



MODEL Kpro

Installation, Operation, Maintenance and Storage Manual



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FOREWORD

This manual provides instructions for the installation, operation, maintenance and storage of the Wilfley Model Kpro Standard Pump. This manual covers the standard product plus common options that are available. For special options, supplemental instructions are supplied. This manual must be read and understood before installation and start-up.

The design, materials, and workmanship incorporated in the construction of Wilfley pumps makes them capable of giving trouble-free service if properly applied and maintained. The life and satisfactory service of any mechanical unit is enhanced and extended by correct application, proper installation, periodic inspection, condition monitoring and careful maintenance. This instruction manual was prepared to assist operators in understanding the construction and the correct methods of installing, operating, maintaining and storing these pumps.

Wilfley shall not be liable for damage or delays caused by a failure to observe the instructions for installation, operation, maintenance and storage contained in this manual.

Warranty is valid only when genuine Wilfley parts are used. Contact your local Wilfley representative for basic warranty information and before making any changes.

Use of the equipment on a service other than stated in the order could nullify the warranty, unless written approval is obtained in advance from A.R. Wilfley and Sons, Inc.

To assure proper installation, supervision from an authorized manufacturer's representative is recommended.

Additional manuals can be obtained by contacting your local Wilfley representative.

THIS MANUAL EXPLAINS

- Proper Storage
- Proper Installation
- Start-up Procedures
- Operating Procedures
- Preventive Maintenance
- Pump Overhaul
- Trouble Shooting
- Ordering Spares or Repair Parts



1.0 INTRODUCTION

This manual contains instructions and guidelines for the installation, operation, maintenance and storage of the Wilfley Kpro Standard Pump.

There are many factors affecting the successful installation, operation and maintenance of a pump. From one pump to the next, there is typically significant variation in these factors. This makes it impossible to create a bulletin that covers all situations.

Therefore, the information contained herein is meant to serve only as a general guideline. If detailed questions or problems arise, contact the Wilfley Sales Office or Distributor/Representative.

It is extremely important that this entire manual be read prior to installation or start-up of the pump.

This is important for safety, for proper performance of the pump and for maximum Mean Time between Planned Maintenance (MTBPM).

2.0 SAFETY

Like all machinery, centrifugal pumps can be dangerous if used improperly. Any of the following misuses may result in a pump that does not function properly. A pump that does not function properly may be a hazard and could cause damage or injury.

For maximum safety and reliability, use only factory-supplied parts and closely follow all maintenance and operating recommendations and instructions.

Do not change the pumping conditions or installation of a Wilfley pump without consulting A.R. Wilfley & Sons, Inc. first to ascertain if the pump is capable of handling the new conditions and/or fluid. It is not possible to list all the conceivable misuses. Therefore, the following list is not meant to be complete and is provided only as a guide of the types of misuse that can damage a pump and cause injury. The list will also give a good idea of the kinds of misuses that will void any and all warranties.

1. Do not run a pump with the discharge valve closed.
2. Do not run a pump in the reverse direction.

3. Do not start a pump that is "wind-milling" in the reverse direction due to fluid flowing back down the discharge pipe.
4. Do not continue to operate a pump when there are indications that something is rubbing, binding or knocking.
5. Do not continue to run a pump that gives an indication of overheating.
6. Do not operate a pump with the coupling guard removed. Make sure the guard fits snugly around the coupling so there are no openings.
7. Do not operate a pump if the governor weights are of different sizes.
8. Do not operate a pump that is vibrating, surging or making abnormal noise.
9. Do not work on a pump unless the drive system is locked out and the pump is disconnected from the drive system.
10. Do not connect the pump to the drive system without first checking to see that the drive system is running in the correct direction.
11. Do not rely on the factory's alignment of the pump and the drive system. Alignment may have changed during shipment.
12. Do not change the pumping conditions or installation of a Wilfley pump without consulting A.R. Wilfley & Sons, Inc. first to ascertain if the pump is capable of handling the new conditions and/or fluid.
13. Do not put a cold liquid in or on a hot pump or a hot liquid in or on a cold pump.
14. Do not hit a pump with any object.
15. Do not use worn or faulty parts.
16. Do not stick hands, arms, legs or any other object into the discharge, suction or any other opening of a pump.
17. Do not weld attachments to the pump.
18. Do not apply external heat to the pump.
19. Do not lift the pump by its case only.



