Read and understand this manual prior to installing, operating or servicing this equipment.
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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.
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

   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 46 for replacement part numbers.

Application Instructions

Apply to clean, dry surface. Remove backing from label, place in proper position, protect with cover sheet and burnish. (A soft rubber roller also may be used to press label into place.) Apply all labels to be readable from front of pump.
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

Numerical callouts in illustrations reflect item numbers in Parts Lists beginning on page 46. Alphabetical callouts represent pre-assembled parts not found in Parts Lists.

Pump Receiving

DANGER: Pump contains internal moving parts. DO NOT put hands or fingers into 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.

All ports are covered at the factory to keep out foreign objects during transit. If covers are missing or damaged, remove pump cover for a thorough inspection of fluid head. Be sure pumping head is clean and free of foreign material before rotating shaft.

Each Waukesha Cherry-Burrell pump is shipped completely assembled, lubricated and ready for use. Review “Operation” on page 26 before operating 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 with double tapered roller bearings.

• Designed for continuous operation.
• Rotor connections sealed from product zone.
• Rotors secured to shafts using rotor nuts supplied with belleville washers.
• Non-galling “88” alloy rotors standard.
• Single mechanical seals standard.
• Optional CIP capability.

Equipment Serial Number

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

Figure 1 - Gear Case Nameplate

Pump Shaft Location

There are two pump drive shaft locations.

Figure 2 - Upper and Lower Shaft Mount

Figure 3 - Sidemount Left Hand and Right Hand (as viewed from pump cover)
Factory Remanufacturing Program

Waukesha Cherry-Burrell will restore Universal II pumps to new pump status as many times as possible. Regardless of condition, pumps will be remanufactured twice guaranteed. To prevent downtime, the program’s Pump Exchange Policy will twice supply a newly remanufactured pump before the worn pump is returned. Remanufactured pumps are backed with a new pump warranty each time.

The program provides remanufacturing to standard oversized tolerances, allowing interchangeability of parts. All worn parts such as shafts, bearings, oil seals, gears, etc. will be replaced. The pump body and cover are re-machined and new rotors are installed.

Contact your Waukesha Cherry-Burrell Customer Service Representative at 1-800-252-5200 for more information.
Universal II PD Pump Dimensions
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**Notes:**
- CP = Standard Cover
- CP1 = Jacketed Cover
- CP4 = Manual Vented Cover
- Port Sizes for Jacketed Covers are 3/4-14 NPT on Models 006 to 040; 1" - 11-1/2 NPT on Models 045 to 320
Rectangular Flange Universal II PD Pump Dimensions
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CP= Standard Cover
CP1= Jacketed Cover
CP4= Manual Vented Cover
Port Sizes for Jacketed Covers are 3/4-14 NPT on Models 045 to 320; 1" - 11-1/2 NPT on Models 064 to 324

### Universal II RF Pump Size

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Tru-Fit™ Universal II PD Pump Dimensions - Ductile Iron Base
## Table of Dimensions

| Pump Size | A     | B     | B/2   | C     | D1    | E     | F     | G     | H     | J     | K     | L     | M2    | N2    | P2    | R     | S     | T     | U     | V     |
|-----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|           | inch  | mm    | inch  | mm    | inch  | mm    | inch  | mm    | inch  | mm    | inch  | mm    | inch  | mm    | inch  | mm    | inch  | mm    | inch  | mm    | inch  |
| 006       | 12.0  | 305   | 10.0  | 254   | 5.0   | 127   | 9.15  | 177   | 6.97  | 200   | 7.87  | 337   | 13.25 | 51    | 205   | 8.97 | 310   | 2.01 | 12.19 | 15.56 | 10.92 | 2.79  | 5.44  | 2.12  | 5/16-18 X.82 |
|           | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       |       |          |
| 015       | 12.0  | 304   | 10.0  | 254   | 5.0   | 127   | 9.15  | 177   | 6.97  | 200   | 7.87  | 337   | 13.25 | 7.10  | 205   | 8.97 | 310   | 2.01 | 12.19 | 15.56 | 10.92 | 2.79  | 5.44  | 2.12  | 5/16-18 X.82 |
|           | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       |       |          |
| 018       | 12.0  | 304   | 10.0  | 254   | 5.0   | 127   | 9.15  | 177   | 6.97  | 200   | 7.87  | 337   | 13.25 | 7.10  | 205   | 8.97 | 310   | 2.01 | 12.19 | 15.56 | 10.92 | 2.79  | 5.44  | 2.12  | 5/16-18 X.82 |
|           | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       |       |          |
| 030       | 14.0  | 356   | 12.0  | 304   | 6.0   | 152   | 10.02 | 255   | 8.51  | 216   | 8.37  | 213   | 15.11 | 384   | 66    | 73    | 317   | 18.0 | 2.87  | 12.47 | 15.34 | 33.57 | 18.65 | 13.74 | 3.84  | 5.81  | 2.62  | 3/8-16 X.62 |
|           | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       |       |          |
| 040       | 14.0  | 356   | 12.0  | 305   | 6.0   | 152   | 10.02 | 255   | 8.62  | 219   | 8.37  | 213   | 15.11 | 384   | 75    | 508   | 326   | 73   | 399   | 18.65 | 15.71 | 33.94 | 18.65 | 13.74 | 4.22  | 5.81  | 2.62  | 3/8-16 X.62 |
|           | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       |       |          |
| 045       | 18.0  | 457   | 16.0  | 406   | 8.0   | 203   | 12.0  | 273   | 10.74 | 248   | 9.75  | 234   | 20.0  | 7.23  | 28.0  | 4.0   | 17.11 | 21.11 | 43.72 | 22.02 | 17.16 | 4.73  | 8.13  | 3.5   | 1/2-13 X.88 |
|           | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       |       |          |
| 060       | 18.0  | 457   | 16.0  | 406   | 8.0   | 203   | 12.0  | 273   | 10.74 | 248   | 9.75  | 234   | 20.0  | 7.23  | 28.0  | 4.0   | 17.11 | 21.11 | 44.0  | 22.02 | 17.16 | 5.01  | 8.13  | 3.5   | 1/2-13 X.88 |
|           | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       |       |          |
| 130       | 18.0  | 457   | 16.0  | 406   | 8.0   | 203   | 12.0  | 10.74 | 9.75  | 248   | 9.75  | 234   | 20.0  | 7.23  | 28.0  | 4.0   | 17.11 | 21.11 | 45.32 | 22.02 | 17.16 | 5.65  | 8.13  | 3.5   | 1/2-13 X.88 |
|           | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       |       |          |
| 180       | 20.0  | 508   | 18.0  | 457   | 9.0   | 229   | 14.5  | 368   | 13.06 | 322   | 11.5  | 235   | 23.25 | 3.27  | 36.0  | 4.99  | 19.52 | 24.51 | 50.02 | 25.91 | 18.82 | 4.2   | 10.0  | 4.5   | 1/2-13 X.10 |
|           | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       | mm    |       |       |          |
| 220       | 20.0  | 508   | 18.0  | 457   | 9.0   | 229   | 14.5  | 368   | 13.06 | 322   | 11.5  | 235   | 23.25 | 3.51  | 36.0  | 5.49  | 19.76 | 25.25 | 50.76 | 25.91 | 18.82 | 4.73  | 10.0  | 4.5   | 1/2-13 X.10 |

1. Dimensions affected by motor frame size
2. Dimensions affected by connection type

PD-00-439
Tru-Fit™ Universal II PD Pump Dimensions - Stainless Steel Base
### Table of Dimensions

