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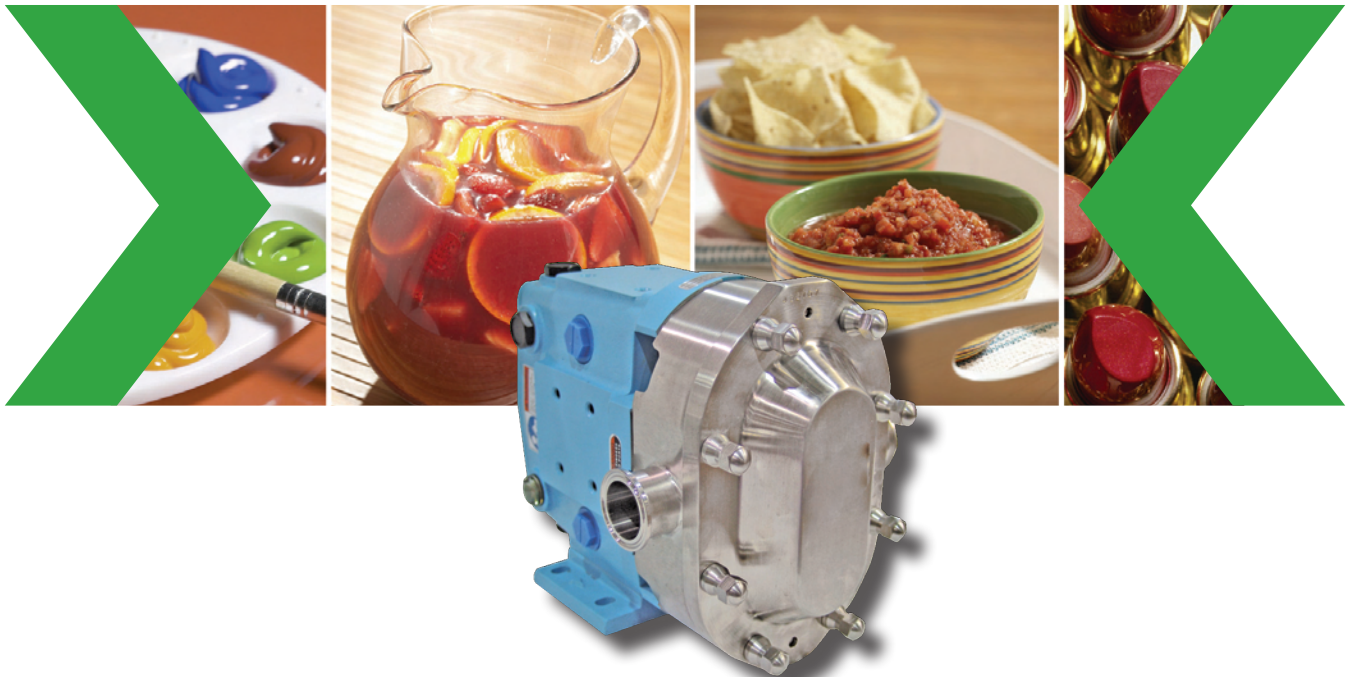


**Waukesha
Cherry-Burrell**

®

AN SPX BRAND

Instruction Manual
Universal II Series
Rotary Positive Displacement Pump



THE WILLIAMS - CARVER COMPANY, INC.

4001 MISSION RD P.O. BOX #3140

KANSAS CITY, KS 66103-0140

Office (913) 236-4949 Fax (913) 236-9331

www.williamscarver.com

Read and understand this manual prior to
operating or servicing this product.

SPX®



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Waukesha Cherry-Burrell Warranty

Seller warrants its products to be free from defect in materials and workmanship for a period of one (1) year from the date of shipment. This warranty shall not apply to products which require repair or replacement due to normal wear and tear or to products which are subjected to accident, misuse or improper maintenance. This warranty extends only to the original Buyer. Products manufactured by others but furnished by Seller are exempted from this warranty and are limited to the original manufacturer's warranty.

Seller's sole obligation under this warranty shall be to repair or replace any products that Seller determines, in its discretion, to be defective. Seller reserves the right either to inspect the products in the field or to request their prepaid return to Seller. Seller shall not be responsible for any transportation charges, duty, taxes, freight, labor or other costs. The cost of removing and/or installing products which have been repaired or replaced shall be at Buyer's expense.

Seller expressly disclaims all other warranties, express or implied, including without limitation any warranty of merchantability of fitness for a particular purpose. The foregoing sets forth Seller's entire and exclusive liability, and Buyer's exclusive and sole remedy, for any claim of damages in connection with the sale of products. In no event shall Seller be liable for any special consequential incidental or indirect damages (including without limitation attorney's fees and expenses), nor shall Seller be liable for any loss of profit or material arising out of or relating to the sale or operation of the products based on contract, tort (including negligence), strict liability or otherwise.

Shipping Damage or Loss

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

Warranty Claim

Warranty claims must have a **Returned Goods Authorization (RGA)** from the Seller before returns will be accepted.

Claims for shortages or other errors, exclusive of transit shortages or damages, must be made in writing to Seller within ten (10) days after delivery. 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

Waukesha Cherry-Burrell 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), Title 29 of the CFR
Section 1910.212- General Requirements for all Machines
2. National Fire Protection Association, ANSI/NFPA 79
ANSI/NFPA 79- Electrical Standards for Industrial Machinery
3. National Electrical Code, ANSI/NFPA 70
ANSI/NFPA 70- National Electrical Code
ANSI/NFPA 70E- Electrical Safety Requirement for Employee Workplaces
4. American National Standards Institute, Section B11

Attention: Servicing energized industrial equipment can be hazardous. Severe injury or death can result from electrical shock, burn, or unintended actuation of controlled 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

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 manufacturer's renewal parts or kits. Adjust or repair in accordance with the manufacturer's instructions.

Periodic Inspection: Industrial 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: marked with a stop sign.
Immediate hazards which WILL result in severe personal injury or death.



WARNING: marked with a warning triangle.
Hazards or unsafe practices which COULD result in severe personal injury or death.



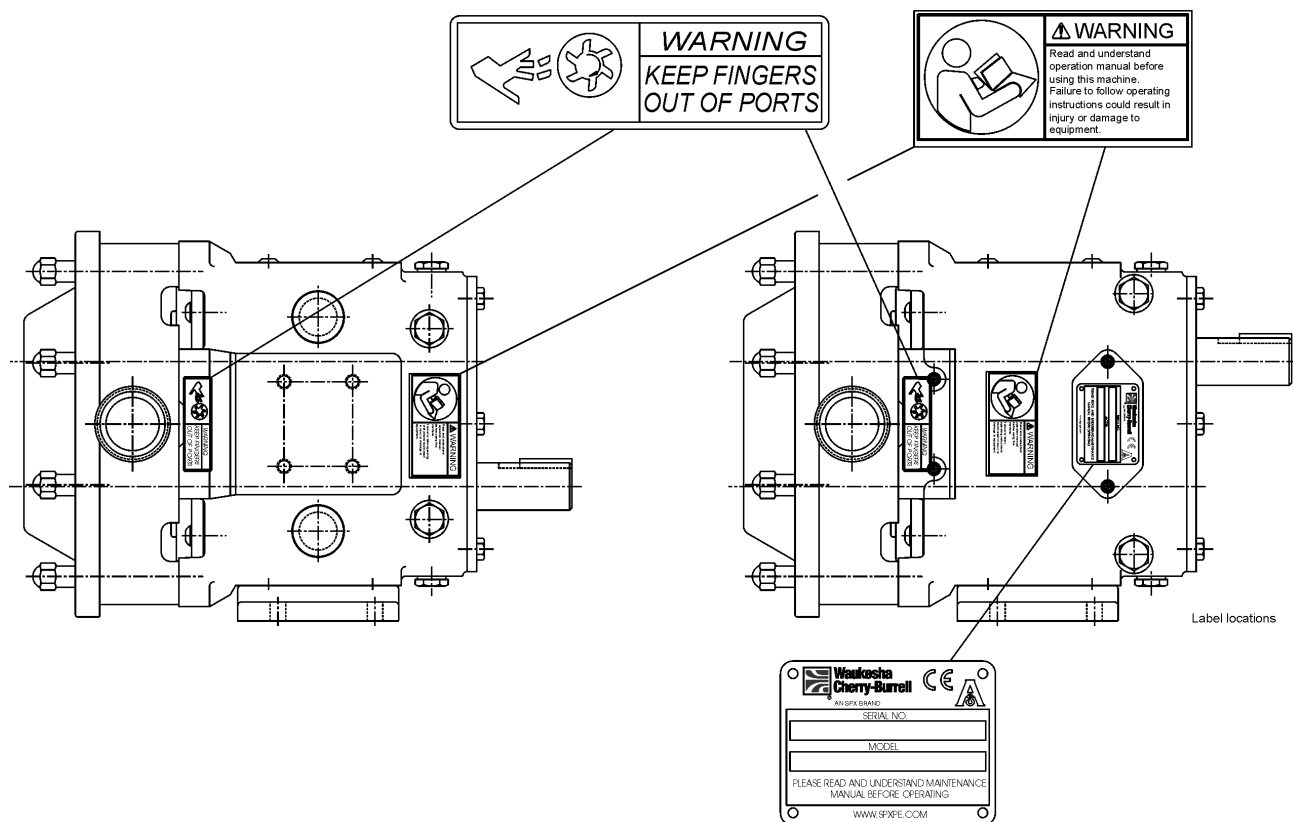
CAUTION: marked with a warning triangle.
Hazards or unsafe practices which COULD result in minor personal injury or product or property damage.

Replacement Labels

WARNING: The following labels are installed on your equipment. If these labels are removed or become unreadable, contact Waukesha Cherry-Burrell customer service at 1-800-252-5200 or 262-728-1900, or refer to "Parts Lists" on page 48 for replacement part numbers.

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.



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.

PD100-236b

33-95

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

Care of Stainless Steel

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 I, Universal II, 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 above properties make Alloy 88 the ideal material for Waukesha stainless steel PD pumps. The non-galling rotors permit close operating clearances in the liquid end. This provides low slip and minimum shear damage. The rotors will not gall or seize if they come in contact with the body or cover during operation.

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 Waukesha Cherry-Burrell Application Engineering for assistance.

Elastomer Seal Replacement Following Passivation

Passivation chemicals can damage product contact areas of WCB 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 for a thorough inspection of the fluid head. Be sure that the pumping head is clean and free of foreign material before rotating the shaft.

Each Waukesha Cherry-Burrell pump is shipped completely assembled, lubricated and ready for use. Review "Operation" on page 20 before operating the pump.

Pump Characteristics

Waukesha Cherry-Burrell Universal II pumps are positive-displacement, low-slip, stainless steel pumps designed with larger diameter shafts for greater strength and stiffness, mounted on a heavy-duty cast iron bearing frame (stainless steel option available) with double-tapered roller bearings.

- Designed for continuous operation.
- Rotor hubs are sealed from the product zone; rotors are locked with belleville-style washers and torqued nuts that can rotate securely in either direction (bi-directional).
- Non-galling "88" alloy rotors are standard; 316 material rotors are optional.
- Seal flush is standard. Seal areas are interconnected to improve circulation and draining of seal flush fluid.
- Single mechanical seals are standard. Bodies are pre-drilled with flush ports if double seals are required.
- Optional CIP capability, with mechanical seals.

Equipment Serial Number

All Waukesha Cherry-Burrell 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:

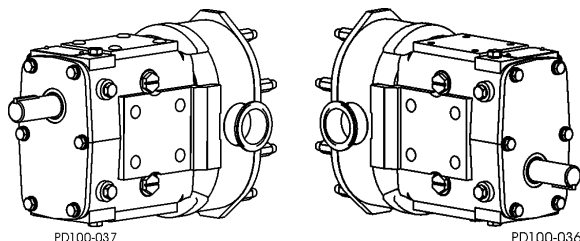


Figure 1 - Upper and Lower Shaft Mount

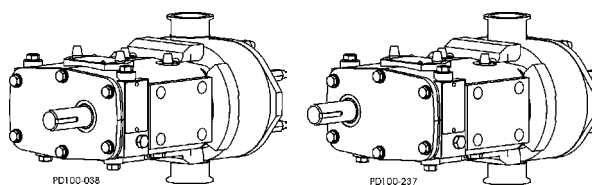


Figure 2 - Sidemount Left Hand and Right Hand
(as viewed from pump cover)

Operating Parameters

UII Model	Displacement per revolution	Maximum Nominal Capacity	Inlet/Outlet	Optional Inlet/Outlet	Maximum Pressure Range	Max. RPM	Temp Range*
006	.0082 gal. (.031 liter)	8 gpm (1.8 m ³ /hr.)	1"	1-1/2"	300 psi (20.7 bar)	1000	Std. Rotors: -40°F (-40°C) to 200°F (93°C); Hot Clearance Rotors: 180°F (82°C) to 300°F (149°C)
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	.153 gal. (.579 liter)	90 gpm (20.4 m ³ /hr.)	2-1/2"	3"	300 psi (20.7 bar)	600	
130	.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, 213	.502 gal. (1.900 liter)	300 gpm (68.1 m ³ /hr.)	4"	-	500 psi (34.5 bar)	600	
220	.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	
370	1.099 gal. (4.160 liter)	660 gpm (150 m ³ /hr.)	6"	-	200 psi (13.8 bar)	600	

Rectangular Flange Models

UII Model	Displacement per revolution	Maximum Nominal Capacity	Inlet W x L Inches	Outlet	Maximum Pressure Range	Max. RPM	Temp Range*
014	.0142 gal. (.054 liter)	5.68 gpm (1.3 m ³ /hr.)	1.44 x 4.94	1-1/2"	250 psi (17.2 bar)	400	Std. Rotors: -40°F (-40°C) to 200°F (93°C); Hot Clearance Rotors: 180°F (82°C) to 300°F (149°C)
034	.060 gal. (.227 liter)	24 gpm (5.5 m ³ /hr.)	1.81 x 6.84	2"	250 psi (17.2 bar)	400	
064	.153 gal. (.579 liter)	61 gpm (13.9 m ³ /hr.)	2.44 x 9.0	2-1/2"	300 psi (20.7 bar)	400	
134	.253 gal. (.958 liter)	101 gpm (22.9 m ³ /hr.)	3.19 x 9.38	3"	200 psi (13.8 bar)	400	
184	.380 gal. (1.438 liter)	152 gpm (34.5 m ³ /hr.)	3.28 x 11.25	3"	450 psi (31.0 bar)	400	
214	.502 gal. (1.900 liter)	200 gpm (45.4 m ³ /hr.)	3.45 x 12.70	4"	500 psi (34.5 bar)	400	
224	.521 gal. (1.972 liter)	208 gpm (47.2 m ³ /hr.)	4.06 x 11.25	4"	300 psi (20.7 bar)	400	
324	.752 gal. (2.847 liter)	300 gpm (68.1 m ³ /hr.)	4.25 x 12.70	6"	300 psi (20.7 bar)	400	

* Contact WCB Application Engineering for higher pressures or higher temperature applications.

"Standard" clearance rotors may be used with liquid temperatures up to 200°F (93°C). However, between 180°-200°F (82°-93°C), consider other application factors such as:

- speed of operation
- differential pressure
- lubricating properties of liquid being pumped

If these factors trend toward a difficult application (high speed, high pressure, non-lubricating) then "Front Face" or "Hot" clearance rotors are recommended.

Factory Remanufacturing Program

Waukesha Cherry-Burrell Universal II pumps are designed so that they may be factory remanufactured twice and backed with a new pump warranty each time.

Factory remanufacturing involves replacement of all shafts, bearings, oil seals, gears, etc. The pump body and cover are re-machined and new oversized rotors are installed. The pumps are stamped R-1 or R-2, after the serial number, designating that they have been reconditioned once or twice.

Contact your Waukesha Cherry-Burrell Customer Service Representative at 1-800-252-5200 and furnish the serial number of any pump being considered for remanufacturing.

Installation

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

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 pump within its limits.



CAUTION: These pumps are positive displacement, low slip 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.

Install Pump and Drive Unit



WARNING: Full guards must be installed to isolate operators and maintenance personnel from rotating components. Guards are provided with Waukesha Cherry-Burrell pumps as part of a complete pump and drive package.

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 3 through Figure 6 (the shaded area indicates the guard location).

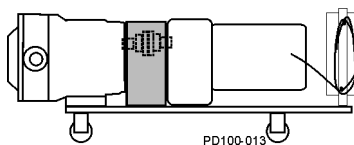


Figure 3 - Portable Base

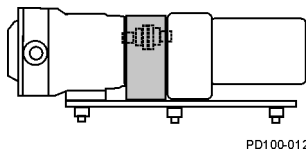


Figure 4 - Adjustable Leg Base

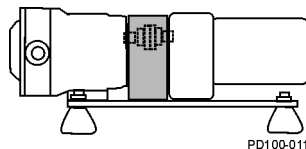


Figure 5 - Leveling and/or Vibration Isolation Pads

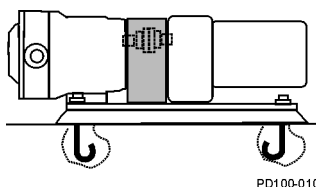


Figure 6 - Permanent Installation on Foundation

NOTE: When installing unit as shown in Figure 6, level the unit before installing the bolts.

Install Connections and Piping

Fittings

Waukesha Cherry-Burrell produces a wide variety of fittings made to fit your needs. Contact Waukesha Cherry-Burrell Customer Service at 1-800-252-5200 or 262-728-1900 for information on fittings.

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

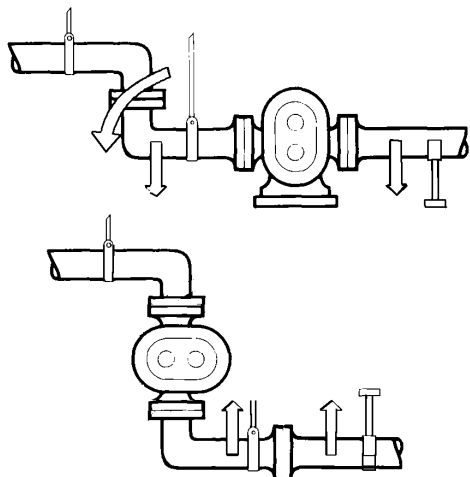


Figure 7 - Piping Support

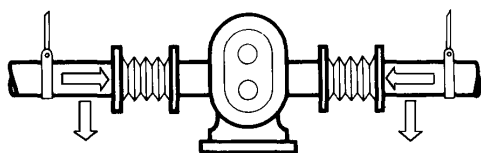


Figure 8 - Flexible Connections and Supports

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 (Figure 9).

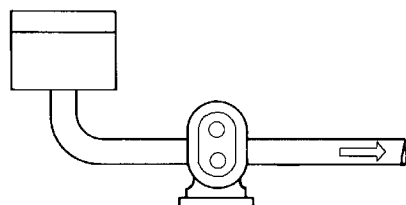
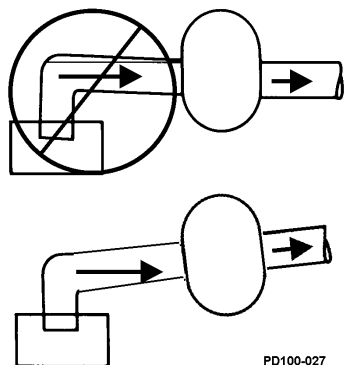


Figure 9 - Pump Below Supply

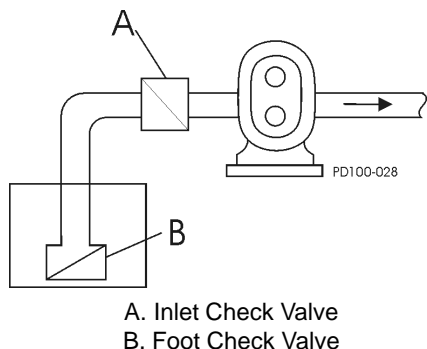
If the pump is installed above the supply liquid level, the piping on the inlet side must slope up toward the pump, preventing air pockets in the pipes (Figure 10).



PD100-027

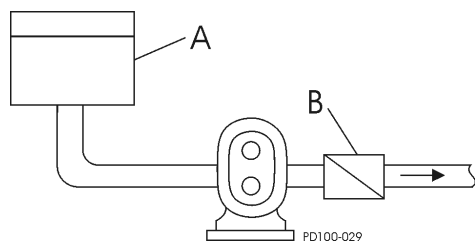
Figure 10 - Correct Piping to Prevent Inlet Air Pockets

Install Check Valves



A. Inlet Check Valve
B. Foot Check Valve

Figure 11 - Inlet Check Valve



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

Figure 12 - Discharge Check Valve

Inlet Side on Lift Applications

Use check valves to keep the inlet line full, particularly with low-viscosity fluids (Figure 11).

Discharge Side

For systems with liquid under a vacuum, install a check valve on the discharge side of the pump. The check valve prevents backflow (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 12).

Install Isolation Valves

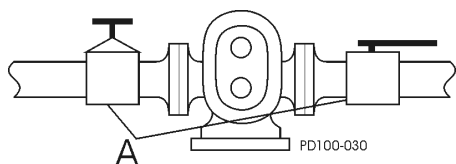


Figure 13 - Isolation Valves

Isolation valves permit pump maintenance and safe pump removal without draining the system (Figure 13, item A).

Install Relief Valves

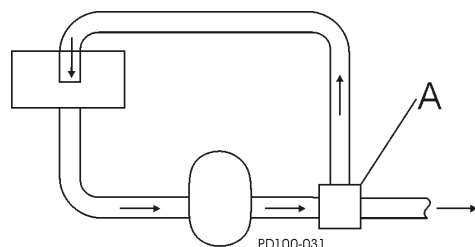
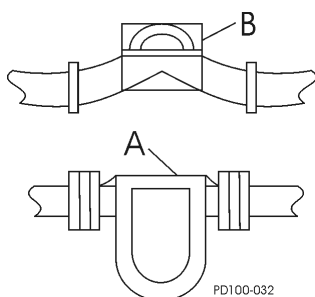


Figure 14 - Relief Valves

Install relief valves to protect the pump and piping system against excessive pressure. We recommend installing an external relief valve designed to bypass fluid from the pump outlet to the inlet side of the system (Figure 14, item A).

NOTE: Integral relief valves are available, but are not recommended on applications with viscosities over 500 cps or where the discharge must be closed for more than a few minutes. Prolonged operation of the pump with closed discharge will cause heating of fluid circulating through the relief valve. If this is the case, install an external relief valve to discharge externally through the piping connected to the fluid source, or into inlet piping near the source.

Inlet Side Strainers and Traps



A. Strainer B. Magnetic Trap

Figure 15 - Inline Strainers and Traps

Inlet side strainers and traps (Figure 15, 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.

Install Pressure Gauges

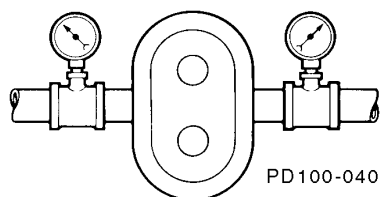


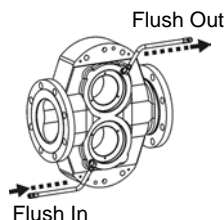
Figure 16 - Pressure and Vacuum Gauges

Pressure and vacuum gauges provide valuable information about pump operation (Figure 16). Wherever possible, install the gauges to help provide information on the following:

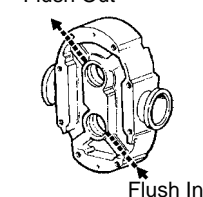
- Normal or abnormal pressures
- Indication of flow
- Changes in pump condition
- Changes in system conditions
- Changes in fluid viscosity

Seal Flush Connections

UII Models 210, 213,
320, 323, 370



UII Models 006, 015,
018, 030, 040, 045,
060, 130, 180, 220



Pumps with double seals require flushing. The flush media (typically water) must be connected and flowing whenever pump is operated.



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

Pump bodies have two 1/8-inch female pipe thread flush connections located near the bottom and top of the body.

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

NOTE: 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.

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 30 psi (2 bar) and adjust the flow rate to approximately 1/4 gpm (more for high temperature applications).

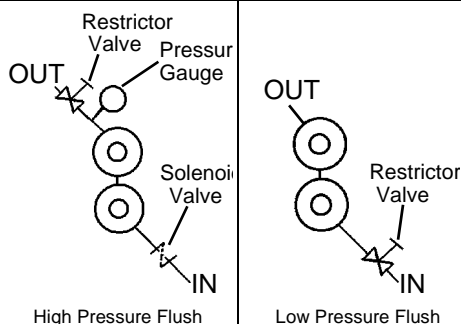


Figure 17 - Flush Piping Setup

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.

NOTE: *If the pumped product contains abrasive solids or hardens on the seal faces, an alternate high pressure barrier flush arrangement may be used. A very small amount of flush liquid enters the pumped liquid, therefore the flush media must be compatible with the product. Contact WCB Application Engineering for assistance.*

CIP (Clean-In-Place) Features

WCB Universal II pumps with optional CIP features are designed to provide complete access of the CIP solutions to all product contact surfaces. Optional CIP features include:

1. Flat Body Profile (minimum requirement for CIP installations) which allows complete draining of the side-mounted pump, and provides the CIP solution access to the entire cover o-ring groove.

NOTE: *Select applications use the optional CIP feature of holes in the rotor hubs and rotors for cleaning.*

2. Holes in the Rotor Hubs, which provide additional CIP solution access to the cover hub/shaft seal areas for difficult cleaning applications.

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 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 WCB Application Engineering.
- Ensure 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) differential pressure is adequate for most applications.
- 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.

Check Coupling Alignment



Figure 18 - Lovejoy Coupling



Figure 19 - 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.

- WCB recommends using a flexible coupling to connect the drive to the pump. Several different types are available, including couplings with slip or overload provisions. Waukesha Cherry-Burrell provides Lovejoy (Figure 18) or T.B. Woods® (Figure 19) 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

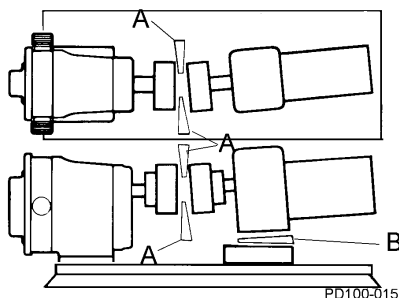


Figure 20 - Check Angular Alignment

1. Using feeler gauges or taper gauges (Figure 20, 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

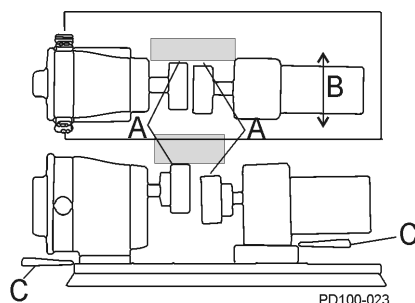


Figure 21 - Check Parallel Alignment

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 21, determine the direction and amount of movement needed (Figure 21, item B).
3. If necessary, shim at location "C" and/or move drive as needed.

Check Belt and Chain Drive Alignment

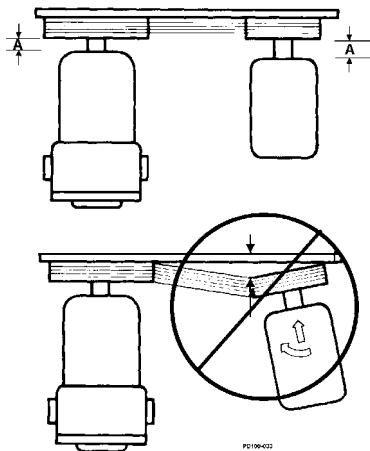


Figure 22 - Aligning Belt and Chain Drives

Use a straight edge to visually check the belt or chain alignment. Keep the shaft distance to a minimum (Figure 22, 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 23). After the correct drive rotation is verified, connect the coupling and assemble the pump and coupling guards.

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

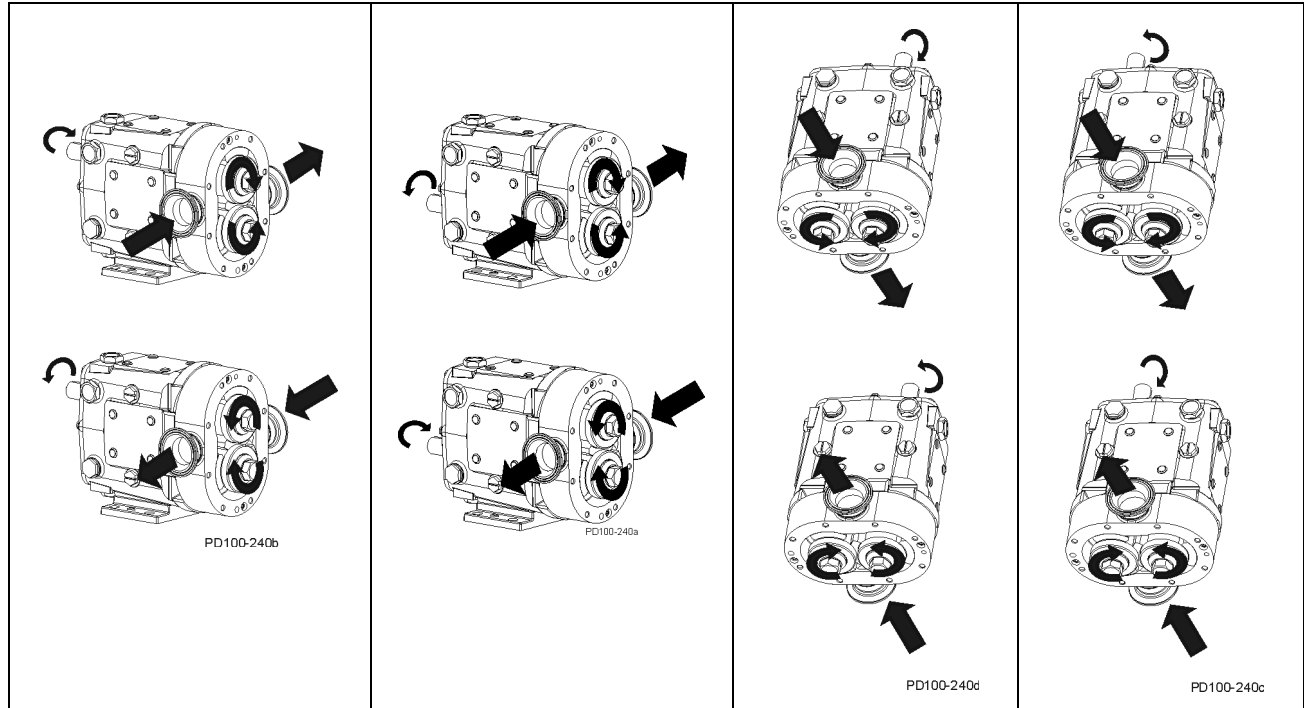


Figure 23 - Upper Shaft Drive Flow, Lower Shaft Drive Flow and Vertical Porting Flow and Pump Rotation (Liquid End Shown)

Operation



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.



