 Seal" on page 38.**Abbreviation Key:**

SM Single Mechanical
DM Double Mechanical
C Carbon
SC Silicon Carbide
TC Tungsten Carbide
NF Narrow Face

For O-ring seals, see page 167.

For mechanical seal kits, see page 166.

Universal 3 Mechanical Seal Cross-Section Generation 2

Items in **bold** below are contained in the seal kits listed on the following pages. For individual item part numbers, see page 159.

- 151 O-Ring, Adjusting Ring**
- 190 Adjusting Ring
- 191 O-Ring ,Flush (Outer) Rotary Seal**
- 192 Flush-Side(Outer) Rotary Seal**
- 193 Flush-Side (Outer) Stationary Seal**
- 194 O-Ring, Flush (Outer) Stationary Seal**
- 195 Wave Spring kit (Wave spring + drive ring)
- 198 O-Ring, Seal Housing**
- 199 O-Ring, Product (Inner) Stationary Seal**
- 200 Product-side (Inner) Stationary Seal**
- 201 Product-side (Inner) Rotary Seal**

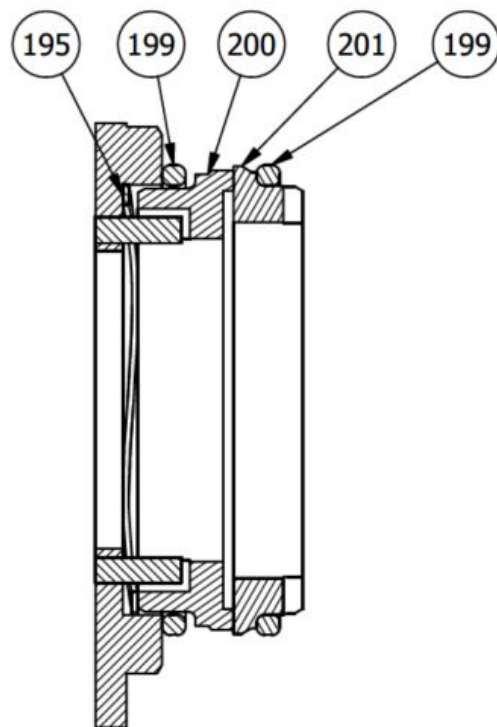


Figure 302 - U3 Single Mechanical Seal

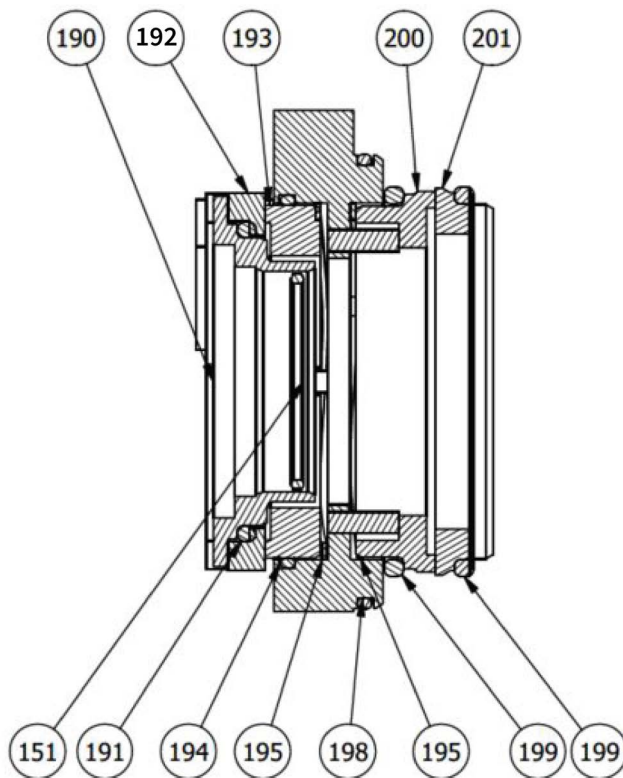


Figure 303 - U3 Double Mechanical Seal

Mechanical Seal Kits, Standard Models Generation 2

Seal Type	Rotary Inner (201)	Stationary Inner (200)	Stationary Outer (193)	Rotary Outer (192)	Elastomer	006/015/018 U3	030/040 U3	045/060/130 U3	180/220 U3	210 U3	320 U3
SM	SC	C	None	None	FKM	303957+	303993+	304029+	304065+	304101+	304137+
SM	SC	C	None	None	EPDM	303958+	303994+	304030+	304066+	304102+	304138+
SM	SC	C	None	None	FFKM	303959+	303995+	304031+	304067+	304103+	304139+
SM	SC	SC	None	None	FKM	303960+	303996+	304032+	304068+	304104+	304140+
SM	SC	SC	None	None	EPDM	303961+	303997+	304033+	304069+	304105+	304141+
SM	SC	SC	None	None	FFKM	303962+	303998+	304034+	304070+	304106+	304142+
SM	SC	TC	None	None	FKM	303963+	303999+	304035+	304071+	304107+	304143+
SM	SC	TC	None	None	EPDM	303964+	304000+	304036+	304072+	304108+	304144+
SM	SC	TC	None	None	FFKM	303965+	304001+	304037+	304073+	304109+	304145+
SM	SC	SC NF	None	None	FKM	303969+	304005+	304041+	304077+	304113+	304149+
SM	SC	SC NF	None	None	EPDM	303970+	304006+	304042+	304078+	304114+	304150+
SM	SC	SC NF	None	None	FFKM	303971+	304007+	304043+	304079+	304115+	304151+
SM	SC	TC NF	None	None	FKM	303972+	304008+	304044+	304080+	304116+	304152+
SM	SC	TC NF	None	None	EPDM	303973+	304009+	304045+	304081+	304117+	304153+
SM	SC	TC NF	None	None	FFKM	303974+	304010+	304046+	304082+	304118+	304154+
SM	TC	C	None	None	FKM	303975+	304011+	304047+	304083+	304119+	304155+
SM	TC	C	None	None	EPDM	303976+	304012+	304048+	304084+	304120+	304156+
SM	TC	C	None	None	FFKM	303977+	304013+	304049+	304085+	304121+	304157+
SM	TC	SC	None	None	FKM	303978+	304014+	304050+	304086+	304122+	304158+
SM	TC	SC	None	None	EPDM	303979+	304015+	304051+	304087+	304123+	304159+
SM	TC	SC	None	None	FFKM	303980+	304016+	304052+	304088+	304124+	304160+
SM	TC	TC	None	None	FKM	303981+	304017+	304053+	304089+	304125+	304161+
SM	TC	TC	None	None	EPDM	303982+	304018+	304054+	304090+	304126+	304162+
SM	TC	TC	None	None	FFKM	303983+	304019+	304055+	304091+	304127+	304163+
SM	TC	SC NF	None	None	FKM	303987+	304023+	304059+	304095+	304131+	304167+
SM	TC	SC NF	None	None	EPDM	303988+	304024+	304060+	304096+	304132+	304168+
SM	TC	SC NF	None	None	FFKM	303989+	304025+	304061+	304097+	304133+	304169+
SM	TC	TC NF	None	None	FKM	303990+	304026+	304062+	304098+	304134+	304170+
SM	TC	TC NF	None	None	EPDM	303991+	304027+	304063+	304099+	304135+	304171+
SM	TC	TC NF	None	None	FFKM	303992+	304028+	304064+	304100+	304136+	304172+

Abbreviation Key:

SM Single Mechanical

DM Double Mechanical

C Carbon

SC Silicon Carbide

TC Tungsten Carbide

NF Narrow Face

Inner = Product Side, Outer = Flush Side

Mechanical Seal Kits, Standard Models Generation 2

Seal Type	Rotary Inner (201)	Stationary Inner (200)	Stationary Outer (193)	Rotary Outer (192)	Elastomer	006/015/018 U3	030/040 U3	045/060/130 U3	180/220 U3	210 U3	320 U3
DM	SC	C	C	SC	FKM	304207+	304255+	304303+	304351+	304399+	304447+
DM	SC	C	C	SC	EPDM	304208+	304256+	304304+	304352+	304400+	304448+
DM	SC	C	C	SC	FFKM/FKM	304209+	304257+	304305+	304353+	304401+	304449+
DM	SC	C	C	SC	FFKM/EPDM	304210+	304258+	304306+	304354+	304402+	304450+
DM	SC	SC	C	SC	FKM	304211+	304259+	304307+	304355+	304403+	304451+
DM	SC	SC	C	SC	EPDM	304212+	304260+	304308+	304356+	304404+	304452+
DM	SC	SC	C	SC	FFKM/FKM	304213+	304261+	304309+	304357+	304405+	304453+
DM	SC	SC	C	SC	FFKM/EPDM	304214+	304262+	304310+	304358+	304406+	304454+
DM	SC	TC	C	SC	FKM	304215+	304263+	304311+	304359+	304407+	304455+
DM	SC	TC	C	SC	EPDM	304216+	304264+	304312+	304360+	304408+	304456+
DM	SC	TC	C	SC	FFKM/FKM	304217+	304265+	304313+	304361+	304409+	304457+
DM	SC	TC	C	SC	FFKM/EPDM	304218+	304266+	304314+	304362+	304410+	304458+
DM	SC	SC NF	C	SC	FKM	304223+	304271+	304319+	304367+	304415+	304463+
DM	SC	SC NF	C	SC	EPDM	304224+	304272+	304320+	304368+	304416+	304464+
DM	SC	SC NF	C	SC	FFKM/FKM	304225+	304273+	304321+	304369+	304417+	304465+
DM	SC	SC NF	C	SC	FFKM/EPDM	304226+	304274+	304322+	304370+	304418+	304466+
DM	SC	TC NF	C	SC	FKM	304227+	304275+	304323+	304371+	304419+	304467+
DM	SC	TC NF	C	SC	EPDM	304228+	304276+	304324+	304372+	304420+	304468+
DM	SC	TC NF	C	SC	FFKM/FKM	304229+	304277+	304325+	304373+	304421+	304469+
DM	SC	TC NF	C	SC	FFKM/EPDM	304230+	304278+	304326+	304374+	304422+	304470+
DM	TC	C	C	SC	FKM	304231+	304279+	304327+	304375+	304423+	304471+
DM	TC	C	C	SC	EPDM	304232+	304280+	304328+	304376+	304424+	304472+
DM	TC	C	C	SC	FFKM/FKM	304233+	304281+	304329+	304377+	304425+	304473+
DM	TC	C	C	SC	FFKM/EPDM	304234+	304282+	304330+	304378+	304426+	304474+
DM	TC	SC	C	SC	FKM	304235+	304283+	304331+	304379+	304427+	304475+
DM	TC	SC	C	SC	EPDM	304236+	304284+	304332+	304380+	304428+	304476+
DM	TC	SC	C	SC	FFKM/FKM	304237+	304285+	304333+	304381+	304429+	304477+
DM	TC	SC	C	SC	FFKM/EPDM	304238+	304286+	304334+	304382+	304430+	304478+
DM	TC	TC	C	SC	FKM	304239+	304287+	304335+	304383+	304431+	304479+
DM	TC	TC	C	SC	EPDM	304240+	304288+	304336+	304384+	304432+	304480+
DM	TC	TC	C	SC	FFKM/FKM	304241+	304289+	304337+	304385+	304433+	304481+
DM	TC	TC	C	SC	FFKM/EPDM	304242+	304290+	304338+	304386+	304434+	304482+
DM	TC	SC NF	C	SC	FKM	304247+	304295+	304343+	304391+	304439+	304487+
DM	TC	SC NF	C	SC	EPDM	304248+	304296+	304344+	304392+	304440+	304488+
DM	TC	SC NF	C	SC	FFKM/FKM	304249+	304297+	304345+	304393+	304441+	304489+
DM	TC	SC NF	C	SC	FFKM/EPDM	304250+	304298+	304346+	304394+	304442+	304490+
DM	TC	TC NF	C	SC	FKM	304251+	304299+	304347+	304395+	304443+	304491+
DM	TC	TC NF	C	SC	EPDM	304252+	304300+	304348+	304396+	304444+	304492+
DM	TC	TC NF	C	SC	FFKM/FKM	304253+	304301+	304349+	304397+	304445+	304493+
DM	TC	TC NF	C	SC	FFKM/EPDM	304254+	304302+	304350+	304398+	304446+	304494+