| Tru-Fit Universal II Pump Size | A   | B   | B/2 | C   | D1  | E   | F   | G   | H   | J   | K   | L   | M2  | N2  | P2  | R   | S   | T   | U   | V   |
|-------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 006 inch                     | 12.0| 10.0| 5.0 | 9.15| 7.87| 13.25| 2.01| 18.0| 2.11| 10.08| 12.19| 27.31| 15.56| 10.92| 2.79| 5.44| 2.13| 5/16-18 X 62 | 2.0 |
| mm                           | 305 | 254 | 127 | 232 | 177 | 200  | 337 | 51  | 457 | 54  | 256  | 310  | 394  | 395 | 227 | 71  | 138 | 54  | N/A | 51  |
| 015 inch                     | 12.0| 10.0| 5.0 | 9.15| 7.87| 13.25| 2.01| 18.0| 2.11| 10.08| 12.19| 27.31| 15.56| 10.92| 2.79| 5.44| 2.13| 5/16-18 X 62 | 2.0 |
| mm                           | 304 | 254 | 127 | 232 | 177 | 200  | 337 | 51  | 457 | 54  | 256  | 310  | 394  | 395 | 227 | 71  | 138 | 54  | N/A | 51  |
| 018 inch                     | 12.0| 10.0| 5.0 | 9.15| 7.10| 7.87| 13.25| 2.25| 18.0| 2.54| 10.31| 12.85| 27.31| 15.56| 10.92| 3.02| 5.44| 2.13| 5/16-18 X 62 | 2.0 |
| mm                           | 304 | 254 | 127 | 232 | 180 | 200  | 337 | 57  | 457 | 65  | 262  | 326  | 694  | 395 | 227 | 77  | 138 | 54  | N/A | 51  |
| 030 inch                     | 14.0| 12.0| 6.0 | 10.02| 8.51| 8.37| 15.11| 2.59| 20.0| 2.87| 12.47| 15.34| 33.57| 18.65| 13.74| 3.84| 5.81| 2.62| 3/8-16 X 62 | 2.25 |
| mm                           | 356 | 304 | 152 | 255 | 216 | 213  | 384 | 66  | 508 | 73  | 317  | 390  | 853  | 474 | 349 | 98  | 148 | 67  | N/A | 57  |
| 040 inch                     | 14.0| 12.0| 6.0 | 10.02| 8.62| 8.37| 15.11| 2.97| 20.0| 2.87| 12.84| 15.71| 33.94| 18.65| 13.74| 4.22| 5.81| 2.62| 3/8-16 X 62 | 2.25 |
| mm                           | 356 | 305 | 152 | 255 | 219 | 213  | 384 | 75  | 508 | 73  | 326  | 399  | 862  | 474 | 349 | 107 | 148 | 67  | N/A | 57  |
| 045 inch                     | 18.0| 16.0| 8.0 | 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| 8.13| 3.5  | 1/2-13 X 88 | 3.5 |
| mm                           | 457 | 406 | 203 | 305 | 273 | 248  | 508 | 69  | 711 | 102 | 435   | 536  | 1110  | 559 | 436 | 120 | 207 | 89  | N/A | 89  |
| 060 inch                     | 18.0| 16.0| 8.0 | 12.0 | 10.74| 9.75| 20.0 | 3.01| 28.0| 4.0  | 17.39| 21.39| 44.0  | 22.02| 17.16| 5.01| 8.13| 3.5  | 1/2-13 X 88 | 3.5 |
| mm                           | 457 | 406 | 203 | 305 | 273 | 248  | 508 | 76  | 711 | 102 | 442   | 543  | 1118  | 559 | 436 | 127 | 207 | 89  | N/A | 89  |
| 130 inch                     | 18.0| 16.0| 8.0 | 12.0 | 10.74| 9.75| 20.0 | 3.64| 28.0| 4.38 | 18.02| 22.4  | 45.01 | 22.02| 17.16| 5.65| 8.13| 3.5  | 1/2-13 X 88 | 3.5 |
| mm                           | 457 | 406 | 203 | 305 | 273 | 248  | 508 | 92  | 711 | 111 | 458   | 569  | 1143  | 559 | 436 | 144 | 207 | 89  | N/A | 89  |
| 180 inch                     | 20.0| 18.0| 9.0 | 14.5 | 13.06| 11.5| 23.25| 3.27| 36.0| 4.99 | 19.52| 24.51| 50.02 | 25.91| 18.82| 4.2  | 10.0 | 4.5 | 1/2-13 X 1.0 | 5.38 |
| mm                           | 508 | 457 | 229 | 368 | 332 | 292  | 591 | 83  | 914 | 127 | 496   | 623  | 1271  | 658 | 478 | 107 | 254 | 114 | N/A | 137 |
| 220 inch                     | 20.0| 18.0| 9.0 | 14.5 | 13.25| 11.5| 23.25| 3.51| 36.0| 5.49 | 19.76| 25.25| 50.76 | 25.91| 18.82| 4.73| 10.0 | 4.5 | 1/2-13 X 1.0 | 5.38 |
| mm                           | 508 | 457 | 229 | 368 | 337 | 292  | 591 | 89  | 914 | 139 | 502   | 641  | 1289  | 658 | 478 | 120 | 254 | 114 | N/A | 137 |

1 Dimensions affected by motor frame size
2 Dimensions affected by connection type
Installation

Installation of pump and piping system should be 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 insure 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. 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.

Typical installation configuration is mounting pump and drive unit on common base plate. Unit can be installed in any of the following ways: (shaded area indicates guard location)

- **Figure 4 - Portable Base**
- **Figure 5 - Adjustable Leg Base**
- **Figure 6 - Leveling and/or Vibration Isolation Pads**
- **Figure 7 - Permanent Installation on Foundation**

**NOTE:** When installing unit as shown in Figure 7, unit must be leveled before installation on 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**

All piping to pump should be supported independently with hangers or pedestals minimizing forces exerted on pump. Such forces can cause misalignment of pump parts and lead to excessive wear of rotors, bearings and shafts.

Figure 8 shows typical supporting methods used to independently support each pipe reducing weight effect of piping and fluid on pump.
Expansion Joints
Thermal expansion of piping can cause tremendous forces. Use thermal expansion joints to minimize forces on pump. Flexible joints can be used to limit transmission of mechanical vibration. Ensure free ends of any flexible connections in system are anchored.

Install Check Valves
Inlet Side on Lift Applications
Use check valves to keep inlet line full, particularly with low viscosity fluids (Figure 12).

Discharge Side
For systems with liquid under a vacuum, a check valve on discharge side of pump is recommended. Check valve prevents backflow (air or fluid) to aid in initial start-up by minimizing required differential pressure supplied by pump to start flow (Figure 13).

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

Install relief valves to protect pump and piping system against excessive pressure. An external relief valve designed to bypass fluid from pump outlet to inlet side of system is recommended (Figure 15, 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 pump with closed discharge will cause heating of fluid circulating through the relieve valve. When such operation is necessary, external relief valve should discharge externally through piping connected to the fluid source or into inlet piping near the source.

Inlet Side Strainers and Traps

Inlet side strainers and traps (Figure 16, items A and B) can be used to prevent foreign matter from damaging pump. Selection must be carefully made to prevent restriction of inlet causing cavitation. If inlet strainers are used, they must be serviced regularly to prevent clogging and flow stoppage.

Install Pressure Gauges

Pressure and vacuum gauges provide valuable information about pump operation (Figure 17). Wherever possible, install 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

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

WARNING: Operating pump without flush will damage 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 bottom and top of body.

1. Connect flush inlet to lower connection, and outlet to upper connection so flush area is completely flooded.

2. Connect flush outlet for unrestricted flow to drain.

NOTE: If steam is used as flush media, connect inlet at upper connection, and outlet at lower connection to ensure condensation removal.

3. Use cool, filtered flush media to obtain maximum service life of seal components. If pumped product is sticky or solidifies at room temperature, use warm or hot media.

4. Install a pressure reducing valve and flow control valve (needle valve) on flush supply line. Set supply pressure at a maximum of 30 psi (2 bar) and adjust flow rate to approximately 1/4 gpm (more for high temperature applications).
5. A solenoid valve also should be installed in flush supply and wired in series with motor starter to provide automatic start/stop of flush media flow before motor turns on and after motor turns off.

**NOTE:** When pumped product contains abrasive solids or hardens on seal faces, an alternate high pressure barrier flush arrangement may be used. A very small amount of flush liquid enters pumped liquid, therefore flush media must be compatible with 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) - allows complete draining of side mounted pump, and provides CIP solution access to entire cover o-ring groove.

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

2. Holes in Rotor Hubs - provides additional CIP solution access to 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 velocity rate of CIP solutions is adequate to clean 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 a differential pressure is created across the pump. Differential pressure will push CIP solutions through close clearance areas of pump resulting in better cleaning action. Inlet or outlet side may be high pressure side. 30 psi (2 bar) differential pressure is adequate for most applications.

- Pump must be operated during CIP to increase turbulence and cleaning action within pump. If complete draining is required, pump must be in side mount position.

---

**Check Coupling Alignment**

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

- Using flexible coupling connecting drive to pump is recommended. Several different types are available, including couplings with slip or overload provision. Waukesha Cherry-Burrell provides Lovejoy (Figure 19) or T.B. Woods® (Figure 20) couplings unless otherwise specified when ordering. Flexible coupling can be used to compensate for end play and small differences in alignment.

---

![Figure 18 Flush Piping Setup](image1)

![Figure 19 - Lovejoy Coupling](image2)

![Figure 20 - T.B. Woods® Coupling](image3)
• Align pump and drive shaft as closely as possible.

**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.

*Figure 21 - Alignment Sticker*

**Check Angular Alignment**

1. Using feeler gauges or taper gauges (Figure 22, items A and B), check alignment at four points every 90 degrees around coupling; **adjust to equal dimension at all points.**

2. Set space between coupling halves to manufacturer’s recommended distance.

3. Install shims to bring system into alignment.

*Figure 22 - Check Angular Alignment*

**Check Parallel Alignment**

1. Check both horizontal and vertical alignment of pump and drive using straight edge.

2. Using feeler gauge at location "A" in Figure 23, determine direction and amount of movement needed (Figure 23, item B).

3. If necessary, shim at location "C" and/or move drive as needed.

*Figure 23 - Check Parallel Alignment*

**Check Belt and Chain Drive Alignment**

Use a straight edge to visually check belt or chain alignment. Keep shaft distance to a minimum (Figure 24, item A).

*Figure 24 - Aligning Belt and Chain Drives*

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

Check rotation direction of drive to determine rotation direction of pump (Figure 25). After correct drive rotation is verified, connect coupling and assemble pump and coupling guards.

**NOTE:** Pump covers in the following figures have been removed to view rotor rotation. Pump must never be operated with covers removed.

*Figure 25 - Upper Shaft Drive Flow, Lower Shaft Drive Flow and Vertical Porting Flow and Pump Rotation (Liquid End Shown)*
**DANGER:** Pump contains internal moving parts. DO NOT put hands or fingers into 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.

**CAUTION:** These pumps are positive displacement, low slip design and will be severely damaged if operated with closed valves in discharge or inlet lines. 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

1. Ensure pump is correctly installed as described in “Installation” on page 20. Review “Install Relief Valves” on page 22 and install relief valves as needed.

