

### Inspect for Wear

If your Oberdorfer Centrifugal Pump exhibits reduced flow, an inability to maintain pressure, is noisy or performs otherwise abnormally, first refer to the Troubleshooting Matrix below. If the problem persists, the pump should be inspected for wear or damage. Oberdorfer Centrifugal pumps may be readily inspected in the field. In many cases, this can be accomplished without removal from the system plumbing by way of a back pull-out design. Simply remove the body screws, leaving the body with the system piping. Before attempting an inspection, follow safety precautions. Full pump removal and complete disassembly may be needed for a comprehensive inspection.

### Bearings

No lubrication is required on pump. For motor lubrication, refer to and follow motor manufacturer's instruction.

### 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
- Detailed instructions are included in the "Centrifugal Pumps: Seal Replacement Instructions" document.

### Lip Seals

Model 170M pumps, equipped with lip seals are of the metal cased, spring energized, single 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

These are readily replaceable by pressing out the old seals and pressing in new replacement seals.

### Seasonal Service

To **REMOVE** pump from service, remove all drain plugs and drain all piping.

To **RETURN** pump to service, replace all drain plugs using an appropriate thread sealant. Reconnect suction line if removed, examine union and repair if necessary. Reprime and operate pump following all instructions and warnings in the "OPERATION" section of manual.

### Recommended Spares

Repair kits are available for all Oberdorfer Centrifugal Pumps. For the proper kit, refer to the cut sheet literature for your specific product. For further support, contact your Oberdorfer Distributor or the factory. Kits are supplied with a full set of internal components including impellers, seals, gaskets, shafts and bearings.



# OBERDORFER PUMPS

A Subsidiary of Thomas Industries Inc.

## Bronze or Aluminum Centrifugal Pumps Installation, Operation, and Maintenance Instructions

CLOSE COUPLED/PEDESTAL MOUNT/STANDARD CENTRIFUGAL SELF PRIMING CENTRIFUGAL

### INTRODUCTION

*Congratulations for choosing an Oberdorfer Centrifugal pump, the Industry Standard for quality since 1890.*

### Design

Oberdorfer Centrifugal pumps are of the single stage, end suction, overhung type. Models use open vane style and enclosed style impellers. Centrifugals convert driver energy to kinetic energy in a liquid by accelerating it to the outer rim of a revolving impeller. Since the amount of energy given to the liquid corresponds to the velocity at the impeller's vane tip, the faster the impeller revolves (or the bigger the impeller is), the higher the velocity of the liquid at the vane tip and the greater the energy imparted to the liquid. In comparison to positive displacement devices, centrifugals are quieter and require no relief valve to protect the pumps from pressure build-up.

### Construction

**Housings:** Oberdorfer Pumps metal pump housings are made of top quality rugged cast bronze or light weight corrosion resistant cast aluminum. Shafts are corrosion resistant stainless steel or monel.

**Bearings:** Pedestal Pumps use heavy duty "lubricated for life" ball bearings suitable for pulley loads. Most of the Close Coupled pumps are designed to fit jet pump C-faced motors; relying on the motor bearings to support pump loads.

**Seals:** Conventional mechanical shaft seals with carbon and ceramic faces are used. A variety of elastomers and seal styles are available. Model 170M uses a lip seal instead. Static housing sealing is accomplished with elastomeric o-ring seals or cellulose gaskets.

### Application Range

Centrifugals are well suited for thin fluids and normally run at 3450 RPM speed. Because these units have large internal clearances, they can handle small impurities in the fluid. Bronze centrifugals can pump a variety of common fluids in the PH range from 4-11 and are particularly well suited for non-potable water or sea water service. The temperature limit for units equipped with buna seals is 212oF. Solvent handling and higher temperatures are possible with viton or teflon seals. Centrifugals are not well suited for viscous fluids; becoming less efficient with increased viscosities. The product portfolio of over 28 models spans a hydraulic coverage range from 2.2 GPM to 100 GPM with pressures to 58 psi (135 feet).

