

Simply remove the cover nuts (or cap screws) to pull the rear cover. Full pump removal and complete disassembly may be needed for a comprehensive inspection. Refer to Oberdorfer's Chemsteel® Gear Pump Inspection and Repair Manual for detailed inspection and repair instructions covering a range of service life conditions including opened clearances, bearing wear, gear wear, bulged covers, scoured shafts, and chemical deterioration.

**Mechanical Seals**

Pumps equipped with mechanical seals are of the standard pusher bellows type or wedge style. They can be expected to provide long and troublefree service provided:

- 1) Seal materials are compatible with pumped fluid and properly applied to the service.
- 2) Adequate cooling and lubrication is provided
- 3) Dry running is avoided
- 4) Abrasives are kept away from the seal area
- 5) Pump and driver are properly aligned

**TROUBLE SHOOTING MATRIX**

DIFFICULTY	PROBABLE CAUSE	REMEDY
<b>No liquid delivery</b>	<ol style="list-style-type: none"> <li>1) Closed valves</li> <li>2) Plugged suction</li> <li>3) Air leak at suction</li> <li>4) Suction lift too high</li> <li>5) Motor wired incorrectly</li> <li>6) Wrong rotation</li> </ol>	<ol style="list-style-type: none"> <li>1) Open valves</li> <li>2) Eliminate restriction</li> <li>3) Locate and repair leak</li> <li>4) Do not exceed vapor pressure of liquid</li> <li>5) Check wiring diagram</li> <li>6) Correct rotation</li> </ol>
<b>Low liquid delivery</b>	<ol style="list-style-type: none"> <li>1) Pump shaft speed incorrect</li> <li>2) Discharge pressure too high</li> <li>3) Air leak at suction</li> <li>4) Worn or damaged pump</li> <li>5) Low viscosity</li> </ol>	<ol style="list-style-type: none"> <li>1) Check driver speed, motor wiring, pulley tension</li> <li>2) Reduce downstream pressure</li> <li>3) Locate and repair leak</li> <li>4) Inspect and repair as required</li> <li>5) Verify original application conditions</li> </ol>
<b>Gradually loses prime</b>	<ol style="list-style-type: none"> <li>1) Suction lift too high</li> <li>2) Air or gas in fluid</li> <li>3) Air leak at suction</li> <li>4) Worn or damaged pump</li> </ol>	<ol style="list-style-type: none"> <li>1) Improve suction pressure</li> <li>2) Eliminate air or gas from fluid</li> <li>3) Locate and repair leak</li> <li>4) Inspect and repair as required</li> </ol>
<b>Noisy</b>	<ol style="list-style-type: none"> <li>1) Cavitating</li> <li>2) Solid particles in fluid</li> <li>3) Air or gas in fluid</li> <li>4) Worn or damaged pump</li> </ol>	<ol style="list-style-type: none"> <li>1) Improve system suction pressure, provide adequate NPSH</li> <li>2) Install suction strainer. Clean suction strainer</li> <li>3) Eliminate air or gas from fluid</li> <li>4) Inspect and repair as required</li> </ol>
<b>Motor runs hot or overloads</b>	<ol style="list-style-type: none"> <li>1) Discharge pressure too high</li> <li>2) Shaft speed too fast</li> <li>3) Fluid viscosity higher than expected</li> <li>4) Incorrectly wired motor</li> <li>5) Binding internal pump parts</li> <li>6) Motors normally feel hot</li> </ol>	<ol style="list-style-type: none"> <li>1) Reduce downstream pressure. Check relief valve setting. Be sure discharge pressure gages functions correctly</li> <li>2) Reduce speed</li> <li>3) Change to larger horsepower or higher service factor motor. Thin fluid.</li> <li>4) Check wiring diagram</li> <li>5) Inspect and corr</li> </ol>
<b>Seal leaks</b>	<ol style="list-style-type: none"> <li>1) Dry running</li> <li>2) Solids in fluid</li> <li>3) Damaged during field replacement</li> <li>4) Seal material incompatible with fluid</li> </ol>	<ol style="list-style-type: none"> <li>1) Open valves. Prime pump</li> <li>2) Add suction strainer</li> <li>3) Inspect and replace damaged components</li> <li>4) Verify original application conditions. Consult factory</li> </ol>

Teflon® is a registered trademark of DuPont, an equivalent fluoropolymer may be used.  
 Ryton® is a registered trademark of Chevron Phillips Chemical, an equivalent polyphenylenesulfide may be used.  
 PEEK® is a registered trademark of Victrex, an equivalent polyetheretherketone may be used.  
 Grafoil® is a trademark of UCAR Carbon Technology, an equivalent may be used.  
 Loctite® is a trademark of Henkel Company.