Abbreviation Key:

SM Single Mechanical

DM Double Mechanical

C Carbon

SC Silicon Carbide

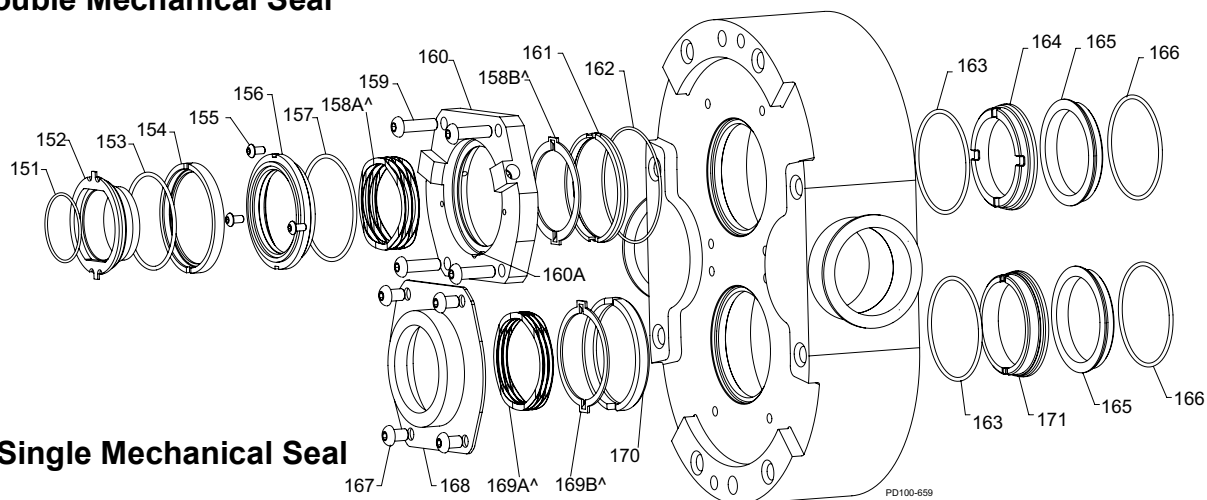
TC Tungsten Carbide

NF Narrow Face

Inner = Product Side, Outer = Flush Side

Universal 3 Standard Mechanical Seal Generation 1

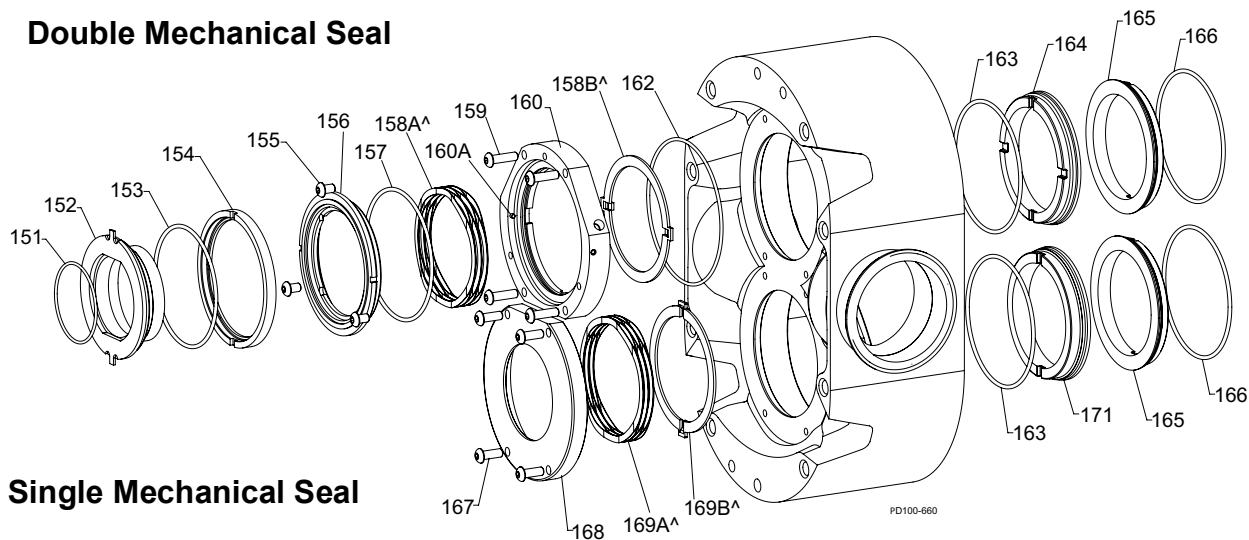
Double Mechanical Seal



Single Mechanical Seal

Figure 304 - Mechanical Seals, U3 pumps 134-U3 and smaller

Double Mechanical Seal



Single Mechanical Seal

Figure 305 - Mechanical Seals, U3 pumps 180-U3 and larger

^ Kit contains 1 wave spring and 1 drive ring.

Note: For a cross-section view, see page 165.

Universal 3 Standard Mechanical Seal Generation 1

Item No.	Description		Qty. per Pump		Part Number by Model						Notes
			Mechanical Seal		006, 014, 015, 018-U3	030, 034, 040-U3	045, 060, 064, 130, 134-U3	180, 184, 220, 224-U3	210, 214, 320, 324-U3		
			Single	Double							
*	151	O-Ring, Adjusting Ring	EPDM FKM	N/A	2	E70023	E70031	E70149			
						V70023	V70031	V70149			
	152	Adjusting Ring		N/A	2	138246+	137980+	138212+			
*	153	O-Ring, Flush Rotary Seal	EPDM FKM	N/A	2	E70130	E70144	E70245			
						V70130	V70144	V70245			
	154	Flush-Side Rotary Seal	SC	N/A	2	138371+	138372+	138373+			
	155	Seal Retaining Bolt		N/A	6	30-546	30-546	30-741			
	156	Flush-Side Stationary Seal	C	N/A	2	139787+	139788+	139789+			
*	157	O-Ring, Flush Stationary Seal	EPDM FKM	N/A	2	E70134	E70147	E70248			
						V70134	V70147	V70248			
*	158A	Wave Spring		N/A	2	139890+	139892+	139894+			2
	158B	Drive Ring									
	159	Seal Housing Bolt		N/A	8	30-765	30-725	30-742	30-742		
	160	Seal Housing - DM		N/A	2	138245+	137979+	138074+	138192+	138289+	
	160A	Stop Pin, Seal		N/A	4	137124+	137985+	138451+			
	161	Shaft Ring - DM		N/A	2	139161+	LA1215400	N/A	N/A		1
*	162	O-Ring, Seal Housing	EPDM FKM	N/A	2	E70036	E70041	L25071004			
						V70036	V70041	L25071002			
*	163	O-Ring, Product Stationary Seal	EPDM FKM FFKM	2	2	E70135	E70147	E70248			
						V70135	V70147	V70248			
						K70135	K70147	K70248			
	164	Product-side stationary seal (Double Mech. Seal only)	SC	N/A	2	138368+	138369+	138370+			
			C			138385+	138386+	138387+			
			TC			138400+	138401+	138402+			
			SC NF			139592+	139596+	N/A			
			TC NF			139593+	139597+	N/A			
	165	Product-side rotary seal	SC	2	2	138362+	138363+	138364+	138364+		
			TC			138394+	138395+	138396+	138396+		
*	166	O-Ring, Product Rotary Seal	EPDM FKM FFKM	2	2	E70135	E70147	E70248	E70248		
						V70135	V70147	V70248	V70248		
						K70135	K70147	K70248	K70248		
	167	Seal Housing Bolt		8	N/A	30-546	30-741	30-745	30-745		
	168	Seal Housing - SM		2	N/A	138244+	137946+	138076+	138195+	138343+	
*	169A	Wave Spring		2	N/A	139891+	139893+	139895+			2
	169B	Drive Ring									
	170	Shaft Ring - SM		2	N/A	LA2363201	LA2363401	N/A	N/A		1
	171	Stationary Seal (Single Mech. Seal only)	SC	2	N/A	138365+	138366+	138367+	138367+		
			C			138382+	138383+	138384+	138384+		
			TC			138397+	138393+	138399+	138399+		
			SC NF			139590+	139594+	N/A	N/A		
			TC NF			139591+	139595+	N/A	N/A		

PL5060-CH162

Notes:

* Recommended spare part

- Does not apply to U3 pumps 180-U3 and larger
- Wave Spring Kit (indicated with ^ on page 161) contains 1 wave spring and 1 drive ring.

Abbreviation Key:

SM Single Mechanical
DM Double Mechanical
C Carbon
SC Silicon Carbide
TC Tungsten Carbide
NF Narrow Face

For O-ring seals, see page 167.

For mechanical seal kits, see page 166.

Universal 3 Mechanical Seal Cross-Section Generation 1

Items in **bold** below are contained in the seal kits listed on the following pages. For individual item part numbers, see page 159.

- 151 **O-Ring, Adjusting Ring**
152 Adjusting Ring
153 **O-Ring, Flush (Outer) Rotary Seal**
154 **Flush-Side (Outer) Rotary Seal**
155 Seal Retaining Bolt
156 **Flush-Side (Outer) Stationary Seal**
157 **O-Ring, Flush (Outer) Stationary Seal**
158 Wave Spring kit (Wave spring + drive ring)
159 Seal Housing Bolt
160 Seal Housing - DM, includes stop pin
160A Stop Pin, Seal
161 Shaft Ring - DM
162 **O-Ring, Seal Housing**
163 **O-Ring, Product (Inner) Stationary Seal**
164 **Product-side (Inner) stationary seal**
165 **Product-side (Inner) rotary seal**
166 **O-Ring, Product (Inner) Rotary Seal**
167 Seal Housing Bolt
168 Seal Housing - SM
169 Wave Spring kit (Wave spring + drive ring)
170 Shaft Ring - SM
171 **Stationary Seal**