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: 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.**



WARNING: Full guards must be installed to isolate the operators and maintenance personnel from the rotating components. Guards are provided with Waukesha Cherry-Burrell pumps as part of a complete pump and drive package.



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

1. Ensure that the pump is correctly installed as described in "Installation" on page 13. Review "Install Relief Valves" on page 15 and install relief valves as needed.
2. Check the coupling alignment. See "Check Coupling Alignment" on page 18.
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 21.
6. Ensure that all guards are in place and secure.
7. Double mechanical seals require adequate supply and flow of clean flushing fluids.
8. Ensure that all valves are open on the discharge side and a free flow path is open to the destination.
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 19.

Startup Procedure

1. Start the pump drive. Where possible, start at a slow speed or jog.
2. Ensure that the liquid is reaching the pump within 60 seconds. If pumping does not begin and stabilize, check "Troubleshooting" on page 90.

Shutdown Procedure

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

Emergency Shutdown Procedure

Emergency Shutdown Procedures should be documented by plant personnel after assessing system-wide requirements.

Maintenance

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.

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

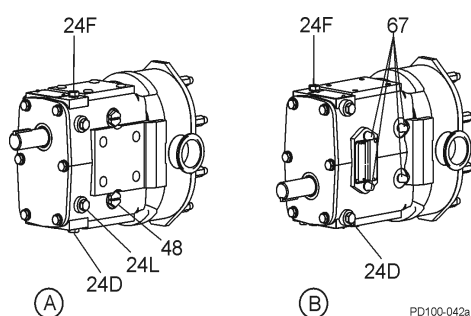


Figure 24 - Lubrication Points

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

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 1. **Change the oil every 500 hours.**

Gear Oil Specification

ISO Grade 320, SAE 140 or AGMA Number 6EP.

Bearings

Bearings are factory-lubricated with grease. Re-lubricate them at the quantity shown in Table 1. **Grease the bearings every 250 hours.**

Excess grease will accumulate in the gear case and must be removed through the cleanout hole covered with a plastic plug (Figure 24, item 48).

Bearing Lubricant Grease

NLGI Grade No. 2, EP, Lithium-based lubricant is standard.

Table 1: Lubrication Quantities

Universal II Model	Oil Capacity (Gears)		Grease Quantity (per Bearing)	
	Top or Bottom	Side Mount	Front	Rear
006, 015, 018	1.3 oz (40 ml)	3.3 oz (100 ml)	0.37 oz (11 cc)	0.13 oz (4 cc)
030, 040	2.0 oz (60 ml)	4 oz (120 ml)	0.60 oz (18 cc)	0.21 oz (6 cc)
045, 060, 130, 134	6.0 oz (170 ml)	9.5 oz (280 ml)	0.84 oz (25 cc)	0.76 oz (22 cc)
180, 220, 224	11 oz (320 ml)	20 oz (600 ml)	1.33 oz (39 cc)	1.03 oz (30 cc)
210, 213, 320, 370	17 oz (500 ml)	44 oz (1300 ml)	1.96 oz (58 cc)	1.16 oz (34 cc)

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.

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 25.

Refer to the “Maintenance Inspection Chart” on page 24 for possible causes and solutions to common issues discovered during inspection.

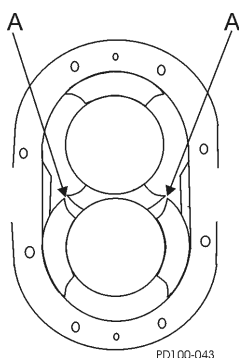


Figure 25 - Rotor to Rotor Tip Clearance

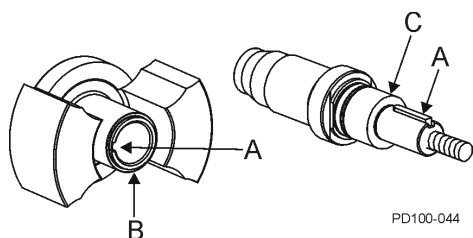


Figure 26 - Rotor and Shaft Inspection

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

Inspection of Rotor Tips

Remove the cover (see “Remove Cover” on page 26) 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 25.

Inspection of Rotor, Shaft Key and Keyway

Visually inspect the rotor, shaft key and rotor keyway (Figure 26, item A) for excessive wear; replace them as necessary.

Inspection of Shaft

Visually inspect the shaft for twists or bends; replace it as necessary.

Inspection of Rotor Hub End

Visually inspect the rotor hub end (Figure 26, item B) for excessive wear; replace it as necessary. Each time the rotors are removed, replace the o-rings on the hub.

Inspection of Shaft Shoulder

Visually inspect the shaft shoulder (Figure 26, 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 Gears and Bearings

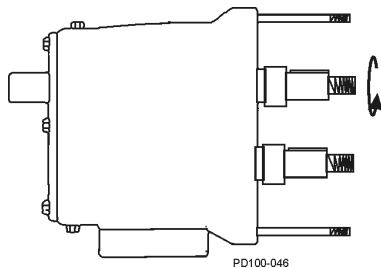


Figure 27 - Backlash Check

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.

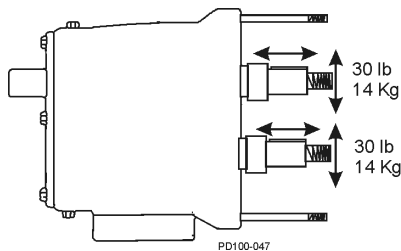


Figure 28 - Bearing Deflection Check

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 on page 21.

Maintenance Inspection Chart

Problem	Possible Causes	Possible Solutions
Rotor tip to rotor tip contact or uneven rotor tip to rotor tip clearance.	Hard object jammed into rotors and twisted shafts.	Replace shafts. Install strainers if necessary. Check and replace gears if necessary.
Rotor tip to rotor hub contact.	Loose rotor nut(s). Belleville-style washer(s) on backwards. Backface clearances not even. Bearings need replacing.	Torque rotor nut(s) properly. Install belleville-style washers correctly. Verify backface clearances are even. Check and replace bearings.
Worn rotor or shaft keyway(s). Worn or damaged rotor key(s).	Loose rotor nut(s). Belleville-style washer(s) on backwards.	Replace rotors, shafts and keys. Torque rotor nut(s). See "Torque Values" on page 46. Install belleville-style washer(s) correctly.
Worn rotor hub end or shaft shoulder.	Loose rotor nut(s). Belleville-style washer(s) on backwards. Rotors slammed against shoulder when installed.	Torque rotor nut(s). See "Torque Values" on page 46. Install belleville-style washer(s) correctly. Replace rotors and shafts or shim front bearing(s) to maintain proper backface clearances.
Sharp edged shaft shoulder.	Loose rotor nut(s). Belleville-style washer(s) on backwards. Rotors slammed against shoulder when installed. Backface clearances not even.	Remove sharp edge with file to prevent cutting shaft o-ring. Verify backface clearances are even.
Gear backlash.	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 46. Check and replace gears if necessary.
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 46. Check and replace gears if necessary.
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 46. Check and replace gears if necessary. Inspect gear key, shaft keyway and shaft, replace if necessary.
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.
Damaged front grease seals.	Seal may be old and worn. No grease on lips to lubricate. Shaft worn under seals.	Replace seals. Properly lubricate with grease when installing. Inspect shaft surface under seals.
Damaged rear oil seals.	Seal may be old and worn. No grease on lips to lubricate. Shaft worn under seals. Not centered on shaft when installed.	Replace seals. Properly lubricate with grease when installing. Inspect shaft surface under seals.

Annual Maintenance



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.

At least annually, perform the procedures and corrective measures outlined in “Maintenance Inspections” on page 22, in addition to the following preventive maintenance:

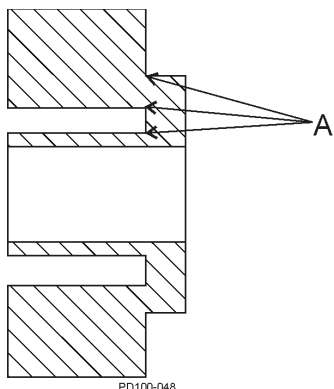


Figure 29 - Rotor Stress Points

- 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 (“Checking for Proper Clearance” on page 37), replace the bearings.
- Remove the gear 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 keyways, hub wear and stress cracks (Figure 29, item A). 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 to avoid crossover interference.

Cleaning

Determine the pump cleaning schedule on-site for materials being processed and plant maintenance schedule. For CIP models, see “CIP (Clean-In-Place) Features” on page 17.

To disassemble the fluid head, see “Fluid Head Disassembly” on page 26. 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 rotor hub o-rings when reassembling the pump. If the area behind these seals becomes soiled, contact WCB 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.

Also, 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.

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.

Fluid Head Disassembly



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 pump unless all power is off and locked out.



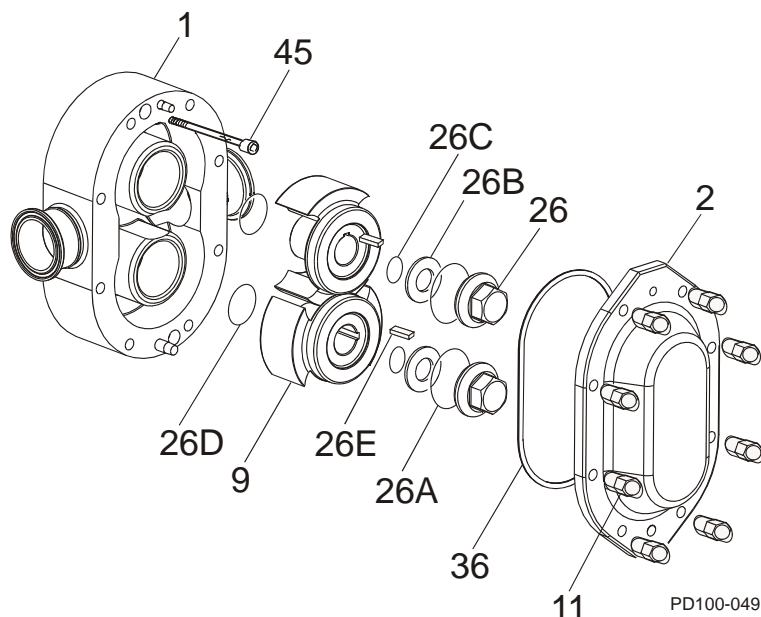
DANGER: To avoid serious injury, shut off and drain product from the pump prior to disconnecting the piping.

Table 2: Callout table for Figure 31

1. Body	2. Cover
9. Rotor	11. Cover Nut
26. Rotor Nut	26A. Rotor Nut O-ring*
26B. Belleville-style washer	26C. Retainer O-ring
26D. Rotor O-ring*	36. Cover O-ring
45. Body Retaining Cap Screw	
* Discard the o-rings from the rotor and rotor nut; these are intended for one-time use only.	



Figure 30 - Blocking Dowel



PD100-049

Figure 31 - Exploded View of Fluid Head

Blocking Dowels	
Ull Model	Dowel Dia.
006, 015, 018	0.75 in (19 mm)
030, 040	1.00 in (25 mm)
045, 060, 130	1.50 in (38 mm)
180, 220	1.875 in (48 mm)
210, 320, 370	2.00 in (51 mm)

Remove Cover

1. Remove the cover nuts (Figure 31, item 11) from the cover (Figure 31, item 1).
2. Using a soft hammer, tap the cover (Figure 31, item 2) off the body studs and dowel pins.
3. Place the cover on a protected surface with the finished surfaces facing up.
4. Remove and inspect the cover o-ring (Figure 31, item 36).

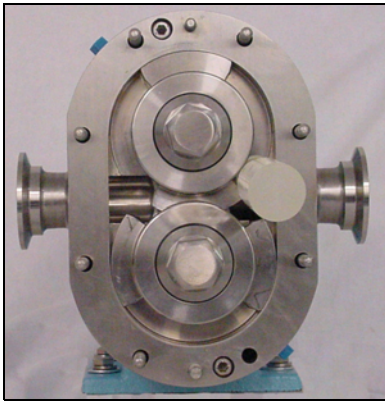


Figure 32 - Loosen Top Rotor

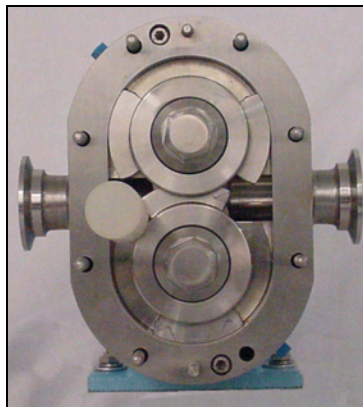
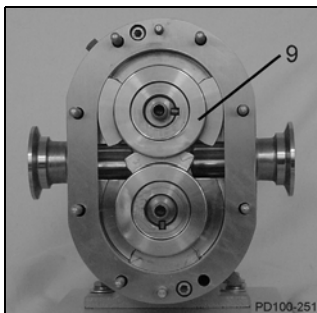


Figure 33 - Loosen Bottom Rotor



**Figure 34 - Remove Overlapping Rotor
First**

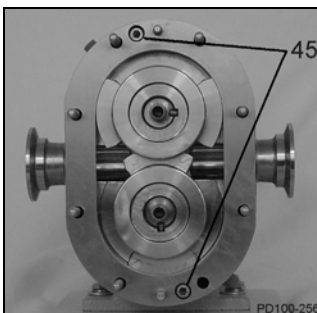


Figure 35 - Location of Cap Screws

Remove Rotor Nut Assemblies

1. Use a blocking dowel to keep the rotors from turning when removing the rotor nuts.

NOTE: When working on a rotor, always use a dowel to block the rotor against the body, not against the other rotor. See Figure 32 and Figure 33.

2. Using a wrench, remove the rotor nuts, belleville-style washers, rotor nut o-rings and rotor hub o-rings.

Remove Rotors

Using only your hands, remove the rotor with the hub overlapping the other rotor wing (Figure 34, item 9). Place the rotors in the up-turned cover to prevent damage to close-tolerance parts.

If the rotors cannot be removed by hand:

- Use plastic or hardwood dowels to pry out the rotors.
- Remove the body retaining cap screws. Tap the body forward and backward with a soft hammer to loosen the rotors.
- If necessary, use a puller. Use care with the puller or dowels to avoid damaging the rotors.

Remove Pump Body

1. Remove the two body retaining cap screws (Figure 35, item 45).
2. Using a plastic mallet, tap the body off the gear case, dowel pins and body studs.
3. Slide the body straight off the body studs to prevent damaging mechanical seal parts.
4. Place the body on a protected surface with seals facing up to protect the seals.

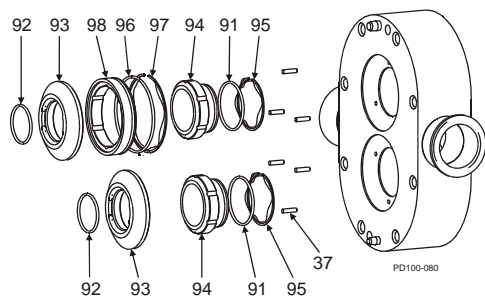


Figure 36 - Single (Bottom) and Double (Top) Mechanical Seal

Table 3: Callout table for Figure 36

37. Stop Pin
91. Inner Seal O-ring
92. Shaft O-ring
93. Seal Seat
94. Inner Seal
95. Inner Wave Spring
96. Outer Seal O-ring
97. Outer Wave Spring
98. Outer Seal

Remove Mechanical Seal

1. Remove the stationary seals from the pump body, using care not to damage the seals on the three body pins.
2. Remove the mechanical seal springs and o-rings on the stationary seals.
3. Inspect the three seal body pins for damage and repair or replace them as necessary. If the pins are loose, replace them with new ones.
4. Remove the rotary seal from each shaft. Use caution not to damage the seals during removal. Use a steady, even force behind the seal in multiple locations. After the rotary seals are removed, remove and replace the shaft o-rings. Before installing the new o-rings, inspect the shaft's o-ring groove(s) for damage and repair or replace them if required.
5. Inspect the flats on the shaft shoulder and repair or replace the shafts if required.

Gear Case Disassembly



DANGER: To avoid serious injury, DO NOT install, clean, service, or repair the pump unless all power is off and locked out.



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

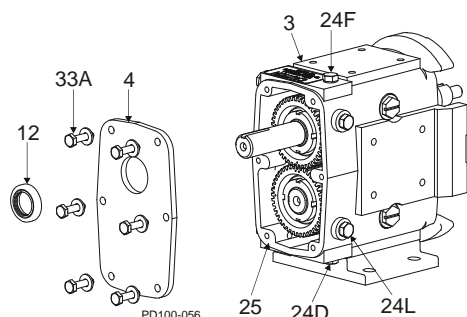


Figure 37 - Remove Gear Case Cover

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

Remove Gear Case Cover

1. Remove the oil drain plug (Figure 37, item 24D); drain the oil.
2. Remove the cap screws from the gear case (Figure 37, 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.
6. Straighten the tab on the lock washers (Figure 38, item 39).

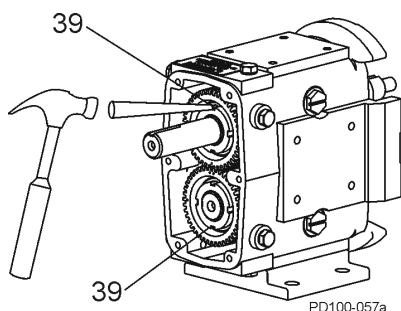


Figure 38 - Straighten Lock Tab on Lock Washers

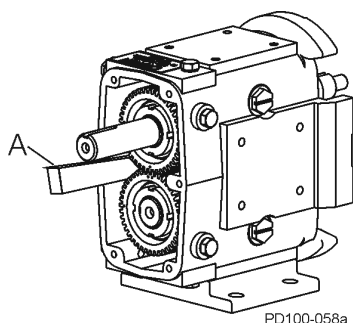


Figure 39 - Block Shaft Rotation

Remove Shaft

1. Prevent the shafts from turning by placing a wedge between the gears (Figure 39, item A). Use a spanner wrench or drift punch to remove the gear lock nut. The gears will be removed later.

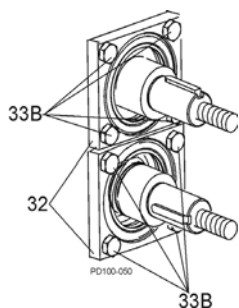


Figure 40 - Remove Bearing Retainers

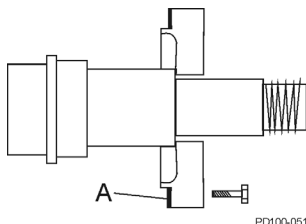


Figure 41 - Remove Sealant from Retainer

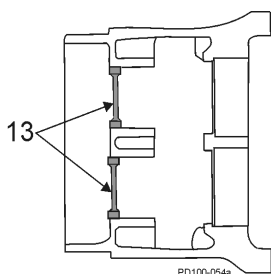


Figure 42 - Remove Rear Oil Seals

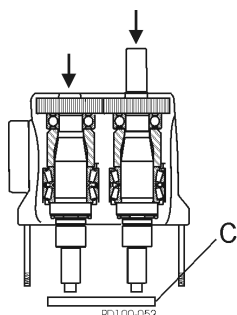


Figure 43 - Press Shafts from Gear Case

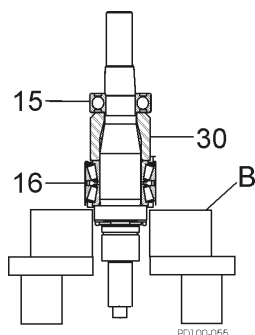


Figure 44 - Remove Bearings From Shaft

2. Remove the front bearing retainer screws (Figure 40, 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.)

3. Remove the silicone sealant (Figure 41, item A) from the bearing retainer and gear case.

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

4. 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 43, item C) and press the shafts out of the gear case.

5. Remove the gear spacers and gear keys from the shafts.

6. Remove the gears from the gear case.

7. Press out and discard the front bearing seals from the front bearing retainers. Clean and reuse the bearing isolators, if installed.

8. Remove the shims. If the shafts and bearings will be reused, identify the shims and bearings that belong with each shaft.

9. Press out and discard both rear oil seals in the gear case (Figure 42, item 13).

10. Use a hydraulic press and V-blocks (Figure 44, 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.

Shaft Assembly

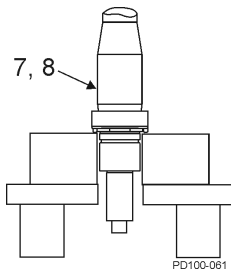


Figure 45 - Grease Shaft

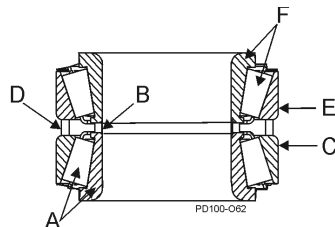


Figure 46 - Bearing assembly

Table 4: Callout table for Figure 46

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

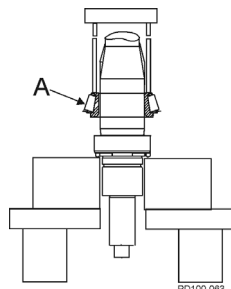


Figure 47 - Press Lower Cone onto Shaft

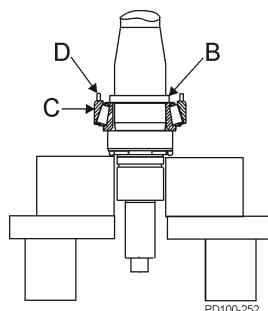


Figure 48 - Install Inner & Outer Spacer and Lower Cup

Front Bearing Assembly

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 45, item 7, 8) with oil or grease. 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 46.

3. Lift the lower cone and roller assembly (Figure 47, 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 48, 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.

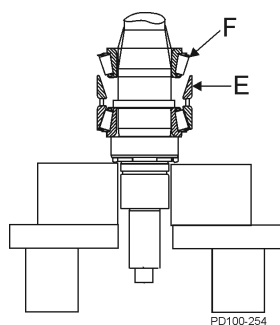


Figure 49 - Install Upper Cup & Upper Cone

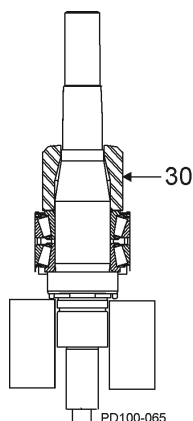


Figure 50 - Install Bearing Spacer

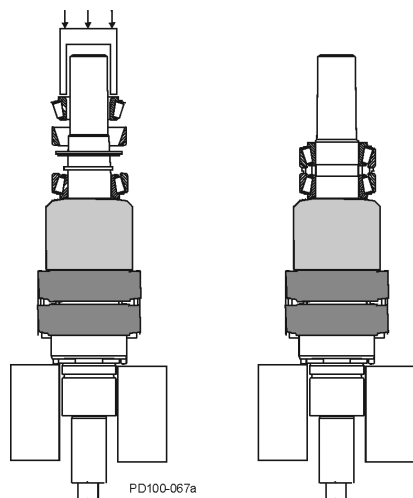


Figure 51 - Rear Tapered Roller Bearing Assembly

7. Place the upper cup (Figure 49, item E) on top of the outer spacer.
8. Lubricate the remaining upper cone and roller assembly (Figure 49, item F) with oil or grease and slip it over the shaft with the roller radius facing up. Press it onto the shaft and into the upper cup.

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

9. Install the bearing spacer (Figure 50, 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 inner bearing race with oil or grease. 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 oil or grease. Follow the "Front Bearing Assembly" procedures on page 31.

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

Gear Case Assembly

Shimming

Suggested Shims		
Universal II Model	Standard Shaft	Replacement Shaft
006, 015, 018	0.113 in (2.87 mm)	0.110 in (2.79 mm)
030, 040	0.105 in (2.27 mm)	0.102 in (2.59 mm)
045, 060, 130	0.093 in (2.36 mm)	0.088 in (2.24 mm)
180, 220	0.115 in (2.92 mm)	0.110 in (2.79 mm)
210, 320, 370	0.125 in (3.18 mm)	0.120 in (3.05 mm)

- 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. The backface clearance must be equal for both rotors to prevent the rotors from hitting each other during operation.

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 52 and Figure 53; carry measurements and calculations to three decimal places (i.e. 0.059).

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

- Determine the shim thickness required for the front bearing:
 - Measure "B" in the gear case and "C" on the shaft (Figure 52).
 - Measure "D" and "E" on the body (Figure 53).
 - Determine the proper backface clearance. Refer to Table 6, "Standard Rotor Clearance," on page 38.
 - Required Shims = Backface clearance - C + B + D - E.
- Place the shims in the body, resting against the shoulder in the front bearing bore.

Table 5: Callout table for Figure 52 and Figure 53

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

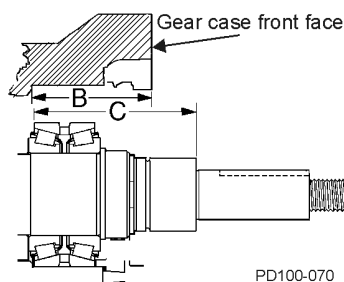


Figure 52 - Measure B and C

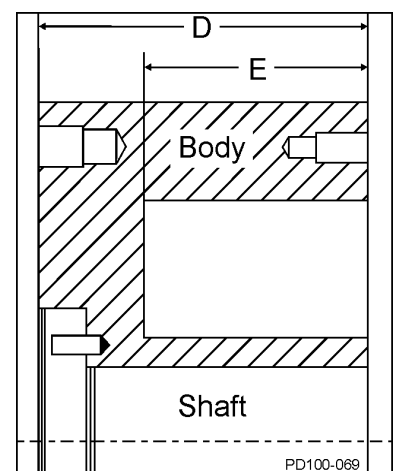


Figure 53 - Measure D and E

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 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 54). If this clearance is not met, place shims between the bearing 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, belleville-style washers and retainer o-rings are not required at this time.

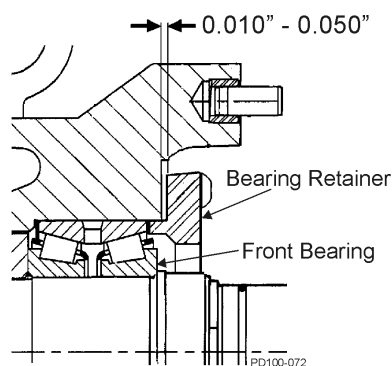


Figure 54 - Bearing Retainer Clearance

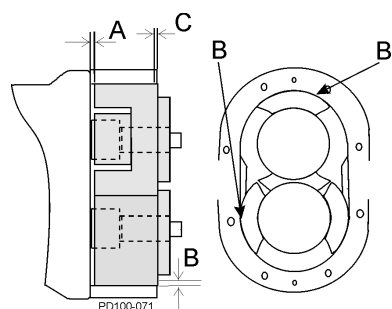


Figure 55 - Measure Clearance

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

9. Measure the rotor backface clearance (Figure 55, 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 6, "Standard Rotor Clearance," on page 38.
10. Check the rotor front face clearance (Figure 55, item C).
11. Check the rotor to body clearance (Figure 55, item B).
12. Check the clearances against Table 6, "Standard Rotor Clearance," on page 38. For non-standard rotors, check with the factory.

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

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 Waukesha Cherry-Burrell technical services for proper adjustment procedures.

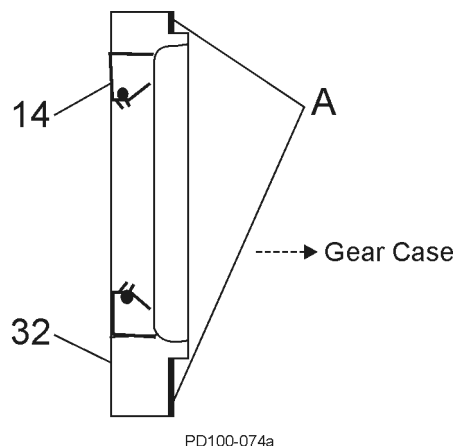


Figure 56 - Install Bearing Retainer

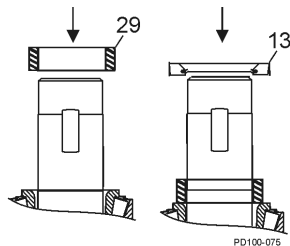


Figure 57 - Install Rear Seal

15. After obtaining proper clearance, remove the rotor nuts, rotors, body, and bearing retainers.
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 21. 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 56, 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 56, 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 57, 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 57, 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 58).

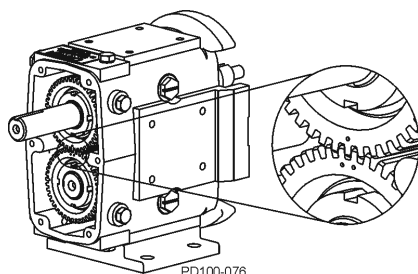


Figure 58 - Timing Gear Marks

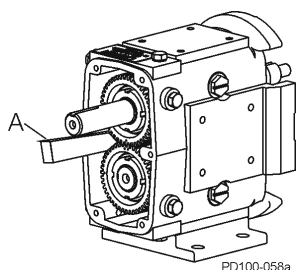


Figure 59 - Block Shaft Rotation

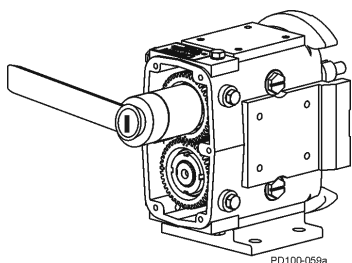


Figure 60 - Install Gear Locknuts

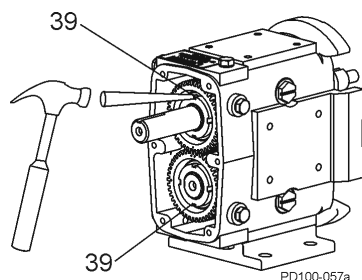


Figure 61 - Bend Lock Tab on Lockwashers

4. Use a wood or nylon block (Figure 59, 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 lockwashers onto the shaft. Lubricate the threaded area on the shafts and face of the locknuts with oil or grease.
6. Tighten the gear locknuts using a spanner wrench or drift.
7. Bend the locking tab on the lockwashers into the locking nut slots, securing the gear locknut into place (Figure 61).