2. Check coupling alignment. See “Check Coupling Alignment” on page 23.

3. Ensure pump and piping are clean and free of foreign material such as welding slag, gaskets, etc.

   **CAUTION:** Do not use this pump to flush newly installed system. Severe damage may occur to pump and system if pump is used to flush system. **Remove rotors during system flushing.**

4. Ensure all piping connections are tight and leak-free. Where possible, check system with non-hazardous fluid.

5. Ensure pump and drive are lubricated. See “Lubrication” on page 27.

6. Ensure all guards are in place and secure.

---

### Startup Procedure

1. Start pump drive. Where possible start at slow speed or jog.

2. Ensure liquid is reaching pump within 60 seconds. If pumping does not begin and stabilize, check “Troubleshooting” on page 99.

---

### Shutdown Procedure

1. Shut off power to pump drive.

2. Shut off supply and discharge lines.

### Emergency Shutdown Procedure

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

**DANGER:** Pump contains internal moving parts. DO NOT put hands or fingers into 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.

Before detaching port connections to pump:
- Close suction and discharge valves.
- Drain pump and clean or rinse, if necessary.
- Disconnect or shut off electrical supply and lock out all power.

**Lubrication**

**Drive Lubrication**
Refer to manufacturer’s manual shipped with drive for proper drive lubrication and frequency.

<table>
<thead>
<tr>
<th>UNIVERSAL II MODEL</th>
<th>OIL CAPACITY (GEARS)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Top or Bottom</td>
</tr>
<tr>
<td>006, 015, 018</td>
<td>1.3 oz (40 ml)</td>
</tr>
<tr>
<td>030, 040</td>
<td>2.0 oz (60 ml)</td>
</tr>
<tr>
<td>045, 060, 130, 134</td>
<td>6.0 oz (170 ml)</td>
</tr>
<tr>
<td>180, 220, 224</td>
<td>11 oz (320 ml)</td>
</tr>
<tr>
<td>320, 210, 213</td>
<td>17 oz (500 ml)</td>
</tr>
</tbody>
</table>

**Gear Oil Specification**
ISO Grade 320, SAE 140 or AGMA Number 6EP. Gear oil can be ordered through your local representative with WCB part number 118402, sold in one-gallon (U.S.) containers.

**Bearings**
Bearings are factory lubricated with grease at quantity shown. **Grease bearings every 250 hours.**

Excess grease will accumulate in gear case and must be removed through cleanout hole covered with plastic plug.

**Bearing Lubricant Grease**
NLGI Grade No. 2, EP, Lithium-based lubricant can be ordered through your local representative with WCB part number 118401, sold in 14 ounce, 2-inch diameter tubes.
Maintenance Inspections

**DANGER:** Pump contains internal moving parts. DO NOT put hands or fingers into 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.

Detecting wear in the early stages can reduce repair costs and down time. A simple “look-feel” inspection of 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 30.

**Inspection of Rotor Tips**
With cover removed, check for metal-to-metal contact between rotor wings. When contact is detected, pump should be repaired or replaced.

Visually inspect rotors for rotor tip to rotor tip contact and rotor tip to rotor hub contact. Manually rotate pump drive shaft and ensure rotor tip clearance is equal on both sides as indicated in Figure 27.

**Inspection of Rotor Hub End**
Visually inspect rotor hub end (Figure 28, item B) for excessive wear; replace as necessary. Each time rotors are removed, o-rings on hub should be replaced.

**Inspection of Shaft Shoulder**
Visually inspect shaft shoulder (Figure 28, item C) for excessive wear; replace as necessary. If shaft shoulder has a sharp edge, remove edge with file to prevent cutting shaft o-ring on installation.

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

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

With fluid head and seals removed, check bearing condition by applying (by hand) an up or down force of approximately 30 lbs (14 kg). If movement is felt, bearing may be failing. Also check shaft movement forward or backward. When bearing is determined to be failing, replace bearing and review lubrication schedule.

**Figure 27 - Rotor to Rotor Tip Clearance**

**Figure 28 - Rotor and Shaft Inspection**

**Figure 29 - Backlash Check**

**Figure 30 - Bearing Deflection Check**
### Maintenance Inspection Chart

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>POSSIBLE CAUSES</th>
<th>POSSIBLE SOLUTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotor tip to rotor tip contact or uneven rotor tip to rotor tip clearance.</td>
<td>Hard object jammed into rotors and twisted shafts.</td>
<td>Replace shafts. Install strainers if necessary. Check and replace gears if necessary.</td>
</tr>
<tr>
<td>Rotor tip to rotor hub contact. Worn rotor or shaft keyway(s). Worn or damaged rotor key(s).</td>
<td>Loose rotor nut(s). Belleville washer(s) on backwards. Backface clearances not even. Bearings need replacing.</td>
<td>Torque rotor nut(s) properly. Install belleville washers correctly. Verify backface clearances are even. Check and replace bearings.</td>
</tr>
<tr>
<td>Worn rotor hub end or shaft shoulder.</td>
<td>Loose rotor nut(s). Belleville washer(s) on backwards.</td>
<td>Replace rotors, shafts and keys. Torque rotor nut(s). See “Torque Values” on page 42. Install belleville washer(s) correctly.</td>
</tr>
<tr>
<td>Sharp edged shaft shoulder.</td>
<td>Loose rotor nut(s). Belleville washer(s) on backwards. Rotors slammed against shoulder when installed.</td>
<td>Remove sharp edge with file to prevent cutting shaft o-ring. Verify backface clearances are even.</td>
</tr>
<tr>
<td>Worn or broken gear teeth.</td>
<td>Lack of lubrication. Excessive hydraulic loads. Loose gear locknuts.</td>
<td>Check lubrication level and frequency. Reduce hydraulic loads. Torque locknuts to specified torque values. See “Torque Values” on page 42. Check and replace gears if necessary.</td>
</tr>
<tr>
<td>Loose gears.</td>
<td>Gear locknuts not torqued properly. Locking assembly not torqued properly. Worn gear key.</td>
<td>Torque gear nut to specified torque value. See “Torque Values” on page 42. Check and replace gears if necessary.</td>
</tr>
<tr>
<td>Loose bearings, axially or radially.</td>
<td>Lack of lubrication. Excessive hydraulic loads. Product or water contamination.</td>
<td>Check lubrication level and frequency. Reduce hydraulic loads. Ensure no excess grease build-up. Replace bearings if necessary.</td>
</tr>
<tr>
<td>Damaged front grease seals.</td>
<td>Seal may be old and worn. No grease on lips to lubricate. Shaft worn under seals.</td>
<td>Replace seals. Properly lubricate with grease when installing. Inspect shaft surface under seals.</td>
</tr>
<tr>
<td>Damaged rear oil seals.</td>
<td>Seal may be old and worn. No grease on lips to lubricate. Shaft worn under seals. Not centered on shaft when installed.</td>
<td>Replace seals. Properly lubricate with grease when installing. Inspect shaft surface under seals.</td>
</tr>
</tbody>
</table>
Annual Maintenance

**DANGER:** Pump contains internal moving parts. **DO NOT** put hands or fingers into 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.

Procedures and corrective measures outlined in "Maintenance Inspections" on page 28 should be performed at least annually, in addition to the following preventive maintenance:

- Check bearings with dial indicator for shaft radial play. If deflection is equal to or greater than rotor-to-body diametrical clearance ("Checking for Proper Clearance" on page 39), replace bearings.

- Remove gear cover and inspect gears for wear, backlash and looseness. Loosen and torque gear retaining nuts to proper torque.

- Thoroughly inspect rotors for worn keyways, hub wear and stress cracks (Figure 31, item A). Use dye check method to detect any fatigue-type cracks at rotor stress points.

- Review performance record on pump, and check radial and backface clearances to determine wear and effect on performance. Adjustment to operating speed can compensate for wear in some applications.

**CAUTION:** When bearings or shafts are replaced in the field, care must be taken to correctly position shaft by shimming to maintain sufficient running clearances between rotor wing faces and pump body faces (backface and cover face). It is important to hold the same backface dimension for both rotors to avoid crossover interference.

Cleaning

Pump cleaning schedule should be determined on site for materials being processed and plant maintenance schedule. For CIP models, see "CIP (Clean-In-Place) Features" on page 23.

To disassemble fluid head, see “Fluid Head Disassembly” on page 31. Remove and clean cover o-ring, pump seals and rotor nut assembly. Inspect and replace as necessary.

**NOTE:** Always replace 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.

In applications where material can harden in pump during shutdown, a CIP cleaning, flush or disassembly of fluid head and manual cleaning is strongly recommended.
Fluid Head Disassembly

**DANGER:** Pump contains internal moving parts. DO NOT put hands or fingers into 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 pump prior to disconnecting piping.

1. **Remove Cover**
   1. Remove cover nuts (Figure 32, item 11) from cover (Figure 32, item 1).
   2. Using a soft hammer, tap cover (Figure 32, item 2) off body studs and dowel pins.
   3. Place cover on a protected surface with finished surfaces up.
   4. Remove and inspect cover o-ring (Figure 32, item 36).