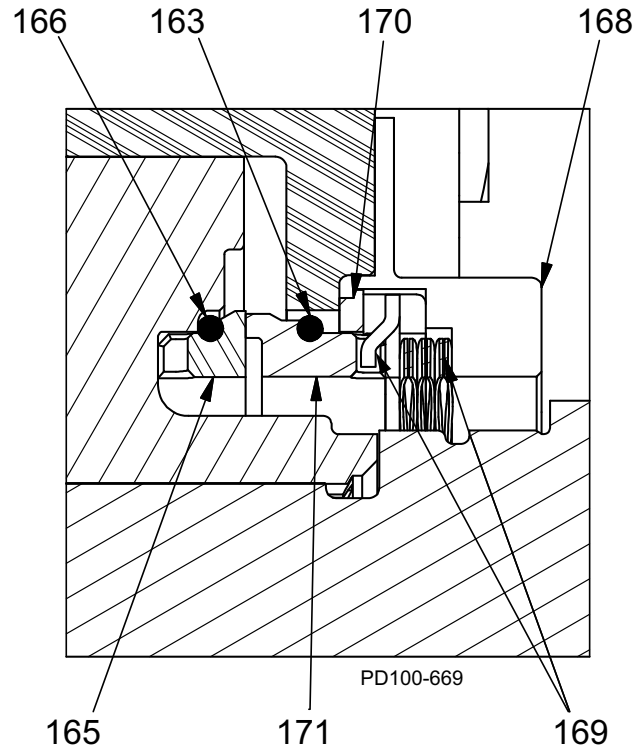


Figure 306 - U3 Single Mechanical Seal

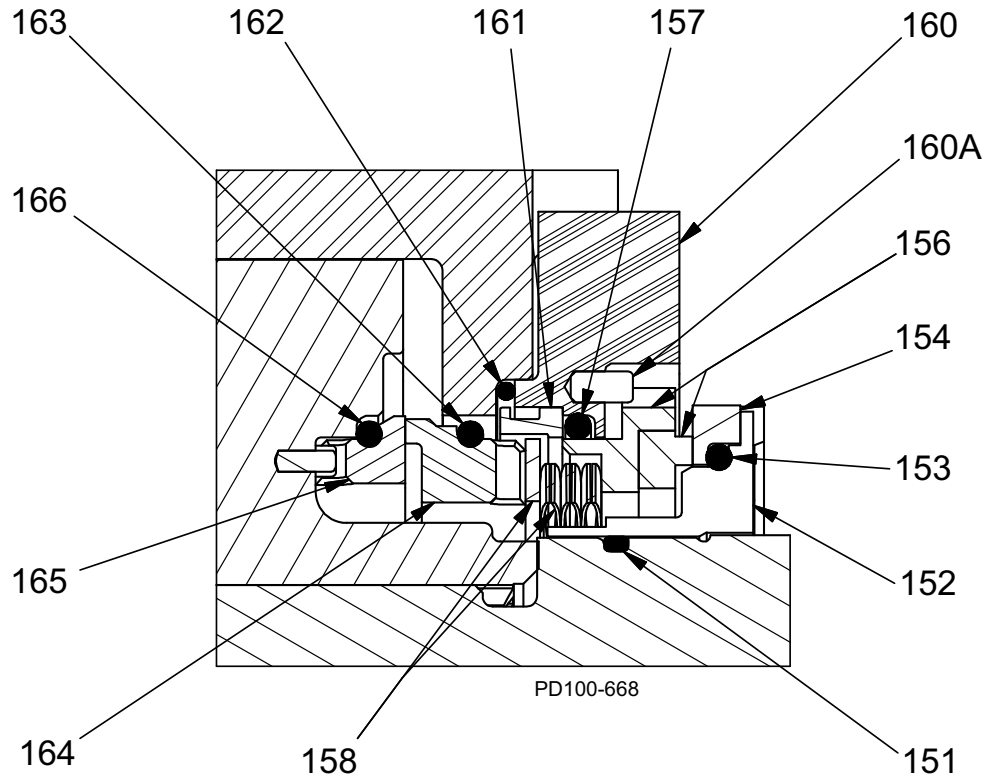


Figure 307 - U3 Double Mechanical Seal

Mechanical Seal Kits, Standard Models Generation 1

Seal Type	Rotary Inner (165)	Stationary Inner (164)	Rotary Outer (154)	Stationary Outer (156)	Elastomer (see notes)	006/015/018-U3	030/040-U3	045/060/130-U3	180/220-U3	210-U3	320-U3
SM	SC	C	None	None	FKM	139357+	139387+	139821+	139431+	140018+	139459+
SM	SC	C	None	None	EPDM	139358+	139388+	139822+	139432+	140019+	139460+
SM	SC	C	None	None	FFKM	139359+	139389+	139823+	139433+	140020+	139461+
SM	SC	SC	None	None	FKM	139360+	139390+	139824+	139434+	140021+	139462+
SM	SC	SC	None	None	EPDM	139361+	139391+	139825+	139435+	140022+	139463+
SM	SC	SC	None	None	FFKM	139362+	139392+	139826+	139436+	140023+	139464+
SM	TC	SC	None	None	FKM	139363+	139393+	139827+	139437+	140024+	139465+
SM	TC	SC	None	None	EPDM	139364+	139394+	139828+	139438+	140025+	139466+
SM	TC	SC	None	None	FFKM	139365+	139395+	139829+	139439+	140026+	139467+
SM	TC	TC	None	None	FKM	139366+	139396+	139830+	139440+	140027+	139468+
SM	TC	TC	None	None	EPDM	139367+	139397+	139831+	139441+	140028+	139469+
SM	TC	TC	None	None	FFKM	139368+	139398+	139832+	139442+	140029+	139470+
SM	SC	SC NF	None	None	FKM	139554+	139568+	139833+	NA	NA	NA
SM	SC	SC NF	None	None	EPDM	139555+	139569+	139834+	NA	NA	NA
SM	SC	SC NF	None	None	FFKM	139556+	139570+	139835+	NA	NA	NA
SM	TC	TC NF	None	None	FKM	139557+	139571+	139836+	NA	NA	NA
SM	TC	TC NF	None	None	EPDM	139558+	139572+	139837+	NA	NA	NA
SM	TC	TC NF	None	None	FFKM	139559+	139573+	139838+	NA	NA	NA
DM	SC	C	SC	C	FKM	139369+	139399+	139415+	139443+	140030+	139471+
DM	SC	C	SC	C	EPDM	139370+	139400+	139416+	139444+	140031+	139472+
DM	SC	C	SC	C	FFKM/FKM	139371+	139401+	139417+	139445+	140032+	139473+
DM	SC	C	SC	C	FFKM/EPDM	139372+	139402+	139418+	139446+	140033+	139474+
DM	SC	SC	SC	C	FKM	139373+	139403+	139419+	139447+	140034+	139475+
DM	SC	SC	SC	C	EPDM	139374+	139404+	139420+	139448+	140035+	139476+
DM	SC	SC	SC	C	FFKM/FKM	139375+	139405+	139421+	139449+	140036+	139477+
DM	SC	SC	SC	C	FFKM/EPDM	139376+	139406+	139422+	139450+	140037+	139478+
DM	TC	SC	SC	C	FKM	139377+	139407+	139423+	139451+	140038+	139479+
DM	TC	SC	SC	C	EPDM	139378+	139408+	139424+	139452+	140039+	139480+
DM	TC	SC	SC	C	FFKM/FKM	139379+	139409+	139425+	139453+	140040+	139481+
DM	TC	SC	SC	C	FFKM/EPDM	139380+	139410+	139426+	139454+	140041+	139482+
DM	TC	TC	SC	C	FKM	139381+	139411+	139427+	139455+	140042+	139483+
DM	TC	TC	SC	C	EPDM	139382+	139412+	139428+	139456+	140043+	139484+
DM	TC	TC	SC	C	FFKM/FKM	139383+	139413+	139429+	139457+	140044+	139485+
DM	TC	TC	SC	C	FFKM/EPDM	139384+	139414+	139430+	139458+	140045+	139486+
DM	SC	SC NF	SC	C	FKM	139560+	139574+	139582+	NA	NA	NA
DM	SC	SC NF	SC	C	EPDM	139561+	139575+	139583+	NA	NA	NA
DM	SC	SC NF	SC	C	FFKM/FKM	139562+	139576+	139584+	NA	NA	NA
DM	SC	SC NF	SC	C	FFKM/EPDM	139563+	139577+	139585+	NA	NA	NA
DM	TC	TC NF	SC	C	FKM	139564+	139578+	139586+	NA	NA	NA
DM	TC	TC NF	SC	C	EPDM	139565+	139579+	139587+	NA	NA	NA
DM	TC	TC NF	SC	C	FFKM/FKM	139566+	139580+	139588+	NA	NA	NA
DM	TC	TC NF	SC	C	FFKM/EPDM	139567+	139581+	139589+	NA	NA	NA

Notes:

Item numbers listed in parentheses above are from page 165 and from the pump parts list pages.

Elastomers listed above include item numbers: 151, 153, 157, 162, 163, 166, 36, 36C, and 26A.

SM seals do not include items 151, 153, 157, or 162.

Abbreviation Key:

SM Single Mechanical

DM Double Mechanical

C Carbon

SC Silicon Carbide

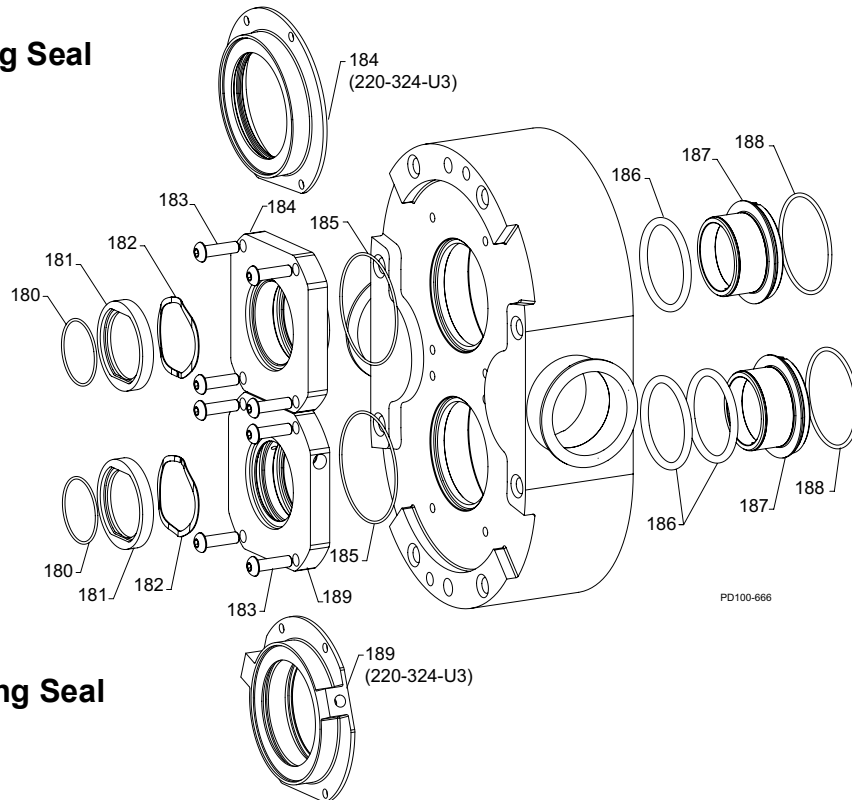
TC Tungsten Carbide

NF Narrow Face

Inner = Product Side, Outer = Flush Side

Universal 3 O-Ring Seal

Single O-ring Seal



Double O-ring Seal

Figure 308 - O-Ring Seals

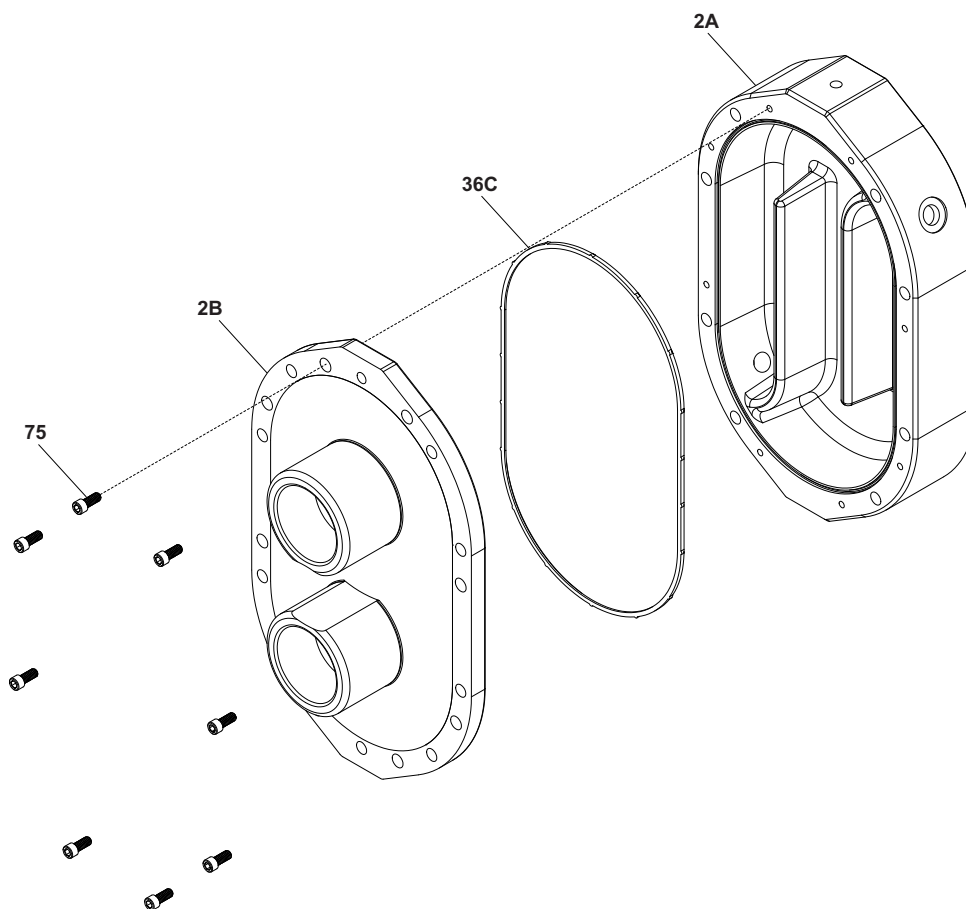
Item No.	Description		Qty. Per Pump		Part Number				
			Double O-ring Seal	Single O-ring Seal	006, 014, 015, 018 U3	030, 034, 040 U3	045, 060, 064, 130, 134 U3	180, 184, 220, 224 U3	210, 214, 320, 324 U3
*180	O-Ring, Sleeve Back	EPDM	2	2	E70024	E70031		E70150	
		FKM			V70024	V70031		V70150	
181	Spring Seat, O-Ring Seal		2	2	138467+	138442+		139115+	
*182	Wave Spring		2	2	139799+	101685+		220304000+	101688+
183	Button Socket Head Single Cap Screw (BSHCS) Double		8	8	30-546	30-742		30-741	
					30-747				
184	Housing, Single O-Ring Seal		N/A	2	138470+	138424+	138425+	139098+	139099+
*185	O-Ring, Seal Housing	EPDM	2	2	E70036	E70041		L25071004	
		FKM			V70036	V70041		L25071002	
*186	O-Ring, Seal	EPDM	4	2	E70326	E70331		E70343	
		FKM			V70326	V70331		V70343	
*187	Sleeve, O-Ring Seal	COX	2	2	138465+	138428+		139116+	
		SS			140543+	140544+		140545+	
*188	O-Ring, Sleeve Front FKM	EPDM	2	2	E70135	E70147		E70248	
		FKM			V70135	V70147		V70248	
189	Housing, Double O-Ring Seal		2	N/A	138466+	138426+	138427+	139095+	139097+

Notes:

* Recommended spare part

For flush extensions for double seal, see page 159.