**WARNING:** These units are not designed for use with hazardous liquids or flammable gases.

**!** Standard centrifugals are not self-priming. They should be installed below the liquid level to allow fluid to flow to the inlet by gravity (flooded suction).

Self-Priming centrifugals must be manually primed once at initial start-up. On subsequent starts, the pump will automatically prime itself and develop lifting capability. See model specific product literature for information regarding suction lifts.

### Field Inspection

Oberdorfer Centrifugal pumps may be readily inspected in the field. In many cases, this can be accomplished without removal from the system plumbing by way of a back pull-out design. Simply remove the body screws, leaving the body with the system piping. 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, 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 nametag, 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.

**!** **WARNING:** Splashing or immersing open drip proof motors in fluid can cause fire, shock, burns or death.

#### Wiring and Grounding


**!** **SAFETY ALERT:** Install, ground and wire according to local and National Electrical Code Requirements.

## TROUBLESHOOTING MATRIX

| Difficulty                 | Probable Cause              | Remedy                                           |
|----------------------------|-----------------------------|--------------------------------------------------|
| <b>No Liquid Delivery</b>  | Closed Valves               | Open Valves                                      |
|                            | Plugged Suction             | Eliminate Restriction                            |
|                            | Air Leak at Suction         | Locate and Repair Leak                           |
|                            | Suction Lift too high       | Do not exceed vapor pressure of liquid           |
|                            | Motor wired incorrectly     | Check wiring diagram                             |
|                            | Wrong rotation              | Correct rotation                                 |
|                            | Vapor Lock                  | Purge trapped air                                |
| <b>Low Liquid Delivery</b> | Pump Shaft speed incorrect  | Check Driver speed, motor wiring, pulley tension |
|                            | Discharge Pressure too high | Reduce downstream pressure                       |
|                            | Air Leak at Suction         | Locate and Repair Leak                           |
|                            | Worn or damaged pump        | Inspect and repair as required                   |
|                            | Low viscosity               | Verify original application conditions           |
|                            | Suction Lift too high       | Reduce suction lift                              |
|                            | Foot valve too small        | Increase size                                    |
|                            | Wrong direction of rotation | Inspect for damage, correct rotation             |


| Difficulty                         | Probable Cause                        | Remedy                                                                                     |
|------------------------------------|---------------------------------------|--------------------------------------------------------------------------------------------|
| <b>Gradually Loses Prime</b>       | Suction Lift too high                 | Improve suction pressure                                                                   |
|                                    | Air or gas in fluid                   | Eliminate air or gas from fluid                                                            |
|                                    | Air Leak at Suction                   | Locate and Repair Leak                                                                     |
|                                    | Worn or damaged pump                  | Inspect and repair as required                                                             |
| <b>Noisy</b>                       | Cavitating                            | Improve system suction pressure, provide adequate NPSH                                     |
|                                    | Solid particles in fluid              | Install suction strainer. Clean suction strainer                                           |
|                                    | Air or gas in fluid                   | Eliminate air or gas from fluid                                                            |
|                                    | Worn or damaged pump                  | Inspect and repair as required                                                             |
|                                    | Pump, motor or piping loose           | Tighten with care for alignment and piping stress                                          |
| <b>Motor Runs Hot or Overloads</b> | Incorrectly sized motor               | Check performance curve and published power requirements against actual system conditions. |
|                                    | Shaft speed too fast                  | Reduce speed                                                                               |
|                                    | Fluid viscosity higher than expected  | Change to larger horsepower or higher service factor motor. Thin fluid.                    |
|                                    | Incorrectly wired motor               | Check wiring diagram                                                                       |
|                                    | Binding internal pump parts           | Inspect and correct condition                                                              |
|                                    | Motors normally feel hot              | Verify actual motor amperage draw is within rating                                         |
|                                    |                                       | Dry running                                                                                |
| <b>Seal Leaks</b>                  | Abrasive solids in fluid              | Add suction strainer                                                                       |
|                                    | Damaged during field replacement      | Inspect and replace damaged components                                                     |
|                                    | Seal material incompatible with fluid | Verify original application conditions. Consult factory                                    |