Checking for Proper Clearance

Waukesha Cherry-Burrell 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.

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.

1. To check backface clearance, first mount the body (less seals) onto the housing. Assemble the rotors and secure them with rotor jam nuts.
2. With feeler gauges, measure the rotor backface clearance (Figure 62, item A), through the port or from the front.

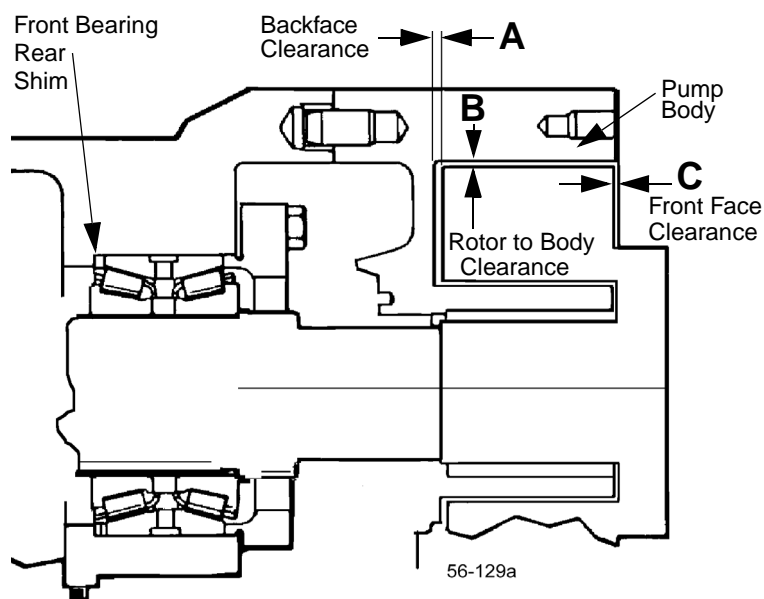


Figure 62 - Clearance Measurements

3. Measure the rotor front face clearance (Figure 62, item C).
4. Measure the rotor to body clearance (Figure 62, item B).
5. Check the measured clearances against Table 6, "Standard Rotor Clearance," on page 38.
6. Make corrections as required and follow examples in Table 7, "Backface Clearance Corrections," on page 38, to determine the exact adjustment to make and to avoid unnecessary assembly/disassembly.
7. To make shim adjustments, first remove the rotors, body and shafts. Make the required shim adjustment and reassemble.
8. Re-check the backface clearances. Be sure both rotors have the same clearance to avoid crossover interference with the adjacent rotor hub.

Table 6: Standard Rotor Clearance

Universal II Model	A Back Face	B Rotor to Body	C Front Face
006, 015, 018, 030, 040	0.002 in 0.05 mm	0.002 in 0.05 mm	0.005 in 0.13 mm
045, 060, 130	0.004 in 0.10 mm	0.005 in 0.13 mm	0.008 in 0.2 mm
180, 220	0.005 in 0.13 mm	0.006 in 0.15 mm	0.008 in 0.2 mm
210, 320	0.005 in 0.13 mm	0.010 in 0.25 mm	0.011 in 0.28 mm

NOTE: Clearances listed are for standard rotors. Contact Waukesha Cherry-Burrell application engineering if alternate rotors are needed.

Table 7: Backface Clearance Corrections

Problem	Condition	Correction
Too Much Backface Clearance (A)	Dimension A is greater than the value in Table 6	A (measured) minus Column A (Table 6) = 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 6) = shims to remove from the rear of the front bearing
Not Enough Backface Clearance (A)	Dimension A is less than the value in Table 6	Column A (Table 6) minus A (measured) = shims to add to the rear outer race of the front bearing

NOTE: If the clearance corrections in Table 7 have been performed and desired performance is not achieved, contact Waukesha Cherry-Burrell technical services for guidance.

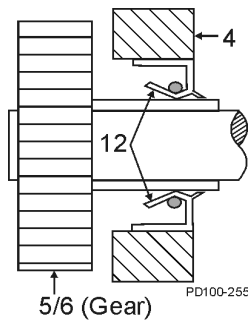


Figure 63 - Orientation of Oil Seal

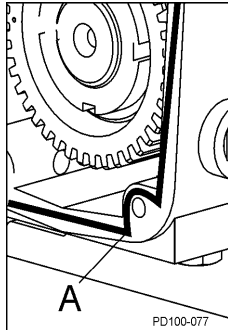


Figure 64 Sealant Placement

Install Gear Case Cover

1. Lubricate the inside diameter of a new oil seal.
 2. Press the new oil seal (Figure 63, 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 64, 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 proper level. Refer to "Lubrication" on page 21.

Fluid Head Assembly

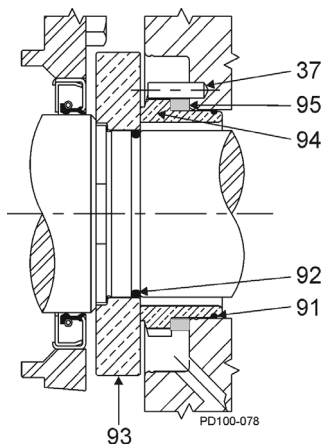


Figure 65 - Single Mechanical Seal

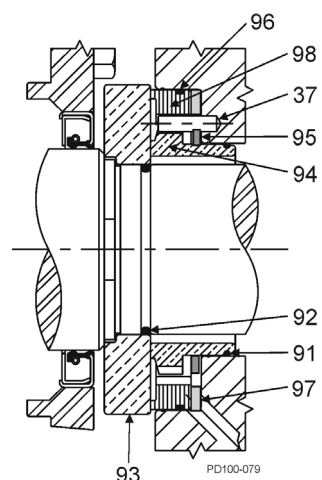


Figure 66 - Double Mechanical Seal

Table 8: Callout table for Figure 65, Figure 66, and Figure 67

37. Stop Pin
91. Inner Seal O-ring
92. Shaft O-ring
93. Seal Seat
94. Inner Seal
95. Inner Wave Spring
96. Outer Seal O-ring
97. Outer Wave Spring
98. Outer Seal

Install Mechanical Seal

1. Lubricate the shaft o-ring (Figure 65, item 92) with a lubrication compound compatible with the o-ring material and process fluid(s). Place the o-ring on the shaft.
2. Install the rotating seal seat (item 93) on the shaft. Align the drive flats on the seat with the drive flats on the shaft.
3. Push the seat squarely against the shaft shoulder.
4. Install the inner wave spring (item 95) onto the inner seal (item 94).
5. Lubricate the inner seal o-ring (item 91) with a lubrication compound compatible with the o-ring material and process fluid(s). Install the inner seal o-ring into the groove of the inner seal.
6. Place the inner seal into the back of the pump body. Ensure that the notches are aligned in the inner seal with the stop pins in the body. Press firmly and evenly into place.
7. If a double mechanical seal is used, install the outer wave spring (Figure 66, item 97) in the body and the outer o-ring (item 96) in the outer seal groove (item 98). Place the outer seal in the pump body around the inner seal, aligning the notches in the outer seal with the stop pins in the body.
8. Inspect the seal faces for cleanliness. Ensure that the faces have no nicks or scratches. Lubricate the seal faces with a lubricant compatible with the process fluid(s).
9. Perform steps 1 through 5 on both shafts.

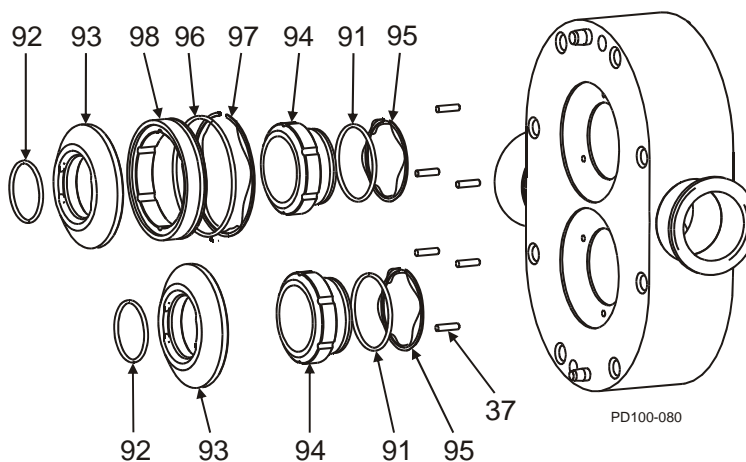


Figure 67 - Single (Bottom) and Double (Top) Mechanical Seal

Install Pump Body

1. Match the large and small dowel pin sizes on the pump body with the dowel pin holes in the pump gear case.
2. Install the body (Figure 68, item 1) to the gear case assembly, aligning the body with the body studs. Avoid damaging the seals as the body is drawn over the shafts.
3. Secure the body to the gear case using two cap screws (Figure 68, item 45).

Install Rotors

1. Lubricate the rotor hub o-ring (Figure 68, item 26D) with a lubrication compound compatible with the o-ring material and process fluid(s).
2. Install new rotor hub o-rings (item 26D) into the groove on the rotor hubs.
3. Install the rotors (item 9) onto the shafts.
4. Align the keyways in the rotors with the keyways on the shafts and install the keys (item 26E).

NOTE: For rotor nut assembly detail, including orientation of the belleville-style washer (item 26B), see Figure 69 and Figure 70 on page 42.

Table 9: Callout table for Figure 68

1. Body
2. Cover
9. Rotor
11. Cover Nut
26. Rotor Nut
26A. Rotor Nut O-ring*
26B. Belleville-style Washer
26C. Retainer O-ring
26D. Rotor Hub O-ring*
26E. Rotor Key
36. Cover O-ring
45. Body Retaining Cap Screw
* Discard rotor hub and rotor nut o-rings; these are one-time use only.

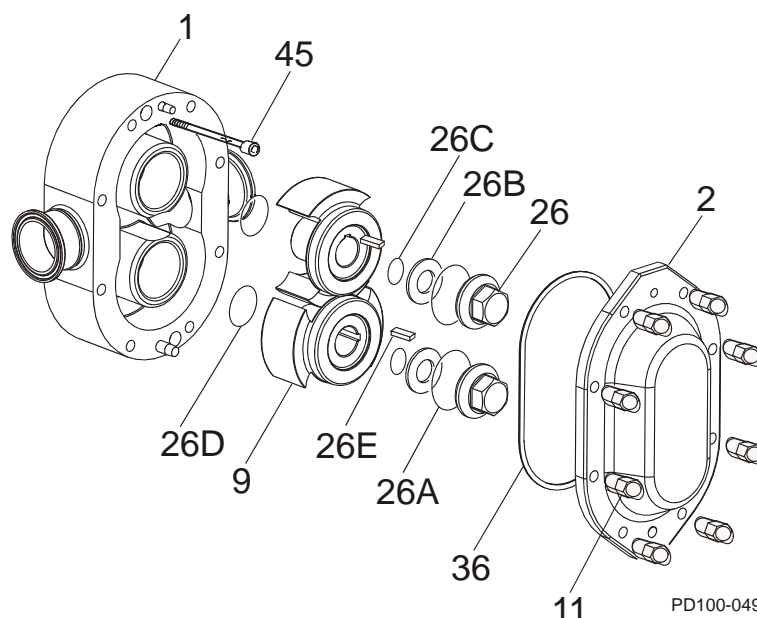


Figure 68 - Exploded View of Fluid Head

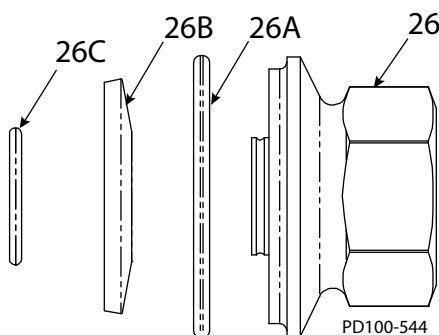


Figure 69 - Detail View of Rotor Nut Assembly

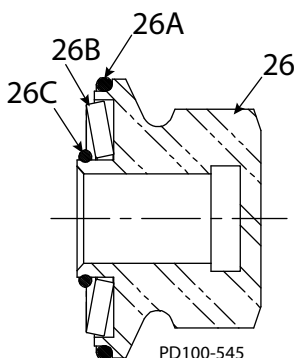


Figure 70 - Cross-Section View of Rotor Nut Assembly, as Assembled

Install Rotor Nut Assemblies

See Figure 68 on page 41, and Figure 69 and Figure 70 on this page.

1. Install a belleville-style washer (item 26B) into the rotor nut (26) with the raised side of the washer facing **toward** the rotor nut.
2. Place the retainer o-ring (item 26C) into the rotor nut to retain the belleville-style washer. The washer should **not** be tight against the o-ring.
3. Lubricate a new rotor nut o-ring (item 26A) with a lubrication compound compatible with the o-ring material and process fluid(s). If the o-ring is not lubricated, it will pucker when tightening the rotor nut.
4. Install the rotor nut o-ring onto the rotor nut.
5. Prior to assembling the rotor nuts, apply an anti-seize compound to the shaft threads.
6. Use a blocking dowel to prevent the rotors from turning during installation. See "Blocking Dowels" on page 26 for rotor blocking dowel size.

NOTE: Always use a dowel to block the rotor against the body, not against the other rotor.

7. Screw the rotor nuts (item 26) onto the shafts (clockwise) and tighten them to the required torque.



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

Install Cover

1. Clean the cover o-ring (See Figure 68, page 41, item 36) and install it in the groove in the cover.
2. Match the large and small dowel pin sizes on the pump body with the dowel pin holes in the cover.
3. Install the cover (See Figure 68, page 41, item 2) on the pump body.
4. Prior to assembling the cover nuts, apply an anti-seize compound compatible with the product to the threads of the body studs.
5. Tighten the cover securely using the cover nuts (See Figure 68, page 41, item 11).



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



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.

Relief Cover Option (Vented Cover)

The optional Relief Cover Feature (also called Vented Cover) is an adjustable, internal by-pass arrangement which can be used for control of the pressure and/or flow. It is bidirectional; that is, the pump flow or rotation can be in either direction.

This option does not provide full flow relief for all pumping situations.

The pressure downstream of the pump may increase with increasing amount of by-pass through the Relief Cover. Actual downstream pressure will depend on the pump speed, product viscosity, and the relief set point (spring adjustment or air pressure). Avoid high flow rates through the cover with high viscosity products. The resulting pressure may be greater than the maximum rating of the pump or other system components. Install a pressure gauge and measure the pressure under the worst conditions of maximum flow and maximum viscosity to determine the maximum pressure for your process. **Under any conditions, if there is a complete flow shut off downstream, stop the pump as soon as possible.** Continued pump operation with the entire flow by-passing will rapidly build heat within the pump body. Contact Waukesha Application Engineering for assistance.

Three types of Relief Covers are available:

Manual

By-pass pressure is adjusted by a threaded adjusting screw (2) which compresses a spring (5). Several spring sizes are available, to cover a range of operating pressures.

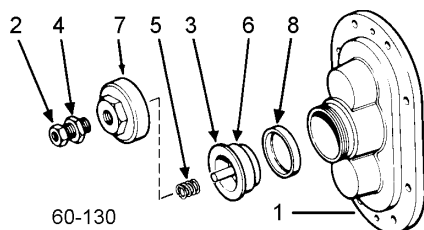


Figure 71 - Manual Vented Cover

Pneumatic

By-pass pressure is adjusted by regulated air or gas pressure, operating on the side of a diaphragm (9) opposite the pumped fluid.

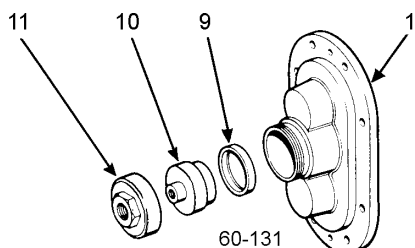


Figure 72 - Pneumatic Vented Cover

Piston

By-pass pressure is adjusted by regulated air or gas pressure, operating on the side of a metal piston (12), opposite the pumped fluid. An extended pressure range is possible.

NOTE: On all types of relief covers, the temperature and chemical resistance of the elastomer diaphragms and O-rings determine the useful range:

Buna-N: Material supplied as standard

Silicone Rubber: Optional material upon request

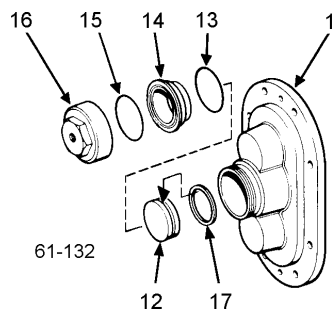


Figure 73 - Piston Vented Cover

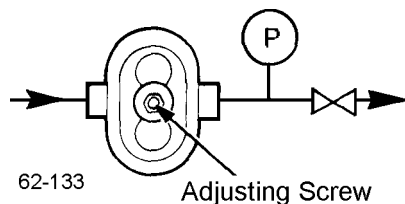


Figure 74 - Manual Adjustment

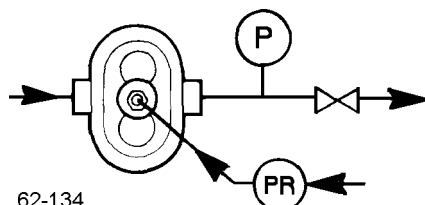


Figure 75 - Adjustment with a Pressure Gauge

Installation Adjustment

Manual

Turn the adjusting screw counterclockwise to its farthest position, then clockwise until a light spring pressure is felt.

Pneumatic

1. Set air/gas pressure to 2-5 psig.
2. Turn on the pump.
 - A. With the pressure gauge and valve in the discharge line:
 - Close the discharge valve.
 - Turn the adjusting screw clockwise until the desired relief pressure registers on the gauge. Lock the adjusting screw with a lock nut.
 - Open the valve in the discharge line. The relief cover is set and will open if the system pressure exceeds the preset limit.
 - B. Without a pressure gauge in the discharge line:
 - Turn the adjusting screw clockwise and observe the product flow at the discharge of the system.

When the product flow reaches the maximum or desired flow rate, lock the adjusting screw with a lock nut.

Piston

1. With a pressure gauge and valve in the discharge line:
 - Close the discharge valve slowly and observe the gauge pressure. **DO NOT ALLOW PRESSURE TO EXCEED 200 psi.**
 - Increase the air/gas pressure, until the desired relief pressure registers on the gauge. Lock the air/gas pressure regulator adjusting screw with a lock nut.
 - Open the valve in the discharge line. The relief cover is set and will open if the system pressure exceeds the preset limit.
2. Without a pressure gauge in the discharge line:
 - With a regulator, increase the air/gas pressure to the relief valve and observe the product flow at the discharge of the system.

When the product flow reaches a maximum or desired flow rate, lock the regulator adjusting screw with a lock nut.

Jacketed Cover

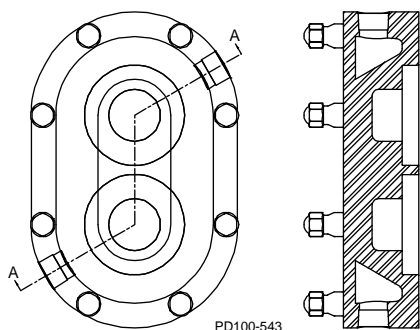


Figure 76 - Jacketed Cover

Table 10: Pipe Tap

Model Number	Pipe Tap
006, 015, 018, 030, 040	3/4"
045, 060, 130, 180, 220, 210, 320, 370	1"

Available on Models 006, 015, 018, 030, 040, 045, 060, 130, 180, 220, 210, 320, and 370.

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: Pressure limit for cover media is 60 PSI.

Pump Jackets

Split cast aluminum jackets with cast in pipe passages are available for higher pressures and temperatures. Consult factory for recommendations.

NOTE: Jacketed pumps require longer mounting studs in the gearcase.

Low Pressure Flush

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

See also "Seal Flush Connections" on page 16.

Flushing Connection - Aseptic Series

All connections are 1/8" female pipe taps. The pump has double "barriers" or seals at every opening to the pump chamber. Live steam or a sterile fluid is circulated between these double seals at the ports, in the cover and at the shaft seals.

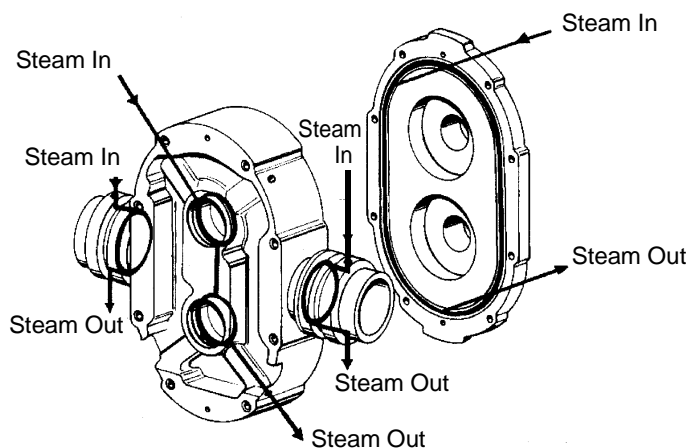


Figure 77 - Flushing Connection - Aseptic Series

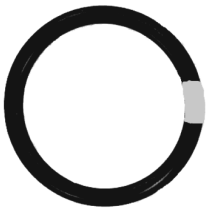


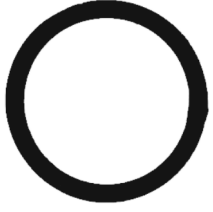



Reference Tables

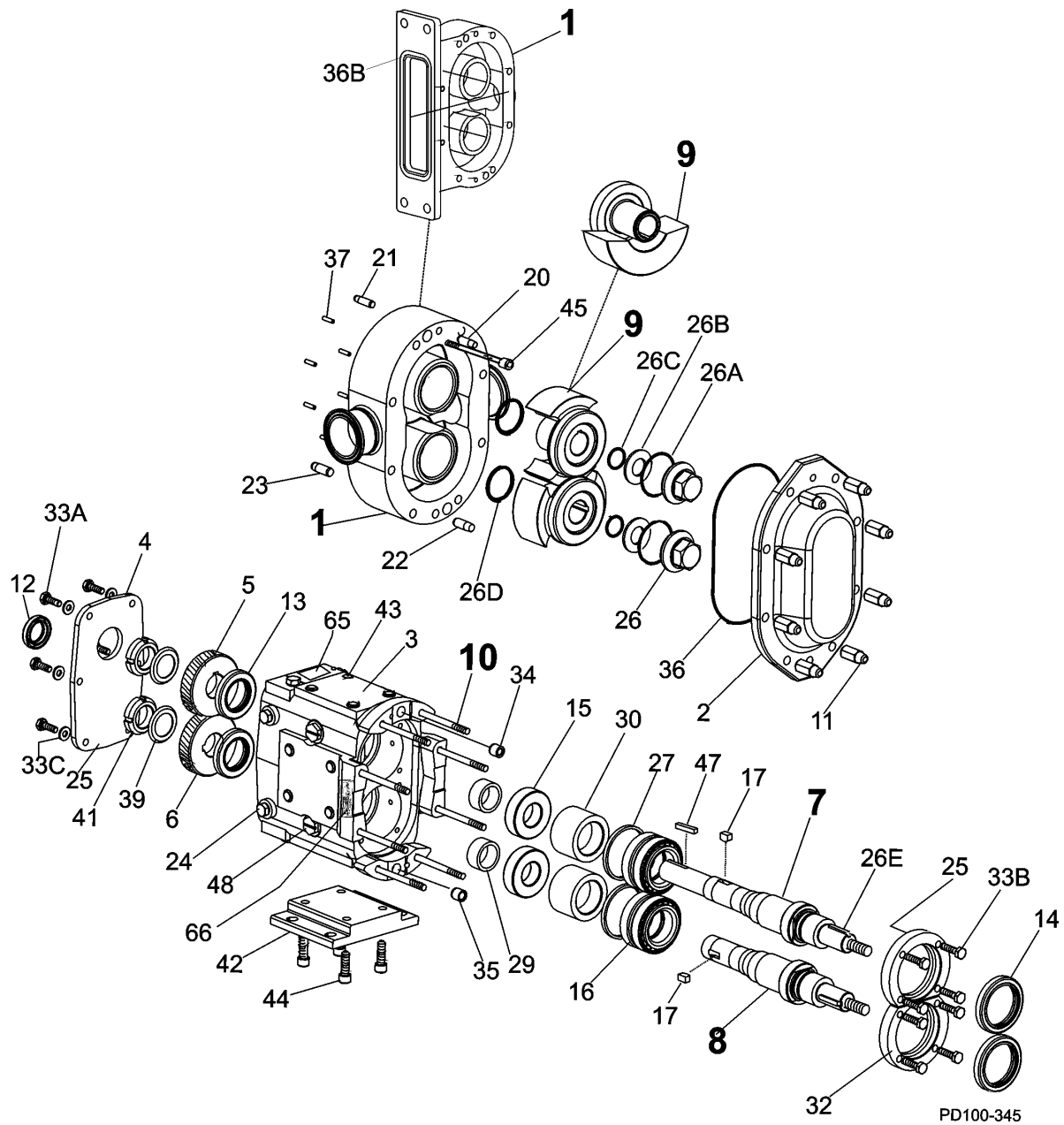
Universal II Wrench Size			
Model	Rotor Nut	Body Retaining Cap Screw	Cover Nut
006, 015, 018	15/16"	3/16"	5/8"
030, 040	1-1/4"	3/16"	5/8"
045, 060, 130	1-5/8"	1/4"	7/8"
180, 220	2-1/4"	5/16"	7/8"
210, 320, 370	2-3/8"	5/16"	1"

Torque Values				
Model	Locknuts			Locknut Tool
	Gear	Rotor	Cover	
006, 015, 018	75 ft lbs 102 N·m	50 ft lbs 68 N·m	7 ft lbs 10 N·m	109281+
030, 040	100 ft lbs 136 N·m	120 ft lbs 163 N·m	11 ft lbs 15 N·m	109282+
045, 060	140 ft lbs 190 N·m	250 ft lbs 339 N·m	56 ft lbs 76 N·m	109283+
130	140 ft lbs 190 N·m	250 ft lbs 339 N·m	25 ft lbs 34 N·m	109283+
180, 220	230 ft lbs 312 N·m	325 ft lbs 441 N·m	110 ft lbs 149 N·m	--
210, 320, 370	320 ft lbs 434 N·m	375 ft lbs 508 N·m	158 ft lbs 214 N·m	--

Arbor or Hydraulic Press Tonnage (Approximate)						
Model	Shaft		Front Bearing		Rear Bearing	
	IN	OUT	ON	OFF	ON	OFF
006, 015, 018	0.25	0.50	0.50	1.00	0.50	1.00
030, 040	0.25	1.00	0.50	1.00	0.50	1.00
045, 060, 130	0.50	1.00	2.00	5.00	3.00	5.00
180, 220	0.50	1.00	5.00	15.00	5.00	15.00
210, 320, 370	0.50	1.00	5.00	20.00	5.00	20.00

Standard WCB O-Ring Selections, Descriptions and Color Codes

Nitrile (Buna-N) (NBR) Compound Color: Black Color Code: Yellow FDA Compliant to 21CFR177.2600 3A Sanitary		Silicone (Si) Compound Color: Orange Color Code: Black FDA Compliant to 21CFR177.2600 3A Sanitary	
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.	
Ethylene Propylene Diene Rubber (Sulfur Free) (EPDM) Compound Color: Black or Purple Color Code: Blue FDA Compliant to 21CFR177.2600		PTFE Encapsulated Compound Color: Translucent coating over Orange or Black Silicone or FKM core Color Code: None FDA Compliant to 21CFR177.2600	
Fluorocarbon Rubber (FKM) Compound Color: Rust, Brown or Black Color Code: White FDA Compliant to 21CFR177.2600 3A Sanitary			

Parts Lists**006-014-015-018-UII Pump Parts**

006-014-015-018-U11 Pump Parts

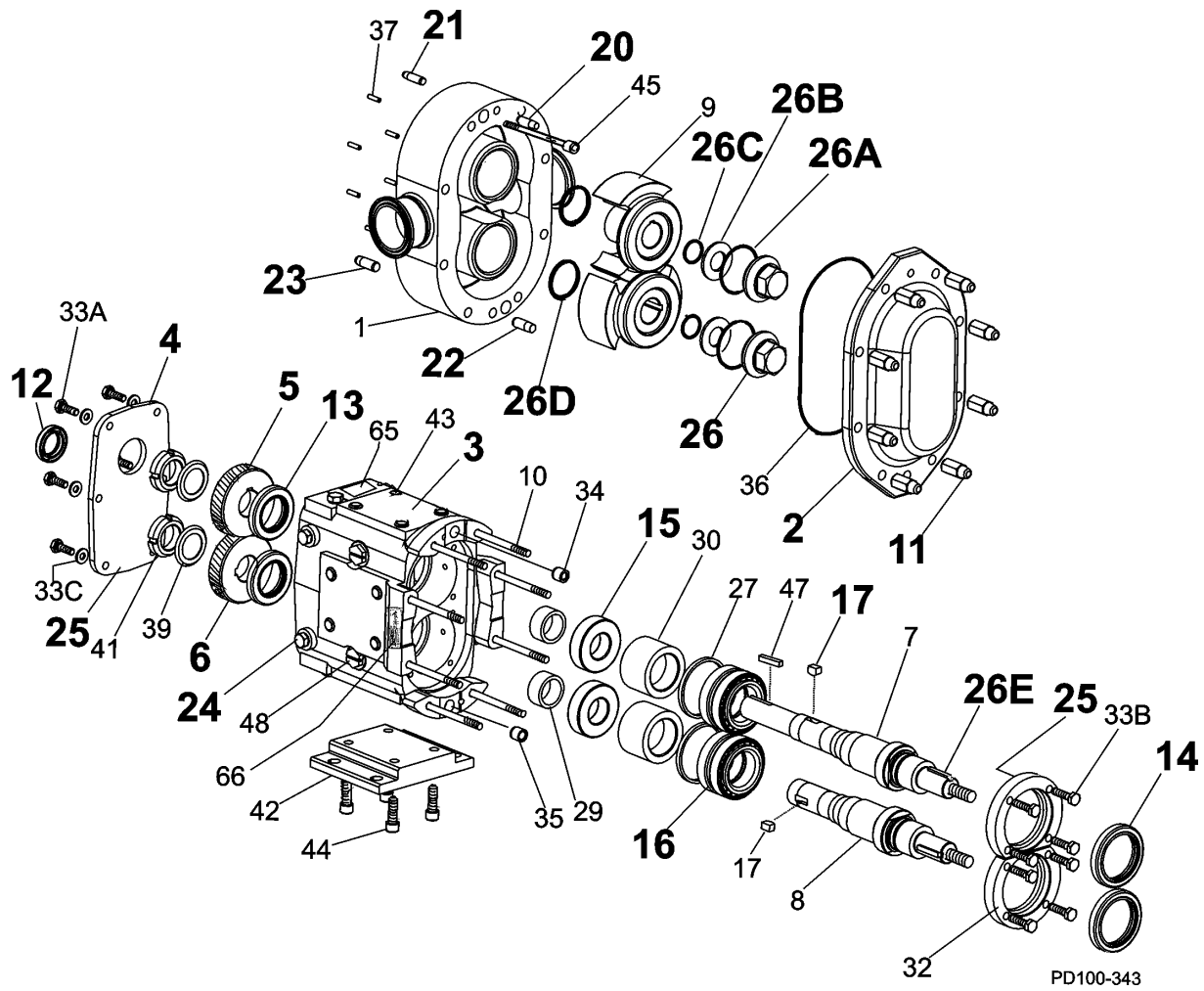
ITEM NO.	DESCRIPTION	QTY. PER PUMP	PART NO.	NOTES
1	006-U2 Pump Body	1	See Note 1	1
	006-U2 Pump Body with Flush	1	See Note 1	1
	014-U2 Rectangular Flange Inlet Body	1	See Note 1	1
	014-U2 Rect. Flange Inlet Body with Flush	1	See Note 1	1
	015-U2 Pump Body	1	See Note 1	1
	015-U2 Pump Body with Flush	1	See Note 1	1
	018-U2 Pump Body	1	See Note 1	1
	018-U2 Pump Body with Flush	1	See Note 1	1
7	006-014-015-U2 Drive Shaft	1	108405+	
	018-U2 Drive Shaft	1	108407+	
8	006-014-015-U2 Short Shaft	1	108406+	
	018-U2 Short Shaft	1	108408+	
9	006-U2 Rotor, Twin Wing, Alloy 88	2	101870+	2
	006-U2 Rotor, Twin Wing, 316SS	2	102199+	2
	014-015-U2 Rotor, Twin Wing, Alloy 88	2	101882+	2
	014-015-U2 Rotor, Twin Wing, 316SS	2	102205+	2
	015-U2 Rotor, Single Wing, Alloy 88	2	117060+	2, 13
	018-U2 Rotor, Twin Wing, Alloy 88	2	101894+	2
	018-U2 Rotor, Twin Wing, 316SS	2	102211+	2
	018-U2 Rotor, Single Wing, Alloy 88	2	117072+	2
10A	006-015-U2 Stud	8	AD0 011 000	
10B	006-015-U2 Stud, Jacketed Cover	8	AD0 011 J00	
10C	014-U2 Stud	6	AD0 011 000	
	014-U2 Stud	2	35547+	
10D	014-U2 Stud, Jacketed Cover	6	AD0 011 J00	
	014-U2 Stud, Jacketed Cover	2	35548+	
10E	018-U2 Stud	8	101721+	
10F	018-U2 Stud, Jacketed Cover	8	107754+	

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NOTES:

1. Contact Factory with Serial Number of pump for Part Number.
2. Standard clearances and finishes for Rotor Part Numbers shown. Contact Factory for optional clearances and finishes.
13. Single wing rotors cannot be used in Rectangular Flange Inlet pumps.