   ![Figure 32 - Exploded View of Fluid Head](image)

<table>
<thead>
<tr>
<th>Item</th>
<th>Part Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Body</td>
</tr>
<tr>
<td>2.</td>
<td>Cover</td>
</tr>
<tr>
<td>9.</td>
<td>Rotor</td>
</tr>
<tr>
<td>11.</td>
<td>Cover Nut</td>
</tr>
<tr>
<td>26.</td>
<td>Rotor Nut</td>
</tr>
<tr>
<td>26A.</td>
<td>Rotor Nut O-ring*</td>
</tr>
<tr>
<td>26B.</td>
<td>Belleville Washer</td>
</tr>
<tr>
<td>26C.</td>
<td>Retainer O-ring</td>
</tr>
<tr>
<td>26D.</td>
<td>Rotor Hub O-ring*</td>
</tr>
<tr>
<td>26E.</td>
<td>Rotor Key</td>
</tr>
<tr>
<td>36.</td>
<td>Cover O-ring</td>
</tr>
<tr>
<td>45.</td>
<td>Body Retaining Cap Screw</td>
</tr>
</tbody>
</table>

   *Discard rotor hub and rotor nut o-rings; one-time use only.

2. **Remove Rotor Nut Assemblies**
   1. Use blocking dowel to keep rotors from turning when removing rotor nuts. Always use dowel to block rotor against body, not against other rotor. See Figure 33 through Figure 35.

   ![Figure 33 - Blocking Dowel](image)

   ![Figure 34 - Loosening Top Rotor](image)

   ![Figure 35 - Loosening Bottom Rotor](image)

<table>
<thead>
<tr>
<th>UNIVERSAL II MODEL</th>
<th>DOWEL DIAMETER</th>
</tr>
</thead>
<tbody>
<tr>
<td>006, 015, 018</td>
<td>0.75 in (19 mm)</td>
</tr>
<tr>
<td>030, 040</td>
<td>1.00 in (25 mm)</td>
</tr>
<tr>
<td>045, 060, 130</td>
<td>1.50 in (38 mm)</td>
</tr>
<tr>
<td>180, 220</td>
<td>1.875 in (48 mm)</td>
</tr>
<tr>
<td>210, 320</td>
<td>2.00 in (51 mm)</td>
</tr>
</tbody>
</table>

   | Figure 33 - Blocking Dowel |
   | Figure 34 - Loosening Top Rotor |
   | Figure 35 - Loosening Bottom Rotor |
Remove Rotors
1. Using only your hands, first remove rotor with hub overlapping other rotor wing (Figure 36, item 9). Place rotors in up-turned cover to prevent damage to close tolerance parts.

If rotors cannot be removed by hand:
   a. Use plastic or hardwood dowels to pry out rotors.
   b. Remove body retaining cap screws. Tap body forward and backward with soft hammer to loosen rotors.
   c. If necessary, use a puller. Use care with puller or dowels to avoid damaging rotors.

Remove Pump Body
1. Remove two body retaining cap screws (Figure 37, item 45).

2. Using plastic mallet, tap body off gear case, dowel pins and body studs.

3. Slide body straight off body studs to prevent damaging mechanical seal parts.

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

Remove Mechanical Seal
1. Remove rotating seal seats and shaft o-rings.

2. Apply even pressure to both sides on back of seal seats when removing.

Gear Case Disassembly

DANGER: 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 pump prior to disconnecting piping.

Remove Gear Case Cover
1. Remove oil drain plug (Figure 38, item 24D); drain oil.

2. Remove cap screws from gear case (item 33A).

3. Pull cover (item 4) off shaft extension. If cover sticks, use soft hammer to loosen.

4. Remove silicone sealant (item 25) from gear case and cover.

5. Remove oil seal (item 12) from cover using arbor press. Discard used oil seal.

6. Straighten lock tab on lock washers (Figure 39, item 39).
Remove Shaft

1. Wedge a wooden block, nylon dowel or rag (Figure 40, item A) between gears to prevent shafts from turning during gear locknut removal.

![Figure 40 - Block Shaft Rotation](image)

2. Using a Waukesha Cherry-Burrell Gear Locknut Tool, remove gear locknuts and lock washers. **DO NOT** remove gears at this time. For proper Gear Locknut Tool, see Parts Lists beginning on on page 44.

![Figure 41 - Remove Gear Locknuts](image)

**NOTE:** A spanner wrench or drift can also be used to remove gear locknuts.

3. Remove front bearing retainer bolts (Figure 42, item 33B) and pull off bearing retainers (item 32). (Stuck retainers will press out when shaft is removed.)

![Figure 42 - Remove Bearing Retainers](image)

4. Remove silicone sealant (Figure 43, item A) from bearing retainer and gear case.

![Figure 43 - Remove Sealant from Retainer](image)

5. Place gear case on arbor press with liquid end down. Protect shaft ends with wood or plastic block (Figure 44, item C) and press shafts out of gear case.

![Figure 44 - Press Shafts from Gear Case](image)

6. Remove gear spacers and gear keys from shafts.

7. Remove gears from gear case.

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

9. Remove shims. If shafts and bearings will be reused, identify shims and bearings with each shaft.

10. Press out and discard both rear oil seals in gear case (Figure 45, item 13).

![Figure 45 - Remove Rear Oil Seals](image)

11. Use hydraulic press and V-blocks (Figure 46, item B) to remove bearings (items 15 and 16) and spacer (item 30).

![Figure 46 - Remove Bearings From Shaft](image)

**NOTE:** Make sure both ends of shaft are protected when removing shaft.
Replace Bearing Assemblies

Front Bearing Assembly

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

1. Lubricate front bearing area of shaft (Figure 47, item 7, 8) with oil or grease. Place upright in hydraulic press with liquid end down.

2. Unwrap front bearing assembly. DO NOT interchange parts of one bearing assembly with another. Parts are precisely matched during manufacturing and must be installed as a matched assembly.

3. Lift lower cone and roller assembly (Figure 49, item A) out of bearing stack and place on shaft with radius down. Press onto shaft until seated against shaft shoulder. Press only on inner cone.

4. Place inner spacer (Figure 50, item B) over shaft onto lower cone and roller assembly.

5. Place lower cup (item C) over lower cone and roller assembly, keeping cup opening toward assembly.

6. Place outer spacer (item D) over shaft and onto lower cup.

7. Place upper cup (Figure 51, item E) on top of outer spacer.

8. Lubricate remaining upper cone and roller assembly (Figure 51, item F) with oil or grease and slip over shaft with roller radius up. Press onto shaft and into upper cup.

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

9. Install bearing spacer (Figure 52, item 30).

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

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

1. Unwrap rear bearing assembly. **DO NOT** interchange parts of one bearing assembly with another. These parts are precisely matched during manufacturing and must be installed as a matched assembly.

2. **For models with ball bearing assemblies:**
   Lubricate shaft inner bearing race with oil or grease. Press bearing into place. Shielded side of bearing fits against bearing spacer. Press only on inner race.

   **For models with tapered roller bearing assemblies:**
   Lubricate shaft bearing area with oil or grease. Follow “Front Bearing Assembly” procedures on page 34.

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

Install Shaft

*Shimming*

When installing shafts in gear case, shim behind front bearing to achieve proper backface clearance between back of rotors and body. Backface clearance must be equal for both rotors to prevent rotors from hitting each other during operation.

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

1. If shafts and/or bearings do not need to be replaced and shims are marked indicating shaft and bearing they are matched with, shim adjustment probably will not be necessary. Reuse existing tagged shims, shafts and bearings in same gear case bores.

   If existing shims are lost and/or a standard shaft is used, determine required shims from chart.

   If necessary to calculate required shims for replacement shafts, bearings or both, refer to Figure 54 and Figure 55; carry measurements and calculations to three decimal places (i.e. 0.059).

<table>
<thead>
<tr>
<th>SUGGESTED SHIMS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>UNIVERSAL II</strong></td>
</tr>
<tr>
<td><strong>MODEL</strong></td>
</tr>
<tr>
<td>006, 015, 018</td>
</tr>
<tr>
<td>030, 040</td>
</tr>
<tr>
<td>045, 060, 130</td>
</tr>
<tr>
<td>180, 220</td>
</tr>
<tr>
<td>210, 320</td>
</tr>
</tbody>
</table>

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

   | **Figure 54 - Measure B and C** |
   | **Figure 55 - Measure D and E** |
   |
   | B. Front face of gear case to back of bearing bore. | D. Body thickness. |
   | C. Shaft shoulder to back of bearing race. | E. Depth of rotor cavity. |

2. Place shims in body resting against shoulder in front bearing bore.

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

   **NOTE:** Shafts may need to be removed for final shim adjustment.

4. Lubricate outside diameter of bearing.
5. Use a Waukesha Cherry-Burrell Shaft Assembly Pusher to press shaft into place until seated against shim pack. **Press only against outer race of bearing.** For proper Shaft Assembly Pusher, see Parts Lists beginning on on page 44.

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

6. Temporarily secure shaft/bearing in place with bearing retainers to aid in checking clearances. **DO NOT** install silicone sealant at this time.

7. Bearing retainer must rest firmly against bearing. Leave a 0.010 to 0.050 in (.25 to 1.25 mm) clearance between back of bearing retainer and front of gear case (Figure 56). If this clearance is not met, place shims between bearing and retainer.

8. Temporarily mount body on gear case.

9. Secure body to gear case using body retaining screws.

10. Install rotors and rotor nuts. Rotor nut o-rings, belleville washers and retainer o-rings are not required at this time.

11. Measure rotor backface clearance (Figure 57, item A) through the port or from the front. Backface clearance for both rotors must be the same to prevent rotor crossover contact and must be ±.0005" of value found on “Standard Rotor Clearance” on page 39.