Install an all leg disconnect switch near the pump. Disconnect and lockout electrical power before installing or servicing the pump. Electrical supply MUST match nameplate specifications. Incorrect voltage can cause fire, damage to the motor. Motors not protected MUST be provided with contactors and thermal overloads for single phase motors, or starters with heaters for three phase motors. See motor name plate. Use only copper wire to motor and ground. The ground wire MUST be at least as large as the wire to the motor. Wires should be color coded for ease of maintenance. Carefully follow motor manufacturer's wiring diagram (usually located on the motor nameplate or terminal cover).

 **WARNING:** Failure to permanently ground the pump, motor and controls before connecting to electrical power can cause shock, burns or death.

#### **Flow Direction and Shaft Rotation**

Oberdorfer Centrifugal pumps are unidirectional; fluid moves from the end suction inlet port to the tangential discharge outlet port. Impellers are intended to spin in only one rotation direction as indicated by the rotation arrow located on the pump body.

 **WARNING:** Incorrect rotation can cause pump damage.

Prior to supplying liquids to the pump, check shaft rotation by momentarily energizing or bumping the motor (for no more than a few seconds). Some motors have a removable end cap or plug. To reverse three-phase motor rotation, interchange any two power supply leads.

#### **Pump Orientation**

**Standard Centrifugal-** Pumps can function horizontally, vertically, or inclined provided there is adequate fluid supplied to the pump inlet and ultimately, the eye of the impeller. For vertical mounting, do not install with pump above motor. Relative to the motor base, the casing/body discharge can be oriented to any of the multiple positions possible given the symmetry of the bolting pattern.

**Self-Primers** - Pumps must be operated with shaft in the horizontal position and the discharge facing upwards. A slight incline of no more than 15% can be tolerated.

#### **Suction Plumbing**

Suction side plumbing considerations are key to desirable pump performance, providing protection against cavitation and other problems. Minimize head loss by assuring sufficient pipe size. Generally the same size pipe as the pump ports is adequate. For long runs (beyond 3 feet) 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. For Standard Centrifugals, a flooded suction is generally preferred. When taking suction from a tank or vessel, it is usually recommended to 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 (key to avoiding vapor locking the pump). Be sure all joints are tight (allowing air to enter can lead to a loss of prime). Flush out all suction lines prior to installing the pump.

#### **SELF PRIMERS**

**Standard Centrifugals** (If flooded suction cannot be attained)

Use a foot valve only if necessary for priming or to hold prime during intermittent duty. To avoid air pockets, no part of the piping should be above the pump suction connection. Slope the piping upward from liquid source. Suction strainers must be at least three times the suction pipe diameter area.

#### **Discharge Plumbing**

To control and throttle pump discharge, it is advisable to install an adjustable valve in the discharge line close to the pump. To monitor the head that the pump is working against, install a pressure gage also. The gage should be located between the pump and the adjustable valve. Installing a check valve in the discharge line may be desirable to prevent backflow during maintenance or pump idle time. To further reduce the head that the pump is working against, and to increase flow rate design the downstream system piping to minimize friction losses and unnecessary rises in elevation.

#### **General Piping**

Hard piping must not be connected to the pump until the pump unit hold down bolts have been tightened.

For further ease of maintenance, use union fittings to connect the pump to the system. If the pump is installed below the liquid source, install a gate valve in the suction for pump inspection and maintenance.

**NOTICE:** Do not use a suction side gate valve to throttle pump. This may cause loss of prime, excessive temperatures and damage to pump.

For models where a priming port is not already provided, install a 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.

**NOTICE:** Do not force piping into place at pump suction and discharge connections.

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 impeller and interfering with pump performance.

#### **Alignment**

Proper alignment between pump shaft and motor shaft is key to the performance of shaft seals and bearings. Improper alignment can lead to premature pump failure.