006-014-015-018-UII Common Parts



006-014-015-018-UII Common Parts

ITEM NO.	DESCRIPTION	QTY. PER PUMP	PART NO.	NOTES
2	Pump Cover	1	101842+	
	Jacketed Cover	1	107664+	
	Pump Cover Vented - Complete Assembly			
	Manual (over 150 PSI)	1	CVR00108	
	Manual (under 150 PSI)	1	CVR00063	
	Pneumatic Rubber Diaphragm	1	CVR00073	
3	Pneumatic Piston	1	CVR00074	
	Gear Case Assembly, CI, Model 006/015	1	102901-C	1
	Gear Case Assembly, SS; Model 006/015 (Optional)	1	102905-C	1
	Gear Case Assembly, CI, Model 018	1	102907-C	1
4	Gear Case Assembly, SS; Model 018 (Optional)	1	102911-C	1
	Gear Case Cover, Steel	1	020 106 000+	
5	Gear Case Cover, SS; Optional	1	102280+	
6	Gear, Drive Shaft, Spur	1	107997+	
6	Gear, Short Shaft, Spur	1	107997+	
11	Hex Nut	8	108369+	
	Wing Nut; Optional	8	105850+	
12	Oil Seal, Gear Case Cover	1	000 030 016+	
13	Oil Seal, Gear Case Rear	2	000 030 017+	
14	Grease Seal, Bearing Retainer	2	121679+	3, 4
	Bearing Isolator Kit, includes SS Bearing Retainer	2	X06638-1	
15	Bearing, Rear	2	015 035 000+	
16	Bearing, Front	2	101714+	
17	Key, Gear	2	015 037 000+	
20	Dowel Pin, Upper Cover Side	1	AD0 040 000	
21	Dowel Pin, Upper Gear Case Side	1	AD0 040 R00	
22	Dowel Pin, Lower Cover Side	1	AD0 040 100	
23	Dowel Pin, Lower Gear Case Side	1	AD0 040 R10	
24	Hex Capscrew; Fill Drain Level	6	115798+	2
25	Silicone Sealant	1	000 142 301+	
26	Nut, Rotor	2	101804+	
* 26A	O-Ring, Rotor Nut, Buna N	2	N70126	
	O-Ring, Rotor Nut, EPDM	2	E70126	
	O-Ring, Rotor Nut, FKM	2	V70126	
26B	Washer, Belleville	2	101691+	
* 26C	O-Ring, Retainer, Buna N	2	N70112	
	O-Ring, Retainer, EPDM	2	E70112	
	O-Ring, Retainer, FKM	2	V70112	
* 26D	O-Ring, Rotor Hub, Buna N	2	N70121	
	O-Ring, Rotor Hub, EPDM	2	E70121	
	O-Ring, Rotor Hub, FKM	2	V70121	
26E	006-014-015-U2 Key, Rotor	2	101817+	
	018-U2 Key, Rotor	2	101819+	

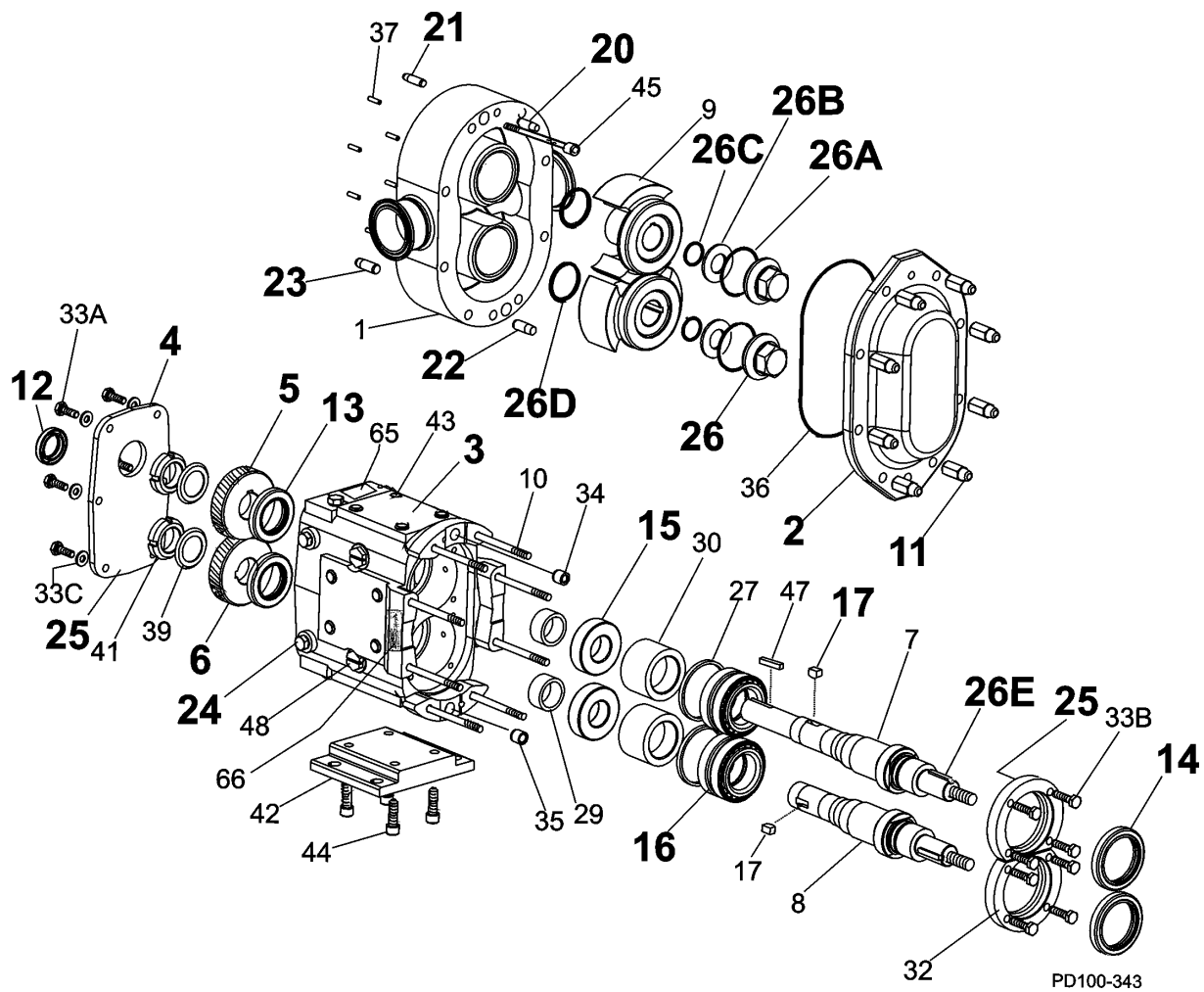
NOTES:

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* Recommended Spare Parts

1. Gear Case Assembly includes shafts and timing gears.
2. The old sight glass plug part number was 000046002. PD pumps changed approximately Oct. of 2003. Please verify the date of manufacture of the pump to identify the correct part
3. Pumps manufactured prior to June 2004 use 000030018 for the grease seal.
4. Pumps with bearing isolators use 101810+ as the bearing retainer and 101716+ as the grease seal.

006-014-015-018-UII Common Parts, cont'd



006-014-015-018-U11 Common Parts, cont'd

ITEM NO.	DESCRIPTION	QTY. PER PUMP	PART NO.	NOTES
27	Shim Kit	2	117889+	
29	Spacer, Gear to Rear Bearing	2	015 055 000+	
30	Bearing Spacer	2	101814+	
32	Bearing Retainer, Front	2	120332+	4
33A, 33B	1/4-20 x .75" HHCS, STD	14	30-287	
	1/4-20 x .75" HHCS, SS	14	30-58	
33C	1/4" Flat Washer	6	43-108	
34	Dowel Bushing, Upper	1	AD0 116 000	
35	Dowel Bushing, Lower	1	AD0 116 100	
* * * 36	O-Ring, Pump Cover, Buna N	1	N70249	
	O-Ring, Pump Cover, EPDM	1	E70249	
	O-Ring, Pump Cover, FKM	1	V70249	
36B	014-U2 O-Ring, Rectangular Flange	1	N70241	
37	Stop Pin, Seal	6	101718+	
39	Lockwasher, Gear	2	STD 136 005	
41	Locknut, Gear	2	STD 236 005	
42	Gear Case Shim, CI	1	020 110 000+	
	Gear Case Shim, SS; Optional	1	102284+	
	Pump Pedestal, 6.75", Optional	1	014 110 675+	
43	Plastic Cap Plug	8	000 121 003+	
44	5/16-18 x 1" SHCS	4	30-343	
	5/16-18 x 1" SHCS, SS; Optional	4	30-525	
45	006-014-015-U2 Body Retaining Screw, 1/4-20 x 1-1/4"	2	30-523	
	018-U2 Body Retaining Screw, 1/4-20 x 2"	2	30-211	
47	Key, Coupling - 3/16 x 3/16 x 1-1/8"	1	000 037 001+	
48	Cleanout Plug	2	35824+	
61	Name Plate, Sanitary	1	001 061 002+	
62	#2 x .125" RHDS	4	30-355	
65	Caution Plate	2	121694+	
66	Warning Label	2	33-63	
67	006-015-018-U1 Grease Fitting, 1/8"	4	BD0 092 000	2
	014-U1 Grease Fitting, 1/8"	4	BD0 092 100	3
68	Plastic Cap, Grease Fitting	4	BD0 093 000	

NOTES:

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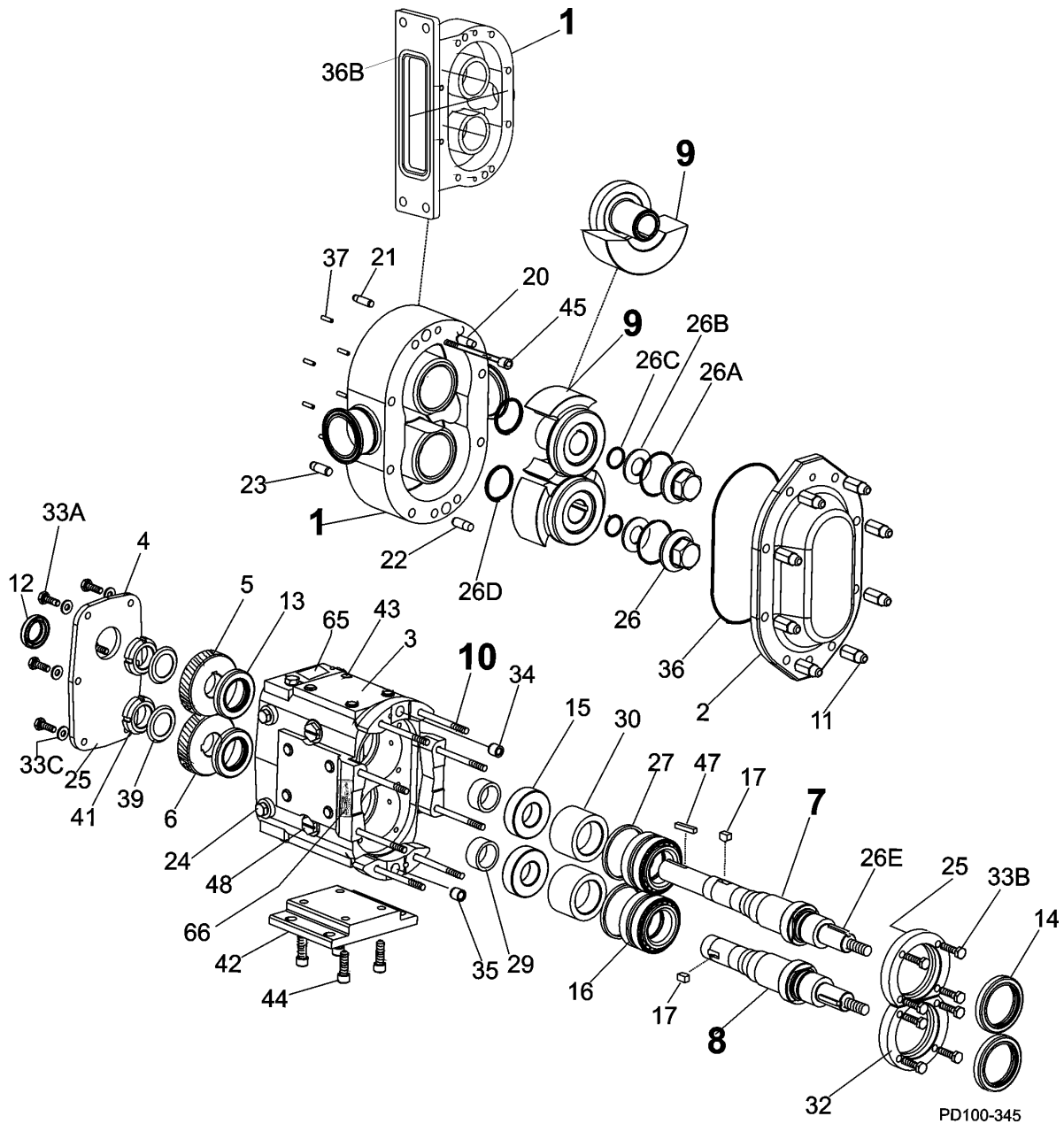
* Recommended Spare Parts

2. This grease fitting is the straight style. Part number BD0092100 is the angled style.
3. This grease fitting is the angled style. Part number BD0092000 is the straight style.
4. Pumps with bearing isolators use 101810+ as the bearing retainer and 101716+ as the grease seal.

For seals, see page 79.

For vented covers, see page 82.

030-034-040-UII Pump Parts



030-034-040-U11 Pump Parts

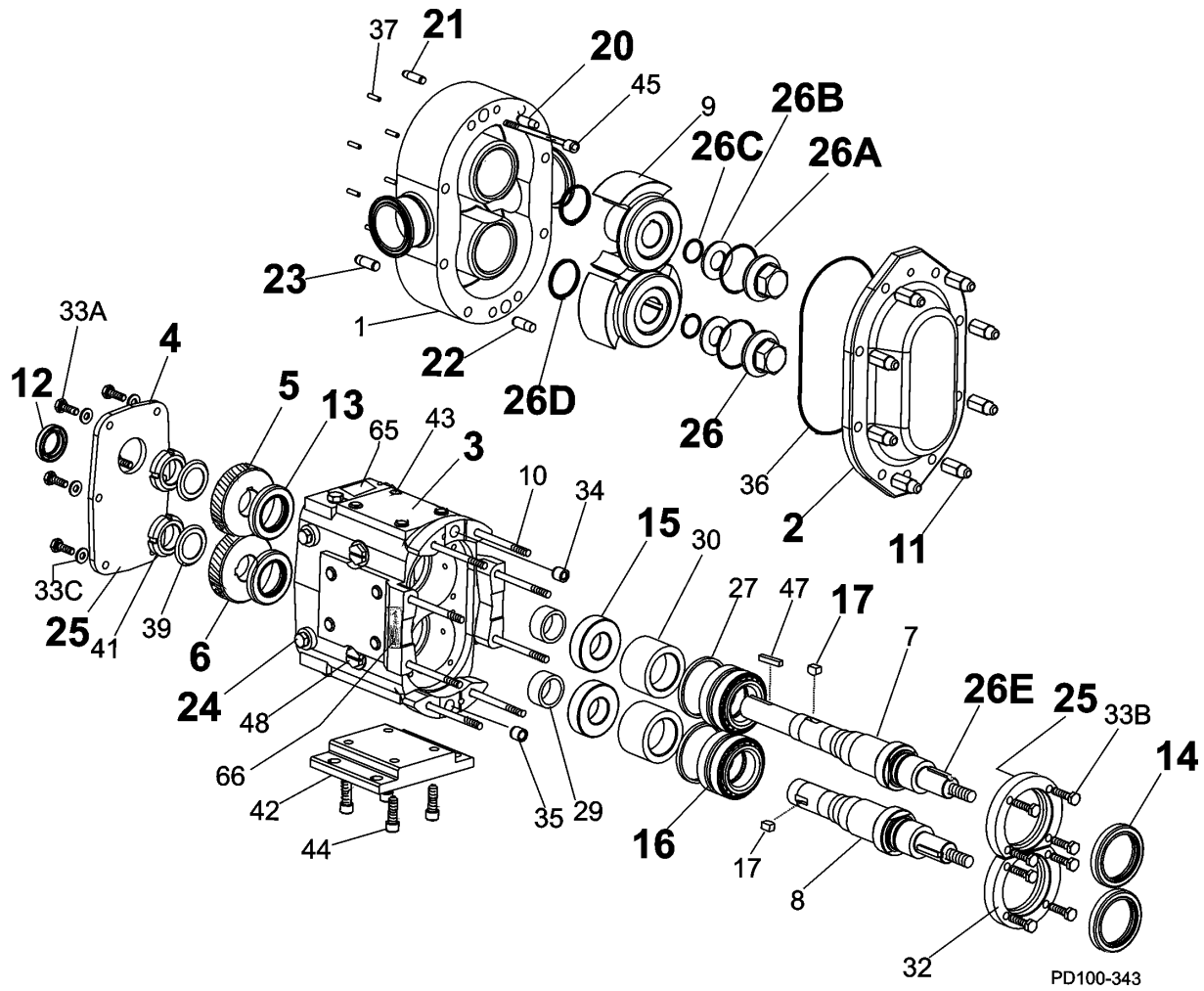
ITEM NO.	DESCRIPTION	QTY. PER PUMP	PART NO.	NOTES
1	030-U2 Pump Body	1	See Note 1	1
	030-U2 Pump Body with Flush	1	See Note 1	1
	034-U2 Rectangular Flange Inlet Body	1	See Note 1	1
	034-U2 Rectangular Flange Inlet Body with Flush	1	See Note 1	1
	040-U2 Pump Body	1	See Note 1	1
	040-U2 Pump Body with Flush	1	See Note 1	1
7	030-034 U2 Drive Shaft	1	108409+	
	040 U2 Drive Shaft	1	118722+	
8	030-034 U2 Short Shaft	1	108410+	
	040-U2 Short Shaft	1	118723+	
9	030-034-U2 Rotor, Twin Wing, Alloy 88	2	102151+	2
	030-034-U2 Rotor, Twin Wing, 316SS	2	102217+	2
	030-U2 Rotor, Single Wing, Alloy 88	2	117084+	2, 12, 13
	030-U2 Rotor, Single Wing, 316SS	2	117088+	2, 12A, 13
	040-U2 Rotor, Twin Wing, Alloy 88	2	118766+	2
	040-U2 Rotor, Twin Wing, 316SS	2	118779+	2
	040-U2 Rotor, Single Wing, Alloy 88	1	124255+	2
	040-U2 Rotor, Single Wing, 316SS	1	124268+	2
10	030-U2 Stud	8	108842+	
	030-U2 Stud, Jacketed Cover	8	108845+	
	034-U2 Stud	6	108842+	
	034-U2 Stud	2	35555+	
	034-U2 Stud, Jacketed Cover	6	108845+	
	034-U2 Stud, Jacketed Cover	2	35549+	
	040-U2 Stud	8	118897+	
	040-U2 Stud, Jacketed Cover	8	118898+	

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NOTES:

1. Contact Factory with Serial Number of pump for Part Number.
2. Standard clearances and finishes for Rotor Part Numbers shown. Contact Factory for optional clearances and finishes.
12. Replaces P/N 104707 (straight) and P/N 104836 (90 degree) rotors.
- 12A. Replaces P/N 104719 (straight) and P/N 104848 (90 degree) rotors.
13. Single wing rotors can not be used in Rectangular Flange Inlet pumps.

030-034-040-UII Common Parts



030-034-040-UII Common Parts

ITEM NO.	DESCRIPTION	QTY. PER PUMP	PART NO.	NOTES
2	Pump Cover	1	101845+	
	Jacketed Cover	1	107666+	
	Pump Cover Vented - Complete Assembly			
	Manual (over 150 PSI)	1	CVR00109	
	Manual (under 150 PSI)	1	CVR00067	
	Pneumatic Rubber Diaphragm	1	CVR00075	
	Pneumatic Piston	1	CVR00076	
3	030-034-U2 Gear Case Assembly, CI	1	102913-C	1
	030-034-U2 Gear Case Assembly, SS; Optional	1	102917-C	1
	040-U2 Gear Case Assembly, CI	1	120370-C	1
	040-U2 Gear Case Assembly, SS; Optional	1	125943-C	1
4	Gear Case Cover, Steel	1	040 106 000+	
	Gear Case Cover, SS; Optional	1	102281+	
5	Gear, Drive Shaft, Spur	1	107999+	
6	Gear, Short Shaft, Spur	1	107999+	
11	Hex Nut	8	108370+	
	Wing Nut; Optional	8	105851+	
12	Oil Seal, Gear Case Cover	1	000 030 013+	
13	Oil Seal, Gear Case Rear	2	000 030 014+	
14	Grease Seal, Bearing Retainer	2	121680+	
	Bearing Isolator Kit, includes SS Bearing Retainer	2	X06639-1	3
15	Bearing, Rear	2	030 035 000+	
16	Bearing, Front	2	101715+	
17	Key, Gear	2	BD0 037 000	
20	Dowel Pin, Upper Cover Side	1	BD0 040 000	
21	Dowel Pin, Upper Gear Case Side	1	BD0 040 200	
22	Dowel Pin, Lower Cover Side	1	BD0 040 100	
23	Dowel Pin, Lower Gear Case Side	1	BD0 040 300	
24	Hex Capscrew; Fill, Drain, Level	6	115799+	2
25	Silicone Sealant	1	000 142 301+	
26	Nut, Rotor	2	101805+	
* 26A	O-Ring, Rotor Nut, Buna N	2	N70130	
* 26A	O-Ring, Rotor Nut, EPDM	2	E70130	
* 26A	O-Ring, Rotor Nut, FKM	2	V70130	
26B	Washer, Belleville	2	101692+	
* 26C	O-Ring, Retainer, Buna N	2	N70115	
* 26C	O-Ring, Retainer, EPDM	2	E70115	
* 26C	O-Ring, Retainer, FKM	2	V70115	
* 26D	O-Ring, Rotor Hub, Buna N	2	N70127	
* 26D	O-Ring, Rotor Hub, EPDM	2	E70127	
* 26D	O-Ring, Rotor Hub, FKM	2	V70127	
* 26E	Key, Rotor	2	101821+	

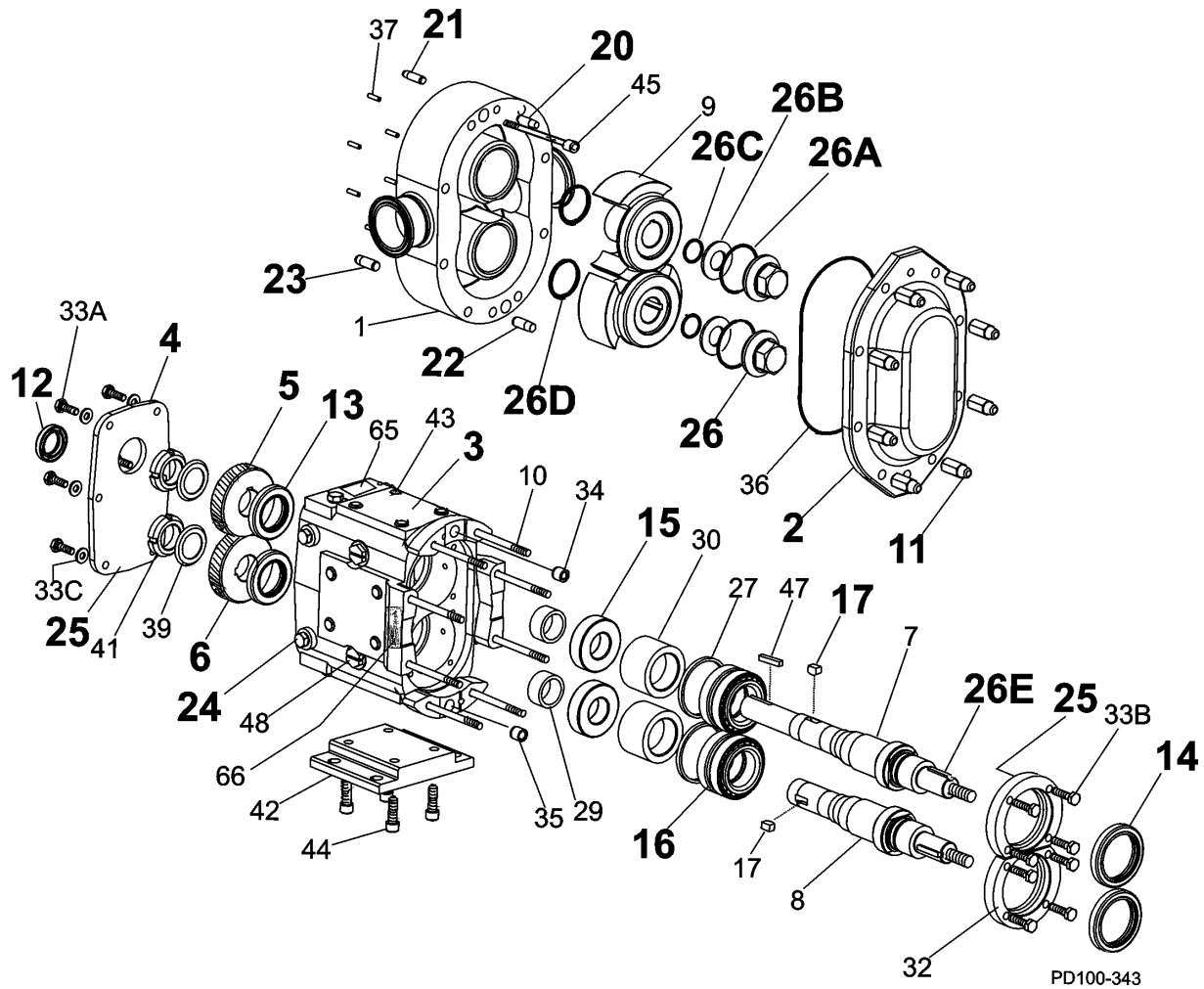
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NOTES:

* Recommended Spare Parts

1. Gear Case Assembly includes shafts and timing gears.
2. The old sight glass plug part number was 000046003. PD pumps changed approximately Oct. of 2003. Please verify the date of manufacture of the pump to identify the correct part
3. For pumps manufactured after July 2004. Prior to July 2004, use part number X06558-1.