Jacketed Cover Kit



KIT NO. WITHOUT STUD	KIT NO. WITH STUD	DESCRIPTION	2A JACKETED COVER (1)	2B STANDARD COVER (1)	36C GASKET (1)	75 CAP SCREW	COVER STUD (NOT SHOWN)
312215+	312215S	KIT, JACKETED COVER ASSY STD 006-U3	141280+	312093-21+	309020E	30-25 (4)	141465+ (8)
312216+	312216S	KIT, JACKETED COVER ASSY STD 015-U3	141281+	312094-21+	309020E	30-25 (4)	141466+ (8)
312470+	312470S	KIT, JACKETED COVER ASSY STD 018-U3	141282+	312095-21+	309020E	30-25 (4)	141467+ (8)
312744+	312744S	KIT, JACKETED COVER ASSY STD 030-U3	141283+	312096-21+	309021E	30-25 (4)	141269+ (8)
312200+	312200S	KIT, JACKETED COVER ASSY STD 040-U3	141283+	312097-21+	309021E	30-25 (4)	141270+ (8)
312217+	312217S	KIT, JACKETED COVER ASSY STD 045-U3	141405+	312098-21+	309022E	30-29 (8)	141271+ (8)
312745+	312745S	KIT, JACKETED COVER ASSY STD 060-U3	141406+	312089-21+	309022E	30-29 (8)	141272+ (8)
312201+	312201S	KIT, JACKETED COVER ASSY STD 130-U3	141406+	312090-21+	309022E	30-29 (8)	141273+ (8)
312218+	312218S	KIT, JACKETED COVER ASSY STD 180-U3	141284+	312099-21+	309023E	30-29 (8)	141274+ (8)
312202+	312202S	KIT, JACKETED COVER ASSY STD 210-U3	141286+	312100-21+	309024E	30-29 (8)	141275+ (8)
312747+	312747S	KIT, JACKETED COVER ASSY STD 220-U3	141285+	312091-21+	309023E	30-29 (8)	141276+ (8)
312748+	312748S	KIT, JACKETED COVER ASSY STD 320-U3	141286+	312101-21+	309025E	30-29 (8)	141277+ (6) & 141482+ (2)

U3 Shaft and Bearing Assemblies

DESCRIPTION	QTY. PER PUMP	PART NO.
006-014-015-018-U3 Drive Shaft & Bearing Assembly	1	139809+
006-014-015-018-U3 Short Shaft & Bearing Assembly	1	139810+
030-034-040-U3 Drive Shaft & Bearing Assembly	1	139811+
030-034-040-U3 Short Shaft & Bearing Assembly	1	139812+
045-060-064-130-134-U3 Drive Shaft & Bearing Assembly	1	139813+
045-060-064-130-134-U3 Short Shaft & Bearing Assembly	1	139814+
180-184-220-224-U3 Drive Shaft & Bearing Assembly	1	139815+
180-184-220-224-U3 Short Shaft & Bearing Assembly	1	139816+
210-214-320-324-U3 Drive Shaft & Bearing Assembly	1	139817+
210-214-320-324-U3 Short Shaft & Bearing Assembly	1	139818+

Note:

Assembly includes items 7 or 8 (drive or short shaft), 15 (rear bearing), 16 (front bearing), 17 (gear key), 29 (gear to rear bearing spacer), 30 (bearing spacer), 40 (body retaining screw), and 47 (coupling key). See the model-specific parts list pages for drawings.

U3 Rotors

Description	006-U3	014-015-U3	018-U3	030-034-U3	040-U3	045-U3
Rotor, Twin Wing, Alloy 88, Std.	138255+	138265+	138275+	137961+	137970+	138053+
Rotor, Twin Wing, 316SS, Std.	138258+	138268+	138278+	137965+	137974+	138056+
Rotor, Twin Wing, Alloy 88, Low Visc.	138253+	138263+	138273+	133421+	137966+	138035+
Rotor, Twin Wing, 316SS, Low Visc.	138257+	138267+	138277+	137963+	137972+	138055+
Rotor, Twin Wing, Alloy 88, Hot	138526+	138266+	138276+	137962+	137971+	138054+
Rotor, Twin Wing, Alloy 88, EH CIP	n/a	142566+	n/a	142567+	n/a	142542+

Description	060-064-U3	130-134-U3	180-184-U3	220-224-U3	210-214-U3	320-324-U3
Rotor, Twin Wing, Alloy 88, Std.	138061+	138068+	138161+	138172+	138334+	138302+
Rotor, Twin Wing, 316SS, Std.	138064+	138071+	138164+	138175+	138337+	138305+
Rotor, Twin Wing, Alloy 88, Low Visc.	138036+	138037+	138159+	138170+	138332+	138300+
Rotor, Twin Wing, 316SS, Low Visc.	138063+	138070+	138163+	138174+	138336+	138304+
Rotor, Twin Wing, Alloy 88, Hot	138062+	138069+	138162+	138173+	138335+	138303+
Rotor, Twin Wing, Alloy 88, EHCIP	142543+	142544+	142545+	142546+	n/a	n/a

Std. = Standard Clearance

Low Visc. = Low Viscosity Clearance

Hot = Hot Clearance

EHCIP = Extra Hot Clearance with CIP Flats

Special Tools for U3 Pumps

Non-Marring Socket Tool for Rotor Nuts

U3 Model	Part Number
006, 014, 015, 018	140074+
030, 034, 040	139795+
045, 060, 064, 130, 134	139796+
180, 184, 220, 224	139797+
210, 214, 320, 324	126536+

PL5060-CH149



O-ring Removal Tools

Description	Part Number
Standard O-ring removal tool	AD0096001
U3 Double O-Ring Seal Removal Tool	140062+

PL5060-CH170

Rotor Blocking Tool

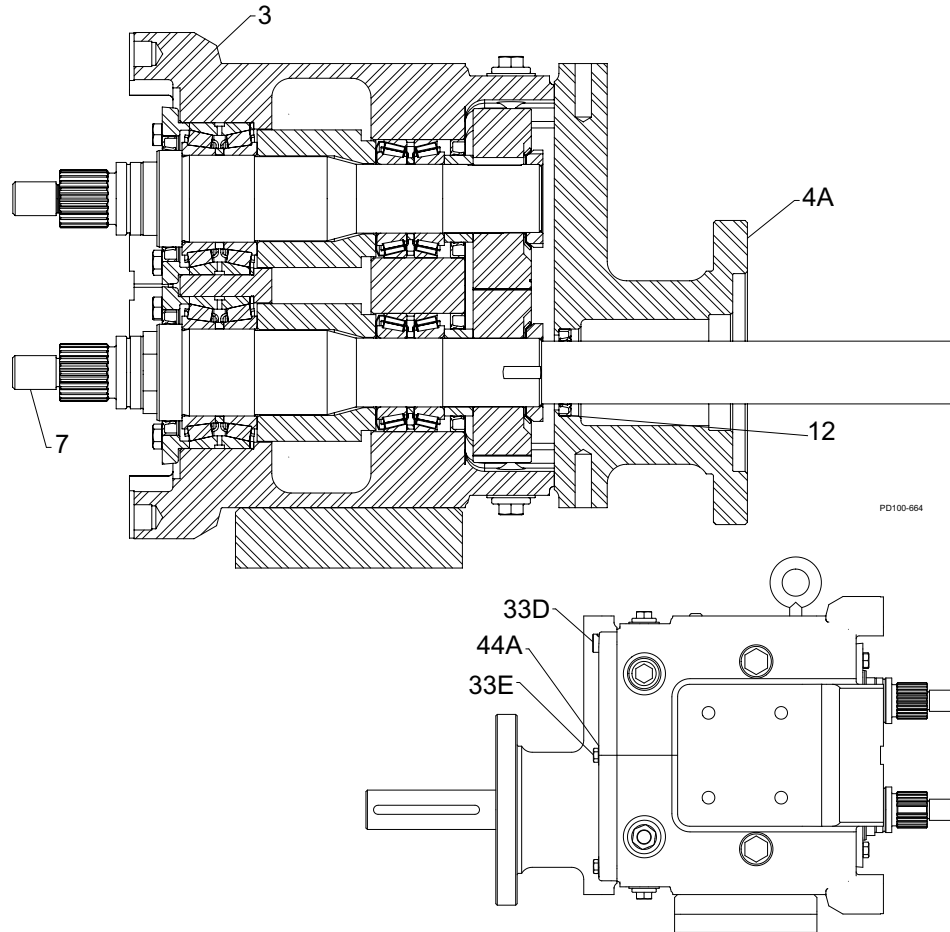
Description	Part Number
Rotor Blocking Tool	139790+

PL5060-CH164

Gear Nut Driver, Gear End Shaft Thread Chaser

Description	Model U3 Pumps	Part Number
Gear Nut Driver	006, 014, 015, 018	109281+
	030, 034, 040	109282+
	045, 060, 064, 130, 134	109283+
	180, 184, 220, 224	110304+
	210, 214, 320, 324	114702+
Gear End Shaft Thread Chaser	006, 014, 015, 018	109287+
	030, 034, 040	109288+
	045, 060, 064, 130, 134	109289+
	180, 184, 220, 224	110305+
	210, 214, 320, 324	POA

PL5060-CH150

Tru-Fit™ Universal 3 PD Pump Parts

Item No.	Description	Qty.	U3 Pump Size					Notes
			006, 014, 015, 018	030, 034, 040	045, 060, 064, 130, 134	180, 184, 220, 224	210, 214, 320, 324	
3	Gear Case, SS	1	125414+	121201+	125355+	124663+	134290+	
4A	Gear Case Cover, Adapter, SS	1	136577+	Serial # Required				1
7	Drive Shaft	1	139062+	139063+	139064+	139065+	139066+	
12	Oil Seal, Gear Case Cover	1	000030016+	000030013+	000030012+	STD030006	STD030004	2
33D	1/4-20 x 1" HHCS	4	30-93	—	—		—	
	—		30-237	—		—		
	—		—	30-50		—		
	—		—	—		30-103		
33E	5/16" x 3/4" lg. SHSB	2	30-690	—	—		—	
	—		30-691	—		—		
	—		—	30-692		—		
	—		—	—		30-693		
44A	Flat Washer, 5/16"	4	43-246	—	—			
	—		43-30	—				
	—		—	43-31				

PL5060-CH163

Note:

1. Depends on the Nord motor, material, paint. Contact customer service with serial number for part number.
2. Item 12 is the same seal that is used on non-Tru-Fit pumps. It is not included with item 4A.