12. Check rotor front face clearance (Figure 57, item B).

13. Check rotor to body clearance (Figure 57, item C).


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

15. If backface clearance is not met, disassemble pump and adjust shimming to achieve correct backface clearance.

16. If rotor to body clearance is not met or is uneven, contact Waukesha Cherry-Burrell technical services for proper adjustment procedures.

17. After obtaining proper clearance, remove rotor nuts, rotors, body and bearing retainers.

18. Grease front and rear bearing through grease fittings until grease is visible around bearing assemblies. Amount of grease required is listed in “Grease Quantity (per Bearing)” on page 27. Rotate shafts while greasing to disperse grease.


20. Coat retainer flanges with silicone sealant (Figure 58, item A). (Gore-Tex® sealing tape can be used on silicone free models.) Grease seal (item 14) will be flush with front of bearing retainer. On 030 models, grease seal will be against step on inside diameter of retainer.

21. Install bearing retainers (Figure 58, item 32).
Install Rear Seal Assembly

1. Install gear spacers (Figure 59, item 29).

2. Lubricate inside and outside diameters of oil seals with oil or grease.

3. Install oil seals with spring facing out (Figure 59, item 13).

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

Install Timing Gears

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

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

2. Slide spur drive gear onto drive shaft. Spur drive gear has one punch mark on gear.

3. Slide short shaft gear onto short shaft. Short shaft gear has two punch marks on gear. Straddle single punch mark of spur drive gear with two punch marks on short shaft gear (Figure 60).

4. Use wood or nylon block (Figure 61, item A) to secure shafts from turning. If block is not available, use rags to block gears, or with one rotor on shaft, block rotor with nylon dowel.

5. Slide lockwashers onto shaft. Lubricate threaded area on shafts and face of locknuts with oil or grease.

6. Using a Waukesha Cherry-Burrell Gear Locknut Tool, tighten gear locknuts. For proper Gear Locknut Tool, see Parts Lists beginning on on page 44.

**NOTE:** Although recommended specifications cannot be assured without the use of Gear Locknut Tool, gear locknuts can be installed using spanner wrench or drift.

7. Bend locking tab on lockwashers into locking nut slots securing gear locknut into place (Figure 63).
Install Gear Case Cover

1. Lubricate inside diameter of new oil seal. Press new oil seal (Figure 64, item 12) into gear case cover (item 4) flush with outside face, spring facing in.

2. Apply silicone sealant to back of gear case. (Gore-Tex® sealing tape can be used on silicone free models.) Place tape on inside of screw holes. (Figure 65, item A).

3. Tape shaft end to prevent cutting seal on keyway. Mount cover assembly on gear case. Secure with cap screws and washers.

4. Remove tape from shaft end.

5. Ensure shaft is centered in lip seal before securing cap screws.

6. Install oil drain plug.

7. Fill gear case with gear oil to proper level. Refer to “Lubrication” on page 27.

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

1. Measure rotor backface clearance (Figure 66, item A) through port or from front. **Backface clearance for both rotors must be equal to avoid crossover interference.**

2. Measure rotor front face clearance (item B).

3. Measure rotor to body clearance (item C).

4. Check measured clearances against recommended Standard Rotor Clearances chart at right.

5. If clearances are greater than values listed and desired performance is not achieved, contact Waukesha Cherry-Burrell technical services for guidance.

<table>
<thead>
<tr>
<th>STANDARD ROTOR CLEARANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>UNIVERSAL II MODEL</strong></td>
</tr>
<tr>
<td>006, 015, 018, 030, 040</td>
</tr>
<tr>
<td>045, 060, 130</td>
</tr>
<tr>
<td>180, 220</td>
</tr>
<tr>
<td>210, 320</td>
</tr>
</tbody>
</table>

NOTE: "B" dimension is below face of casing.
Install Mechanical Seal

1. Lubricate shaft o-ring (Figure 69, item 92) with lubrication compound compatible with o-ring material and process fluid(s). Place o-ring on shaft.

2. Install rotating seal seat (item 93) on shaft. Align drive flats on seat with drive flats on shaft.

3. Push seat squarely against shaft shoulder.

4. Install inner wave spring (item 95) onto inner seal (item 94).

5. Lubricate inner seal o-ring (item 91) with lubrication compound compatible with o-ring material and process fluid(s). Install inner seal o-ring into groove of inner seal.

6. Place inner seal into back of pump body. Ensure notches are aligned in inner seal with stop pins in body. Press firmly and evenly into place.

7. If double mechanical seal is used, install outer wave spring (item 97) in body and outer o-ring (item 96) in outer seal groove (item 98). Place outer seal in pump body around inner seal, aligning notches in outer seal with stop pins in body.

8. Inspect seal faces for cleanliness. Ensure faces have no nicks or scratches. Lubricate seal faces with lubricant compatible with process fluid(s).

9. Perform steps 1 through 5 on both shafts.

---

Figure 67 - Single Mechanical Seal Cross Section

Figure 68 - Double Mechanical Seal Cross Section

Figure 69 - Single (Bottom) and Double (Top) Mechanical Seal Exploded View

| 37. Stop Pin | 95. Inner Wave Spring |
| 91. Inner Seal O-ring | 96. Outer Seal O-ring |
| 92. Shaft O-ring | 97. Outer Wave Spring |
| 93. Seal Seat | 98. Outer Seal |
| 94. Inner Seal |
Install Pump Body
1. Match large and small dowel pin sizes on pump body with dowel pin holes in pump gear case.
2. Install body (Figure 70, item 1) to gear case assembly aligning body with body studs. Avoid damaging seals as body is drawn over shafts.
3. Secure body to gear case using two cap screws (Figure 70, item 45).

Install Rotors
1. Lubricate o-ring (Figure 70, item 26D) with lubrication compound compatible with o-ring material and process fluid(s).
2. Install new rotor hub o-rings (item 26D) into groove on rotors hubs.
3. Align keyways in rotors with keyways on shafts and install keys (item 26E).

Install Rotor Nut Assemblies
1. Install belleville washer (Figure 70, item 26B) into rotor nut with raised side of washer toward rotor nut.
2. Place retainer o-ring (item 26C) into rotor nut to retain belleville washer. Washer should not be tight against o-ring.
3. Lubricate new rotor nut o-ring (item 26A) with lubrication compound compatible with o-ring material and process fluid(s). If o-ring is not lubricated it will pucker when tightening rotor nut.
4. Install rotor nut o-ring onto rotor nut.
5. Prior to assembly of rotor nuts, apply anti-seize compound to shaft threads.
6. Use blocking dowel (Figure 71) to prevent rotors from turning during installation. See “Blocking Dowels” on page 31 for rotor blocking dowel size. Always use dowel to block rotor against body, not against other rotor. See Figure 72 and Figure 73.
7. Screw rotor nuts (Figure 70, item 26) onto shafts (clockwise) and tighten to required torque.

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

*Discard rotor hub and rotor nut o-rings; one-time use only.*

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Body</td>
<td>26B. Belleville Washer</td>
</tr>
<tr>
<td>2. Cover</td>
<td>26C. Retainer O-ring</td>
</tr>
<tr>
<td>9. Rotor</td>
<td>26D. Rotor Hub O-ring*</td>
</tr>
<tr>
<td>11. Cover Nut</td>
<td>26E. Rotor Key</td>
</tr>
<tr>
<td>26. Rotor Nut</td>
<td>36. Cover O-ring</td>
</tr>
<tr>
<td>26A. Rotor Nut O-ring*</td>
<td>45. Body Retaining Cap Screw</td>
</tr>
</tbody>
</table>

*Figure 70 - Exploded View of Fluid Head*  

*Figure 71 - Blocking Dowel*  

*Figure 72 - Tightening Bottom Rotor*  

*Figure 73 - Tightening Top Rotor*
Install Cover
1. Clean cover o-ring (Figure 70, item 36) and install in groove in cover.
2. Match large and small dowel pin sizes on pump body with dowel pin holes in cover.
3. Install cover (Figure 70, item 2) on pump body.
4. Prior to assembly of cover nuts, apply anti-seize compound compatible with product to threads of body studs.
5. Tighten cover securely using cover nuts (Figure 70, item 11).

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

### UNIVERSAL II WRENCH SIZE

<table>
<thead>
<tr>
<th>UNIVERSAL II MODEL</th>
<th>ROTOR NUT</th>
<th>BODY RETAINING CAP SCREW</th>
<th>COVER NUT</th>
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<td>3/16&quot;</td>
<td>5/8&quot;</td>
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<tr>
<td>030, 040</td>
<td>1-1/4&quot;</td>
<td>3/16&quot;</td>
<td>5/8&quot;</td>
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<tr>
<td>045, 060, 130</td>
<td>1-5/8&quot;</td>
<td>1/4&quot;</td>
<td>7/8&quot;</td>
</tr>
<tr>
<td>180, 220</td>
<td>2-1/4&quot;</td>
<td>5/16&quot;</td>
<td>7/8&quot;</td>
</tr>
<tr>
<td>210, 320</td>
<td>2-3/8&quot;</td>
<td>5/16&quot;</td>
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### TORQUE VALUES

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<th>LOCKNUT TOOL</th>
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<tr>
<td></td>
<td>GEAR</td>
<td>ROTOR</td>
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<td>006, 015, 018</td>
<td>75 ft lbs</td>
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<tr>
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<td>68 N·m</td>
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<td>030, 040</td>
<td>100 ft lbs</td>
<td>120 ft lbs</td>
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<td>136 N·m</td>
<td>163 N·m</td>
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<tr>
<td>045, 060, 130</td>
<td>140 ft lbs</td>
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<td>190 N·m</td>
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<tr>
<td>180, 220</td>
<td>230 ft lbs</td>
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<td>312 N·m</td>
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<td>434 N·m</td>
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### ARBOR OR HYDRAULIC PRESS TONNAGE (APPROX.)