030-034-040-UII Common Parts, cont'd



030-034-040-U11 Common Parts, cont'd

ITEM NO.	DESCRIPTION	QTY. PER PUMP	PART NO.	NOTES
27	Shim Kit	2	117890+	
29	Spacer, Gear to Rear Bearing	2	030 055 000+	
30	Bearing Spacer	2	101815+	
32	Bearing Retainer, Front	2	120333+	3, 4
33A	5/16-18 x 3/4" HHCS, STD	6	30-283	
	5/16-18 x 3/4" HHCS, SS	6	30-151	
33B	5/16-18 x 3/4" BSHCS, STD	8	30-296	
	5/16-18 x 3/4" SHCS, SS	8	30-29	
33C	5/16" Flat Washer	6	43-194	
34	Dowel Bushing, Upper	1	BD0 116 000	
35	Dowel Bushing, Lower	1	BD0 116 100	
* 36	O-Ring, Pump Cover, Buna N	1	N70259	
	O-Ring, Pump Cover, EPDM	1	E70259	
	O-Ring, Pump Cover, FKM	1	V70259	
* 36B	034-U2 O-Ring, Rectangular Flange	1	N70357	
37	Stop Pin, Seal	6	101719+	
39	Lockwasher, Gear	2	CD0 036 W00	
41	Locknut, Gear	2	CD0 036 N00	
42	Gear Case Shim, CI	1	040 110 000+	
	Gear Case Shim, SS; Optional	1	102285+	
	Pump Pedestal, 6.25", Optional	1	BD0 110 SM0	
43	Plastic Cap Plug, 3/8"	8	000 121 002+	
44	3/8-16 x 1" SHCS, STD	4	30-344	
	3/8-16 x 1" SHCS, SS; Optional	4	30-189	
45	030,034-U2 Body Retaining Screw, 1/4-20 x	2	30-211	
	040-U2 Body Retaining Screw, 1/4-20 x 2.5"	2	30-543	
47	Key, Coupling - 1/4 x 1/4 x 1-3/4"	1	000 037 002+	
48	Cleanout Plug	2	41013+	
61	Name Plate, Sanitary	1	001 061 002+	
62	#2 x .125" RHDS	4	30-355	
65	Caution Plate	2	121694+	
66	Warning Label	2	33-63	
67	030-U2 and 040-U2 Grease Fitting, 1/8"	4	BD0 092 000	1
	034-U2 Grease Fitting, 1/8"	4	BD0 092 100	2
68	Plastic Cap, Grease Fitting	4	BD0 093 000	

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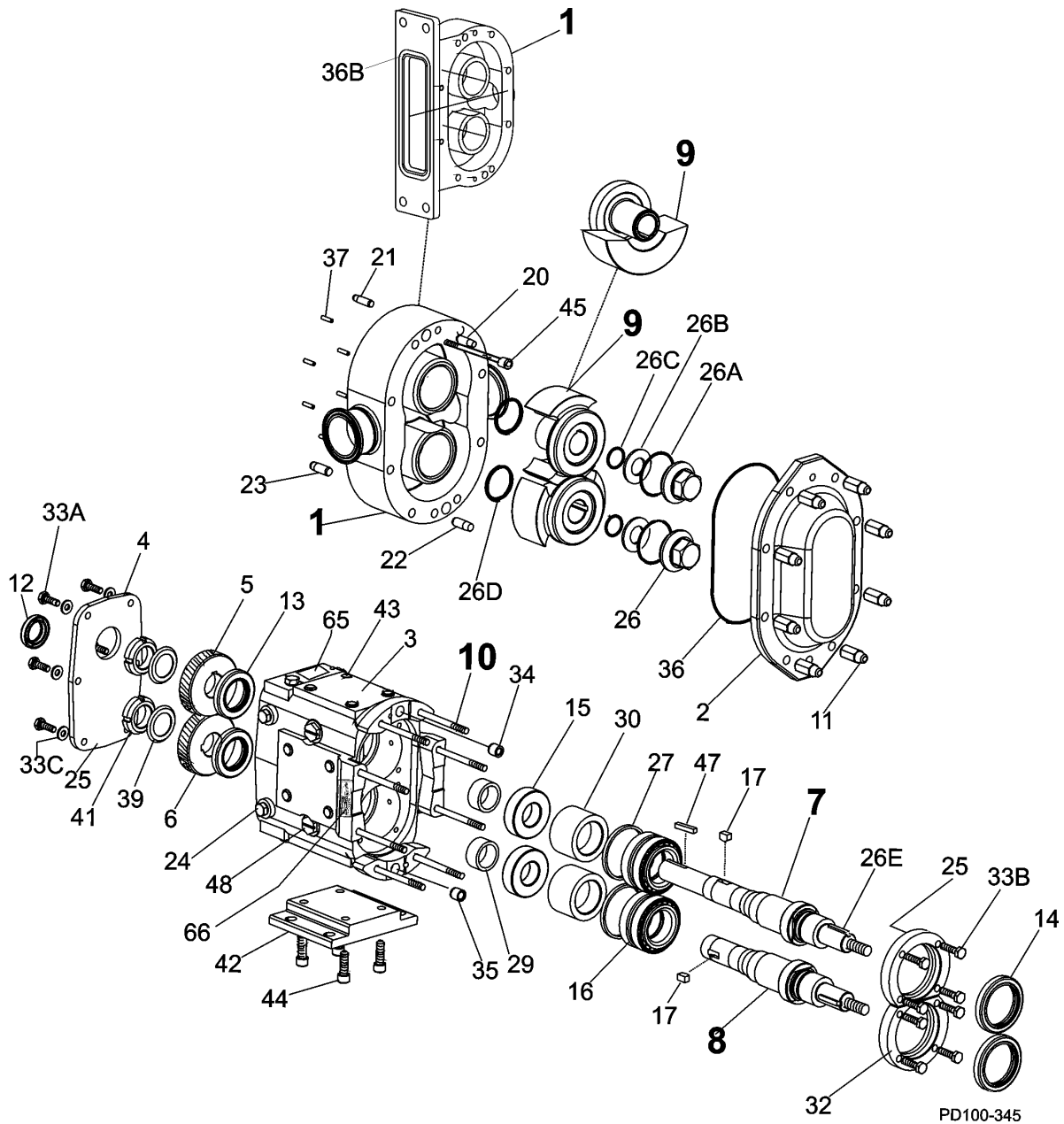
NOTES:*** Recommended Spare Parts**

1. This grease fitting is the straight style. Part number BD0092100 is the angled style.
2. This grease fitting is the angled style. Part number BD0092000 is the straight style.
3. For pumps manufactured after July 2004.
If pump was manufactured between July 2001 and July 2004, use part number 101811+.
If pump was manufactured prior to July 2001, use 030080000.

For seals, see page 79.

For vented covers, see page 82.

045-060-064-130-134-UII Pump Parts



045-060-064-130-134-U2 Pump Parts

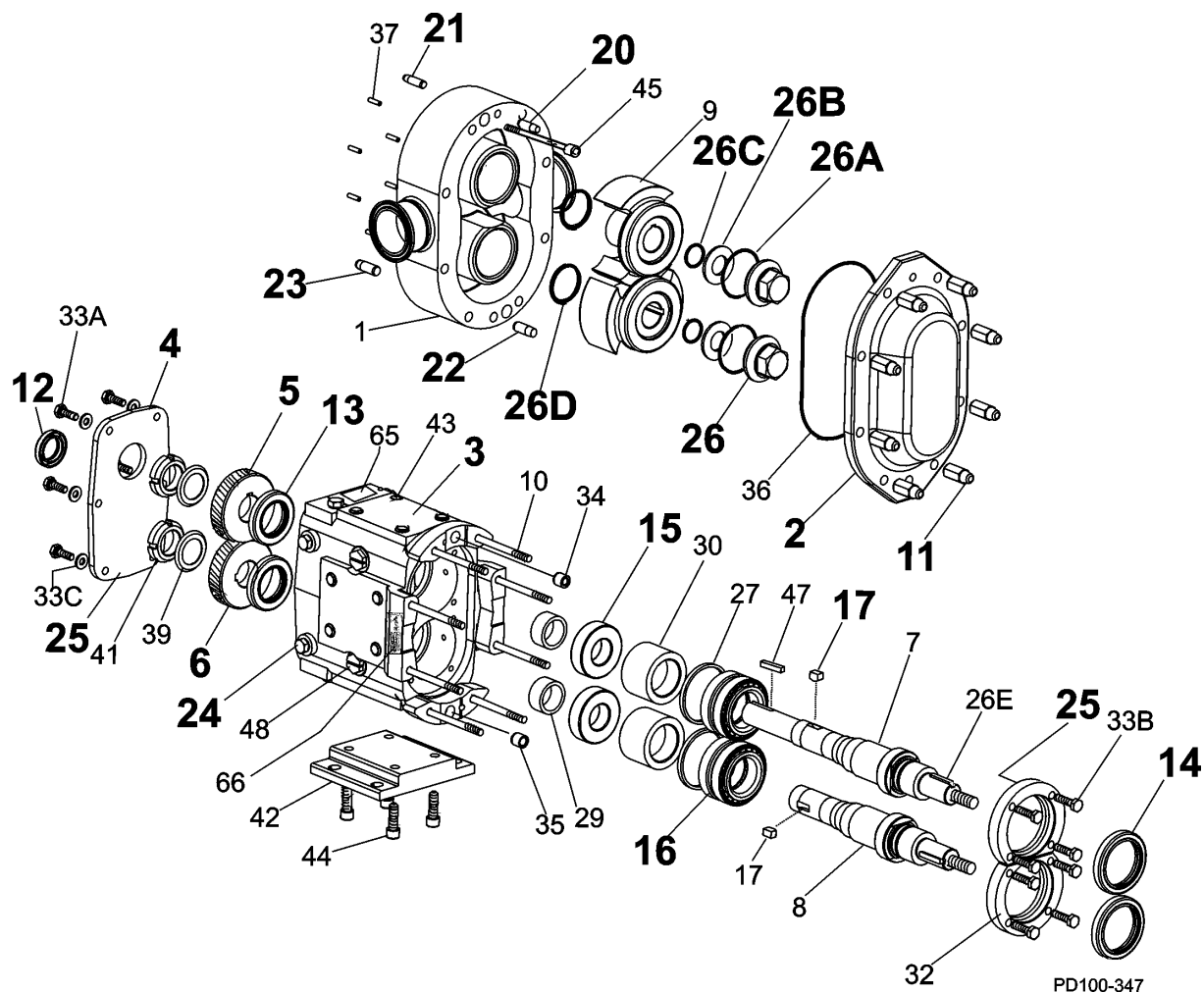
ITEM NO.	DESCRIPTION	QTY. PER PUMP	PART NO.	NOTES
1	045-U2 Pump Body	1	See Note 1	1
	045-U2 Pump Body with Flush	1	See Note 1	1
	060-U2 Pump Body	1	See Note 1	1
	060-U2 Pump Body with Flush	1	See Note 1	1
	064-U2 Rectangular Flange Inlet Body	1	See Note 1	1
	064-U2 Rect. Flange Inlet Body with Flush	1	See Note 1	1
	130-U2 Pump Body	1	See Note 1	1
	130-U2 Pump Body with Flush	1	See Note 1	1
	134-U2 Rectangular Flange Inlet Body	1	See Note 1	1
	134-U2 Rect. Flange Inlet Body with Flush	1	See Note 1	1
7	045-U2 Drive Shaft	1	110021+	
	060-064-U2 Drive Shaft	1	108411+	
	130-134-U2 Drive Shaft	1	108413+	
8	045-U2 Short Shaft	1	110022+	
	060-064-U2 Short Shaft	1	108412+	
	130-134-U2 Short Shaft	1	108414+	
9	045-U2 Rotor, Twin Wing, Alloy 88	2	107252+	2
	045-U2 Rotor, Twin Wing, 316SS	2	107264+	2
	045-U2 Rotor, Single Wing, Alloy 88	2	117105+	2
	060-064-U2 Rotor, Twin Wing, Alloy 88	2	102163+	2
	060-064-U2 Rotor, Twin Wing, 316SS	2	102226+	2
	060-U2 Rotor, Single Wing, Alloy 88	2	117117+	2, 12, 13
	130-134-U2 Rotor, Twin Wing, Alloy 88	2	102175+	2
	130-134-U2 Rotor, Twin Wing, 316SS	2	102232+	2
	130-U2 Rotor, Single Wing, Alloy 88	2	117129+	2, 12A, 13
10A	045-U2 Stud	8	107242+	
10B	045-U2 Stud, Jacketed Cover	8	111584+	
10C	060-U2 Stud	8	108843+	
10D	060-U2 Stud, Jacketed Cover	8	108846+	
10E	064-U2 Stud	6	108843+	
	064-U2 Stud	2	0C1 050 000	
10F	064-U2 Stud, Jacketed Cover	6	108846+	
	064-U2 Stud, Jacketed Cover	2	35556+	
10G	130-U2 Stud	8	101722+	
10H	130-U2 Stud, Jacketed Cover	8	130 011 001+	
10I	134-U2 Stud	6	101722+	
	134-U2 Stud	2	0C1 050 000	
10J	134-U2 Stud, Jacketed Cover	6	130 011 001+	
	134-U2 Stud, Jacketed Cover	2	35556+	

PL5060-CH82

NOTES:

1. Contact Factory with Serial Number of pump for Part Number.
2. Standard clearances and finishes for Rotor Part Numbers shown. Contact Factory for optional clearances and finishes.
12. Replaces P/N 104728 (straight) and P/N 104857 (90 degree) rotors.
- 12A. Replaces P/N 104746 (straight) and P/N 104875 (90 degree) rotors.
13. Single wing rotors cannot be used with Rectangular Flange Inlet Pumps.

045-060-064-130-134-UII Common Parts



045-060-064-130-134-UII Common Parts

ITEM NO.	DESCRIPTION	QTY. PER PUMP	PART NO.	NOTES
2	Pump Cover	1	101848+	
	Jacketed Cover	1	107668+	
	Pump Cover Vented - Complete Assembly			
	Manual (over 150 PSI)	1	CVR00077	
	Manual (under 150 PSI)	1	CVR00051	
	Pneumatic Rubber Diaphragm	1	CVR00078	
	Pneumatic Piston	1	CVR00079	
3	Gear Case Assembly, CI, Model 045	1	111141-C	1
	Gear Case Assembly, SS; Model 045 (Optional)	1	113167-C	1
	Gear Case Assembly, CI, Model 060	1	102919-C	1
	Gear Case Assembly, SS; Model 060 (Optional)	1	102923-C	1
	Gear Case Assembly, CI, Model 064	1	115704-C	1
	Gear Case Assembly, CI, Model 130	1	102925-C	1
	Gear Case Assembly, SS; Model 130 (Optional)	1	102929-C	1
	Gear Case Assembly, CI, Model 134	1	115706-C	1
4	Gear Case Cover, Steel	1	070 106 000+	
	Gear Case Cover, SS; Optional	1	102282+	
5	Gear, Drive Shaft, Spur	1	107404+	
6	Gear, Short Shaft, Spur	1	107404+	
11	Hex Nut	8	108371+	
	Wing Nut, Optional	8	105852+	
12	Oil Seal, Gear Case Cover	1	000 030 012+	
13	Oil Seal, Gear Case Rear	2	000 030 011+	
14	Grease Seal, Bearing Retainer	2	101829+	
	Bearing Isolator Kit, Includes STD Bearing Retainer	2	X06640-1	
	Bearing Isolator Kit, Includes SS Bearing Retainer	2	X06640-2	
15	Bearing, Rear	2	107186+	
16	Bearing, Front	2	060 036 000+	
17	Key, Gear	2	060 037 000+	
20	Dowel Pin, Upper Cover Side	1	CD0 040 000	
21	Dowel Pin, Upper Gear Case Side	1	CD0 040 R00	
22	Dowel Pin, Lower Cover Side	1	CD0 040 100	
23	Dowel Pin, Lower Gear Case Side	1	CD0 040 R10	
24	Oil Plug, M20 x 1.5"	5	115798+	2, 40
	Oil Level Indicator, M20 x 1.5"	1	115799+	2, 40
25	Silicone Sealant	1	000 142 301+	
26	Nut, Rotor	2	101806+	
* 26A	O-Ring, Rotor Nut, Buna N	2	N70227	
* 26A	O-Ring, Rotor Nut, EPDM	2	E70227	
* 26A	O-Ring, Rotor Nut, FKM	2	V70227	
26B	Belleville Washer	2	101693+	
* 26C	O-Ring, Retainer, Buna N	2	N70119	
* 26C	O-Ring, Retainer, EPDM	2	E70119	
* 26C	O-Ring, Retainer, FKM	2	V70119	
* 26D	O-Ring, Rotor Hub, Buna N	2	N70224	
* 26D	O-Ring, Rotor Hub, EPDM	2	E70224	
* 26D	O-Ring, Rotor Hub, FKM	2	V70224	

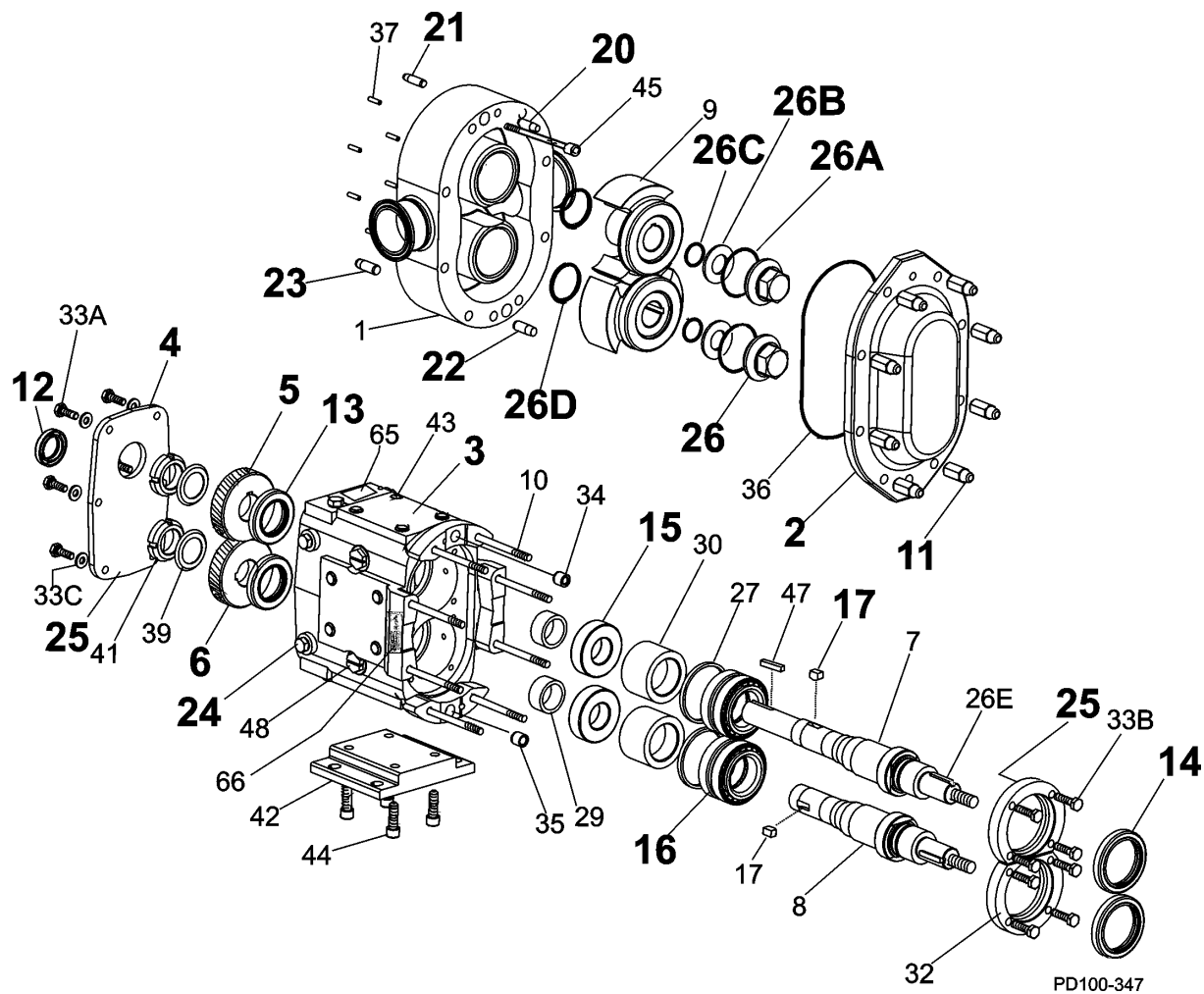
NOTES:

PL5060-CH83

* Recommended Spare Parts

1. Gear Case Assembly includes shafts and timing gears.
2. Applies to pumps shipped after October 2003.
40. Pumps shipped prior to October 2003 used qty 6 of plug w/washer, part number 000046004.

045-060-064-130-134-U11 Common Parts, cont'd



ITEM NO.	DESCRIPTION	QTY. PER PUMP	PART NO.	NOTES
26E	045-U2 Key, Rotor	2	110926+	
	060-064-U2 Key, Rotor	2	101823+	
	130-134-U2 Key, Rotor	2	101825+	
27	Shim Kit	2	117891+	
29	Spacer, Gear to Rear Bearing	2	107187+	
30	Bearing Spacer	2	060 055 003+	
31	Grease Retainer, Rear Bearing	2	STD 091 002	
32	Bearing Retainer, Front, STD	2	123531+	
	Bearing Retainer, Front, SS	2	121828+	

PL5060-CH84

045-060-064-130-134-U11 Common Parts, cont'd

ITEM NO.	DESCRIPTION	QTY. PER PUMP	PART NO.	NOTES
33A	3/8-16 x 3/4" HHCS, STD Gear Case Cover	6	30-314	
	3/8-16 x 3/4" HHCS, SS Gear Case Cover	6	30-50	
33B	3/8-16 x 1-1/4" HHCS, STD Bearing Retainer	8	30-351	
	3/8-16 x 1-1/4" HHCS, SS Bearing Retainer	8	30-60	
33C	3/8" Flat Washer, Gear Case Cover	6	43-189	
34	Dowel Bushing, Upper	1	CD0 116 000	
35	Dowel Bushing, Lower	1	CD0 116 100	
36	O-Ring, Pump Cover, Buna N	1	N70373	
	O-Ring, Pump Cover, EPDM	1	E70373	
	O-Ring, Pump Cover, FKM	1	V70373	
	O-Ring, Pump Cover, Silicone	1	S75373	
36B	064-U2 O-Ring, Rectangular Flange	1	N70366	
	134-U2 O-Ring, Rectangular Flange	1	N70369	
37	Stop Pin, Seal	6	101720+	
39	Lockwasher, Gear	2	STD 136 009	
41	Locknut, Gear	2	STD 236 009	
42	Gear Case Shim, CI	1	070 110 000+	
	Gear Case Shim, SS; Optional	1	102286+	
	Pump Pedestal, 5.5", Optional	1	CD0 110 SM5	
	Pump Pedestal, 10", Optional	1	CD0 110 SM1	
43	Plastic Cap Plug	6	000 121 001+	
44	1/2-13 x 1-1/4" SHCS	4	30-275	
	1/2-13 x 1-1/4" SS SHCS	4	30-503	
45	045-U2 Body Retaining Screws, 5/16-8 x 2-1/2"	2	30-615	
	060-064-U2 Body Retaining Screws, 5/16-8 x 3"	2	30-319	
	130-134-U2 Body Retaining Screws, 5/16-8 x 4"	2	30-423	
46	Eye Bolt, 1/2 -13	2	30-360	
47	Key, Coupling - 3/8 x 3/8 x 1-5/8"	1	000 037 003+	
48	Cleanout Plug	2	41013+	
61	Name Plate, Sanitary	1	001 061 002+	
62	#2 x .125" RHDS	4	30-355	
65	Caution Plate	2	121694+	
66	Warning Label	2	33-60	
67	045-060-130-U2 Grease Fitting, 1/8"	4	BD0 092 000	1
	064-134-U2 Grease Fitting, 1/8"	4	BD0 092 100	2
68	Plastic Cap, Grease Fitting	4	BD0 093 000	

NOTES:

PL5060-CH85

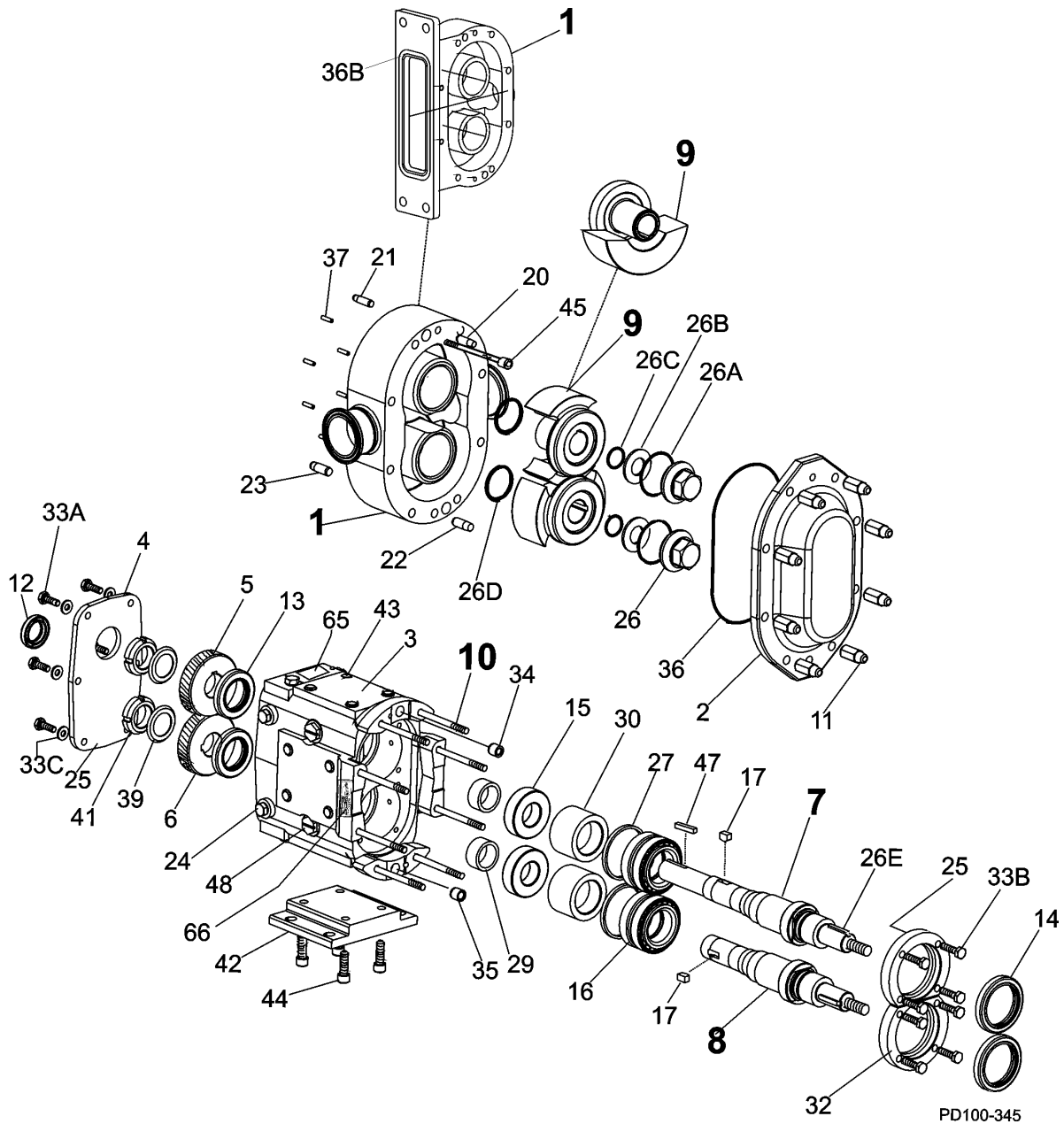
* Recommended Spare Parts

1. This grease fitting is the straight style. Part number BD0092100 is the angled style.
2. This grease fitting is the angled style. Part number BD0092000 is the straight style.

For seals, see page 79.

For vented covers, see page 82.