Long Term Storage

Long-term storage (greater than six months) of Waukesha Cherry-Burrell brand pumps:

Before Storage

1. Lubricate all bearings and seals, including:
 - Rubber o-rings and mechanical seal faces (new pump bearings installed from the factory are already lubricated).
 - Motors and drives (see manufacturer's instructions)
2. Be sure the pump contains no water. Make sure to disassemble the wet end and wipe it dry if necessary.
3. Use rust inhibitor on any exposed metal surfaces:
 - Any unpainted surfaces
 - Shafts, nuts/bolts
4. Cover the inlet/outlet connections of the pumps to keep out foreign materials.
5. Put all related instruction manuals in a separate water-tight envelope or container and store them with the equipment.
6. Completely enclose the equipment to prevent contamination from moisture, dust and other possible contaminants. Certain types of plastic wrap materials, when properly used, make excellent storage enclosures.
7. Rotate the pump and drive shafts several turns every 3 months.

Storage

1. Store in a dry location. Indoor storage is preferred. If stored outdoors, the equipment must be in a weather-tight enclosure and shielded from direct sunlight.
2. Maintain even temperatures to prevent condensation.

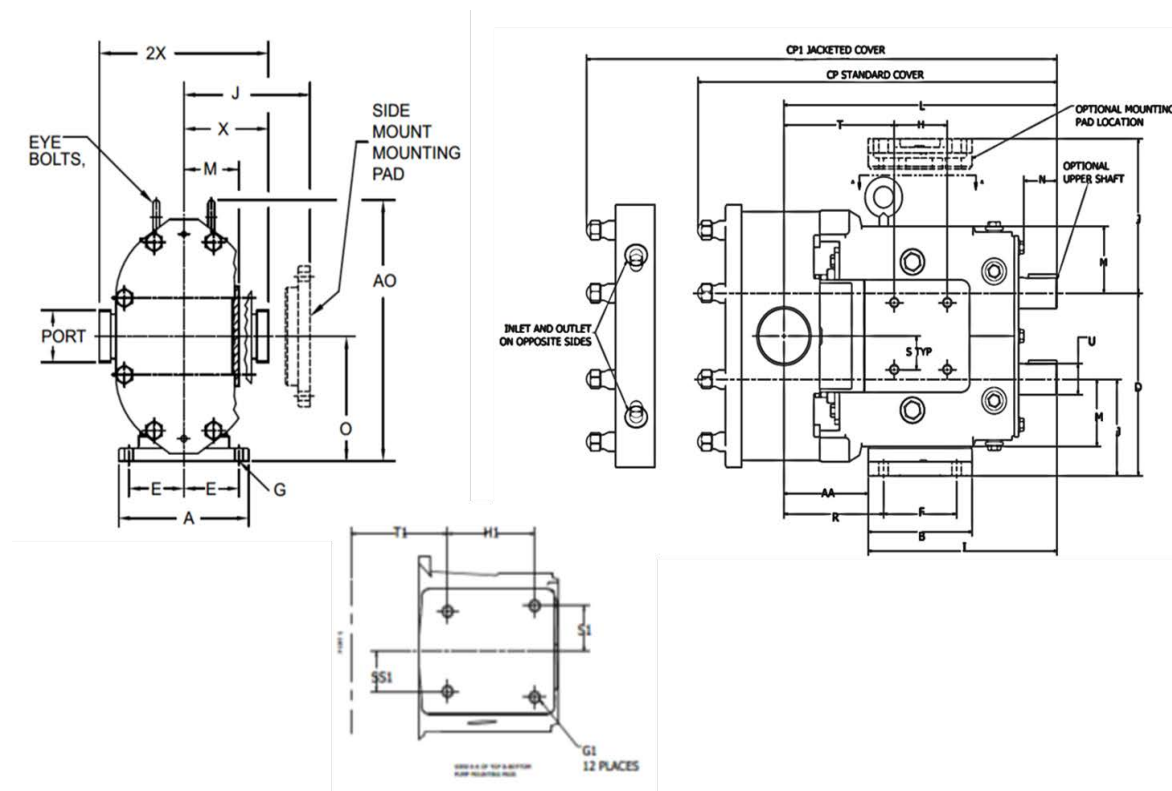
After Storage

NOTE: Do not start the motor if there is any indication of water contamination. Have the motor checked by a qualified electrician before starting.

1. Remove the equipment from the enclosure and repair or replace any damaged items before using equipment.
2. Check the electric motor (if applicable) per the manufacturer's instructions.
3. Pumps:
 - Completely disassemble the product contact liquid end per the instruction manual.
 - Clean and inspect all parts, including seals and o-rings.
 - Replace rubber parts with any sign of age or damage, such as cracks, taking a set, or loss of elasticity.
4. Lubricate the seal and o-rings and reassemble the liquid end per the instruction manual.
5. Purge pump bearings with fresh grease.
6. Lubricate the motor/drive (if applicable) per the manufacturer's instructions.
7. If the pump has been in storage longer than 1 year, change the oil in the pump and drive.

Pump Dimensions

Universal 3 PD Pump Dimensions



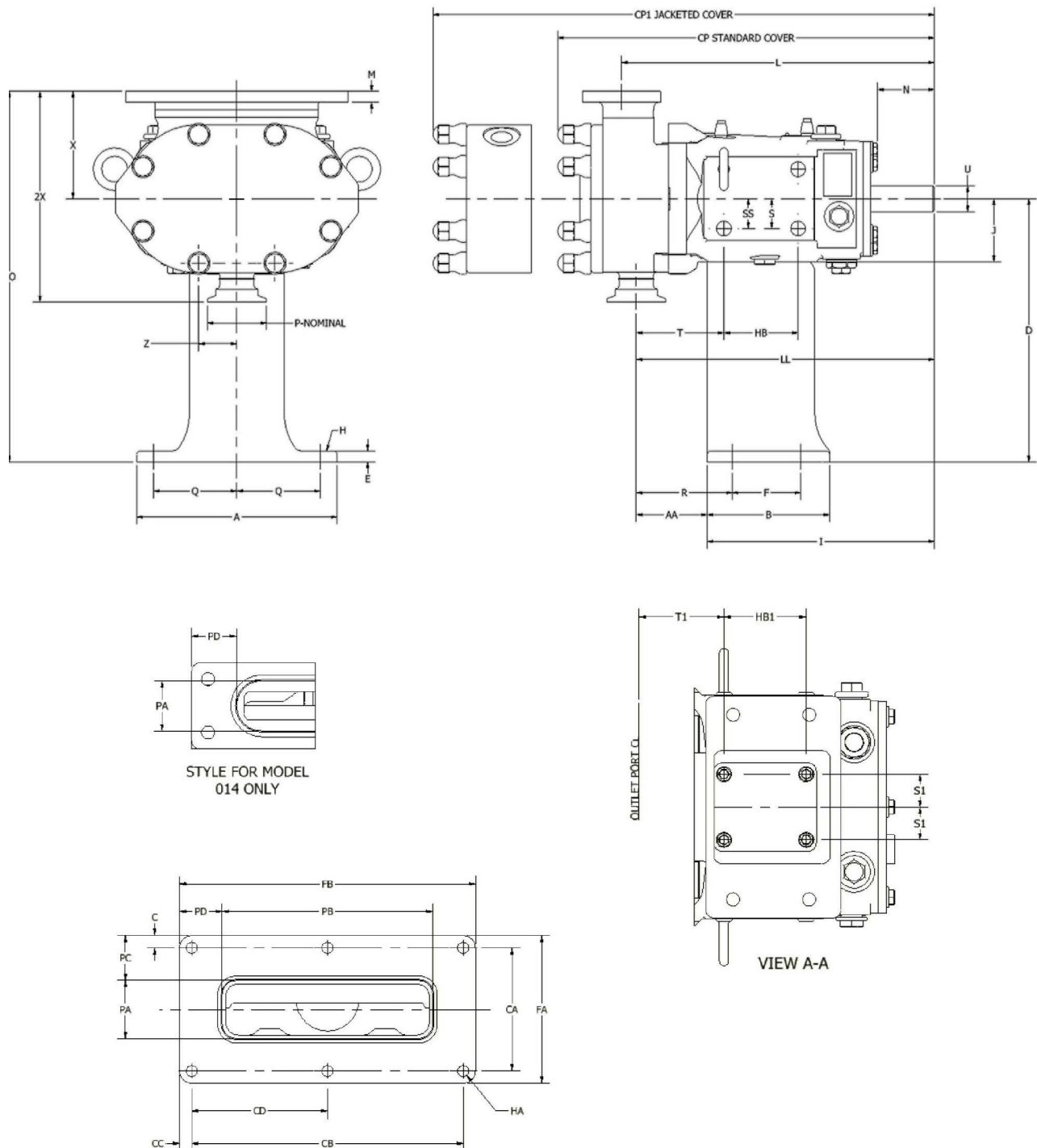
Pump Dimensions

U3 Model		A	AA	AO	B	CP	D	E	F	G	G1	H	H1
006	inch	4.71	2.41	8.3	3.66	12.42	5.50	1.97	2.31	0.50	5/16-18x.62	2.50	2.50
	mm	120	61	211	93	315	140	50	59	13	--	64	64
015	inch	4.71	2.41	8.3	3.66	12.69	5.50	1.97	2.31	0.50	5/16-18x.62	2.50	2.50
	mm	120	61	211	93	322	140	50	59	13	--	64	64
018	inch	4.71	2.65	8.3	3.66	13.35	5.50	1.97	2.31	0.50	5/16-18x.62	2.50	2.50
	mm	120	67	211	93	339	140	50	59	13	--	64	64
030	inch	6.19	3.22	10.29	4.15	15.16	6.86	2.42	2.56	.41, slot	3/8-16x.62	1.81	2.75
	mm	157	82	261	105	385	174	61	65	10, slot	--	46	70
040	inch	6.19	3.39	10.29	4.15	15.54	6.86	2.42	2.56	.41, slot	3/8-16x.62	1.81	2.75
	mm	157	86	261	105	395	174	61	65	10, slot	--	46	70
045	inch	8.25	3.85	15.31	5.88	19.11	9.56	3.5	4.12	0.53	1/2-13x.88	3.00	4.13
	mm	210	98	389	149	485	243	89	105	13	--	76	105
060	inch	8.25	4.13	15.31	5.88	19.66	9.56	3.5	4.12	0.53	1/2-13x.88	3.00	4.13
	mm	210	105	389	149	499	243	89	105	13	--	76	105
130	inch	8.25	4.77	15.31	5.88	20.68	9.56	3.5	4.12	0.53	1/2-13x.88	3.00	4.13
	mm	210	121	389	149	525	243	89	105	13	--	76	105
180	inch	8.5	3.46	19.13	9.00	23.48	12.38	3.75	7.25	.53, slot	1/2-13x.88	5.38	5.38
	mm	216	88	486	229	596	314	95	184	13, slot	--	137	137
210	inch	12	4.14	23.84	11.63	27.07	13.87	5.25	8.00	.66, slot	1/2-13x.88	5.38	5.38
	mm	305	105	606	295	688	352	133	203	17, slot	--	137	137
220	inch	8.5	3.70	19.13	9.00	24.22	12.38	3.75	7.25	.53, slot	1/2-13x.88	5.38	5.38
	mm	216	94	486	229	615	314	95	184	13, slot	--	137	137
270	inch	8.5	4.33	19.13	9.00	24.85	12.38	3.75	7.25	.53, slot	1/2-13x.88	5.38	5.38
	mm	216	110	486	229	631	314	95	184	13, slot	--	137	137
320	inch	12	4.52	23.84	11.63	27.66	13.87	5.25	8.00	.66, slot	1/2-13x.88	5.38	5.38
	mm	305	115	606	295	703	352	133	203	17, slot	--	137	137