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Detailed mechanical seal inspection and replacement instructions are included in Oberdorfer's Chemsteel® Gear Pump Inspection and Repair Manual.

**Lip Seals**

Pumps equipped with lip seals are of the metal cased, Teflon® backed, single Viton® lip style. These are intended to provide minimum friction drag with positive sealing, and again, should be maintenance free provided the same conditions for mechanical seals are met as well as:

- 6) Avoid scouring of the shaft in the lip seal area due to contaminated abrasives
- 7) Avoid excessive seal lip contact pressure on the pump shaft due to excessive pump pressure.

These are readily replaceable by removing retaining rings, pressing out the old seals, pressing in new replacement seals, while re-installing retaining rings.

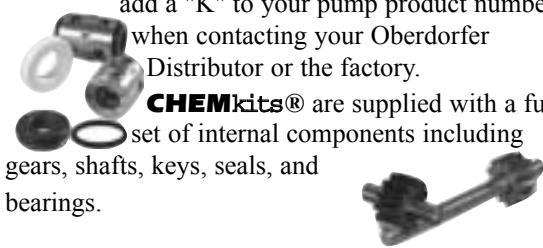
**Packing**

Pumps equipped with Teflon®, Grafoil®, or Teflon® with graphite packing require periodic adjustment as described above in the Startup section to avoid excessive leakage. Eventually all the packing in the pump will become deteriorated and will have to be replaced.

**Recommended Spares or CHEMkits®**

Repair kits are available for all Oberdorfer Chemsteel® Gear Pumps. For the proper kit, simply add a "K" to your pump product number when contacting your Oberdorfer Distributor or the factory.

CHEMkits® are supplied with a full set of internal components including gears, shafts, keys, seals, and bearings.



**OBERDORFER PUMPS LIMITED WARRANTY**

For a period of 12 months from date of shipment, Oberdorfer Pumps, Inc. warrants all of their pumps to be free from defects in material and workmanship when used in a service for which the product was designed. If any pump or part is proved to be defective in workmanship or material on examination in our factory, and is forwarded to our factory by prepaid carrier, it will be repaired or replaced (at the factory's option) and returned to the customer f.o.b. destination.

Oberdorfer Pumps, Inc. assumes no liability for pumps that have been altered or tampered with in any way. No pump shall be returned to the factory for warranty service or credit without prior arrangement with the factory and the assignment of a return goods authorization number.

This warranty is not to be construed that our product shall be deemed fit or suited for all or any particular service. Our pumps are not designed or intended for use with every known substance. If you require assurance or satisfactory pump service life, you are urged to discuss your proposed usage with the company.

Equipment and accessories (motors, controls, etc.) not manufactured by Oberdorfer Pumps, Inc are warranted only to the extent of the original manufacturer's warranty.

Oberdorfer Pumps, Inc assumes no responsibility for consequential damages arising from the operating failure of the equipment for any reason whatsoever. The company will assume no liability for service calls or expenses incurred in the installation or removal of defective equipment and replacements.



**Chemsteel® Sealed Rotary Gear Pumps**

**Installation, Operation and Maintenance Instructions**

**Introduction**

Congratulations for choosing an Oberdorfer Chemsteel® pump, the Industry Standard for quality since 1890.

**Construction**

Chemsteel® metal pump housings are made of top quality investment cast 316 Stainless Steel or Alloy C. Non-metallic pump housings are constructed from injection molded Ryton® PPS or PEEK®. Shafts are Stainless Steel, Alloy C or Alloy B. Pumps are available with carbon-graphite bearings or with Teflon® bearings. No bearing lubrication is required. Dynamic seal arrangements include packing, lip, or mechanical seals for a variety of application requirements. Static cover o-ring seals eliminate gasket problems.