180-184-220-224-UII Pump Parts



180-184-220-224-U11 Pump Parts

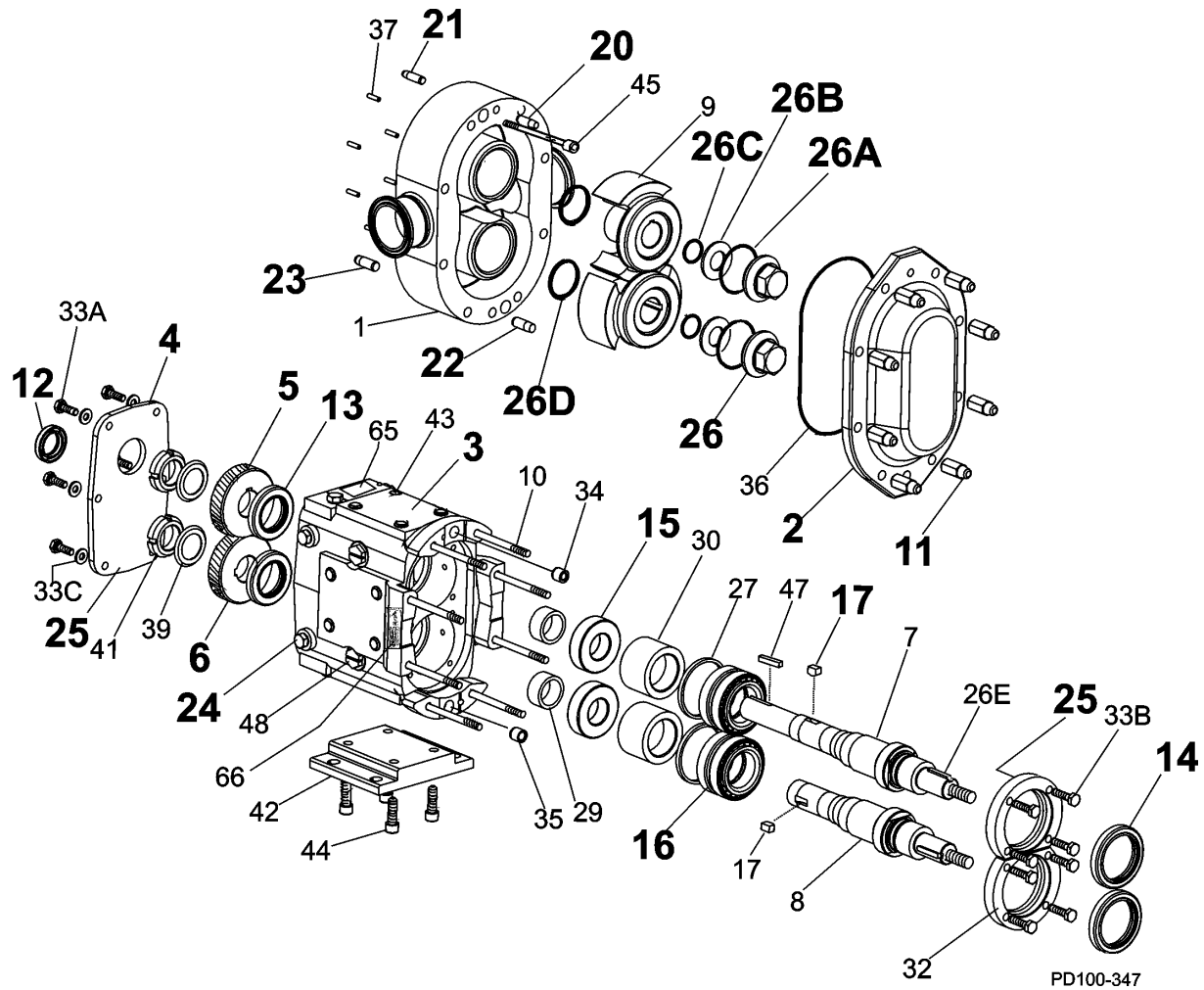
ITEM NO.	DESCRIPTION	QTY. PER PUMP	PART NO.	NOTES
1	180-U2 Pump Body	1	See Note 1	1
	180-U2 Pump Body with Flush	1	See Note 1	1
	184-U2 Pump Body	1	See Note 1	1
	184-U2 Pump Body with Flush	1	See Note 1	1
	220-U2 Pump Body	1	See Note 1	1
	220-U2 Pump Body with Flush	1	See Note 1	1
	224-U2 Rectangular Flange Inlet Body	1	See Note 1	1
	224-U2 Rect. Flange Inlet Body with Flush	1	See Note 1	1
7	180-184-U2 Drive Shaft	1	110023+	
	220-224-U2 Drive Shaft	1	108415+	
8	180-184-U2 Short Shaft	1	110024+	
	220-224 Short Shaft	1	108416+	
9	180-184-U2 Rotor, Twin Wing, Alloy 88	2	107273+	2
	180-184-U2 Rotor, Twin Wing, 316SS	2	107285+	2
	220-224 -U2 Rotor, Twin Wing, Alloy 88	2	102187+	2
	220-224 -U2 Rotor, Twin Wing, 316SS	2	102238+	2
	220-U2 Single Wing, Alloy 88	2	117141+	2, 12, 13
10A	180-184-U2 Stud	8	107243+	
10B	180-184-U2 Stud, Jacketed Cover	8	112629+	
10C	220-U2 Stud	8	108844+	
10D	220-U2 Stud, Jacketed Cover	8	108847+	
10E	224-U2 Stud	6	108844+	
	224-U2 Stud	2	35550+	
10F	224-U2 Stud, Jacketed Cover	6	108847+	
	224-U2 Stud, Jacketed Cover	2	36144+	

PL5060-CH88

NOTES:

1. Contact Factory with Serial Number of pump for Part Number.
2. Standard clearances and finishes for Rotor Part Numbers shown. Contact Factory for optional clearances and finishes.
12. Replaces P/N 104764 (straight) and P/N 104893 (90 degree) rotors.
13. Single wing rotors cannot be used with Rectangular Flange Inlet Pumps.

180-184-220-224-UII Common Parts



180-184-220-224-UII Common Parts

ITEM NO.	DESCRIPTION	QTY. PER PUMP	PART NO.	NOTES
2	Pump Cover	1	101851+	
	Jacketed Cover	1	107670+	
	Pump Cover Vented - Complete Assembly			
	Manual (over 150 PSI)	1	CVR00112	
	Manual (under 150 PSI)	1	CVR00021	
	Pneumatic Piston	1	CVR00080	
3	Gear Case Assembly, CI, Model 180-184	1	111143-C	1
	Gear Case Assembly, SS; Model 180-184 (Optional)	1	112654-C	1
	Gear Case Assembly, CI, Model 220	1	102931-C	1
	Gear Case Assembly, SS; Model 220 (Optional)	1	102935-C	1
	Gear Case Assembly, CI, Model 224	1	115708-C	1
4	Gear Case Cover, Steel	1	230 106 000+	
	Gear Case Cover, SS; Optional	1	102283+	
5	Gear, Drive Shaft, Spur	1	110932+	
6	Gear, Short Shaft, Spur	1	110932+	
11	Hex Nut	8	108372+	
	Wing Nut, Optional	8	105853+	
12	Oil Seal, Gear Case Cover	1	STD 030 006	
13	Oil Seal, Gear Case Rear	2	STD 119 002	
14	Grease Seal, Bearing Retainer	2	121681+	
	Bearing Isolator Kit, Includes STD Bearing Retainer	2	X06634-1	
	Bearing Isolator Kit, Includes SS Bearing Retainer	2	X06634-2	
15	Bearing, Rear	2	200 035 000+	
16	Bearing, Front	2	200 036 000+	
17	Key, Gear	2	200 037 000+	
20	Dowel Pin, Upper Cover Side	1	GD0 040 000	
21	Dowel Pin, Upper Gear Case Side	1	CD0 040 R00	
22	Dowel Pin, Lower Cover Side	1	GD0 040 100	
23	Dowel Pin, Lower Gear Case Side	1	CD0 040 R10	
24	Oil Plug, M20 x 1.5"	5	115798+	2, 40
	Oil Level Indicator, M20 x 1.5"	1	115799+	2, 40
25	Silicone Sealant	1	000 142 301+	
26	Nut, Rotor	2	101807+	
* 26A	O-Ring, Rotor Nut, Buna N	2	N70235	
	O-Ring, Rotor Nut, EPDM	2	E70235	
	O-Ring, Rotor Nut, FKM	2	V70235	
26B	Belleville Washer	2	101694+	
* 26C	O-Ring, Retainer, Buna N	2	N70122	
	O-Ring, Retainer, EPDM	2	E70122	
	O-Ring, Retainer, FKM	2	V70122	
* 26D	O-Ring, Rotor Hub, Buna N	2	N70230	
	O-Ring, Rotor Hub, EPDM	2	E70230	
	O-Ring, Rotor Hub, FKM	2	V70230	

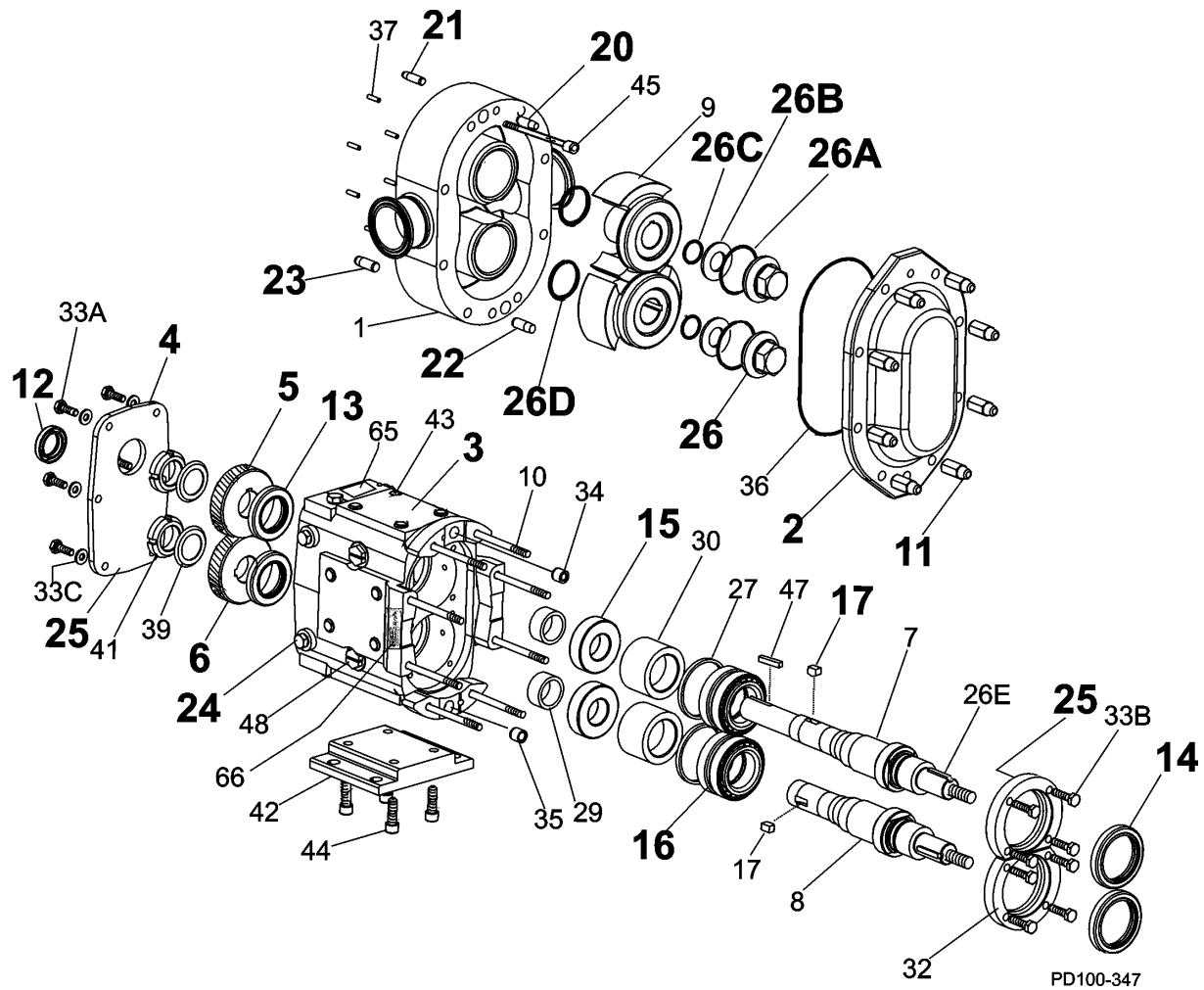
NOTES:

PL5060-CH89

* Recommended Spare Parts

1. Gear Case Assembly includes shafts and timing gears.
2. Applies to pumps shipped after October 2003.
40. Pumps shipped prior to October 2003 used qty 6 of plug w/washer, part number 000046004.

180-184-220-224-UII Common Parts, cont'd



PD100-347

180-184-220-224-UII Common Parts, cont'd

ITEM NO.	DESCRIPTION	QTY. PER PUMP	PART NO.	NOTES
26E	180-184-U2 Key, Rotor	2	101828+	
	220-224-U2 Key, Rotor	2	101827+	
27	Shim Kit	2	117892+	
29	Spacer, Gear to Rear Bearing	2	40878+	
30	Bearing Spacer	2	40752+	
32	Bearing Retainer, Front, STD	2	123532+	
	Bearing Retainer, Front, SS	2	121829+	
33A	3/8-16 x 3/4" HHCS, STD Gear Case Cover	8	30-314	
	3/8-16 x 3/4" HHCS, SS Gear Case Cover	8	30-50	
33B	3/8-16 x 1-1/4" HHCS, STD Bearing Retainer	8	30-351	
	3/8-16 x 1-1/4" HHCS, SS Bearing Retainer	8	30-60	
33C	3/8" Flat Washer, Gear Case Cover	8	43-189	
34	Dowel Bushing, Upper	1	CD0 116 000	
35	Dowel Bushing, Lower	1	CD0 116 100	
36	O-Ring, Pump Cover, Buna N	1	N70381	
	O-Ring, Pump Cover, EPDM	1	E70381	
	O-Ring, Pump Cover, FKM	1	V70381	
	O-Ring, Pump Cover, Silicone	1	S75381	
36B	184-U2 O-ring, Rectangular Flange	1	N70374	
	224-U2 O-Ring, Rectangular Flange	1	N70272	
	224-U2 O-Ring, Rectangular Flange	1	N70376	
37	Stop Pin, Seal	6	101720+	
39	Lockwasher, Gear	2	STD 136 011	
41	Locknut, Gear	2	STD 236 011	
42	Gear Case Shim, Cl	1	230 110 000+	
	Gear Case Shim, SS; Optional	1	102287+	
	Pump Pedestal, 9", Optional	1	GD0 110 SM9	
	Pump Pedestal, 13", Optional	1	GD0 110 SM1	
43	Plastic Cap Plug	6	000 121 001+	
44	1/2-13 x 2" SHCS	4	30-111	
	1/2-13 x 2" SS SHCS	4	30-44	
45	180-184-U2 Body Retaining Screws, 3/8-16 x 4"	2	30-323	
	220-224-U2 Body Retaining Screws, 3/8-16 x 4-1/2"	2	30-499	
46	Eye Bolt, 1/2 -13	2	30-360	
47	Key, Coupling - 1/2 x 1/2 x 1-7/8"	1	000 037 004+	
48	Cleanout Plug	2	41013+	
61	Name Plate, Sanitary	1	001 061 002+	
62	#2 x .125" RHDS	4	30-355	
65	Caution Plate	2	121694+	
66	Warning Label	2	33-60	
67	180-184-220-U2 Grease Fitting, 1/8" (angled)	4	BD0 092 000	
	224-U2 Grease Fitting, 1/8" (straight)	4	BD0 092 100	
68	Plastic Cap, Grease Fitting	4	BD0 093 000	

NOTES:

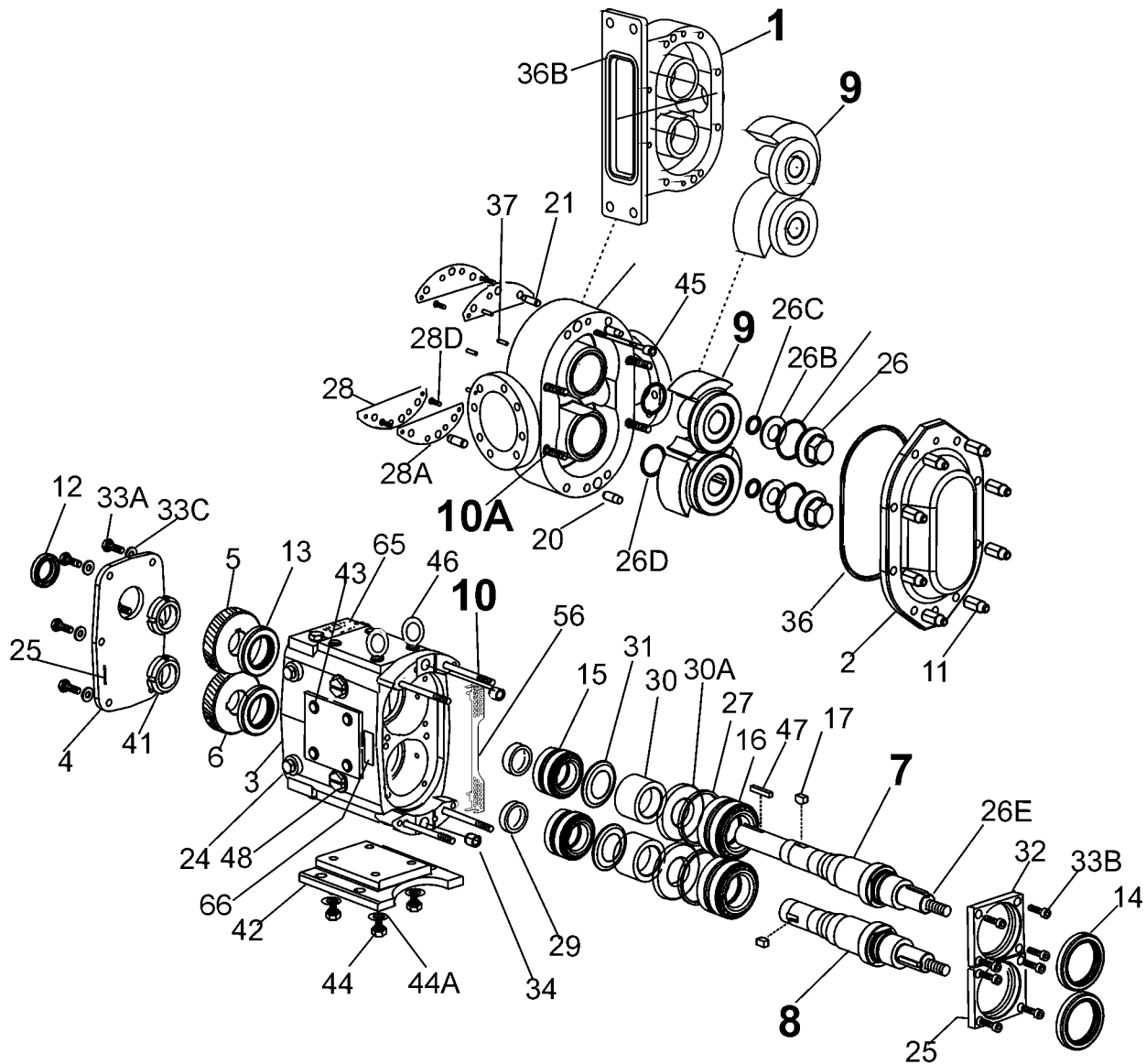
PL5060-CH90

*** Recommended Spare Parts**

For seals, see page 79.

For vented covers, see page 82.

210-213-214-320-323-324-370-UII Pump Parts



PD100-354

210-213-214-320-323-324-370-U2 Pump Parts

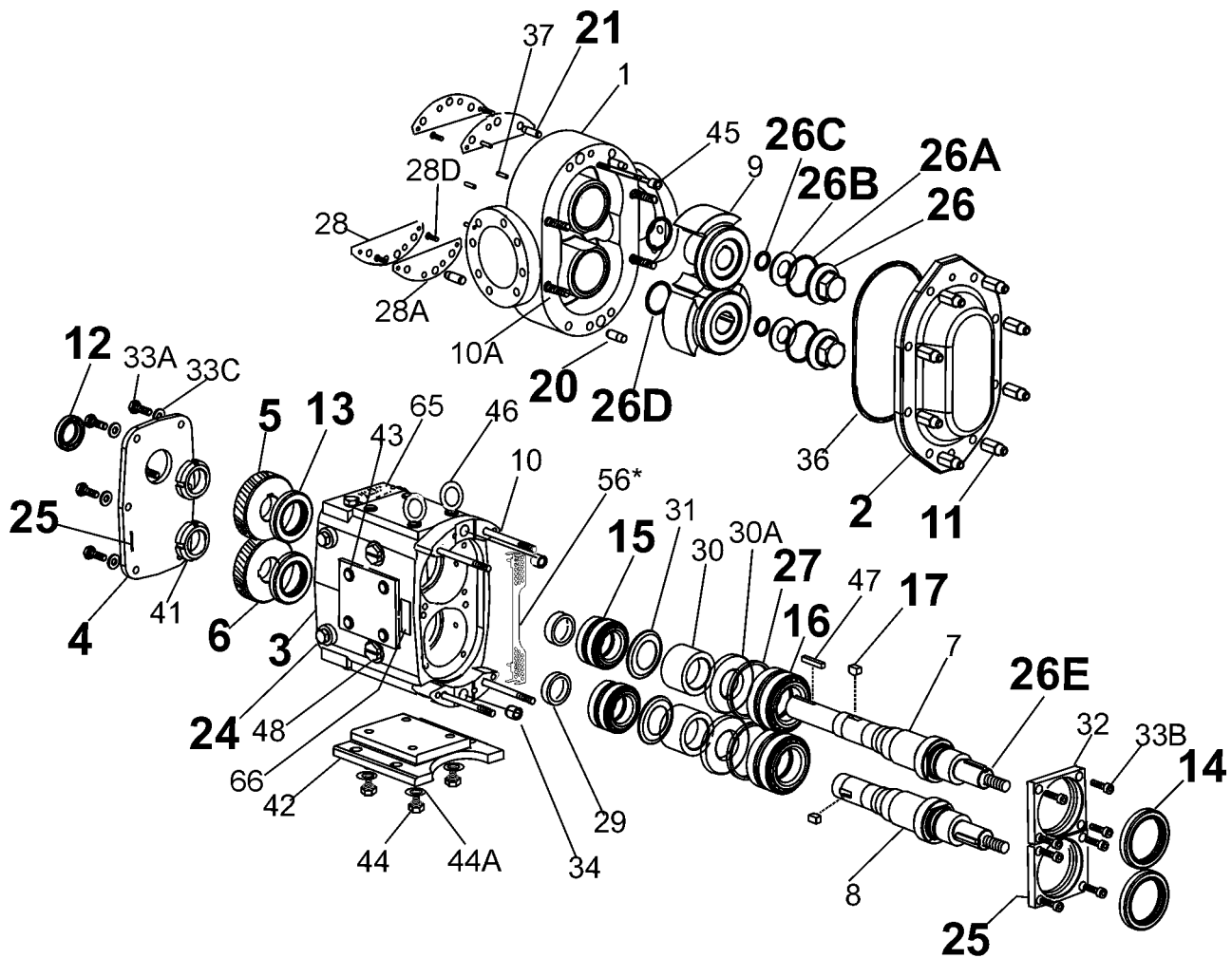
ITEM NO.	DESCRIPTION	QTY. PER PUMP	PART NO.	NOTES
1	210-U2 Pump Body	1	See Note 1	1
	210-U2 Pump Body with Flush	1	See Note 1	1
	213-U2 Pump Body	1	See Note 1	1
	214-U2 Pump Body	1	See Note 1	1
	214-U2 Pump Body with Flush	1	See Note 1	1
	320-U2 Pump Body	1	See Note 1	1
	320-U2 Pump Body with Flush	1	See Note 1	1
	323-U2 Pump Body	1	See Note 1	1
	324-U2 Pump Body	1	See Note 1	1
	324-U2 Pump Body with Flush	1	See Note 1	1
	370-U2 Pump Body	1	See Note 1	1
	370-U2 Pump Body with Flush	1	See Note 1	1
7	210-224-U2 Drive Shaft	1	112186+	
	213-U2 Drive Shaft	1	112188+	
	320-324-U2 Drive Shaft	1	108417+	
	323-U2 Drive Shaft	1	113960+	
	370-U2 Drive Shaft	1	124839+	
8	210-224-U2 Short Shaft	1	112187+	
	213-U2 Short Shaft	1	112189+	
	320-324-U2 Short Shaft	1	108418+	
	323-U2 Short Shaft	1	113961+	
	370-U2 Short Shaft	1	124840+	
9	210-213-214-U2 Rotor, Twin Wing, Alloy 88	2	112199+	2
	210-213-214-U2 Rotor, Twin Wing, 316SS	2	112211+	2
	210-213-214-U2 Rotor, Single Wing, Alloy 88	2	117220+	2
	320-324-U2 Rotor, Twin Wing, Alloy 88	2	105427+	2
	320-324-U2 Rotor, Twin Wing, 316SS	2	105439+	2
	320-324-U2 Rotor, Single Wing, Alloy 88	2	117153+	2, 12
	323-U2 Rotor, Twin Wing, Alloy 88	2	114022+	2
	370-U2 Rotor, Twin Wing, Alloy 88	2	124849+	2
	370-U2 Rotor, Twin Wing, 316SS	2	124861+	2
10	213-320-323-324-U2 Stud, Long	4	111291+	
	210-214-U2 Stud, Long, Jacketed Cover	4	112191+	
	370-U2 Stud, Long	4	124838+	

PL5060-CH93

NOTES:

1. Contact Factory with Serial Number of pump for Part Number.
2. Standard clearances and finishes for Rotor Part Numbers shown. Contact Factory for optional clearances and finishes.
12. Replaces P/N 107662 (straight) and P/N 107663 (90 degree) rotors.

210-213-214-320-323-324-370-UII Common Parts



PD100-353

210-213-214-320-323-324-370-UII Common Parts

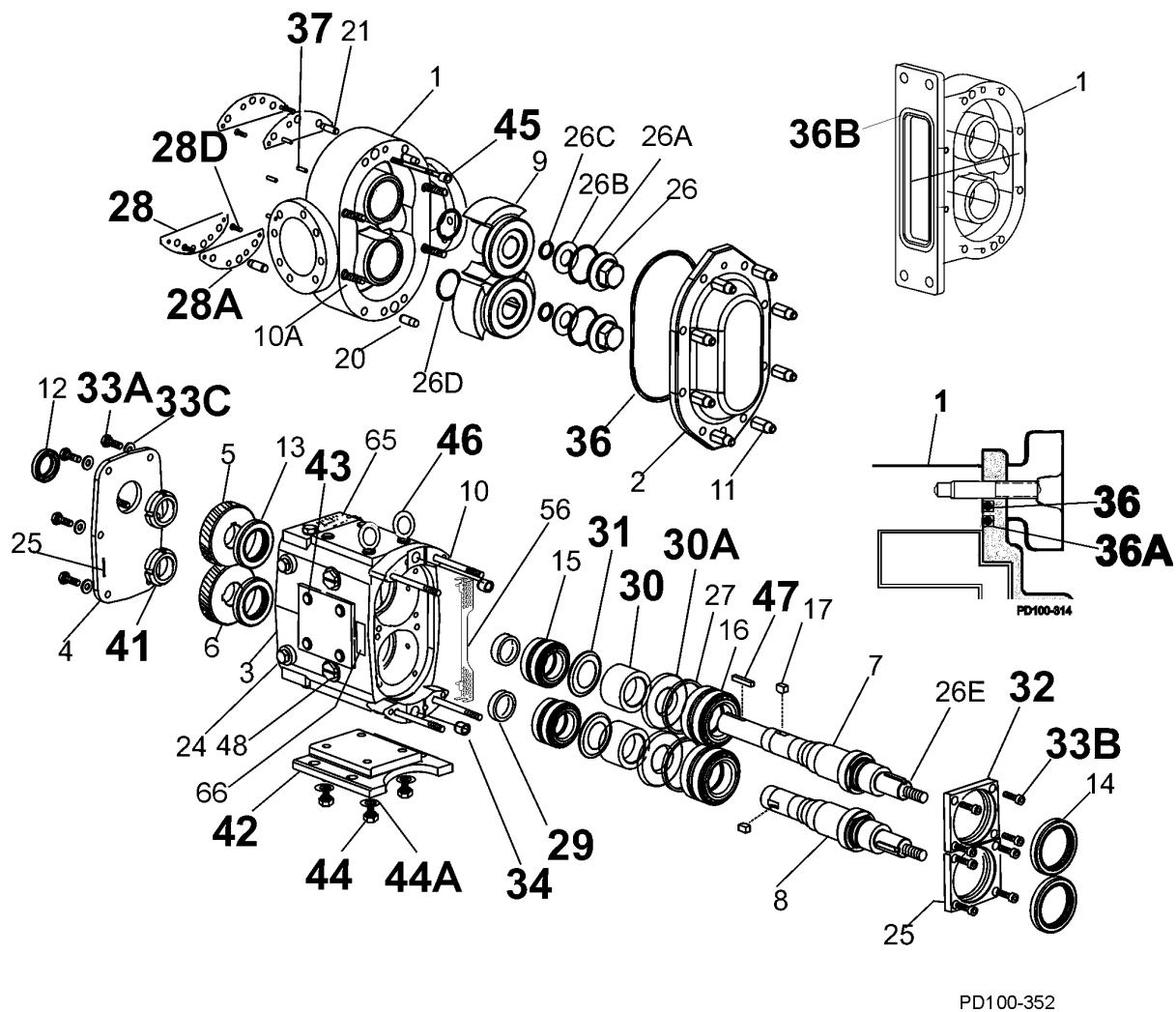
ITEM NO.	DESCRIPTION	QTY (per pump)	PART NO.	NOTES
2	210-224-U2 Pump Cover	1	112865+	
	210-224-U2 Jacketed Cover	1	114358+	
	320-324-370-U2 Pump Cover	1	109974+	
	320-324-370-U2 Jacketed Cover	1	114359+	
	213-323-U2 Pump Cover	1	114020+	
3	Gear Case Assembly, CI, Model 210-213	1	112709-C	1
	Gear Case Assembly, CI, Model 214	1	112709B-C	1
	Gear Case Assembly, CI, Model 320-323-370	1	105479-C	1
	Gear Case Assembly, CI, Model 324	1	105479B-C	1
4	Gear Case Cover, Steel	1	40669+	
5	Gear, Drive Shaft, Spur	1	102470+	
6	Gear, Short Shaft, Spur	1	102470+	
11	Hex Nut	8	108373+	
	Wing Nut, Optional	8	110858+	
12	Oil Seal, Gear Case Cover	1	STD 030 004	
13	Oil Seal, Gear Case Rear	2	102475+	3
14	Grease Seal, Bearing Retainer	2	121681+	
	Bearing Isolator Kit, Incl. STD Bearing Retainer	2	X06634-3	
15	Bearing, Rear	2	OH1 036 000	
16	Bearing, Front	2	OH1 036 003	
17	Key, Gear	2	OH1 037 000	
20	Dowel Pins, Cover Side	2	OH1 040 000	
21	Dowel Pins, Gear Case Side	2	105871+	
24	Oil Plug, M20 x 1.5"	5	115798+	2, 40
	Oil Level Indicator, M20 x 1.5"	1	115799+	2, 40
25	Silicone Sealant	1	000 142 301+	
26	Nut, Rotor	2	105409+	
* * * * 26A	O-Ring, Rotor Nut, Buna N	2	N70237	
	O-Ring, Rotor Nut, EPDM	2	E70237	
	O-Ring, Rotor Nut, FKM	2	V70237	
	O-Ring, Rotor Nut, Silicone	2	S75237	
26B	Washer, Belleville	2	105411+	
* * * * 26C	O-Ring, Retainer, Buna N	2	N70125	
	O-Ring, Retainer, EPDM	2	E70125	
	O-Ring, Retainer, FKM	2	V70125	
	O-Ring, Retainer, Silicone	2	S75125	
* * * * 26D	O-Ring, Rotor Hub, Buna N	2	N70232	
	O-Ring, Rotor Hub, EPDM	2	E70232	
	O-Ring, Rotor Hub, FKM	2	V70232	
	O-Ring, Rotor Hub, Silicone	2	S75232	
26E	210-213-224-U2 Key, Rotor	2	105422+	
	320-323-324-370-U2 Key, Rotor	2	105421+	
27	Shim Kit	2	117893+	

NOTES: * Recommended Spare Parts

PL5060-CH94

1. Gear Case Assembly includes shafts and timing gears.
2. Applies to pumps shipped after October 2003.
3. Applies to pumps shipped after July 2001. Prior to this date, this part was not required. Check the pump serial number to verify the date of manufacture and identify the part number required.
40. Pumps shipped prior to October 2003 used qty 6 of plug w/washer, part number 000046004.