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<tr>
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<th>SHAFT</th>
<th>FRONT BEARING</th>
<th>REAR BEARING</th>
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<td>ON</td>
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<td>0.50</td>
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<tr>
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<td>1.00</td>
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# STANDARD WCB O-RING SELECTIONS, DESCRIPTIONS AND COLOR CODES

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<tr>
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<th>Compound Color</th>
<th>Color Code</th>
<th>FDA Compliance</th>
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<tbody>
<tr>
<td>Nitrile (Buna-N) (NBR)</td>
<td>Black</td>
<td>Yellow</td>
<td>21CFR177.2600 3A Sanitary</td>
</tr>
<tr>
<td>Silicone (Si)</td>
<td>Orange</td>
<td>Black</td>
<td>21CFR177.2600 3A Sanitary</td>
</tr>
<tr>
<td>Ethylene Propylene Diene Rubber (EPDM)</td>
<td>Black or Purple</td>
<td>Green</td>
<td>21CFR177.2600</td>
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<tr>
<td>Perfluoroelastomer (FFKM)</td>
<td>Black</td>
<td>None</td>
<td>Individually packaged with size and material noted.</td>
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<tr>
<td>Ethylene Propylene Diene Rubber (Sulfur Free) (EPDM)</td>
<td>Black or Purple</td>
<td>Blue</td>
<td>21CFR177.2600</td>
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<tr>
<td>PTFE Encapsulated</td>
<td>Translucent coating over Orange or Black Silicone or FKM core</td>
<td>None</td>
<td>21CFR177.2600</td>
</tr>
<tr>
<td>Fluorocarbon Rubber (FKM)</td>
<td>Rust, Brown or Black</td>
<td>White</td>
<td>21CFR177.2600 3A Sanitary</td>
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</tbody>
</table>
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 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 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 pressure under 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 down stream, 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:
1. 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.

2. Pneumatic

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

3. 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. Extended pressure range 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

Installation Adjustment
1. Manual

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

2. Pneumatic

   A. Set air/gas pressure to 2-5 PSIG
   B. Turn on pump.
   C. With pressure gauge and valve in discharge line:
      1. Close discharge valve.
      2. Turn adjusting screw clockwise until desired relief pressure registers on gauge. Lock adjusting screw with lock nut.
3. Open valve in discharge line. Relief cover is set and will open if system pressure exceeds preset limit.

D. Without pressure gauge in discharge line:
   1. Turn adjusting screw clockwise and observe product flow at discharge of system.

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

3. Piston

A. With pressure gauge and valve in discharge line:
   1. Close discharge valve slowly and observe gauge pressure. DO NOT ALLOW PRESSURE TO EXCEED 200 PSI.
   2. Increase air/gas pressure, until desired relief pressure registers on gauge. Lock air/gas pressure regulator adjusting screw with lock nut.
   3. Open valve in discharge line. Relief cover is set and will open if system pressure exceeds preset limit.

B. Without pressure gauge in discharge line:
   1. Increase air/gas pressure to relief valve, with regulator, and observe product flow at discharge of system.

When product flow reaches maximum or desired flow rate, lock regulator adjusting screw with lock nut.
## Parts List
### 006-U2 PD Pumps

<table>
<thead>
<tr>
<th>Item #</th>
<th>Part Description</th>
<th>Part #</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pump Body with Flush (Serial # Req'd)</td>
<td>101842</td>
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<tr>
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<td>Pump Cover</td>
<td>107664</td>
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<tr>
<td>2</td>
<td>Pump Cover Vented - Complete Assembly</td>
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</tr>
<tr>
<td></td>
<td>Manual (&lt;150 psi)</td>
<td>CVR00063</td>
</tr>
<tr>
<td></td>
<td>Manual (&gt;150 psi)</td>
<td>CVR00108</td>
</tr>
<tr>
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<td>Pneumatic Rubber Diaphragm</td>
<td>CVR00073</td>
</tr>
<tr>
<td></td>
<td>Pneumatic Piston</td>
<td>CVR00074</td>
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<tr>
<td>3</td>
<td>Gear Case CI</td>
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<td>Gear Case Cover Steel SS, Optional</td>
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<tr>
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<td>Gear Case Cover Steel SS, Optional</td>
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<tr>
<td>5</td>
<td>Gear, Drive Shaft, Spur</td>
<td>107997</td>
</tr>
<tr>
<td>6</td>
<td>Gear, Short Shaft, Spur</td>
<td>107997</td>
</tr>
<tr>
<td>7</td>
<td>Drive Shaft</td>
<td>108405</td>
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<tr>
<td>8</td>
<td>Short Shaft</td>
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<td>316SS</td>
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<td>10</td>
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<td>12</td>
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<td>Oil Seal, Gear Case Rear</td>
<td>000 030 017</td>
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<td>14</td>
<td>Grease Seal, Bearing Retainer</td>
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<tr>
<td></td>
<td>Optional Bearing Isolator Kit, incl. SS Bearing Retainer</td>
<td>X06638-1</td>
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</table>

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1 See page 98 for new part numbers for pumps sold after July 12, 2004.
### 006-U2 PD Pumps

<table>
<thead>
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<th>Item #</th>
<th>Part Description</th>
<th>Part #</th>
</tr>
</thead>
<tbody>
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<td>15</td>
<td>Bearing, Rear</td>
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<tr>
<td>16</td>
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<tr>
<td>17</td>
<td>Key, Gear</td>
<td>015 037 000</td>
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<tr>
<td>20</td>
<td>Dowel Pin, Upper Cover Side</td>
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<td>21</td>
<td>Dowel Pin, Upper Gear Case Side</td>
<td>AD0 040 R00</td>
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<td>22</td>
<td>Dowel Pin, Lower Cover Side</td>
<td>AD0 040 100</td>
</tr>
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<td>23</td>
<td>Dowel Pin, Lower Gear Case Side</td>
<td>AD0 040 R10</td>
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<tr>
<td>24</td>
<td>Hex Cap Screw; Fill, Drain, Level</td>
<td>000 046 002</td>
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<tr>
<td>25</td>
<td>Silicone Sealant</td>
<td>000 142 301</td>
</tr>
<tr>
<td>26</td>
<td>Nut, Rotor</td>
<td>101804</td>
</tr>
<tr>
<td>26A</td>
<td>O-ring, Rotor Nut</td>
<td>Buna N N70126, EPDM E70126, FKM V70126</td>
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<tr>
<td>26B</td>
<td>Washer, Belleville</td>
<td>101691</td>
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<td>26C</td>
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<td>26D</td>
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### Part Numbers for Pumps Sold after July 12, 2004

- See page 98 for new part numbers for pumps sold after July 12, 2004.

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1 See page 98 for new part numbers for pumps sold after July 12, 2004.
## 014-U2 PD Pumps

### Parts List

<table>
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<th>Part Description</th>
<th>Part #</th>
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</tr>
<tr>
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<td>Pump Cover Vented - Complete Assembly &lt;br&gt; Manual (&lt;150 psi)</td>
<td>CVR00063</td>
</tr>
<tr>
<td>4</td>
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<td>Pneumatic Piston</td>
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### Notes

- See page 98 for new part numbers for pumps sold after July 12, 2004.

<sup>1</sup> See page 98 for new part numbers for pumps sold after July 12, 2004.
### 014-U2 PD Pumps

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<tr>
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<td>Bearing Spacers</td>
<td>101814</td>
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<tr>
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<td>101810</td>
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<tr>
<td>33A, 33B</td>
<td>1/4-20 x 3/4&quot; HHCS</td>
<td>STD 30-287</td>
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<tr>
<td></td>
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<td>SS 30-58</td>
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<th>Item #</th>
<th>Part Description</th>
<th>Part #</th>
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<sup>1</sup> See page 98 for new part numbers for pumps sold after July 12, 2004.
# 015-U2 PD Pumps

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¹ See page 98 for new part numbers for pumps sold after July 12, 2004.
### 015-U2 PD Pumps

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#### Part Descriptions

- **33A, 33B**: See page 98 for new part numbers for pumps sold after July 12, 2004.