**Application Range**

Chemsteel® Rotary Gear pumps are of the external gear positive displacement type, displacing a finite volume of fluid with each shaft revolution. As such, capacity varies in direct proportion to pump speed. They are suited to handle clear lubricating and non-lubricating fluids at temperatures to 450°F. These pumps handle viscous fluids to 100,000 cps (462,000 SSU) at reduced shaft speeds, with flow rates to 60 GPM ( 227 LPM), differential pressures to 150 psig (10.3 BAR), and suction lift capability to 20 feet (6.1 meters) for new pumps.

**Field Inspection**

Chemsteel® Rotary Gear pumps may be readily inspected in the field usually without removal from the drive or system plumbing. Simply remove the cover nuts (or cap screws) to pull the rear cover. Before attempting an inspection, follow safety precautions and be sure to read and understand this manual.

**New Pump Receipt Inspection**

Upon receipt, check for obvious shipping damage and completeness to purchase order requirements. Shortages or damage should be reported immediately to the carrier and to your Oberdorfer distributor. Occasionally during shipment, possible misalignment or other damage including cracked mechanical seal faces can occur. As such, customers are advised to test the pump with water in a convenient location prior to installing into the intended system.

**Storage**

If the pump is to be stored prior to installation, it is recommended that it be left in the original shipping carton with all shipping plugs in place and stored in a dry environment avoiding temperature variations. Contact the motor manufacturer for specific motor storage information.

**Records**

These instructions should be kept in a convenient location for ready reference. The manual should be read carefully by persons responsible for installation, operation, and maintenance of the equipment. For ease of reference, a copy of the order should be kept with the manual. Write down the pump model number as shown on the pump name tag, and the date the unit was placed into service.

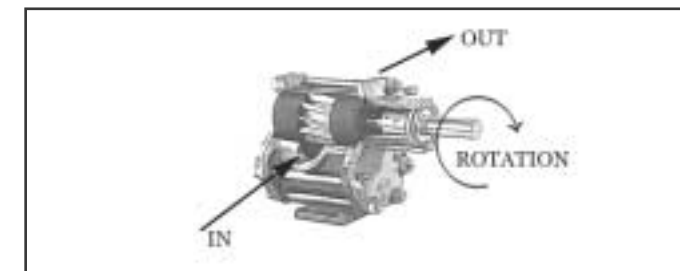
**Installation**

**Site Preparation**

Choose a site that allows easy access to the pump for maintenance. Consider protection from the elements. Guard against drips and spray from nearby equipment. Choose a solid foundation for mounting. If noise is a concern, consider a rubber pad under the pump base to dampen.

**Flow Direction**

Chemsteel® pumps will perform equally well in either direction. To change flow direction effectively reversing the suction and discharge ports, simply switch driver rotation by following motor wiring diagram instructions. Most pump motor units are factory supplied with clockwise shaft rotation (when viewing the pump from the shaft end).



**Suction Plumbing**

Suction side plumbing considerations are key to desirable pump performance. Minimize head loss by assuring sufficient pipe size (especially important for highly viscous services). Generally the same size pipe as the pump ports is adequate. For long runs (beyond 3 feet) or viscous fluids, use one or two pipe sizes larger. Strive to keep the lines as short and straight as possible. If flexible lines are used, they should be selected to prevent wall collapse. To keep the pump from being starved or running dry, be sure there is sufficient fluid supply. A flooded suction is generally preferred. Suction lifts over 3 vertical feet and long horizontal runs (beyond 3 lineal feet) require a foot or

check valve below the level of the liquid being pumped. When taking suction from a tank or vessel, position the inlet above the maximum expected level of solids. Use full-bore ball valves or gate valves to minimize restriction. Suction strainers should be properly sized to minimize pressure drop and positioned for easy cleaning access. If start-up screens are used, be sure they are removed prior to placing the system into regular operation. Orient lines so as to prevent formation of air pockets. Be sure all joints are tight. Flush out all suction lines prior to installing the pump.