210-213-214-320-323-324-370-UII Common Parts, cont'd



210-213-214-320-323-324-370-U1 Common Parts, cont'd

ITEM NO.	DESCRIPTION	QTY. (per pump)	PART NO.	NOTES
28	Shim Plate	2	105426+	
28A	Shims, Body, .002	AR	105866+	
	Shims, Body, .003	AR	105867+	
	Shims, Body, .005	AR	105868+	
	Shims, Body, .010	AR	105869+	
	Shims, Body, .020	AR	105870+	
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	STD 091 000	
32	Bearing Retainer, Front	2	123533+	
33A	3/8-16 x .75" HHCS	6	30-314	
33B	5/16-18 x 1" SHCS	8	30-343	
33C	3/8" Flat Washer	6	43-189	
34	Dowel Bushings	2	OH1 116 000	
36	210-224-U2 O-Ring, Pump Cover, Buna N	1	N70382	
	210-224-U2 O-Ring, Pump Cover, EPDM	1	E70382	
	210-224-U2 O-Ring, Pump Cover, FKM	1	V70382	
	210-224-U2 O-Ring, Pump Cover, Silicone	1	S75382	
	320-324-370-U2 O-Ring, Pump Cover, Buna N	1	N70383	
	320-324-370-U2 O-Ring, Pump Cover, EPDM	1	E70383	
	320-324-370-U2 O-Ring, Pump Cover, FKM	1	V70383	
	320-324-370-U2 O-Ring, Pump Cover, Silicone	1	S75383	
	213-323-U2 O-Ring, Pump Cover, Outer, EPDM	1	323 117 012+	11
	213-323-U2 O-Ring, Pump Cover, Outer, Silicone	1	323 117 013+	11
	213-323-U2 O-Ring, Pump Cover, Outer, FKM	1	323 117 014+	11
	213-323-U2 O-Ring, Pump Cover, Inner, EPDM	1	323 117 002+	11
36A	213-323-U2 O-Ring, Pump Cover, Inner, Silicone	1	323 117 003+	11
	213-323-U2 O-Ring, Pump Cover, Inner, FKM	1	323 117 004+	11
36B	214-U2 Flange O-ring	1	N70377	
	324-U2 Flange O-ring	1	N70378	
37	Stop Pin, Seal	6	102438+	
41	Locknut, Gear	2	105697+	
42	Gear Case Shim, Cl	1	40288+	
	Pump Pedestal, 22", Optional	1	324 110 226+	
43	Plastic Cap Plug	8	000 121 001+	
44	1/2-13 x 1-3/4" HHCS	4	30-250	
44A	Lock Washer, 1/2"	4	43-177	
45	210-213-224-U2 Body Retaining Screws - 3/8-16 x 3-1/2"	2	30-326	
	320-324-370-U2 Body Retaining Screws - 3/8-16 x 4-1/2"	2	30-499	
	323-U2 Body Retaining Screws - 3/8-16 x 4"	2	30-323	
46	Eye Bolt	3	30-360	
47	Key, Coupling - 5/8 x 5/8 x 2-3/4"	1	000 037 005+	

NOTES: * Recommended Spare Parts

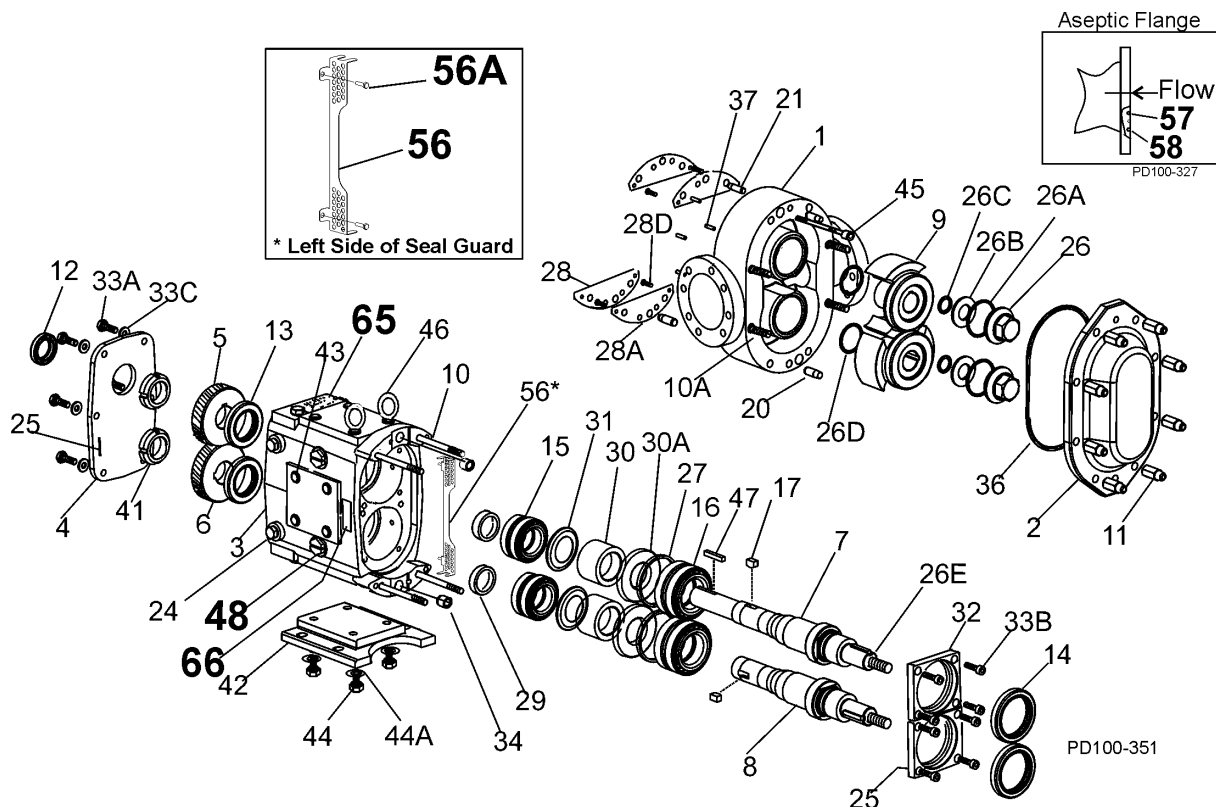
PL5060-CH95

11. Used on 213-U2 and 323-U2 only.

For seals, see page 79.

For vented covers, see page 82.

210-213-214-320-323-324-370-UII Common Parts, cont'd



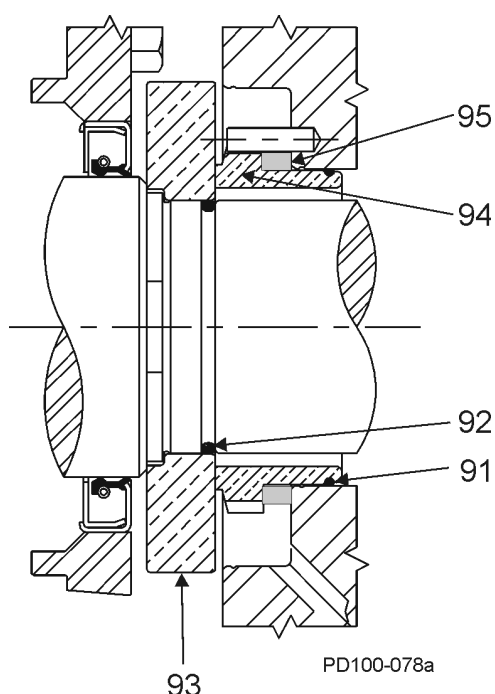
ITEM NO.	DESCRIPTION	QTY. (per pump)	PART NO.	NOTES
48	Cleanout Plug	2	41013+	
56	210-213-U2 Seal Guard	2	113503+	
	214-U2 Seal Guard	1	113503+	
	320-323-370-U2 Seal Guard	2	113504+	
	324-U2 Seal Guard	1	113504+	
		1	126361+	
56A	1/4 - 20 x 3/8" HHCS	4	30-68	
57	O-Ring, Port, Inner, EPDM	2	E70245	11
	O-Ring, Port, Inner, FKM	2	V70245	11
	O-Ring, Port, Inner, Silicone	2	S75245	11
58	O-Ring, Port, Outer, EPDM	2	E70251	11
	O-Ring, Port, Outer, FKM	2	V70251	11
	O-Ring, Port, Outer, Silicone	2	S75251	11
60A	1/8-27 Aseptic Connection Pipe Plugs	10	STD 128 500	11
61	Name Plate, Sanitary	1	001 061 002+	
62	#2 x .125" RHDS	4	30-355	
65	Caution Plate	2	121694+	
66	Warning Label	2	33-60	
67	Grease Fitting, 1/8"	4	BD0 092 000	1
68	Plastic Cap, Grease Fitting	4	BD0 093 000	

NOTES: * Recommended Spare Parts

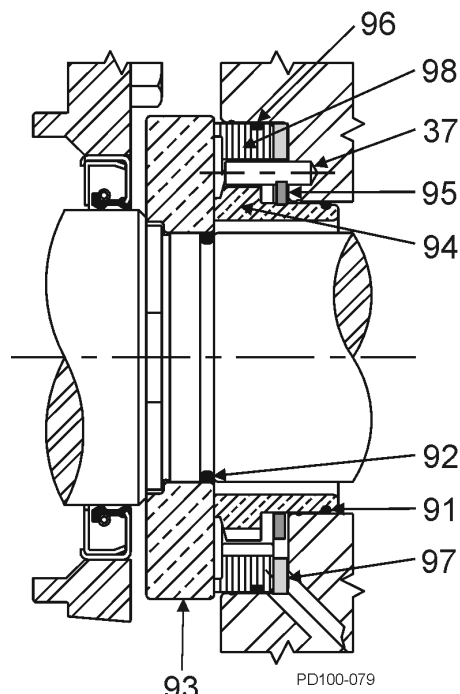
PL5060-CH96

1. This grease fitting is the straight style. Part number BD0092100 is the angled style.
 11. Used on 213-U2 and 323-U2 only.

PD Pump Seals Model 006, 014, 015, 018, 030, 034, 040 Universal II



Single Mechanical Seal



Double Mechanical Seal

ITEM NO.	DESCRIPTION	QTY. PER PUMP	PART NO. (by model)		NOTES
			006, 014, 015, 018 UII	030, 034, 040 UII	
	MECHANICAL SEAL PARTS				
* 91	O-Ring, Inner Seal, Buna N	2	N70028	N70031	25
* 91	O-Ring, Body, EPDM	2	E70028	E70031	25
* 91	O-Ring, Body, FKM	2	V70028	V70031	
* 92	O-Ring, Shaft, Buna N	2	N70024	N70029	25
* 92	O-Ring, Shaft, EPDM	2	E70024	E70029	25
* 92	O-Ring, Shaft, FKM	2	V70024	V70029	
* 93	Seal Seat, Ceramic	2	101667+	101670+	
* 93	Seal Seat, Silicon Carbide	2	101668+	101671+	
* 94	Seal Inner, Carbon	2	101651+	101655+	
* 94	Seal Inner, Ceramic	2	101652+	101656+	
* 94	Seal Inner, Silicon Carbide	2	101653+	101657+	
* 94	Seal Inner, Tungsten Carbide	2	101654+	101658+	
95	Wave Spring, Inner Seal	2	101683+	101685+	
* 96	O-Ring, Outer Seal, Buna N	2	N70035	N70041	8
* 96	O-Ring, Outer Seal, EPDM	2	E70035	E70041	8
* 96	O-Ring, Outer Seal, FKM	2	V70035	V70041	8
97	Wave Spring, Outer Seal	2	101684+	101686+	8
* 98	Outer Seal, Carbon	2	101679+	101680+	8

NOTES: * Recommended Spare Parts

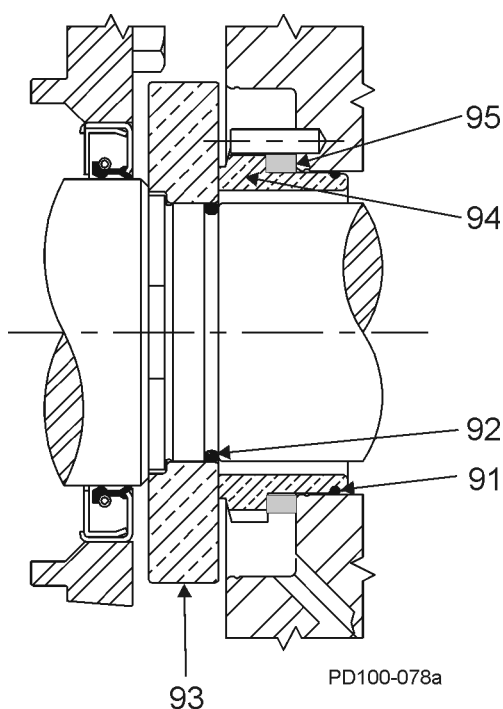
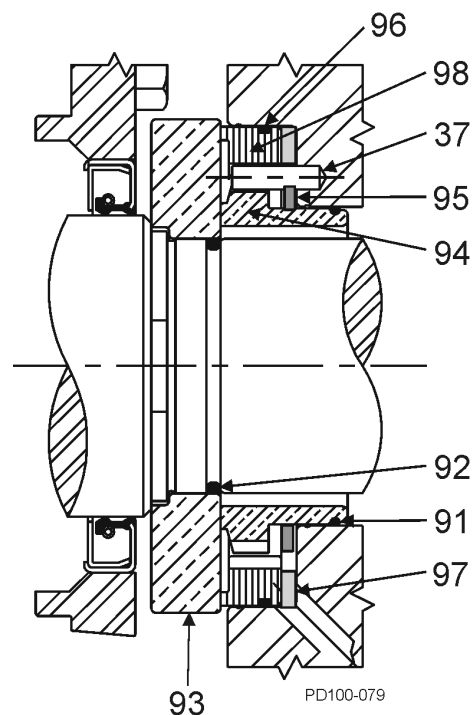
PL5060-CH75

8. Used with double Mechanical Seal.

25. Sold in packages of 25 only.

See page 47 for o-ring selections, descriptions and color codes.

PD Pump Seals Model 045, 060, 064, 130, 134, 180, 220, 224 Universal II

**Single Mechanical Seal****Double Mechanical Seal**

ITEM NO.	DESCRIPTION	QTY. (per pump)	PART NO. (by model)		NOTES
			045, 060, 064, 130, 134 UII	180, 220, 224 UII	
	MECHANICAL SEAL PARTS				
91	O-Ring, Inner Seal, Buna N	2	N70035	N70041	
	O-Ring, Inner Seal, EPDM	2	E70035	E70041	
	O-Ring, Inner Seal, FKM	2	V70035	V70041	
92	O-Ring, Shaft, Buna N	2	N70133	N70145	25
	O-Ring, Shaft, EPDM	2	E70133	E70145	25
	O-Ring, Shaft, FKM	2	V70133	V70145	
93	Seal Seat, Ceramic	2	101673+	101676+	
	Seal Seat, Silicon Carbide	2	101674+	101677+	
94	Seal Inner, Carbon (1 Piece)	2	101659+	101663+	
	Seal Inner, Ceramic	2	101660+	101664+	
	Seal Inner, Silicon Carbide	2	101661+	101665+	
	Seal Inner, Tungsten Carbide	2	101662+	101666+	
95	Wave Spring, Inner Seal	2	101687+	101689+	
96	O-Ring, Outer Seal, Buna N	2	N70043	N70046	8
	O-Ring, Outer Seal, EPDM	2	E70043	E70046	8
	O-Ring, Outer Seal, FKM	2	V70043	V70046	8
97	Wave Spring, Outer Seal	2	101688+	101690+	
98	Outer Seal, Carbon	2	101681+	101682+	8

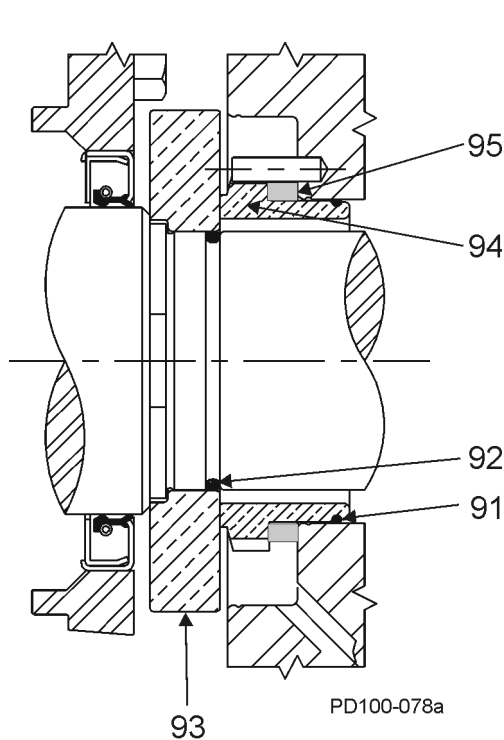
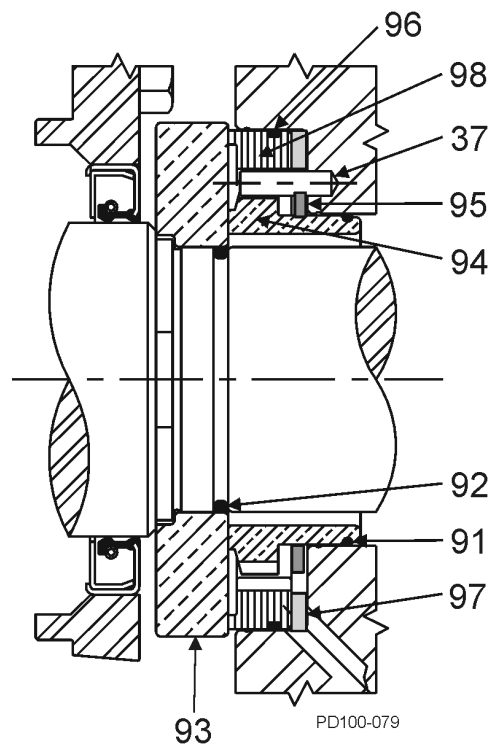
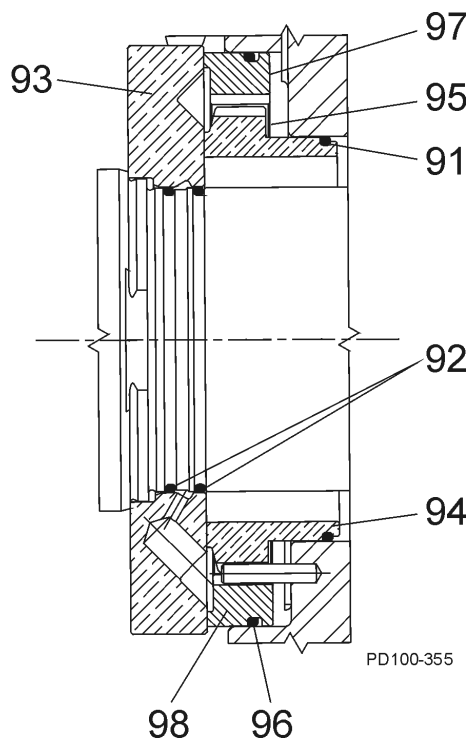
NOTES: * Recommended Spare Parts

PL5060-CH86

8. Used with double Mechanical Seal.

25. Sold in packages of 25 only.

See page 47 for o-ring selections, descriptions and color codes.

PD Pump Seals Model 210, 213, 320, 323, 370 Universal II**Single Mechanical Seal****Double Mechanical Seal - 210, 320, 370****Double Mechanical Seal - 213, 323**

See page 47 for o-ring selections,
descriptions and color codes.

ITEM NO.	DESCRIPTION	QTY. (per pump)	PART NO.	NOTES
O-RING AND MECHANICAL SEAL PARTS				
* 91	O-Ring, Inner Seal, Buna N	2	N70154	25
* 91	O-Ring, Inner Seal, EPDM	2	E70154	
* 91	O-Ring, Inner Seal, FKM	2	V70154	
* 92	O-Ring, Shaft, Buna N	2	N70149	16
* 92	O-Ring, Shaft, EPDM	2	E70149	16
* 92	O-Ring, Shaft, FKM	2	V70149	16
* 93	210-214-320-324-370-U2 Seal Seat, Ceramic	2	105416+	
* 93	210-214-320-324-370-U2 Seal Seat, Silicon Carbide	2	105417+	
* 93	213-323-U2 Seal Seat, Silicon	2	112192+	
* 94	Seal Inner, Carbon (1 Piece)	2	105412+	
* 94	Seal Inner, Ceramic	2	105413+	
* 94	Seal Inner, Silicon Carbide	2	105414+	
* 94	Seal Inner, Tungsten Carbide	2	105415+	
95	Wave Spring, Inner Seal	2	105419+	
* 96	O-Ring, Outer Seal, Buna N	2	N70160	8
* 96	O-Ring, Outer Seal, EPDM	2	E70160	8
* 96	O-Ring, Outer Seal, FKM	2	V70160	8
97	Wave Spring, Outer Seal	2	105420+	8
* 98	Outer Seal, Carbon	2	105418+	8

Notes: * Recommended Spare Parts

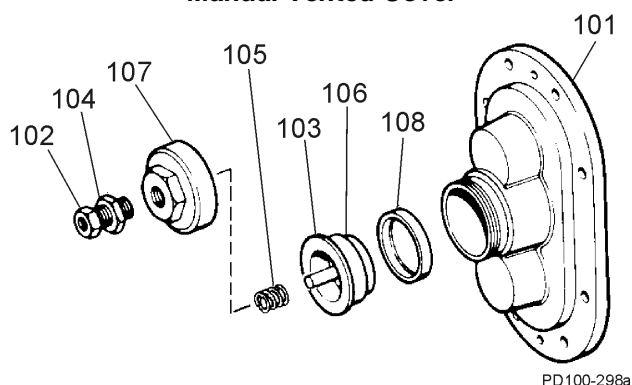
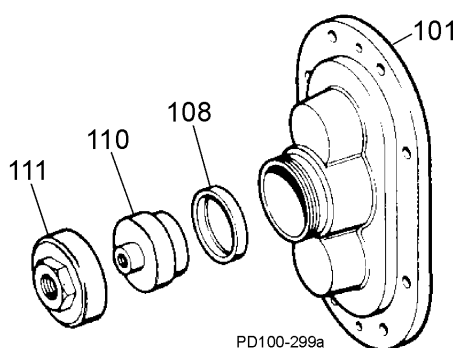
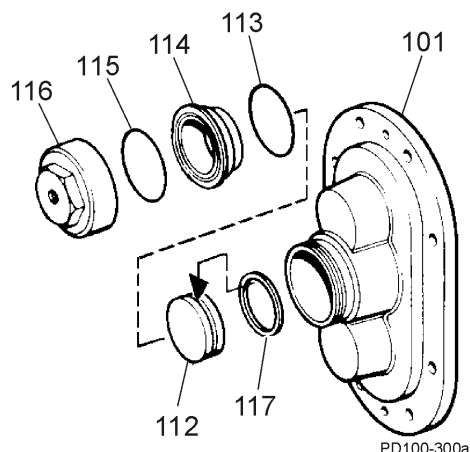
PL5060-CH97

8. Used with Double Mechanical Seal.

16. (4) needed per pump on 213-U2 and 323-U2.

25. Sold in packages of 25 only.

Universal II PD Pump Vented Covers

Manual Vented Cover**Pneumatic Vented Cover****Piston Vented Cover**

ITEM NO.	DESCRIPTION	QTY. PER PUMP	PART NO.				NOTES
			006-014-015-018-UII	030-034-040-UII	045-060-064-130-134-UII	180-220-224-UII	
	MANUAL VENTED COVER						
101	Vented Cover	1	103669	103670	103671	103672	
102	Adjusting Screw	1	AD0 072 000		113657	GD0 072 100	
103	Spring Plunger	1	AD0 073 000		113397	GD0 073 000	
104	Locknut	1	AD0 074 000		GD0 074 000		
105	Spring, Medium (less than 150 PSI)	1	AD0 076 000		113523	113400	
	Spring, High (more than 150 PSI)	1	ABB 076 100		113400	113524	
106	Diaphragm Bushing	1	AD0 077 000		CD0 077 000		
107	Cover Nut	1	AD0 075 000		113398	GD0 075 000	
108	Rubber Diaphragm, Buna N	1	AD0 078 000		CD0 078 000	GD0 078 000	
	PNEUMATIC VENTED COVER						
101	Vented Cover	1	103669	103670	103671	N/A	
108	Diaphragm, Buna N	1	AD0 078 000		CD0 078 000	N/A	
110	Diaphragm Bushing	1	AD0 077 P00		CD0 077 P00	N/A	
111	Cover Nut	1	AD0 075 P00		CD0 075 P00	N/A	
	PISTON VENTED COVER						
101	Vented Cover	1	103669	103670	103671	103672	
112	Piston	1	AD0 073 P10		CD0 073 P10	GD0 073 P10	
113	O-Ring, Bushing Seal, Buna N	1	N70223		N70239	N70261	
114	Diaphragm Bushing	1	AD0 077 P10		CD0 077 P10	GD0 077 P10	
115	O-Ring, Nut Seal, Buna N	1	N70224		N70240	N70261	
116	Cover Nut	1	AD0 075 P10		CD0 075 P10	GD0 075 P10	
117	Piston Seal, Quad Ring	1	AD0 133 000		CD0 133 000	GD0 133 000	9
	Piston Seal, O-Ring	1	N70218		N70236	N70258	9

NOTES:

PL5060-CH112

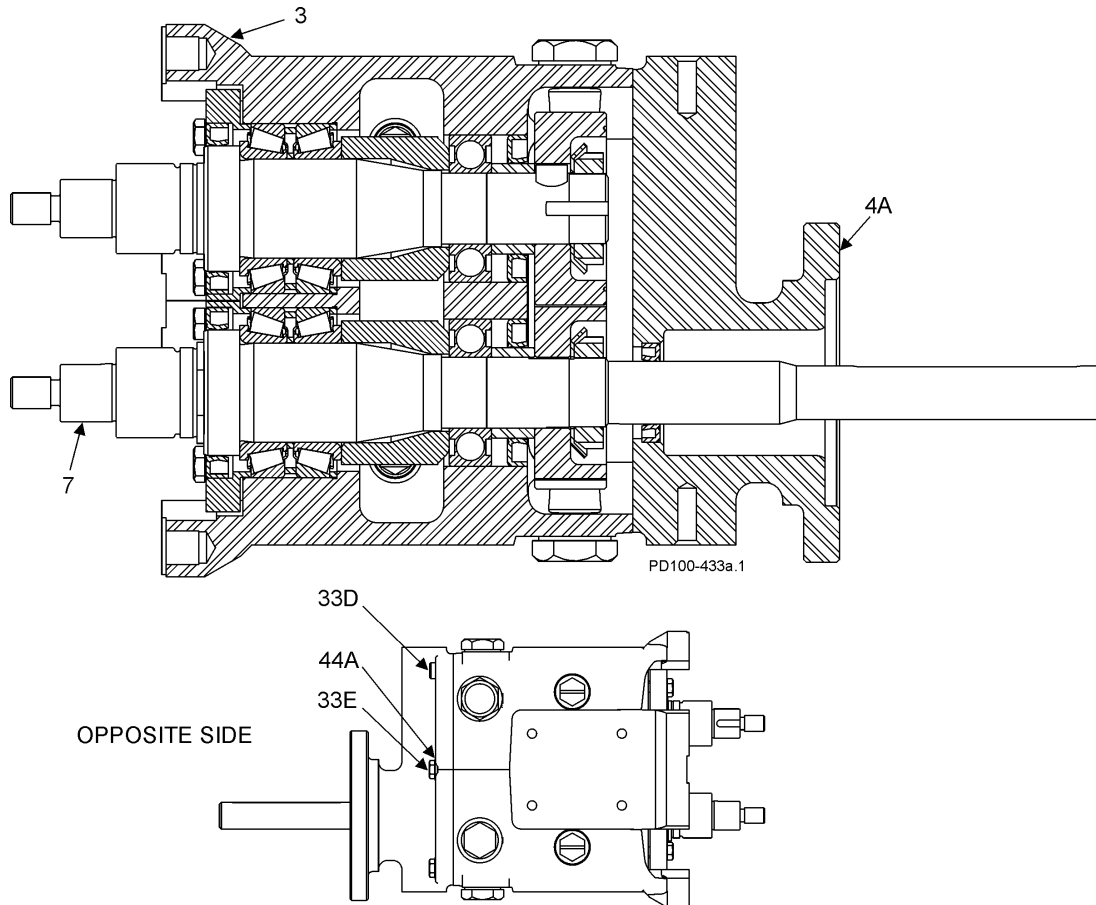
* Recommended Spare Parts

9. Quad Ring and O-Ring can be interchanged.

Bearing Retainer/Seal Part Number Reference

Ull Model Number	Description	Part # <i>before</i> 7/12/04 (OLD)	Part # <i>after</i> 7/12/04 (NEW)
006, 014, 015, 018, 024	Grease Seal, Bearing Retainer	101716	121679+
	Bearing Retainer, Front	101810	120332+
030, 034, 040	Grease Seal, Bearing Retainer	101717	121680+
	Bearing Retainer, Front	101811	120333+
045, 060, 064, 130, 134	Bearing Retainer, Front STD	060080000	123531+
	Bearing Retainer, Front SS	101812	121828+
180, 184, 220, 224	Grease Seal, Bearing Retainer	STD030002	121681+
	Bearing Retainer, Front STD	220080000	123532+
	Bearing Retainer, Front SS	101813	121829+
210, 213, 214, 320, 323, 324	Grease Seal, Bearing Retainer	STD030002	121681+
	Bearing Retainer, Front STD	0H1080000	123533+
	Bearing Retainer, Front SS	118365	123533+