Universal 3 PD Pump Dimensions

U3 Model	I	J	K	L	M	N	O	Port Size	R	S	S1	SS1	T	T1	U	X	2X
006	7.61	2.93	0.19	10.04	2.43	1.92	4.21	1"	3.23	1.00	1.00	1.00	2.95	2.95	0.88	3.49	6.97
	193	74	5	255	62	49	107	--	82	25	25	25	75	75	22	89	177
015	7.61	2.93	0.19	10.04	2.43	1.92	4.21	1-1/2"	3.23	1.00	1.00	1.00	2.95	2.95	0.88	3.49	6.97
	193	74	5	255	62	49	107	--	82	25	25	25	75	75	22	89	177
018	7.61	2.93	0.19	10.28	2.43	1.92	4.21	1/1/2"	3.47	1.00	1.00	1.00	3.18	3.18	0.88	3.55	7.09
	193	74	5	261	62	49	107	--	88	25	25	25	81	81	22	90	180
030	8.80	3.56	0.25	12.05	2.62	2.26	5.21	1-1/2"	4.26	1.12	1.12	1.12	4.42	4.01	1.25	4.25	8.50
	224	90	6	306	67	57	132	--	108	28	28	28	112	102	32	108	216
040	8.80	3.56	0.25	12.21	2.62	2.26	5.21	2"	4.43	1.12	1.12	1.12	4.59	4.18	1.25	4.32	8.64
	224	90	6	310	67	57	132	--	113	28	28	28	117	106	32	110	219
045	11.00	5.06	0.38	14.84	3.50	2.18	7.31	2"	4.72	1.75	2.00	1.75	5.32	4.72	1.63	5.38	10.75
	279	129	10	377	89	55	186	--	120	44	51	44	135	120	41	137	273
060	11.00	5.06	0.38	15.13	3.50	2.18	7.31	2-1/2"	5.01	1.75	2.00	1.75	5.61	5.01	1.63	5.38	10.75
	279	129	10	384	89	55	186	--	127	44	51	44	142	127	41	137	273
130	11.00	5.06	0.38	15.76	3.50	2.18	7.31	3"	5.64	1.75	2.00	1.75	6.24	5.64	1.63	5.38	10.75
	279	129	10	400	89	55	186	--	143	44	51	44	158	143	41	137	273
180	14.80	6.38	0.50	19.03	4.50	2.67	9.38	3"	4.21	2.69	2.69	2.69	5.77	5.77	2.00	6.53	13.06
	376	162	13	483	114	68	238	--	107	68	68	68	147	147	51	166	332
210	17.72	6.87	0.63	21.85	5.06	4.02	10.38	4"	5.64	2.69	2.69	2.69	8.39	8.39	2.38	7.37	14.73
	450	174	16	555	129	102	264	--	143	68	68	68	213	213	60	187	374
220	14.80	6.38	0.50	18.49	4.50	2.67	9.38	4"	4.45	2.69	2.69	2.69	6.01	6.01	2.00	6.63	13.25
	376	162	13	470	114	68	238	--	113	68	68	68	153	153	51	168	337
270	14.80	6.38	0.50	19.13	4.50	2.67	9.38	4"	5.08	2.69	2.69	2.69	6.65	6.65	2.00	6.63	13.25
	376	162	13	486	114	68	238	--	129	68	68	68	169	169	51	168	337
320	17.72	6.87	0.63	22.34	5.06	4.02	10.38	6" 150# FLG	6.02	2.69	2.69	2.69	8.77	8.77	2.38	8.00	16.00
	450	174	16	567	129	102	264		153	68	68	68	223	223	60	203	406

NOTE: Dimensions "X" and "2X" apply for bevel seat, "S" Clamp, "Q" Clamp, 15I, and 14I fittings (except 320-U3).

Universal 3 Rectangular Flange PD Pump Dimensions

Universal 3 Rectangular Flange PD Pump Dimensions

MODEL	UNIT	AO*	CP	CP1	I	PORT SIZE	Z	L	LL	U +.001 -.001	X	2X	WT/LBS KG
014 U3	IN	12.5	12.69	14.51	7.65	1- 1/2"	1.281	10.539	10.044	0.875	3.625	7.11	61.536
	mm	317.5	322.326	368.554	194.31		32.5374	267.6906	255.1176	22.225	92.075	180.594	1563.0144
034 U3	IN	12.745	15.164	17.414	8.504	1- 1/2"	1.609	12.284	12.049	1.25	3.875	8.125	115.78
	mm	323.723	385.1656	442.3156	216.0016		40.8686	312.0136	306.0446	31.75	98.425	206.375	2940.812
064 U3	IN	13.938	19.664	21.914	10.771	2 - 1/2"	2.25	15.707	15.129	1.63	4.938	10.312	292.3
	mm	354.0252	499.4656	556.6156	273.5834		57.15	398.9578	384.2766	41.402	125.425	261.925	7424.42
134 U3	IN	13.938	20.676	22.926	10.771	3"	2.25	16.156	15.816	1.63	4.938	10.312	311.658
	mm	354.0252	525.1704	582.3204	273.5834		57.15	410.3624	401.7264	41.402	125.425	261.925	7916.1132
184 U3	IN	20.75	23.478	26.478	13.858	3"	3	19.174	18.253	2	7.25	13.781	518.184
	mm	527.05	596.3412	672.5412	351.9932		76.2	487.0196	463.6262	50.8	184.15	350.037	13161.8736
214 U3	IN	35.936	27.06	29.06	16.778	4"	3.5	22.442	21.843	2.38	8.812	17.46	558.62
	mm	912.7744	687.324	738.124	426.1612		88.9	570.0268	554.8122	60.452	223.825	443.484	14188.948
224 U3	IN	23.75	24.219	27.219	13.858	4"	3	19.555	18.494	2	6.25	12.875	754.487
	mm	603.25	615.1626	691.3626	351.9932	-	76.2	496.697	469.7476	50.8	158.75	327.025	19163.9698
324 U3	IN	35.936	27.659	29.659	16.778	6"	3.5	22.852	22.24	2.38	8.812	17.748	832.987
	mm	912.7744	702.5386	753.3386	426.1612		88.9	580.4408	564.896	60.452	223.825	450.799	21157.8698

MODEL	UNIT	N	1	D	R	F	AA	B	T	HB	S	SS
014 U3	IN	1.918	2.12	8.875	3.229	2.312	2.39	4.12	2.95	2.5	1	
	mm	48.7172	53.848	225.425	82.0166	58.7248	60.706	104.648	74.93	63.5	25.4	25.4
034 U3	IN	2.256	2.62	8.87	4.17	3	3.545	4.25	4.01	2.75	1.125	1.125
	mm	57.3024	66.548	225.298	105.918	76.2	90.043	107.95	101.854	69.85	28.575	28.575
064 U3	IN	2.176	3.5	9	5.233	5.5	4.358	7	5.008	4.125	2	1.75
	mm	55.2704	88.9	228.6	132.918	139.7	110.69	177.8	127.203	104.8	50.8	44.45
134 U3	IN	2.176	3.5	9	5.92	5.5	5.045	7	5.695	4.125	2	1.75
	mm	55.2704	88.9	228.6	150.368	139.7	128.14	177.8	144.653	104.8	50.8	44.45
184 U3	IN	2.668	4.5	13.5	5.02	8.25	4.395	9.5	5.77	5.375	2.688	2.688
	mm	67.7672	114.3	342.9	127.508	209.55	111.63	241.3	146.558	136.5	68.275	68.275
214 U3	IN	4.025	5.062	27.124	6.315	9.5	5.065	12	8.377	5.375	2.688	2.688
	mm	102.235	128.575	688.95	160.401	241.3	128.65	304.8	212.776	136.5	68.275	68.275
224 U3	IN	2.668	4.5	17.5	5.261	8.25	4.636	9.5	6.011	5.375	2.688	2.688
	mm	67.7672	114.3	444.5	133.629	209.55	117.75	241.3	152.679	136.5	68.275	68.275
324 U3	IN	4.025	5.062	27.124	6.712	9.5	5.462	12	8.774	5.375	2.688	2.688
	mm	102.235	128.575	688.95	170.485	241.3	138.73	304.8	222.86	136.5	68.275	68.275

Universal 3 Rectangular Flange PD Pump Dimensions

MODEL	UNIT	FA	FB	C	CA	CC	CB	CD	HA	PC	PA	PD	PB
014 U3	IN	2.625	7.5	0.5	1.625	0.5	6.5	NA	0.406	0.549	1.528	1.366	4.768
	mm	66.675	190.5	12.7	41.275	12.7	165.1	NA	10.3124	13.9446	38.8112	34.6964	121.1072
034 U3	IN	3	12	0.563	1.875	0.625	10.75	NA	0.531	0.564	1.872	2.548	6.904
	mm	76.2	304.8	14.3002	47.625	15.875	273.05	NA	13.4874	14.3256	47.5488	64.7192	175.3616
064 U3	IN	5	13.226	0.5	4	0.515	12.196	NA	0.531	1.236	2.529	2.067	9.092
	mm	127	335.9404	12.7	101.6	13.081	309.778	NA	13.4874	31.3944	64.2366	52.5018	230.9368
134 U3	IN	4.55	15.25	0.775	3	0.625	14	NA	0.531	0.639	3.272	2.864	9.522
	mm	115.57	387.35	19.685	76.2	15.875	355.6	NA	13.4874	16.2306	83.1088	72.7456	241.8588
184 U3	IN	7	18	0.625	5.75	0.625	16.75	8.375	0.531	1.82	3.36	3.335	11.33
	mm	177.8	457.2	15.875	146.05	15.875	425.45	212.725	13.4874	46.228	85.344	84.709	287.782
214-U3	IN	9	18	0.75	7.5	0.75	16.5	8.25	0.69	2.725	3.55	2.6	12.8
	mm	228.6	457.2	19.05	190.5	19.05	419.1	209.55	17.526	69.215	90.17	66.04	325.12
224 U3	IN	5.625	18	0.625	4.375	0.625	16.75	NA	0.531	0.727	4.172	3.32	11.36
	mm	142.875	457.2	15.875	111.125	15.875	425.45	NA	13.4874	18.4658	105.969	84.328	288.544
324 U3	IN	9.625	18	1.063	7.5	0.75	16.5	8.25	0.69	2.628	4.37	2.59	12.82
	mm	244.475	457.2	27.0002	190.5	19.05	419.1	209.55	17.526	66.7512	110.998	65.786	325.628

MODEL	UNIT	T1	HB1	S1	M	Q	A	E	H
014 U3	IN	2.95	2.5	1	0.375	2.813	6.75	0.375	0.41
	mm	74.93	63.5	25.4	9.525	71.4502	171.45	9.525	10.414
034 U3	IN	4.42	1.811	1.125	0.5	3.375	8	0.375	0.44
	mm	112.268	45.9994	28.575	12.7	85.725	203.2	9.525	11.176
064 U3	IN	5.608	3	1.75	0.48	5.25	11.75	0.5	0.56
	mm	142.443	76.2	44.45	12.192	133.35	298.45	12.7	14.224
134 U3	IN	6.295	3	1.756	0.48	5.25	11.75	0.5	0.56
	mm	159.893	76.2	44.6024	12.192	133.35	298.45	12.7	14.224
184 U3	IN	5.77	5.375	2.687	0.61	6.87	15	0.625	0.56
	mm	146.558	136.525	68.2498	15.494	174.498	381	15.875	14.224
214-U3	IN	8.377	5.375	2.668	1	7.75	18	0.75	0.69
	mm	212.776	136.525	67.7672	25.4	196.85	457.2	19.05	17.526
224 U3	IN	6.011	5.375	2.688	0.5	6.875	15	0.625	0.56
	mm	152.679	136.525	68.2752	12.7	174.625	381	15.875	14.224
324 U3	IN	8.774	5.375	2.688	1	7.751	18	0.75	0.69
	mm	222.86	136.525	68.2752	25.4	196.875	457.2	19.05	17.526