20. Do not examine a pump without using proper eye and face protection.
21. Some materials deteriorate with time. If your pump has been out of service for more than 3 months, please contact A.R. Wilfley & Sons, Inc. for information concerning its suitability for service.

The Wilfley Kpro pump has been designed and manufactured for safe operation. In order to ensure safe operation, it is very important that this manual be read in its entirety prior to installing or operating the pump. Wilfley shall not be liable for physical injury, damage or delays caused by a failure to observe the instructions for installation, operation and maintenance contained in this manual.

Remember that every pump has the potential to be dangerous, because of the following factors:

- Parts are rotating at high speeds.
- High pressures may be present.
- High temperatures may be present.
- Highly corrosive and/or toxic chemicals may be present.

Paying constant attention to safety is always extremely important. However, there are often situations that require special attention. These situations are indicated throughout this book by the following symbols:



DANGER – Immediate hazards that **WILL** result in severe personal injury or death.



WARNING – Hazards or unsafe practices that **COULD** result in severe personal injury or death.



CAUTION – Hazards or unsafe practices that **COULD** result in minor personal injury or product or property damage.

NOTE: ALWAYS COORDINATE REPAIR ACTIVITY WITH OPERATIONS PERSONNEL, AND FOLLOW ALL PLANT SAFETY REQUIREMENTS AND APPLICABLE SAFETY AND HEALTH LAWS/REGULATIONS.

2.1 SAFETY TIPS

Apparel

- Insulated work gloves when handling hot bearings or using bearing heater
- Heavy work gloves when handling parts with sharp edges, especially impellers
- Safety glasses (with side shields) for eye protection, especially in machine shop areas
- Steel-toed shoes for protection when handling parts, heavy tools, etc.
- Other personal protective equipment to protect against hazardous/toxic fluids

Maintenance

- Always lockout / tag out power.
- Ensure pump is isolated from the system and pressure is relieved before disassembling pump, removing plugs or disconnecting piping.
- Use proper lifting and supporting equipment to prevent serious injury.
- Observe proper decontamination procedures.
- Know and follow company safety regulations.
- Never apply heat to remove impeller.
- Observe all cautions and warnings highlighted in the pump instruction manual.



3.0 GENERAL INFORMATION

3.1 STORAGE REQUIREMENTS

If the pump is inoperative for a long period of time, it is recommended that the pump be flushed and thoroughly dried to minimize corrosion. It is also advisable to drain the lines and case if there is a possibility of freezing. If the pump is to be stored for more than 15 days, the pump should be rotated once a week to lubricate and to prevent rusting of the bearings.

Long-Term Storage

The following guidelines should be followed when the pump or parts will be idle for a period of one month or more.

Pump Storage

1. All machined metal surfaces should be coated with a suitable corrosion inhibitor to ensure the integrity of these surfaces at the time of installation.
2. All openings must be covered with suitable covers to protect against contaminants.
3. Storage of the Components and Assemblies should be kept away from all potential vibration sources (i.e. motors, rotating pumps, engines, etc.). This is to prevent unwanted vibration and possible brinelling of the bearings.
4. Components and assemblies are required to be stored indoors in a dry location. Temperature range should be between 40 degrees and 100 degrees Fahrenheit. If the environment is excessively humid (more than 70%), a suitable desiccant should be used.
5. Pump shafts are required to be rotated 5 full revolutions weekly to prevent brinelling.

Parts Storage

Not all parts are packaged in a suitable manner from the factory for long-term storage. To ensure a part's satisfactory performance, the part must be protected from corrosion and contamination.

Motor and Seal Storage

Refer to the manufacturers manuals for storage instructions for these items.

4.0 GENERAL DESCRIPTION OF PUMP FEATURES AND ADVANTAGES

The extra-heavy wall thickness and special volute design extends wear life.

The Wilfley Model Kpro is a horizontally mounted, seal-less (no packing, water glands, or mechanical seals), single-stage, side-intake centrifugal pump designed to handle corrosive and abrasive slurries.

Along with the impeller is an expeller that creates a positive hydraulic seal when the pump is operating, eliminating the need for packing or mechanical seals. A simple governor mechanism (check valve) opens centrifugally and closes under coil spring pressure to prevent leakage at shutdown and eliminate rubbing contact while pump is operating.

The closed-type impeller with extra-thick shrouds and vanes maintains excellent performance characteristics throughout its wear life.