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1 See page 98 for new part numbers for pumps sold after July 12, 2004.
# 018-U2 PD Pumps

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† See page 98 for new part numbers for pumps sold after July 12, 2004.
## 018-U2 PD Pumps

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¹ See page 98 for new part numbers for pumps sold after July 12, 2004.
### 030-U2 PD Pumps

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1 See page 98 for new part numbers for pumps sold after July 12, 2004.
## 030-U2 PD Pumps

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<th>Item #</th>
<th>Part Description</th>
<th>Part #</th>
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<td>Dowel Bushing, Lower</td>
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<td>Locknut, Gear</td>
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<td>Warning Label</td>
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1 See page 98 for new part numbers for pumps sold after July 12, 2004.
# 034-U2 PD Pumps

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## Rectangular Flange Inlet Body with Flush (Serial # Req'd)

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## Pump Cover Vented - Complete Assembly

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<th>Part #</th>
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<td>3</td>
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<td>CVR00109</td>
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## Gear Case

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## Gear Covers

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## Rotor, Twin Wing (std. clearance)

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## Hex Nut

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## Grease Seal, Bearing Retainer

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## Optional: Bearing Isolator Kit, incl. SS Bearing Retainer

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1 See page 98 for new part numbers for pumps sold after July 12, 2004.
# 034-U2 PD Pumps

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<th>Part Description</th>
<th>Part #</th>
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1 See page 98 for new part numbers for pumps sold after July 12, 2004.
### 040-U2 PD Pumps

#### Parts List

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<tr>
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<th>Part Description</th>
<th>Part #</th>
</tr>
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The table above lists the parts for 040-U2 PD Pumps. Each item is paired with its corresponding part number. The diagram on the left side of the page illustrates the pump's components, with each item corresponding to a specific part in the list. The table includes details such as the type of pump, the number of parts, and the specific parts required for assembly. The parts are categorized by type, such as pump body, cover, gear, drive shaft, rotor, and seal. The list also includes optional parts and special notes for necessary information. The page is marked as Revised February 2007, indicating the document's revision date.

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1 See page 98 for new part numbers for pumps sold after July 12, 2004.
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<th>Part Description</th>
<th>Part #</th>
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^1 See page 98 for new part numbers for pumps sold after July 12, 2004.
### 045-U2 PD Pumps

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## 045-U2 PD Pumps

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### Part Description

- **33B**: 3/8-16 x 1-1/4" HHCS
- **33C**: 3/8 Flat Washer, Gear Case Cover
- **34**: Dowel Bushing, Upper
- **35**: Dowel Bushing, Lower
- **36**: O-Ring, Pump Cover
- **37**: Stop Pin, Seal
- **39**: Lock Washer, Gear
- **40**: Locknut, Gear
- **42**: Gear Case Shim
- **43**: Plastic Cap Plug
- **44**: 1/2-13 x 1-1/4" SHCS
- **45**: Body Retaining Screw, 5/16-8 x 2-1/5"
- **46**: Eye Bolt, 1/2-13 x 3/4" (not shown)
- **47**: Key, Coupling - 3/8 x 3/8 x 1-5/8"
- **48**: Cleanout Plug
- **51**: Name Plate, Sanitary (not shown)
- **52**: #2 x 1/8" RHDS (not shown)
- **53**: Caution Plate
- **54**: Warning Label
- **55**: Grease Fitting, 1/8" (not shown)
- **56**: Plastic Cap, Grease Fitting (not shown)
- **57**: Gear Locknut Tool
- **58**: Shaft Assembly Pusher

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### 060-U2 PD Pumps

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1 See page 98 for new part numbers for pumps sold after July 12, 2004.
### 064-U2 PD Pumps

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### 064-U2 PD Pumps

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134-U2 PD Pumps

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## 134-U2 PD Pumps

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<sup>1</sup> See page 98 for new part numbers for pumps sold after July 12, 2004.
### 180-U2 PD Pumps

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1 See page 98 for new part numbers for pumps sold after July 12, 2004.
### 180-U2 PD Pumps

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<sup>1</sup> See page 98 for new part numbers for pumps sold after July 12, 2004.
# 184-U2 PD Pumps

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1 See page 98 for new part numbers for pumps sold after July 12, 2004.
## 184-U2 PD Pumps

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\(^1\) See page 98 for new part numbers for pumps sold after July 12, 2004.
## 210-U2 PD Pumps

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¹ See page 98 for new part numbers for pumps sold after July 12, 2004.
### 210-U2 PD Pumps

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213-U2 PD Pumps

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¹ See page 98 for new part numbers for pumps sold after July 12, 2004.
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1 See page 98 for new part numbers for pumps sold after July 12, 2004.
## 214-U2 PD Pumps

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- **Part Description**: The part numbers listed are specific to the 214-U2 PD pumps. Some parts are specific to pumps sold after July 12, 2004, as noted in the see page 98 footnote. 

\(^1\) See page 98 for new part numbers for pumps sold after July 12, 2004.
## 220-U2 PD Pumps

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1 See page 98 for new part numbers for pumps sold after July 12, 2004.
**220-U2 PD Pumps**

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1 See page 98 for new part numbers for pumps sold after July 12, 2004.
## 224-U2 PD Pumps

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¹ See page 98 for new part numbers for pumps sold after July 12, 2004.
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¹ See page 98 for new part numbers for pumps sold after July 12, 2004.
### 320-U2 PD Pumps

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¹ See page 98 for new part numbers for pumps sold after July 12, 2004.
### 320-U2 PD Pumps

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### Item Numbers

- **320-U2 PD Pumps**

## 323-U2 PD Pumps

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¹ See page 98 for new part numbers for pumps sold after July 12, 2004.
### 323-U2 PD Pumps

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3 See page 98 for new part numbers for pumps sold after July 12, 2004.
### 324-U2 PD Pumps

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1 See page 98 for new part numbers for pumps sold after July 12, 2004.
### 324-U2 PD Pumps

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### Notes
- See page 98 for new part numbers for pumps sold after July 12, 2004.
Universal II PD Pump Seals

Model 006, 014, 015, 018 Universal II

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Model 030, 034, 040 Universal II

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See page 43 for o-ring selections, descriptions and color codes.
**Universal II PD Pump Seals**

**Single Mechanical Seal**

**Double Mechanical Seal**

### Model 045, 060, 064, 130, 134 Universal II

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### Model 180, 220, 224 Universal II

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See page 43 for o-ring selections, descriptions and color codes.
## Universal II PD Pump Seals

### Single Mechanical Seal

### Double Mechanical Seal - 210, 320

### Double Mechanical Seal - 213, 323

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See page 43 for o-ring selections, descriptions and color codes.
### Universal II PD Pump Vented Cover

#### Model 006, 014, 015, 018, 030, 034, 040 Universal II

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<td>104</td>
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<td>107</td>
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<tr>
<td>108</td>
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| **Pneumatic Vented Cover** | | |
| 101 | Vented Cover 006, 014, 015, 018 UII 030, 034, 040 UII | 103669 | 103670 |
| 108 | Diaphragm, Buna N | ADO 078 000 |
| 110 | Diaphragm Bushing | ADO 077 P00 |
| 111 | Cover Nut | ADO 075 P00 |

| **Piston Vented Cover** | | |
| 101 | Vented Cover 006, 014, 015, 018 UII 030, 034, 040 UII | 103669 | 103670 |
| 112 | Piston | ADO 073 P10 |
| 113 | O-ring, Bushing Seal, Buna N | N70223 |
| 114 | Diaphragm Bushing | ADO 077 P10 |
| 115 | O-ring, Nut Seal, Buna N | N70224 |
| 116 | Cover Nut | ADO 075 P10 |
| 117 | Piston Seal Quad Ring O-ring | ADO 133 000 | N70218 |
Universal II PD Pump Vented Cover

Model 045, 060, 064, 130, 134 Universal II

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Pneumatic Vented Cover

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Piston Vented Cover

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# Universal II PD Pump Vented Cover

## Manual Vented Cover

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### Specialized Parts
- Medium (<150 psi): Part # 113400
- High (>150 psi): Part # 113524

## Piston Vented Cover

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### Piston Seal Specifications
- Quad Ring: Part # 117
- O-ring: Part # N70258

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*Image: Diagrams of Manual and Piston Vented Covers*
Tru-Fit™ Universal II PD Pump

OPPOSITE SIDE

33D
44A
33E
### Universal II Pump Size

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### Bearing Retainer/Seal New Part Numbers

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<td>030, 034, 040</td>
<td>Grease Seal, Bearing Retainer</td>
<td>101717</td>
<td>121680</td>
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<tr>
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<td>Bearing Retainer, Front</td>
<td>101811</td>
<td>120333</td>
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<td>045, 060, 064, 130, 134</td>
<td>Bearing Retainer, Front STD</td>
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<td>123531</td>
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<td>Bearing Retainer, Front SS</td>
<td>101812</td>
<td>121828</td>
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<td>180, 184, 220, 224</td>
<td>Grease Seal, Bearing Retainer</td>
<td>STD030002</td>
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<td>Bearing Retainer, Front STD</td>
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<td>Bearing Retainer, Front SS</td>
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<td>121829</td>
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<td>210, 213, 214, 320, 323, 324</td>
<td>Grease Seal, Bearing Retainer</td>
<td>STD030002</td>
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<td>Bearing Retainer, Front STD</td>
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<tr>
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<td>Bearing Retainer, Front SS</td>
<td>118365</td>
<td>123533</td>
</tr>
</tbody>
</table>
## Troubleshooting