Tru-Fit™ Universal 3 PD Pump Dimensions

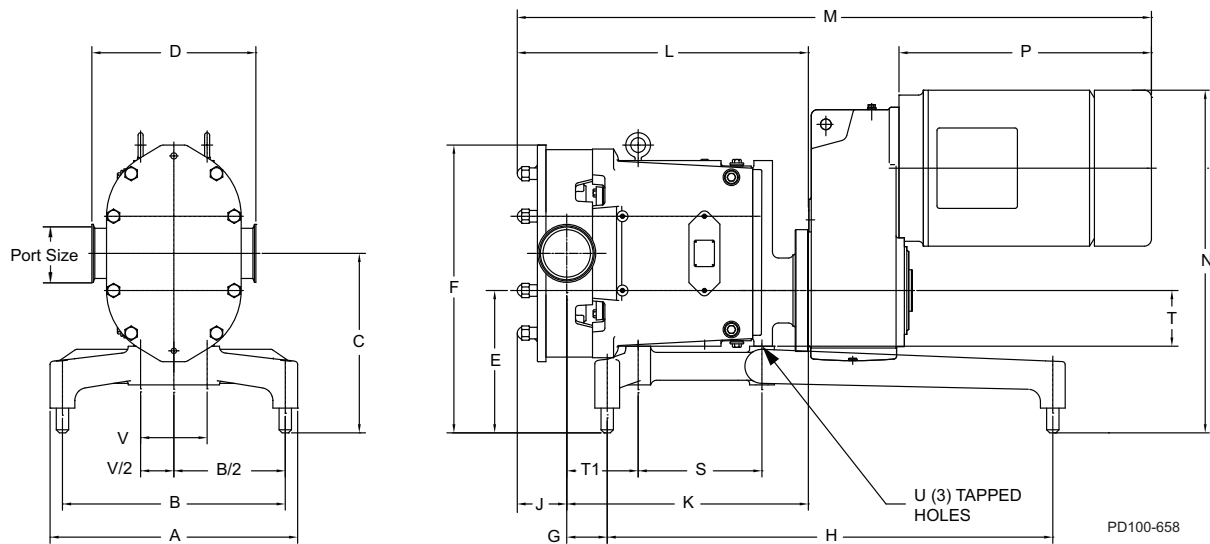


Table of Dimensions

U3 Model		A	B	C	D ²	E	F	G	H	J	K	L	M ¹	N ¹	P ¹	S	T	T1	Port Size	U	V
006	inch	12.00	10.00	9.15	6.97	7.87	13.25	2.45	18.00	1.89	10.52	12.90	28.02	15.56	10.92	5.44	2.12	2.95	1"	5/16-16 x .62	2.00
	mm	305	254	232	177	200	337	62	457	48	267	328	712	395	227	138	54	75	--	--	51
015	inch	12.00	10.00	9.15	6.97	7.87	13.25	2.45	18.00	1.90	10.52	13.17	28.29	15.56	10.92	5.44	2.12	2.95	1-1/2"	5/16-16 x .62	2.00
	mm	304	254	232	177	200	337	62	457	48	267	335	719	395	227	138	54	75	--	--	51
018	inch	12.00	10.00	9.15	7.10	7.87	13.25	2.72	18.00	1.95	10.78	13.83	28.29	15.56	10.92	5.44	2.12	2.98	1-1/2"	5/16-16 x .62	2.00
	mm	304	254	232	180	200	337	69	457	50	274	351	719	395	227	138	54	76	--	--	51
030	inch	14.00	12.00	10.00	8.51	8.37	15.11	3.01	20.00	1.99	12.89	16.01	34.24	18.65	13.74	5.81	2.62	4.01	1-1/2"	3/8-16 x .62	2.25
	mm	356	304	255	216	213	384	76.454	508	51	327	407	870	474	349	148	67	102	--	--	57
040	inch	14.00	12.00	10.00	8.62	8.37	15.11	3.18	20.00	2.20	13.05	16.38	34.61	18.65	13.74	5.81	2.62	4.18	2"	3/8-16 x .62	2.25
	mm	356	305	255	219	213	384	80.772	508	56	331	416	879	474	349	148	67	106	--	--	57
045	inch	18.00	16.00	12.00	10.74	9.75	20.00	2.71	28.00	3.27	17.09	21.63	44.24	22.02	17.16	8.13	3.50	4.99	2"	1/2-13 x .88	3.50
	mm	457	406	305	273	248	508	69	711	83	434	549	1124	559	436	207	89	127	--	--	89
060	inch	18.00	16.00	12.00	10.74	9.75	20.00	3.00	28.00	2.91	17.38	21.91	44.52	22.02	17.16	8.13	3.50	5.00	2-1/2"	1/2-13 x .88	3.50
	mm	457	406	305	273	248	508	76	711	74	441	557	1131	559	436	208	89	127	--	--	89
130	inch	18.00	16.00	12.00	10.74	9.75	20.00	3.63	28.00	3.29	18.01	22.93	45.54	22.02	17.16	8.13	3.50	5.65	3"	1/2-13 x .88	3.50
	mm	457	406	305	273	218	508	92	711	84	457	582	1157	559	436	207	89	144	--	--	89
180	inch	20.00	18.00	14.50	13.06	11.50	23.25	3.28	36.00	4.16	19.53	24.73	50.24	25.91	18.82	10.00	4.50	6.01	3"	1/2-13 x 1.0	5.38
	mm	508	457	368	332	292	591	83.312	914	106	496	628	1276	658	478	254	114	153	--	--	137
220	inch	20.00	18.00	14.50	13.25	11.50	23.25	3.52	36.00	4.10	19.77	25.47	50.98	25.91	18.82	10.00	4.50	6.01	4"	1/2-13 x 1.0	5.38
	mm	508	457	368	337	292	591	89.408	914	104	502	647	1295	658	478	254	114	153	--	--	137

¹ Dimensions affected by motor frame size

² Dimensions affected by connection type

Pump Shaft Guards

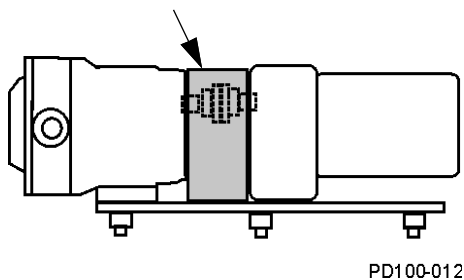
⚠ WARNING

Full guards must be installed to isolate operators and maintenance personnel from rotating components.

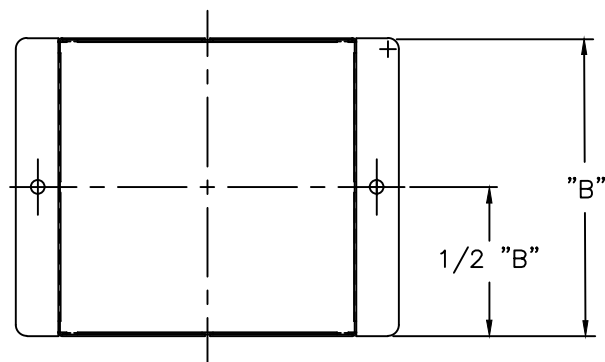
Guards are provided as part of a complete pump and drive package and are selected by SPX FLOW Engineering for the pump, base, and motor ordered. Do not modify the guard provided by SPX FLOW. If the guard provided by SPX FLOW is lost, contact SPX FLOW Customer Service and provide your order number or PO number of the pump to order a correctly-sized replacement guard.

If the pump was not purchased as a unit, it is the responsibility of the customer to ensure proper guarding. Refer to your local regulations for guidance.

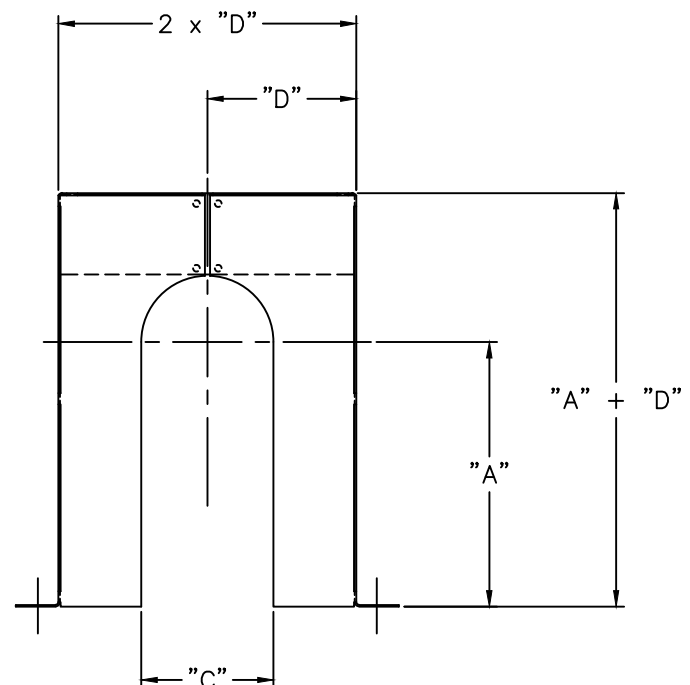
Guard (side view) shown as supplied with an SPX FLOW base package



Top view



Front view



NOTE: Dimensions A, B, C, and D depend on the specific pump unit configuration.

ATEX Declaration for Universal 3

1. The ATEX declaration of incorporation must be included with the order. The declaration on the next page is not valid but is supplied for example purposes only. Please see the certificate you received with your order for your serial number.
2. The sight glass in the gear case is not approved; black plugs must be installed on all drain/level ports.
3. Only Waukesha Cherry-Burrell brand spare parts are allowed to be installed into the pump. Use of non-Waukesha Cherry-Burrell brand parts will void ATEX approval.
4. For ATEX applications, the maximum operating temperature of the pump is 220°F (108°C).
5. The pumps must be supplied with a double mechanical seal with flush in the following cases:
 - In connection with all T4 approvals
 - If media viscosities are higher than 200cP
 - Flushing media requirements for double mechanical seals:
 - Flow: minimum 0.13 gpm (0.5 l/min)
 - Temperature: maximum 104°F (40°C)
 - Pressure, atmosphere side: maximum 218 psi (15 bar)
 - Viscosity: maximum 10cP
 - Differential pressure from atmosphere to product side: maximum 102 psi (7 bar)
6. T2 classification allows for either single or double mechanical seals.

Nameplates

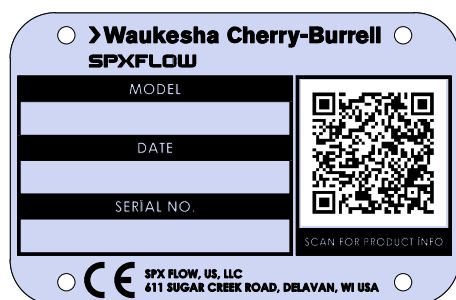


Figure 309 - Standard pump nameplate

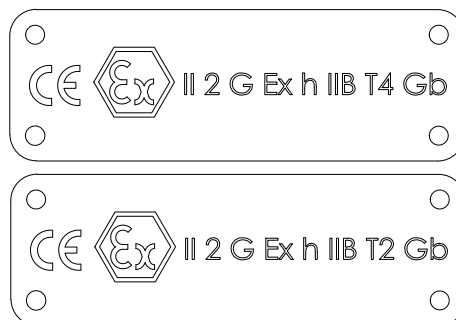


Figure 310 - ATEX Nameplates

Pump identification

The standard pump nameplate identifies the pump model, date of manufacture, and serial number. See Figure 309.

In addition to the standard pump nameplate, an ATEX pump has ATEX nameplate identifying the operating conditions for explosive environments. See Figure 310.

Hazard class identification

See Figure 310.

- II Equipment group
- 2 Equipment category (zone 1 and 2)
- G Hazardous Gas Atmosphere.
- h Constructional Safety 'c' and Liquid Immersion 'k'
- IIB Ethylene and related gas environment.
- T4 Temperature class to max. < 275°F (135°C)
- T2 Temperature class to max. < 572°F (300°C)
- Gb Equipment Protection Level for Category 2G

The ambient temperature should be between -4°F and 104°F (-20°C and 40°C). If not, contact SPX FLOW Application Engineering.

Declaration of Conformity **SPXFLOW**

Product

Nomenclature : **Rotary Positive Displacement Pumps.**
 Model / Type : Universal 2 and Universal 3.
 Variants / Family code : 006-U2 015-U2 018-U2 030-U2 040-U2 045-U2
 060-U2 130-U2 180-U2 210-U2 213-U2 220-U2
 320-U2 370-U2.
 006-U3 015-U3 018-U3 030-U3 040-U3 045-U3
 060-U3 130-U3 180-U3 210-U3 220-U3 320-U3.
 Serial Number : **Please see the certificate received with your order for your serial number. This certificate only provides an example of SPX FLOW's Declaration.**

Manufacturer

Name : **SPX Flow US, LLC.**
 Address : 611 Sugar Creek Road, Delavan, WI 53115, USA.