Wetted parts are available in many materials of construction including White Iron, Ni-hard #4, Maxalloy 2, Maxalloy 5, Stainless Steels, and other specialized alloys.

The shaft is made of extra-strength, high-quality steel. Bearing shoulder diameters are ground for precision bearing fits.

Case bolts are extra large so that fewer are required. Each nut is conveniently located for quick disassembly.

An external draw bolt is used to maintain proper clearances and peak pump performance. The intake design allows for removal of the case without disturbing piping, reduces surging controls pre-whirl and can be vented for froth applications.

Convenient top oil fill port with sight glasses on both sides.

The Model Kpro is available in sizes from 1" to 8" discharge and supplied in three types of drives: overhead V-belt, direct driven and horizontal V-belt driven.



The long cylinder has an oil reservoir for bearing lubrication. Bearing bores are ground to precise concentricity for proper bearing alignment.

The frame base is made of cast iron with heavy rib reinforcement to withstand stress.

The intake design allows for removal of the case without disturbing piping, reduces surging controls pre-whirl, and can be vented for froth applications.

Wilfley's unique design with heavy-duty construction, packingless characteristics and quick-change features can save operation dollars. You will realize less downtime for maintenance, no product loss or dilution, and true trouble-free operation, all of which can maximize profits by lowering the cost of labor and operation. In addition, Wilfley provides lifetime engineering service for your pump. Anytime you have operating or maintenance problems or need to change the pump application in any way, Wilfley is ready to help you.

5.0 INSTALLATION

Inspection upon Arrival

Your pump has been carefully inspected prior to shipment to ensure that it meets your requirements. Please inspect the pump upon arrival for any damage that may have occurred during shipment. Report any damage immediately to the carrier.

Leave all shipping covers attached to the pump unit until it is ready for installation. If installation is to be delayed more than 15 days, the pump shaft should be rotated by hand once a week to lubricate the bearings and prevent rusting.

Choosing Pump Location

The following recommendations may be helpful when choosing the best location for your pump:

1. Locate the pump as close to the liquid source as practical so the suction pipe is short and direct with a minimum of elbows, fittings and valves.
2. Place the pump in a location so the unit is accessible for inspection during operation as well as for maintenance operations involving removal and disassembly.

Foundation

The foundation should be sufficient to absorb any vibration and to form a permanent, rigid support for the baseplate. This is important to maintain the correct alignment of the direct connected unit. A concrete foundation on a solid base is satisfactory. Foundation bolts of the proper size should be embedded in the concrete and located as indicated on the outline drawing.

Alignment

The pump and motor are aligned at the factory before shipment. Realignment may be necessary after the complete unit has been leveled on the foundation and after the foundation bolts have been tightened. Procedures for checking and aligning the pump components are in section 4.2 of this manual and may also be found in the Hydraulic Institute Standards.

Piping

Both suction and discharge pipes should be supported independently near the pump so when the flange bolts are tightened no strain will be transmitted to the pump casing. The customer is responsible for proper suction and discharge pipe design and layout to avoid flow induced problems.

Discharge Piping

A valve should be installed in the discharge line to prevent fluid from flowing back through the pump when it is shut down. The valve should block the discharge line during maintenance.

Suction Piping

Care should be taken in sizing and locating suction piping to prevent cavitation. A valve should be installed in the suction line to prevent fluid from flowing into the pump when it is shut down.

Auxiliary Piping – Purge Piping

When required, purge piping is supplied with the pump. An external connection should be made at the pump so purge flow can be varied as required by valving and the pressure can be monitored. Piping fittings and gauges must be corrosion-resistant to the fluid being pumped.



Piping Note

Refer to the Hydraulic Institute Standards for centrifugal pumps for additional piping information.

5.1 BARE PUMP

When a separate baseplate is not used, the pump frame base can be grouted in position. The frame base does not have grout holes. Use leveling wedges to level the frame base allowing for $\frac{3}{4}$ "– $1\frac{1}{2}$ " gap from top of foundation to bottom of frame base. Build a dam around the frame base and pour grout. (Review Section 6.3.3 on grouting.)

5.2 V-BELT DRIVEN (OVERHEAD AND SIDE) INSTALLATION

Motor is bolted onto the overhead base. Then overhead base is laterally adjusted so that the motor sheave and the pump sheave are lined up. The V-belts are tensioned by raising the overhead base vertically up.