### General Piping

For further ease of maintenance, use union fittings to connect the pump to the system. Install a discharge priming tee for convenience. Do not spring the piping to connect the pump. Use piping supports or hangers as required. When necessary, provide for thermal expansion and contraction to avoid placing strain on the pump. Be sure that connecting pipe male tapered threads are not undersize. Properly sized pipe threads will tighten adequately and (with proper thread sealant) will seal properly without risk of contacting the gears and interfering with pump performance. For non-metallic pumps, plastic threads require finger tight connections & joint sealing compound such as Loctite® Pipe Sealant with Teflon® or equivalent. Over tightening will cause cracks.

### Alignment

Proper alignment is key to all variations of seals and packing as well as bearing performance. Improper alignment can lead to premature pump failure. Check the alignment carefully between the pump and the drive.

### Belt Drive

Ensure that the pump and motor shafts are parallel and in line. Be sure that the belt tension is adequate (per the belt manufacturer's recommendation) but do not overtighten. For heavy pulley loads, external ball bearing supports should be incorporated. A single ½" (A or 4L section) V-belt is satisfactory for drive speeds up to 1 HP 3450 RPM. For larger drive sizes, double-V belts are recommended. Install guards around all moving parts in accordance with OSHA to prevent personal injury.

### Pressure Relief

Discharge lines should be fitted with properly sized line pressure relief valves to protect both the pump and the system. The relief outlet should be piped back to the suction vessel. Relief valves are available through your Oberdorfer representative.

### Fasteners

Unless the pump has been shipped directly from the factory, it is recommended to check all bolts and nuts for tightness to eliminate possible leakage problems or destructive vibration. Chemsteel® pump housing fasteners are factory installed to the following torque specifications: (top of page)

Pump	Bolt Thread	Bolt / Nut Head	Torque
Metal - Series S1	M6	10 mm hex	45 in-lbs
Metal - Series S2	M6	10 mm hex	45 in-lbs
Metal - Series S4	M8	13 mm hex	85 in-lbs
Metal - Series S9	M8	13 mm hex	85 in-lbs
Non-Metallic - Series S2	M6	5 mm hex socket	25 in-lbs
Non-Metallic - Series S9	M8	6 mm hex socket	35 in-lbs

### Flow By-Pass

When a flow by-pass system is used to control output from the pump, the bypassed fluid should be directed back to the suction vessel to avoid recirculation heat build-up. In cases where this is not possible, connect to the suction at least 10 pipe diameters length away from the pump inlet. Provisions for cooling should be made in the event of recirculation heat build-up.

### Pump Driver Mounting

Adapter kits (including faceplate, bracket, coupling components, and hardware) are available for the full line of Chemsteel® Gear pumps allowing Close Coupled connectivity to NEMA and IEC motor frames. Assembly instructions are included with each kit. Base mount kits (including baseplate, coupling components, coupling guard, and hardware) are also available for all Chemsteel® Gear pumps. Contact your Oberdorfer representative for additional information.

### Seals

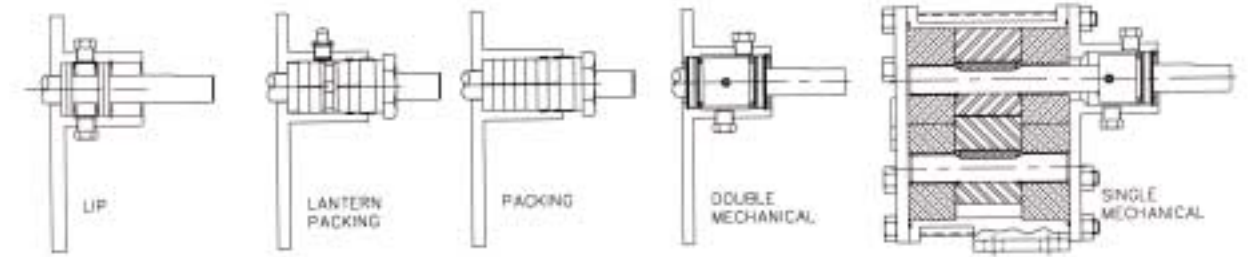
**Packing:** For proper operation, the packing area must be cooled and lubricated. Where packing lubricant is required, use it. Recommended lubricants include:

Service	Lubricant	Typical Source
Solvents	Soap-free grease	Keystone 5P9
Acids/Alkalies	Fluorocarbon grease	Halocarbon 25/20M
High Temperatures	Silicone/Carbon/Graphite	Dow Corning 41

Where pump is equipped with lantern ring and recirculating flush, check for proper piping from pump discharge to lantern ring nipple. Where thorough flush of lantern ring packing area is intended, check flush stream piping.