**Pedestal style** - inline shaft to shaft spacing is dependent upon the coupling being used. Check the alignment carefully between the pump and the drive. A number of techniques are acceptable provided: parallel alignment is achieved at 0.005" TIR or less and angular alignment is achieved at 0.005" TIR or less. If realignment is necessary, always


move the motor. Shim as required.

**NOTICE:** Always recheck both alignments after making any mechanical adjustments.

Close coupled style- pump adapters provide the required alignment to C-faced motors.

#### **Belt Driven Pedestal Pumps**

Ensure that the pump and motor shafts are parallel and in line within 1/8". Be sure that the belt tension is adequate (per the belt manufacturer's recommendation) but do not overtighten. Use belt tension gage if necessary. Strive to achieve 50% belt wrap on pulley (20 to 30 % is inadequate). A single 1/2" (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.

 **WARNING:** Do not operate pedestal pumps without safety guards in place or severe personal injury may result. Install guards around all moving parts in accordance with OSHA to prevent personal injury.

#### **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.

#### **Pump Driver Mounting**

**Close Coupled Pump Heads** - (purchased without factory installed motors). Follow the disassembly / re-assembly instructions specific to the pump model.

**Impeller Shimming** - Since jet pump motor shaft projections can vary, pump heads are provided with impeller shim kits. In general, an air gap of 0.010 to 0.015 is recommended between the rear shroud of the impeller and the motor adapter face. Once the pump casing is mounted, check to be sure that the impeller is not rubbing against the casing. Adjust shimming as needed. **Pedestal Pumps** - Some base mount kits designed for use with Oberdorfer Bronze Gear Pumps, may also be adaptable for use with Oberdorfer Pedestal Centrifugal pumps. These kits include baseplate, coupling components, coupling guard, and hardware. Contact your Oberdorfer representative for additional information. See "Alignment" above for more information.

#### **Seals**

**Lip:** Model 170M Pumps are supplied with spring energized buna lip seals. These require cooling and lubrication to perform properly. Do not run pump dry. Ensure that the lip/shaft surface is wet prior to start-up and operation. Keep abrasives out of the seal area.

**Mechanical Seals:** Models other than 170M use standard single internal bellows or wedge type seals. These 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. Keep abrasives out of the seal area.

#### OPERATION

##### **Pre-Startup**

Prior to start-up, recheck installation as described above. If not already performed previously, verify desired rotation by jogging the motor and make corrections if necessary. Priming: Completely fill the suction lines and pump body with liquid. (Some models such as self-primers are conveniently equipped with an FNPT priming port). Close the discharge valve.


#### **Startup**


Start pump and begin opening the discharge valve as the motor ramps up to its full speed. If the pump does not build up pressure and generate flow, or if the system pressure is surging, or prolonged pressure drop is experienced, the system may not be completely primed. Shut down and reprime pump.


**NOTICE:** If pump is drained or shut off during priming period, ensure casing is refilled before restarting pump.


**Lip Styles:** No adjustment is necessary during operation.

**Single Mechanical Seals:** No seal adjustment is necessary.

 **Warning:** Continued operation at or near zero flow due to loss of prime can cause extreme heat, personal injury or property damage.

 **Warning:** Do not run pump dry or seal damage will result.


 **Warning:** Abrasives will accelerate pump wear. It is advisable to flush the pump after each usage when pumping fluids containing known particles or when pumping fluids that can precipitate particles.


 **WARNING:** Allowing liquid to freeze in the pump can cause damage.

#### 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.

 **Warning:** Before attempting to service the pump: Disconnect motor power and release all pressure within the system. Failure to disconnect and lockout electrical power before attempting any maintenance can cause severe personal injury.

 **Warning:** Failure to relieve system pressure and drain system before attempting any maintenance can cause property damage, personal injury or death. Flush the pump thoroughly with a neutralizing fluid before attempting to disassemble. Wear appropriate personal protection equipment and handle the equipment with care.

##### **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.