Proper alignment tensioning of V-belts and sheaves should be performed per V-belt and sheave manufacturer's recommendations.

5.3 DIRECT DRIVEN

5.3.1 COUPLING INSTALLATION

Couplings should be installed per coupling manufacturer's recommendations.

Note: The pump and motor are aligned at the factory to verify the assembly.

5.3.2 RECOMMENDED PROCEDURE FOR BASEPLATE INSTALLATION AND FINAL FIELD PUMP ALIGNMENT

New Grouted Baseplates

1. The pump foundation should be located as close to the source of the fluid to be pumped as practical. There should be adequate space for workers to install, operate and maintain the pump. The foundation should be sufficient to absorb any vibration and should provide a rigid support for the pump and motor. Recommended mass of a concrete

foundation should be three times that of the pump, motor and base.

2. Level the pump baseplate assembly with the pump and motor on the baseplate. The proper surfaces to reference when leveling the pump baseplate assembly are the pump suction and discharge flanges. **DO NOT** stress the baseplate. Do not bolt the suction or discharge flanges of the pump to the piping until the baseplate foundation is completely installed. If equipped, use leveling jackscrews to level the baseplate. If jackscrews are not provided, shims and wedges should be used. Check for levelness in both the longitudinal and lateral directions. Shims should be placed at all base anchor bolt locations, and in the middle edge of the base if the base is more than five feet long. Do not rely on the bottom of the baseplate to be flat. Standard baseplate bottoms are not machined, and it is not likely that the field-mounting surface is flat.
3. After leveling the baseplate, tighten the anchor bolts. If shims were used, make sure that the baseplate was shimmed near each anchor bolt before tightening. Failure to do this may result in a twist of the baseplate, which could make it impossible to obtain final alignment. Check the level of the baseplate to make sure that tightening the anchor bolts did not disturb the level of the baseplate. If the anchor bolts did change the level, adjust the jackscrews or shims as needed to level the baseplate. Continue adjusting the jackscrews or shims and tightening the anchor bolts until the baseplate is level.
4. Check initial alignment between the pump and driver with a straight edge and correct as needed.
5. Grout the baseplate. A nonshrinking grout should be used. Make sure that the grout fills the area under the baseplate. After the grout has cured, check for voids and repair them. Jackscrews, shims and wedges should be removed from under the baseplate at this time. If they were to be left in place, they could rust, swell and cause distortion in the baseplate.
6. Run piping to the suction and discharge of the pump. There should be no piping loads transmitted to the pump after connection is



made. Recheck the alignment to verify that there are no significant loads.

- 7. Use the following procedure and set up the final alignment between the pump and driver.

Step 8 follows the alignment section.

Alignment Procedure



Before beginning any alignment procedure make sure driver power is locked out.

The points at which alignment is checked and adjusted are:

- **Initial Alignment** is done prior to operation when the pump and the driver are at ambient temperature.
- **Final Alignment** is done after operation when the pump and driver are at operating temperature.

Adding or removing shims under the feet of the motor and pump, and by shifting equipment horizontally as needed, achieves alignment.

NOTE: Proper alignment is the responsibility of the installer and user of the unit, not Wilfley.

Accurate alignment of the equipment must be obtained and sustained. Trouble-free operation can be accomplished by following the proper procedures.

Alignment Checks

Initial Alignment (Cold Alignment)

- Before Grouting Baseplate – To ensure alignment can be obtained.
- After Grouting Baseplate – To ensure no changes have occurred during the grout process.
- After Connecting Piping – To ensure pipe strains haven't altered alignment. If changes have occurred, alter piping to remove pipe strains on pump flanges.

Final Alignment (Hot Alignment)

- After First Run – To obtain correct alignment when both pump and driver are at operating temperature. Thereafter, alignment should be checked periodically in accordance with plant operating procedures.

Alignment Criteria

Good alignment is achieved when the dial indicator readings are specified in the alignment procedure as 002 in (.05 mm) Total Indicated Reading (T.I.R.) or less when the pump and driver are at operating temperature (Final Alignment).

During the installation phase, however, it is necessary to set the parallel alignment in the vertical direction to a different criterion due to differences in expansion rates of the pump and driver. Recommended preliminary (cold) settings for electric motor-driven pumps based on different pumpage temperatures are listed in the following table.