## !! WARNING !!

Follow National Electrical Code. Verify that electrical service is properly grounded, fused, and adequately sized for motor nameplate requirements. Check to be sure that motor wiring connections are correct referring to the wiring diagram on the motor nameplate or inside the terminal box.



**Lip:** Pumps supplied with two lip seals and flush chamber arrangement come factory supplied with a small amount of lubricant applied to the outer lip seal. The design is intended to be used with an externally supplied flush fluid. Remove the pipe plugs and install "in" and "out" connections to the flush source. Failure to supply flush fluid will lead to outer lip seal breakdown.

**Mechanical Seals:** (see above) Two types are offered as standard: single internal (in both the wedge and bellows styles) and double mechanical seals (in both the wedge and bellows styles). Both require cooling and lubrication to perform properly. Do not run pump dry. Ensure that the seal surfaces are wet prior to start-up and operation. If a seal flush system is to be used, make sure the system is connected to the cover ports correctly. Keep abrasives out of the seal area. Dirty flush streams can destroy seal faces.

### Operation

#### Pre-Startup

Prior to start-up, recheck installation as described above. Verify desired rotation by jogging the motor and make corrections if necessary. Before initial startup, pre-wet the gears and seal, make sure the pump is adequately primed. Failure to do so could cause immediate damage to pump components. Make sure that discharge valves are open.

#### Startup

Start pump and check for proper operation.

**Packing Styles:** Adjust packing as necessary, allowing adequate time to run in. Do not overtighten the packing nut, else damage to the packing and the shaft can occur. A properly packed and adjusted packing nut will leak at about 10 drops every 3 to 5 minutes. If a packing nut runs hot, it is generally a sign that the packing is too tight.

**Lip Styles:** No adjustment is necessary during operation. For two lip arrangements, insure that flush fluid continues to be supplied to the chamber.

**Single Mechanical Seals:** No seal adjustment is necessary. Check mechanical seal flush arrangements where used.

**Double Mechanical Seals:** Pressurized flush must be in operation at an inlet pressure of 10 to 15 psi above

## !! WARNING !!

Dry running leads to immediate damage to pump components. Due to tight running clearances, liquids containing solids and abrasives will accelerate pump wear. When possible, flush the pump after each usage. Allowing liquid to freeze in the pump can cause damage.

intended pump discharge pressure prior to and when operating the pump. Flush must continue when pump is stopped until pump pressure is reduced to within 20 psi of double seal chamber pressure.

If the pump's bearing areas or seal area runs hot, shut the pump down and determine the cause. It is recommended that the line mounted pressure relief setting should be set at 5 psig above the operating pressure in the discharge line. If start-up screens were used, be sure they are removed prior to placing the system into regular operation. Depending on suction conditions, it may be necessary to reprime the pump for subsequent restarts.

## CAUTION

Before attempting to service the pump: Disconnect motor power and release all pressure within the system. Flush the pump thoroughly with a neutralizing fluid before attempting to disassemble. Wear appropriate personal protection equipment and handle the pump with care.

### Maintenance

#### Frequency

Since each installation differs, the frequency and extent of pump maintenance is best established based upon past performance. Keeping detailed maintenance records of past performance aids in determining future preventative maintenance intervals. During routine operating inspections, pay particular attention to seal and bearing areas of the pump. Consult the motor manufacturer for motor maintenance instructions.

#### Changing Applications

Verify that all wetted parts of the pump are compatible with the new fluid to be handled and that the motor is adequately sized. Check with your Oberdorfer distributor if in doubt.

#### Inspect for Wear

If your Chemsteel® Gear Pump exhibits reduced flow, an inability to maintain pressure, is noisy or performs otherwise abnormally, first refer to the Troubleshooting Matrix on page 4. If the problem persists, the pump should be inspected for wear or damage. Oberdorfer Chemsteel® Gear pump internals may be readily inspected in the field usually without removal from the drive or system plumbing.