Applicable EU Harmonisation Legislation

EU / EC Declaration of Conformity in accordance with

ATEX Directive – 2014/34/EU

- Essential Health and Safety Requirement have been met by complying to the harmonised standard/s - EN 80079-36:2016, EN 80079-37:2016.
- Marking: II 2 G Ex h IIB T4 Gb or II 2 G Ex h IIB T2 Gb.
- Notified Body involved:
 Name: Bureau Veritas Italia S.p.A.
 Notified Body no.: 1370.
 Certification reference for:
 (i) Universal 2: BVI/ATEX/ITA/21/012
 (ii) Universal 3: BVI/ATEX/ITA/21/013

EC Declaration of Incorporation In accordance with

Machinery Directive – 2006/42/EC

For partly completed machinery

- Essential Health and Safety Requirement for the relevant applicable clauses have been met by complying to harmonised standard/s - EN 12100:2010, EN 809:1998+AC:2010.
 Note: Partly completed machinery must not be put into service until the final machinery into which it is incorporated has been declared in conformity with the Directive –2006/42/EC.

This declaration of conformity is issued under the sole responsibility of the manufacturer. It will lose its validity if the product is modified without the written permission from the manufacturer and/or if the safety instructions specified in the instruction manual are not being followed.

Authorised Signatory:

Signature: _____ Date: **01//12/2021**

Ashishkumar Lahoti, Engineering Manager.
 SPX FLOW, 611 Sugar Creek Road, Delavan, WI 53115, USA.

Universal 3 Maintenance Summary Reference Sheet

Universal 3 Model	Change oil every 750 hours* ISO Grade 320, SAE 140 or AGMA Number 6EP		Grease bearings every 750 hours* NLGI Grade No. 2, EP, Lithium-based grease.	
	Oil Capacity (Gears)		Grease Quantity (per Bearing)	
	Top or Bottom	Side Mount	Front	Rear
006, 014, 015, 018	1.3 oz (40 ml)	3.3 oz (100 ml)	.37 oz (11 ml)	.13 oz (4 ml)
030, 034, 040	2.0 oz (60 ml)	4 oz (120 ml)	.60 oz (18 ml)	.21 oz (6 ml)
045, 060, 063, 064, 130, 133, 134	6.0 oz (170 ml)	9.5 oz (280 ml)	.84 oz (25 ml)	.76 oz (22 ml)
180, 184, 220, 223, 224	11 oz (320 ml)	20 oz (600 ml)	1.33 oz (39 ml)	1.03 oz (30 ml)
210, 214, 320, 324	17 oz (500 ml)	44 oz (1300 ml)	1.96 oz (58 ml)	1.16 oz (34 ml)

Universal 3 Model	Torque Values - Locknuts		Universal 3 Wrench Size		
	Rotor	Cover	Rotor Nut	Body Retaining Cap Screw	Cover Nut
006, 014, 015, 018	50 ft-lb (68 N·m)	7 ft-lb (10 N·m)	15/16"	3/16"	5/8"
030, 034, 040	120 ft-lb (163 N·m)	11 ft-lb (15 N·m)	1-1/4"		
045, 060, 063, 064	250 ft-lb (339 N·m)	56 ft-lb (76 N·m)	1-5/8"	1/4"	7/8"
130, 133, 134		25 ft-lb (34 N·m)			
180, 184, 220, 223, 224	325 ft-lb (441 N·m)	110 ft-lb (149 N·m)	2-1/4"	5/16"	1"
210, 214, 320, 324	375 ft-lb (508 N·m)	158 ft-lb (214 N·m)	2-3/8"		

Model	Jacketed Cover Cap Screw Torque
006, 015, 018	1.4 ft-lb / 1.9 N·m
030, 040, 045, 060, 130, 180, 220, 210, 320	9.33 ft-lb / 12.6 N·m

Universal 3 Model	A - Back Face in (mm)		B - Rotor to Body in (mm)		C - Front Face in (mm)	
	Low Viscosity	Standard	Low Viscosity	Standard	Low Viscosity	Standard
006	0.0025 - 0.004 (0.06 - 0.10)	0.0035 - 0.005 (0.09 - 0.13)	0.001 - 0.004 (0.03 - 0.10)	0.0025 - 0.0055 (0.06 - 0.14)	0.004 - 0.005 (0.10 - 0.13)	0.0045 - 0.0055 (0.11 - 0.14)
015, 014, 018	0.0025 - 0.0045 (0.06 - 0.11)	0.003 - 0.005 (0.08 - 0.013)	0.001 - 0.004 (0.03 - 0.10)	0.0025 - 0.0055 (0.06 - 0.14)	0.004 - 0.005 (0.10 - 0.13)	0.0055 - 0.0065 (0.14 - 0.17)
030, 034, 040	0.002 - 0.004 (0.05 - 0.10)	0.0035 - 0.0055 (0.09 - 0.14)	0.001 - 0.005 (0.03 - 0.13)	0.0025 - 0.006 (0.06 - 0.15)	0.0045 - 0.0055 (0.11 - 0.14)	0.006 - 0.007 (0.15 - 0.18)
045, 060, 063, 064	0.003 - 0.007 (0.08 - 0.18)	0.004 - 0.008 (0.10 - 0.20)	0.003 - 0.0075 (0.08 - 0.19)	0.005 - 0.010 (0.13 - 0.25)	0.0055 - 0.0075 (0.14 - 0.19)	0.0085 - 0.0105 (0.22 - 0.27)
130, 133, 134	0.003 - 0.007 (0.08 - 0.18)	0.004 - 0.008 (0.10 - 0.20)	0.0035 - 0.0075 (0.09 - 0.19)	0.0055 - 0.0095 (0.14 - 0.24)	0.006 - 0.007 (0.15 - 0.18)	0.009 - 0.0115 (0.23 - 0.29)
180, 184, 220, 223, 224	0.004 - 0.008 (0.10 - 0.20)	0.005 - 0.009 (0.13 - 0.23)	0.0055 - 0.0095 (0.14 - 0.24)	0.009 - 0.013 (0.23 - 0.33)	0.006 - 0.008 (0.15 - 0.20)	0.010 - 0.012 (0.25 - 0.30)
210, 214, 320, 324	0.005 - 0.009 (0.13 - 0.23)	0.007 - 0.011 (0.18 - 0.28)	0.008 - 0.012 (0.20 - 0.30)	0.010 - 0.014 (0.25 - 0.36)	0.008 - 0.010 (0.20 - 0.25)	0.012 - 0.014 (0.30 - 0.36)

Low Viscosity Rotors: -40°F (-40°C) to 180°F (82°C); Standard Clearance Rotors: -40°F (-40°C) to 300°F (149°C). Contact SPX FLOW Application Engineering if alternate rotors are needed.

NOTE: The assembly clearances stated above are for reference only. Actual pump clearances may vary based on pump performance testing.

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Universal 3 Maintenance Summary Reference Sheet - Copy for optional removal\

Universal 3 Model	Change oil every 750 hours* ISO Grade 320, SAE 140 or AGMA Number 6EP		Grease bearings every 750 hours* NLGI Grade No. 2, EP, Lithium-based grease.	
	* Aggressive washdown or extreme running conditions may require more frequent lubrication intervals.			
	Oil Capacity (Gears)		Grease Quantity (per Bearing)	
	Top or Bottom	Side Mount	Front	Rear
006, 014, 015, 018	1.3 oz (40 ml)	3.3 oz (100 ml)	.37 oz (11 ml)	.13 oz (4 ml)
030, 034, 040	2.0 oz (60 ml)	4 oz (120 ml)	.60 oz (18 ml)	.21 oz (6 ml)
045, 060, 064, 130, 134	6.0 oz (170 ml)	9.5 oz (280 ml)	.84 oz (25 ml)	.76 oz (22 ml)
180, 184, 220, 224	11 oz (320 ml)	20 oz (600 ml)	1.33 oz (39 ml)	1.03 oz (30 ml)
210, 214, 320, 324	17 oz (500 ml)	44 oz (1300 ml)	1.96 oz (58 ml)	1.16 oz (34 ml)

Universal 3 Model	Torque Values - Locknuts		Universal 3 Wrench Size		
	Rotor	Cover	Rotor Nut	Body Retaining Cap Screw	Cover Nut
006, 014, 015, 018	50 ft-lb (68 N·m)	7 ft-lb (10 N·m)	15/16"	3/16"	5/8"
030, 034, 040	120 ft-lb (163 N·m)	11 ft-lb (15 N·m)	1-1/4"		
045, 060, 064	250 ft-lb (339 N·m)	56 ft-lb (76 N·m)	1-5/8"	1/4"	7/8"
130, 134		25 ft-lb (34 N·m)			
180, 184, 220, 224	325 ft-lb (441 N·m)	110 ft-lb (149 N·m)	2-1/4"	5/16"	1"
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Model	Jacketed Cover Cap Screw Torque
006, 015, 018	1.4 ft-lb / 1.9 N·m
030, 040, 045, 060, 130, 180, 220, 210, 320	9.33 ft-lb / 12.6 N·m

Universal 3 Model	A - Back Face in (mm)		B - Rotor to Body in (mm)		C - Front Face in (mm)	
Rotor Type	Low Viscosity	Standard	Low Viscosity	Standard	Low Viscosity	Standard
006	0.0025 - 0.004 (0.06 - 0.10)	0.0035 - 0.005 (0.09 - 0.13)	0.001 - 0.004 (0.03 - 0.10)	0.0025 - 0.0055 (0.06 - 0.14)	0.004 - 0.005 (0.10 - 0.13)	0.0045 - 0.0055 (0.11 - 0.14)
015, 014, 018	0.0025 - 0.0045 (0.06 - 0.11)	0.003 - 0.005 (0.08 - 0.013)	0.001 - 0.004 (0.03 - 0.10)	0.0025 - 0.0055 (0.06 - 0.14)	0.004 - 0.005 (0.10 - 0.13)	0.0055 - 0.0065 (0.14 - 0.17)
030, 034, 040	0.002 - 0.004 (0.05 - 0.10)	0.0035 - 0.0055 (0.09 - 0.14)	0.001 - 0.005 (0.03 - 0.13)	0.0025 - 0.006 (0.06 - 0.15)	0.0045 - 0.0055 (0.11 - 0.14)	0.006 - 0.007 (0.15 - 0.18)
045, 060, 063, 064	0.003 - 0.007 (0.08 - 0.18)	0.004 - 0.008 (0.10 - 0.20)	0.003 - 0.0075 (0.08 - 0.19)	0.005 - 0.010 (0.13 - 0.25)	0.0055 - 0.0075 (0.14 - 0.19)	0.0085 - 0.0105 (0.22 - 0.27)
130, 133, 134	0.003 - 0.007 (0.08 - 0.18)	0.004 - 0.008 (0.10 - 0.20)	0.0035 - 0.0075 (0.09 - 0.19)	0.0055 - 0.0095 (0.14 - 0.24)	0.006 - 0.007 (0.15 - 0.18)	0.009 - 0.0115 (0.23 - 0.29)
180, 184, 220, 223, 224	0.004 - 0.008 (0.10 - 0.20)	0.005 - 0.009 (0.13 - 0.23)	0.0055 - 0.0095 (0.14 - 0.24)	0.009 - 0.013 (0.23 - 0.33)	0.006 - 0.008 (0.15 - 0.20)	0.010 - 0.012 (0.25 - 0.30)
210, 214, 320, 324	0.005 - 0.009 (0.13 - 0.23)	0.007 - 0.011 (0.18 - 0.28)	0.008 - 0.012 (0.20 - 0.30)	0.010 - 0.014 (0.25 - 0.36)	0.008 - 0.010 (0.20 - 0.25)	0.012 - 0.014 (0.30 - 0.36)

Low Viscosity Rotors: -40°F (-40°C) to 180°F (82°C); Standard Clearance Rotors: -40°F (-40°C) to 300°F (149°C). Contact SPX FLOW Application Engineering if alternate rotors are needed.

NOTE: The assembly clearances stated above are for reference only. Actual pump clearances may vary based on pump performance testing.

Notes



› Waukesha Cherry-Burrell®



Universal 3 Series

Rotary Positive Displacement Pump

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ISSUED 09/2024
Form No.: 95-03103

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