PL5060-CH113

Tru-Fit™ Universal II PD Pump

Item No.	Description	Pump Size			
		006, 014, 015	018, 024	030, 034	040
3	Gear Case, CI	118986+		121687+	
4A	Gear Case Cover, Adapter	118982+		118678+	
7	Drive Shaft	119182+	118183+	119184+	119185+
33D	1/4-20 x 1" HHCS	30-93		N/A	
	5/16-18 x 1-1/8" HHCS	N/A		30-237	
33E	5/16" x 3/4" lg. SHSB	30-690		N/A	
	3/8" x 3/4" lg. SHSB	N/A		30-691	
44A	Flat Washer, 5/16"	43-246		N/A	N/A
	Flat Washer, 3/8"	N/A		43-30	

Item No.	Description	Pump Size							
		045	060, 064	130, 134	180, 184	220, 224	210, 214	320, 324	370
3	Gear Case, CI	118987+			118988+		119009+		
4A	Gear Case Cover, Adapter	Serial Number Required							
7	Drive Shaft	119186+	119187+	119188+	119189+	119190+	119191+	119192+	124841+
33D	3/8-16 x 1-1/2" HHCS	30-50					N/A		
	1/2-13 x 1-1/2" HHCS	N/A					30-103		
33E	1/2" x 1" Ig. SHSB	30-692					N/A		
	5/8" x 1" Ig. SHSB	N/A					30-693		
44A	Flat Washer, 1/2"	43-31							

PL5060-CH66

Pump Dimensions

Tru-Fit™ Universal II PD Pump Dimensions

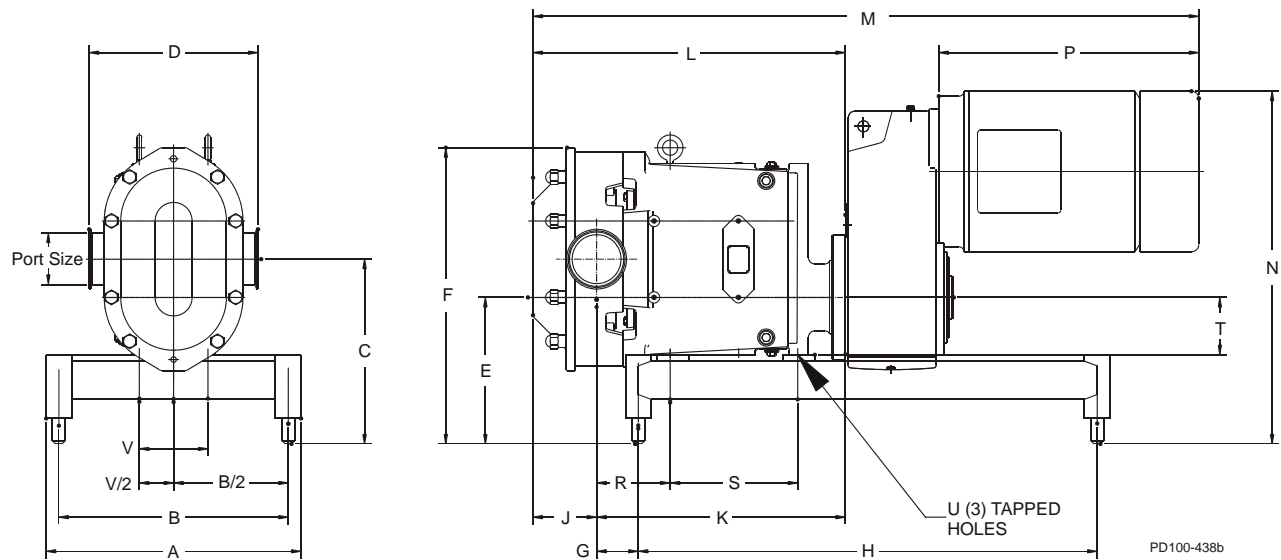


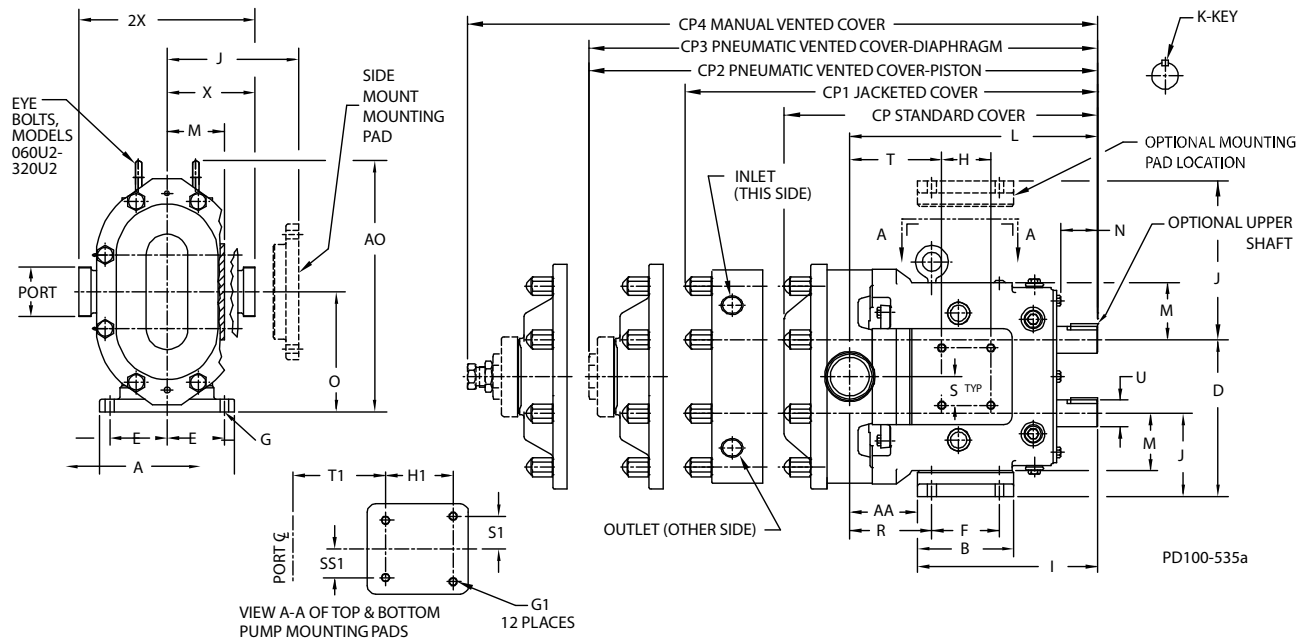
Table of Dimensions

UII Model		A	B	C	D ²	E	F	G	H	J	K	L	M ¹	N ¹	P ¹	R	S	T	Port Size	U	V
006	in.	12.0	10.0	9.2	6.97	7.9	13.3	2	18.0	2.1	10.1	12.2	27.3	15.6	10.9	2.79	5.4	2.1	1-1/2"	5/16-18 x .62	2.0
	mm	305	254	232	177	200	337	51	457	54	256	310	394	395	227	71	138	54	--	N/A	51
015	in.	12.0	10.0	9.2	6.97	7.9	13.3	2	18.0	2.1	10.1	12.2	27.3	15.6	10.92	2.79	5.4	2.1	1-1/2"	5/16-18 x .62	2.0
	mm	304	254	232	177	200	337	51	457	54	256	310	694	395	227	71	138	54	--	N/A	51
018	in.	12.0	10.0	9.2	7.10	7.9	13.3	2.3	18.0	2.5	10.3	12.9	27.3	15.6	10.9	3.02	5.4	2.1	1-1/2"	5/16-18 x .62	2.0
	mm	304	254	232	180	200	337	57	457	65	262	326	694	395	227	77	138	54	--	N/A	51
030	in.	14.0	12.0	10	8.51	8.4	15.1	2.6	20.0	2.9	12.5	15.3	33.6	18.7	13.7	3.84	5.8	2.6	1-1/2"	3/8-16 x .62	2.3
	mm	356	304	255	216	213	384	66	508	73	317	390	853	474	349	98	148	67	--	N/A	57
040	in.	14.0	12.0	10	8.62	8.4	15.1	2.97	20.0	2.9	12.8	15.7	33.9	18.7	13.7	4.22	5.8	2.6	2"	3/8-16 x .62	2.3
	mm	356	305	255	219	213	384	75	508	73	326	399	862	474	349	107	148	67	--	N/A	57
045	in.	18.0	16.0	12.0	10.74	9.75	20.0	2.73	28.0	4.0	17.11	21.11	43.72	22.02	17.16	4.73	8.1	3.5	2"	1/2-13 x .88	3.5
	mm	457	406	305	273	248	508	69	711	102	435	536	1110	559	436	120	207	89	--	N/A	89
060	in.	18.0	16.0	12.0	10.74	9.8	20.0	3	28.0	4.0	17.4	21.4	44.0	22	17.2	5.01	8.1	3.5	2-1/2"	1/2-13 x .88	3.5
	mm	457	406	305	273	248	508	76	711	102	442	543	1118	559	436	127	207	89	--	N/A	89
130	in.	18.0	16.0	12.0	10.74	9.8	20.0	3.6	28.0	4.4	18	22.4	45	22	17.2	5.65	8.1	3.5	3"	1/2-13 x .88	3.5
	mm	457	406	305	273	248	508	92	711	111	458	569	1143	559	436	144	207	89	--	N/A	89
180	in.	20.0	18.0	15	13.06	12	23.3	3.3	36.0	5	19.5	24.5	50	25.9	18.8	4.2	10.0	4.5	3"	1/2-13 x 1.0	5.4
	mm	508	457	368	332	292	591	83	914	127	496	623	1271	658	478	107	254	114	--	N/A	137
220	in.	20.0	18.0	15	13.25	12	23.3	3.5	36.0	5.5	19.8	25.3	50.8	25.9	18.8	4.73	10.0	4.5	4"	1/2-13 x 1.0	5.4
	mm	508	457	368	337	292	591	89	914	139	502	641	1289	658	478	120	254	114	--	N/A	137

PD100-439

¹ Dimensions affected by motor frame size² Dimensions affected by connection type

Universal II PD Pump Dimensions



Ull Model		A	AA	AO	B	CP	CP1	CP2	CP3	CP4	D	E	F	G	G1
6	inch	4.75	1.95	8.3	3.75	11.71	13.92	13.2	13.29	14.92	5.5	1.94	2.31	.41, slot	5/16-18x.62
	mm	121	50	211	95	297	354	335	338	379	140	49	59	10, slot	-
15	inch	4.75	1.95	8.3	3.75	11.71	13.92	13.2	13.29	14.92	5.5	1.94	2.31	.41, slot	5/16-18x.62
	mm	121	50	211	95	297	354	335	338	379	140	49	59	10 slot	-
18	inch	4.75	2.18	8.3	3.75	12.37	14.59	13.86	13.95	15.58	5.5	1.94	2.31	.41, slot	5/16-18x.62
	mm	121	55	211	95	314	371	352	354	396	140	49	59	10 slot	-
30	inch	6.25	2.78	10.29	4.25	14.49	16.49	15.89	15.98	17.58	6.86	2.31	2.56	.41, slot	3/8-16x.62
	mm	159	71	261	108	368	419	404	406	447	174	59	65	10 slot	-
40	inch	6.25	2.99	10.29	4.25	14.87	16.87	16.27	16.36	17.96	6.86	2.31	2.56	.41, slot	3/8-16x.62
	mm	159	76	261	108	378	428	413	416	456	174	59	65	10 slot	-
45	inch	8.25	3.86	15.31	5.87	18.59	20.7	20.68	20.97	22.28	9.56	3.50	4.12	.53, slot	1/2-13x.88
	mm	210	98	389	149	472	526	525	533	566	243	89	105	13, slot	-
60	inch	8.25	4.14	15.31	5.87	19.14	21.25	21.23	21.52	22.83	9.56	3.50	4.12	0.53	1/2-13x.88
	mm	210	105	389	149	486	540	539	547	580	243	89	105	13	-
130	inch	8.25	4.78	15.31	5.87	20.15	22.27	22.25	22.53	23.84	9.56	3.50	4.12	0.53	1/2-13x.88
	mm	210	121	389	149	512	566	565	572	606	243	89	105	13	-
180	inch	8.5	3.45	19.13	9	23.26	25.32	26.71	N/A	28.51	12.38	3.75	7.25	.53, slot	1/2-13x.88
	mm	216	88	486	229	591	643	678	-	724	314	95	184	13, slot	-
210	inch	12	3.45	22.38	11.63	27.08	28.58	-	-	-	13.88	5.25	8.00	0.66	1/2-13x.88
	mm	305	88	568	295	688	726	-	-	-	353	133	203	17	-
213	inch	12	3.45	22.38	11.6	27.08	-	-	-	-	13.88	5.25	8.00	0.66	1/2-13x.88
	mm	305	88	568	295	688	-	-	-	-	353	133	203	17	-
220	inch	8.5	3.69	19.13	9	24	26.06	27.45	-	29.25	12.38	3.75	7.25	.53, slot	1/2-13x.88
	mm	216	94	486	229	610	662	713	-	743	314	95	184	13, slot	-
320	inch	12	3.84	22.38	11.6	27.66	29.16	-	-	-	13.88	5.25	8.00	0.66	1/2-13x.88
	mm	305	97	568	295	703	741	-	-	-	353	133	203	17	-
370	inch	12	4.53	22.38	11.63	29.16	30.66	-	-	-	13.88	5.25	8.00	0.66	1/2-13x.88
	mm	305	115	568	295	741	779	-	-	-	353	133	203	17	-

PD100-534

Universal II PD Pump Dimensions

UII Model		H	H1	I	J	K +002 -000	L	M	N	O	Port Size	R	S	S1	SS1	T	T1	U +002 -000	X	2X
6	inch	2.50	2.50	7.66	2.93	.1875	9.61	2.12	2	4.21	1"	2.79	1.00	1.00	1.00	2.51	2.51	0.88	3.49	6.97
	mm	64	64	194	74	4.76	244	54	51	107	--	71	25	25	25	64	64	22.2	89	177
15	inch	2.50	2.50	7.66	2.93	.1875	9.61	2.12	2.00	4.21	1-1/2"	2.79	1.00	1.00	1.00	2.51	2.51	0.88	3.49	6.97
	mm	64	64	194	74	4.76	244	54	51	107	--	71	25	25	25	64	64	22.2	89	177
18	inch	2.50	2.50	7.66	2.93	.1875	9.84	2.12	2.00	4.21	1-1/2"	3.02	1.00	1.00	1.00	2.74	2.51	0.88	3.55	7.09
	mm	64	64	194	74	4.76	250	54	51	107	--	77	25	25	25	70	64	22.2	89	177
30	inch	1.81	2.75	8.83	3.56	0.25	11.61	2.62	2.32	5.21	1-1/2"	3.84	1.12	1.12	1.12	4.00	3.59	1.25	4.25	8.50
	mm	46	70	224	90	6.35	295	67	59	132	--	102	28	28	28	102	91	31.8	108	216
40	inch	1.81	2.75	8.83	3.56	0.25	11.99	2.62	2.32	5.21	2"	4.00	1.12	1.12	1.12	4.38	3.97	1.25	4.31	8.62
	mm	46	70	224	90	6.35	305	67	59	132	--	107	28	28	28	111	101	31.8	109	219
45	inch	3.00	4.13	10.99	5.06	0.38	14.86	3.50	2.25	7.31	2"	4.73	1.75	2.00	1.75	5.34	5.01	1.63	5.37	10.75
	mm	76	105	279	129	9.525	377	89	57	186	--	120	44	51	44	136	127	41.3	136	273
60	inch	3.00	4.13	10.99	5.06	0.38	15.14	3.50	2.25	7.31	2-1/2"	5.01	1.75	2.00	1.75	5.62	5.01	1.63	5.4	10.75
	mm	76	105	279	129	9.53	385	89	57	186	--	127	44	51	44	143	127	41.3	136	273
130	inch	3.00	4.13	10.99	5.06	0.38	15.77	3.50	2.25	7.31	3"	5.65	1.75	2.00	1.75	6.25	5.66	1.63	5.4	10.75
	mm	76	105	279	129	9.53	401	89	57	186	--	144	44	51	44	159	144	41.3	136	273
180	inch	5.38	5.38	14.80	6.38	0.5	18.25	4.50	2.75	9.38	3"	4.20	2.69	2.69	2.69	5.76	6.00	2.00	6.53	13.06
	mm	137	137	376	162	12.7	464	114	70	238	--	107	68	68	68	146	152	50.8	168	332
210	inch	5.38	5.38	17.80	6.88	0.63	21.24	5.06	4.06	10.38	4"	4.70	2.69	2.69	2.69	7.83	7.83	2.38	7.37	14.73
	mm	137	137	452	175	15.9	539	129	103	264	--	119	68	68	68	199	199	60.45	187	374
213	inch	5.38	5.38	17.80	6.88	0.625	21.24	5.06	4.06	10.38	4" 300# FLG	4.70	2.69	2.69	2.69	7.83	7.83	2.38	8.6	17.3
	mm	137	137	452	175	15.9	539	129	103	264	--	119	68	68	68	199	199	60.5	219	438
220	inch	5.38	5.38	14.80	6.38	0.50	18.49	4.50	2.75	9.38	4"	4.44	2.69	2.69	2.69	6.00	6.00	2.00	6.63	13.25
	mm	137	137	376	162	12.7	470	114	70	238	--	113	68	68	68	152	152	50.80	168	337
320	inch	5.38	5.38	17.80	6.88	0.63	21.63	5.06	4.03	10.38	6" 150# FLG	5.09	2.69	2.69	2.69	8.22	8.22	2.38	8.00	16.00
	mm	137	137	452	175	15.9	549	129	103	264	--	129	68	68	68	209	209	60.5	203	406
370	inch	5.38	5.38	17.80	6.88	0.63	22.32	5.06	4.06	10.38	6" 150# FLG	5.78	2.69	2.69	2.69	8.91	8.91	2.38	8.50	17.00
	mm	137	137	452	175	15.9	567	129	103	264	--	147	68	68	68	226	226	60.5	216	432

PD100-534b

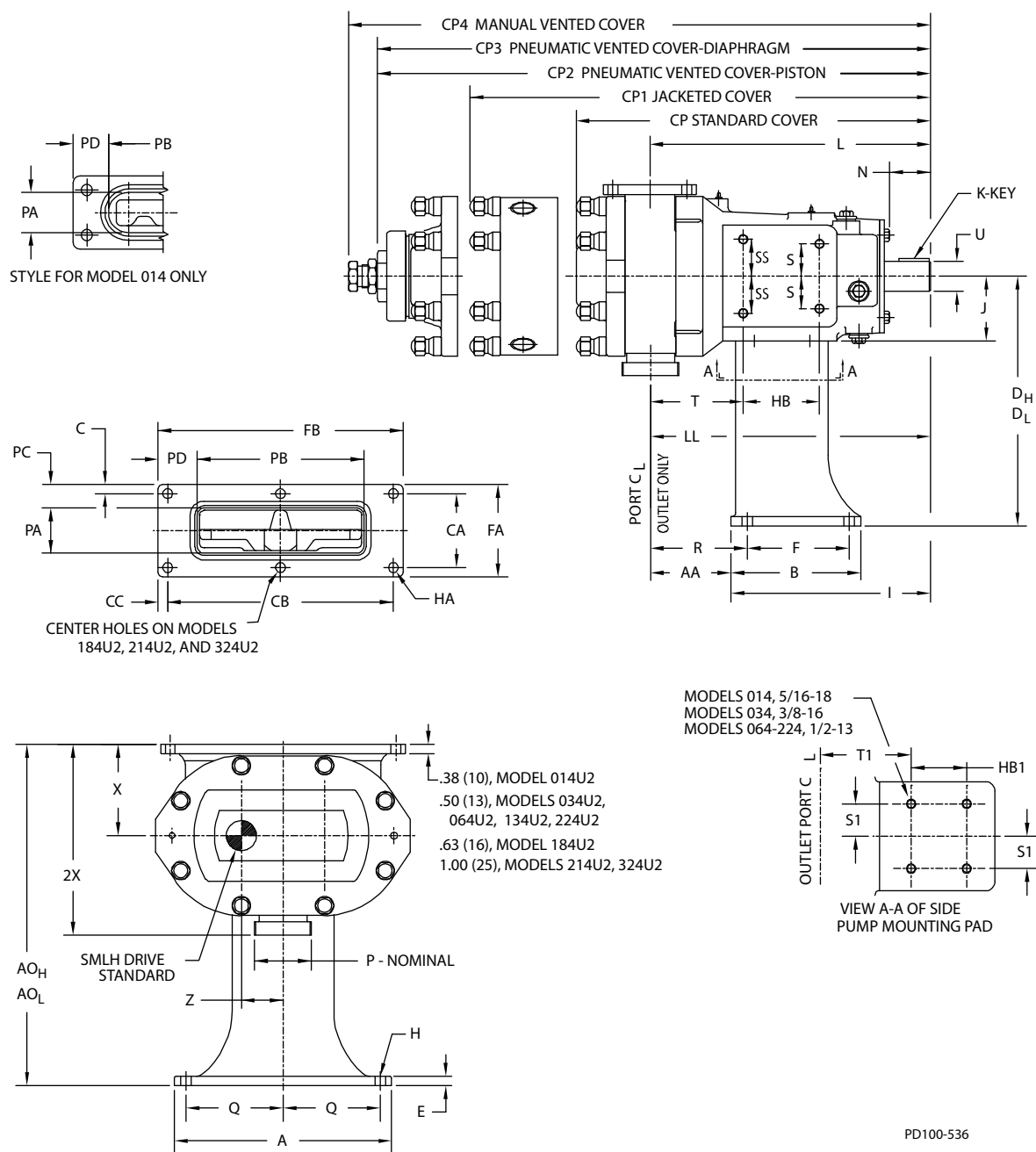
Note:

Dimensions 'X' and '2X' apply for bevel seat, 'S' Clamp, 'Q' Clamp, 15I and 14I fittings (except 213UII & 320UII).

CP= Standard Cover, CP1= Jacketed Cover, CP4= Manual Vented Cover.

Connection Sizes for Jacketed Covers are 3/4" NPT on Models 006 to 030UII; 1" NPT on Models 045 to 370UII.

Rectangular Flange Universal II PD Pump Dimensions



Rectangular Flange Universal II PD Pump Dimensions

UII RF Model		A	AA	AOL	B	C	CA	CB	CC	CP	CP1	CP4	DL	E	F	FA
14	inch	6.75	1.95	12.5	4.13	0.5	1.62	6.5	0.5	11.71	13.92	14.92	8.88	0.38	2.31	2.63
	mm	171	50	318	105	13	41	165	13	297	354	379	226	10	59	67
34	inch	8	2.88	12.75	4.25	0.62	1.88	10.75	0.62	14.49	16.49	17.58	8.88	0.38	3	3.12
	mm	203	73	324	108	16	48	273	16	368	419	447	226	10	76	79
64	inch	11.75	4.35	13.94	7	0.5	4	12.2	0.52	19.14	21.25	22.83	9	0.5	5.5	5
	mm	298	110	354	178	13	102	310	13	486	540	580	229	13	140	127
134	inch	11.75	5	13.94	7	0.78	3	14	0.63	20.15	22.27	23.84	9	0.5	5.5	4.55
	mm	298	127	354	178	20	76	356	16	512	566	606	229	13	140	116
184	inch	15	4.32	35.94	9.5	0.63	5.75	16.75	0.63	23.26	25.32	28.51	13.5	0.63	8.25	7
	mm	381	110	913	241	16	146	425	16	591	643	724	343	16	210	178
214	inch	18	4.38	35.94	12	0.75	7.5	16.5	0.75	27.08	28.58	-	27.13	0.75	9.5	9
	mm	457	111	913	305	21	203	419	19	688	726	-	689	19	241	229
224	inch	15	4.75	19.75	9.5	0.63	4.37	16.75	0.63	24	26.06	29.25	13.5	0.63	8.25	5.62
	mm	381	121	502	241	16	111	425	16	610	662	743	343	16	210	143
324	inch	18	4.79	35.94	12	0.81	8	16.5	0.75	27.66	29.16	-	27.13	0.75	9.5	9.63
	mm	457	122	913	305	21	203	419	19	703	741	-	689	19	241	245

UII RF Model		FB	H	HA	I	J	L	P	PA	PB	PC	PD	U	X	2X
14	inch	7.5	0.41	0.41	7.66	2.12	9.61	1-1/2"	1.44	4.94	0.59	1.28	0.875	3.63	7.11
	mm	191	10	10	195	54	244	--	37	125	15	33	22.23	92	181
34	inch	12	0.44	0.53	8.49	2.62	11.37	2"	1.81	6.84	0.66	2.58	1.25	3.88	8.12
	mm	305	11	13	216	67	289	--	46	174	17	66	31.75	99	206
64	inch	13.23	0.56	0.53	10.77	3.5	15.16	2-1/2"	2.44	9	1.28	2.11	1.625	4.94	10.31
	mm	336	14	13	274	89	385	--	62	229	33	54	41.28	125	262
134	inch	15.25	0.56	0.53	10.77	3.5	15.78	3"	3.19	9.38	0.68	2.94	1.625	4.94	10.31
	mm	387	14	13	274	89	401	--	81	238	17	75	41.28	125	262
184	inch	18	0.56	0.53	13.74	4.5	18.31	3"	3.28	11.25	1.86	3.38	2	7.25	13.78
	mm	457	14	13	349	114	465	--	83	286	47	86	50.8	184	350
214	inch	18	0.69	0.69	16.86	5.06	21.26	4"	3.45	12.7	2.78	2.65	2.375	8.81	16.17
	mm	457	18	18	428	129	540	--	88	323	71	67	60.33	224	411
224	inch	18	0.56	0.53	13.74	4.5	18.49	4"	4.06	11.25	0.78	3.38	2	6.25	12.87
	mm	457	14	13	349	114	470	--	103	286	20	86	50.8	159	327
324	inch	18	0.69	0.69	16.86	5.06	21.63		4.25	12.7	2.69	2.65	2.375	8.81	17.81
	mm	457	18	18	428	129	549	--	108	323	68	67	60.33	224	452

PD100-537

Note:

Dimension '2X' applies for bevel seat, 'S' Clamp, 'Q' Clamp, 15l and 14l fittings.

CP= Standard Cover, CP1= Jacketed Cover, CP4= Manual Vented Cover.

Connection Sizes for Jacketed Covers are 3/4" NPT on Models 014 to 034; 1" NPT on Models 064-324.

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, keys, 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 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.

PROBLEM	POSSIBLE CAUSE	SUGGESTED ACTION
No flow, pump not priming, cont'd	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.
Insufficient flow	Speed too low or too high to obtain desired flow.	Check flow-speed curve (available from WCB customer service) 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	Hot (HC) or extra clearance rotors on "cold" fluid and/or low viscosity fluid.	Replace with standard clearance rotors.
	Worn pump.	Increase pump speed (within limits). Replace rotors, have pump remanufactured.
	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.

PROBLEM	POSSIBLE CAUSE	SUGGESTED ACTION
Fluid vaporization, cont'd	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.
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 Required or reduce NIPR - Net Inlet Pressure Required. Contact WCB customer service 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.	This has caused severe damage to components - rebuild with new parts.
	Sheared keys.	This has caused severe damage to components - rebuild with new parts.
	Worn gear splines.	This has caused severe damage to components - rebuild with new parts.
	Drive noise caused by gear trains, chains, couplings, bearings.	Repair or replace drive parts. Check bearings for damage and replace as necessary.

PROBLEM	POSSIBLE CAUSE	SUGGESTED ACTION
Pump requires excessive power (overheats, stalls, high current draw, breakers trip)	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.
	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.

ATEX Supplement to Universal II Operational Manuals

1. ATEX declaration of conformity must be included with operational manual.
2. Sight glass in gear case is not approved; black plugs must be installed on all drain/level ports.
3. Only Waukesha Cherry-Burrell spare parts are allowed to be installed into the pump. Use of non-WCB parts will void ATEX approval.



Declaration of conformity

8.2 The manufacturer

Waukesha Cherry Burrell

611 Sugar Creek Road

Delavan, Wisconsin, USA 53115

*Here with declares, that the assembly***Universal II Pump**

Type-, Positive displacement pump:

max. working pressure:

max. allowable test pressure

allowable min./ max. temperature TS:

Model no.

6,15,18,30,34,40,45,60,64,130,134,180,184,210,214,220,224,320,324,420,520

200 to 500 PSIG

300 to 750 PSIG

-40 to 149 °C

*was found in compliance with following EC-Directives***Directive 98/37/EC Machinery**

Applied standards and technical specifications:

EN 292-1, EN 292-2, EN 809, EN 60204
EN1050**Directive 97/23/EC Equipment and protective systems intended for use in potentially explosive atmospheres**

II 2G c IIB T2

Applied standards and technical specifications:

EN 1127-1, EN 13463-5

Technical documentation showing conformity with the directive is deposited to:

TUV Rheinland of North America, Inc. 1279 Quarry Lane, Suite A, Pleasanton, California, USA 94566
with the tech. file reference numbers

Name: Paul Neellen

General Manager
November 20, 2008

Notes



Your local contact:



THE WILLIAMS - CARVER COMPANY, INC.

4001 MISSION RD P.O. BOX #3140

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E-mail: wcb@spx.com

For more information about our worldwide locations, approvals, certifications, and local representatives, please visit www.spxpe.com.

SPX Corporation reserves the right to incorporate our latest design and material changes without notice or obligation. Design features, materials of construction and dimensional data, as described in this bulletin, are provided for your information only and should not be relied upon unless confirmed in writing. Certified drawings are available upon request.



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Where Ideas Meet Industry

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