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>POSSIBLE CAUSE</th>
<th>SUGGESTED ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>No flow, pump rotors are not turning.</strong></td>
<td>Drive motor not running.</td>
<td>Check resets, fuses, circuit breakers.</td>
</tr>
<tr>
<td></td>
<td>Keys sheared or missing.</td>
<td>Replace.</td>
</tr>
<tr>
<td></td>
<td>Drive belts, power transmission components slipping or broken.</td>
<td>Replace or adjust.</td>
</tr>
<tr>
<td></td>
<td>Pump shaft, keys, or gears sheared.</td>
<td>Inspect: and replace parts as necessary.</td>
</tr>
<tr>
<td><strong>No flow, pump rotors are turning.</strong></td>
<td>Rotors turn in the wrong direction.</td>
<td>Check motor hookup to reverse motor rotation.</td>
</tr>
<tr>
<td></td>
<td>Relief valve not properly adjusted, or held open by foreign material.</td>
<td>Adjust or clear valve.</td>
</tr>
<tr>
<td><strong>No flow, pump not priming.</strong></td>
<td>Valve closed in inlet line.</td>
<td>Open valve.</td>
</tr>
<tr>
<td></td>
<td>Inlet line clogged or restricted.</td>
<td>Clear line, clean filters, etc.</td>
</tr>
<tr>
<td></td>
<td>Air leaks due to bad gaskets or pipe connections.</td>
<td>Replace gaskets; check lines for leakage (can be done by air, by pressure or by filling with liquid and pressurizing with air).</td>
</tr>
<tr>
<td></td>
<td>Pump speed too slow.</td>
<td>Increase pump speed.</td>
</tr>
<tr>
<td></td>
<td>Liquid drains or siphons from system during off periods.</td>
<td>Use foot valve or check valves.</td>
</tr>
<tr>
<td></td>
<td>&quot;Air&quot; lock caused by fluids which &quot;gas off&quot;, or vaporize, or allow gas to come out of solution during off periods.</td>
<td>Install and use a manual or automatic air bleed from pump or lines near pump.</td>
</tr>
<tr>
<td></td>
<td>Extra clearance rotors, worn pump.</td>
<td>Increase pump speed, use foot valve to improve priming.</td>
</tr>
<tr>
<td></td>
<td>Net inlet pressure available too low.</td>
<td>Check Net Inlet Pressure Available &amp; Net Inlet Pressure Required. Change inlet system as needed.</td>
</tr>
<tr>
<td></td>
<td>On &quot;Vacuum&quot; inlet system: On initial start-up, atmospheric &quot;blow back&quot; prevents pump from developing enough differential pressure to start flow.</td>
<td>Install check valve in discharge line.</td>
</tr>
<tr>
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<td>SUGGESTED ACTION</td>
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<tr>
<td>--------------------------------</td>
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</tr>
<tr>
<td>Insufficient flow.</td>
<td>Speed too low to obtain desired flow.</td>
<td>Check flow-speed curve (available from WCB customer service) and adjust as necessary.</td>
</tr>
<tr>
<td></td>
<td>Air leak due to bad seals, gadgets or pipe connections.</td>
<td>Replace seals, check inlet fittings.</td>
</tr>
<tr>
<td>Fluid vaporization (&quot;starved&quot; pump inlet).</td>
<td>Strainers, foot valves, inlet fittings or lines clogged.</td>
<td>Clear lines. If problem continues, inlet system may require changing.</td>
</tr>
<tr>
<td></td>
<td>Inlet line size too small, inlet line too long. Too many fittings or valves. Foot valve, strainers too small.</td>
<td>Increase inlet line size. Reduce length, minimize direction and size changes, reduce number of fittings.</td>
</tr>
<tr>
<td></td>
<td>NIPA - Net Inlet Pressure Available at Pump is too low.</td>
<td>Raise liquid level in source tank to increase Net Inlet Pressure (NIPA).</td>
</tr>
<tr>
<td></td>
<td>Fluid viscosity greater than expected.</td>
<td>Reduce pump speed and accept lower flow, or change system to reduce line losses.</td>
</tr>
<tr>
<td></td>
<td>Fluid temperature higher than expected (vapor pressure higher).</td>
<td>Reduce temperature, reduce speed and accept lower flow or change system to increase Net Inlet Pressure Available.</td>
</tr>
<tr>
<td>Insufficient flow. Flow being bypassed somewhere.</td>
<td>Flow diverted in branch line, open valve, etc.</td>
<td>Check system and controls</td>
</tr>
<tr>
<td></td>
<td>Relief valve not adjusted or jammed.</td>
<td>Clear or adjust valve.</td>
</tr>
<tr>
<td>Insufficient flow. High slip.</td>
<td>Hot (HC) or extra clearance rotors on &quot;cold&quot; fluid, and/or low viscosity fluid.</td>
<td>Replace with standard clearance rotors.</td>
</tr>
<tr>
<td></td>
<td>Worn pump.</td>
<td>Increase pump speed (within limits). Replace rotors, have pump remanufactured.</td>
</tr>
<tr>
<td></td>
<td>High pressure.</td>
<td>Reduce pressure by adjusting system settings or hardware.</td>
</tr>
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<tr>
<td>----------------------------------------------</td>
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</tr>
<tr>
<td>Noisy operation caused by fluid.</td>
<td>Cavitation due to high fluid viscosity.</td>
<td>Slow down pump, reduce temperature, change system setup.</td>
</tr>
<tr>
<td></td>
<td>High vapor pressure fluid.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>High temperature.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cavitation due to Net Inlet Pressure Available less than Net Inlet Pressure Required</td>
<td>Increase NIPA - Net Inlet Pressure Required or reduce NIPR - Net Inlet Pressure Required. WCB customer service if necessary.</td>
</tr>
<tr>
<td></td>
<td>Air or gas in fluid caused by leaks in the piping.</td>
<td>Check system and fix any leaks.</td>
</tr>
<tr>
<td></td>
<td>Air or gas in fluid caused by dissolved gas or naturally aerated products.</td>
<td>Minimize discharge pressure (also see Cavitation).</td>
</tr>
<tr>
<td>Noisy operation caused by mechanical problems.</td>
<td>Rotor to body contact due to improper assembly of pump.</td>
<td>Check clearances and adjust shimming.</td>
</tr>
<tr>
<td></td>
<td>Rotor to body contact caused by distortion of pump due to improper piping installation.</td>
<td>Change piping installation to eliminate piping stress and distortion on body.</td>
</tr>
<tr>
<td></td>
<td>Pressures required higher than the pump is rated for.</td>
<td>Reduce discharge pressure required.</td>
</tr>
<tr>
<td></td>
<td>Rotor to body contact caused by worn bearings.</td>
<td>Rebuild with new bearings and lubricate regularly.</td>
</tr>
<tr>
<td></td>
<td>Rotor to Rotor Contact caused by loose or not timed correctly gears.</td>
<td>This has caused severe damage to components - rebuild with new parts.</td>
</tr>
<tr>
<td></td>
<td>Rotor to Rotor Contact caused by sheared keys.</td>
<td>This has caused severe damage to components - rebuild with new parts.</td>
</tr>
<tr>
<td></td>
<td>Rotor to Rotor Contact caused by worn gear splines.</td>
<td>This has caused severe damage to components - rebuild with new parts.</td>
</tr>
<tr>
<td></td>
<td>Drive noise caused by gear trains, chains, couplings, bearings.</td>
<td>Repair or replace drive parts. Check bearings for damage and replace as necessary.</td>
</tr>
<tr>
<td>PROBLEM</td>
<td>POSSIBLE CAUSE</td>
<td>SUGGESTED ACTION</td>
</tr>
<tr>
<td>----------------------------------------------</td>
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<td>-------------------------------------------------------</td>
</tr>
<tr>
<td>Pump requires excessive power (over heats, stalls, high current draw, breakers trip).</td>
<td>Higher than expected viscosity losses.</td>
<td>If within pump rating, increase drive size.</td>
</tr>
<tr>
<td></td>
<td>Higher than expected pressures.</td>
<td>Reduce pump speed.</td>
</tr>
<tr>
<td></td>
<td>Fluid is colder with a higher viscosity than expected.</td>
<td>Insulate lines or heat trace lines.</td>
</tr>
<tr>
<td></td>
<td>Fluid sets in line and pump during shutdown.</td>
<td>Install a “soft start” drive.</td>
</tr>
<tr>
<td></td>
<td>Fluid builds up on pump surfaces.</td>
<td>Install a recirculating bypass system.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flush system with a nonsetting fluid.</td>
</tr>
<tr>
<td>Short pump service life.</td>
<td>Pumping abrasives</td>
<td>Larger pumps at slower speeds.</td>
</tr>
<tr>
<td></td>
<td>Speeds and pressures higher than rated.</td>
<td>Reduce speeds and pressures by making changes in the system.</td>
</tr>
<tr>
<td></td>
<td>Worn bearings and gears due to lack of lubrication.</td>
<td>Replace pump with a large model with higher pressure ratings.</td>
</tr>
<tr>
<td></td>
<td>Misalignment of drive and piping. (Excessive over hung load or misaligned couplings).</td>
<td>Check alignment of piping and drive. Adjust as necessary.</td>
</tr>
</tbody>
</table>
Declaration of conformity

*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:**
Model no. 6,15,18,30,34,40,45,60,84,130,134,180,184,210, 214,220,224,320,324

**max. working pressure:**
150 to 500 PSIG

**max. allowable test pressure**
300 to 750 PSIG

**allowable min./ max. temperature TS:**
-40 to 135 °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 94/9/EG**
Equipment and protective systems intended for use in potentially explosive atmospheres

**Classification**
II 2G c IIB T2

Applied standards and technical specifications:
EN 1127-1, EN 13463-1, EN 13463-5

Technical documentation showing conformity with the directive is deposed to:
TUV Anlagentechnik GmbH
Zertifizierungsstelle fuer Ex-Schutz
Am Grauen Stein
D-51105 Koeln
Germany

with technical file reference numbers: 968/Ex-Ab 355/03

[Signature]
David Smith
General Manager
16, September, 2003
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.