Table 1 – Vertical Cold Settings Values

Pumpage Temp	Set Driver Shaft
50°F (10°C)	0.002 in (.05 mm) LOW
122°F (50°C)	0.001 in (.03 mm) HIGH
302°F (150°C)	0.005 in (.12 mm) HIGH

Dual Dial Indicator Alignment Set-Up

1. Mount two dial indicators on one of the coupling halves *P* so they contact the other coupling half *M*.
2. Check setting of indicators by rotating coupling half *P* to ensure indicators stay in contact with coupling half *M* but do not bottom out. Adjust indicators accordingly.

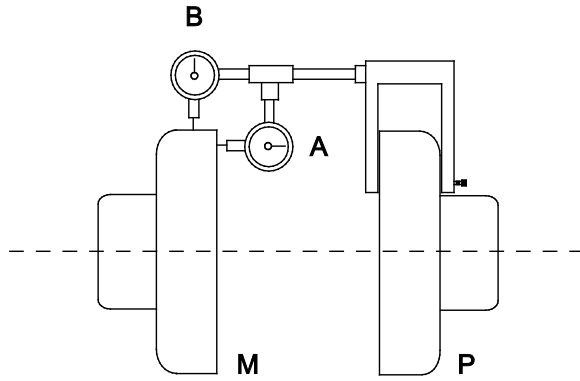


Figure 1 – Alignment – Two-Dial Indicator Method

Measurement

1. To ensure accuracy of indicator readings, always rotate both coupling halves together so indicators contact the same point on coupling half *M*. This will eliminate any measurement problems due to runout on coupling half *M*.
2. Take indicator measurements with driver feet hold-down bolts tightened. Loosen hold-down bolts prior to making alignment corrections.
3. Take care not to damage indicators when moving driver during alignment corrections.

Angular Alignment

A unit is in angular alignment when indicator *A* (Angular Indicator) does not vary by more than .002 in (.05 mm) as measured at four points 90° apart.

Vertical Correction (Top to Bottom)

1. Zero indicator *A* at top dead center (12 o'clock) of coupling half *M*.
2. Rotate indicators to bottom dead center (6 o'clock). Observe needle and record reading.
3. **Negative Reading** – The coupling halves are further apart at the bottom than the top. Correct by either raising the driver feet at the shaft end (add shims) or lowering the driver feet at the other end (remove shims).
Positive Reading – The coupling halves are closer at the bottom than at the top. Correct by either lowering the driver

feet at the shaft end (remove shims) or raising the driver feet at the other end (add shims).

4. Repeat steps 1–3 until indicator *A* reads .002 in (.05 mm) or less.

Horizontal Correction (Side to Side)

1. Zero indicator *A* on the left side of coupling half *M*, 90° from top dead center (9 o'clock).
2. Rotate indicators through top dead center to the right side, 180° from the start (3 o'clock). Observe needle and record reading.
3. **Negative Reading** – The coupling halves are further apart on the right side than the left. Correct by either sliding the shaft end of the driver to the left or the other end to the right.
Positive Reading – The coupling halves are closer together on the right side than the left. Correct by either sliding the shaft end of the driver to the right or the other end to the left.
4. Repeat steps 1–3 until indicator *A* reads .002 in (.05 mm) or less.
5. Re-check both horizontal and vertical readings to ensure adjustment of one did not disrupt the other.

Parallel Alignment

A unit is in parallel alignment when indicator *B* (Parallel Indicator) does not vary by more than .002in (.05mm) as measured at four points 90° apart at operating temperature. Note the preliminary vertical cold setting table for values.

Vertical Correction (Top to Bottom)

1. Zero indicator *B* at top dead center of coupling (12 o'clock) half *M*.
2. Rotate indicator to bottom dead center (6 o'clock). Observe needle and record reading.
3. **Negative Reading** – Coupling half *P* is lower than coupling half *M*. Correct by adding shims of thickness equal to half of the indicator reading under each driver foot.
Positive Reading – Coupling half *P* is higher than coupling half *M*. Correct by

removing shims of thickness equal to half of the indicator reading from each driver foot.

NOTE: Equal amounts of shims must be added to or removed from each driver foot. Otherwise the vertical angular alignment will be affected.

- Repeat steps 1-3 until indicator *B* reads within .002 in (.05 mm) or less when hot, or per the vertical cold setting table values.

Horizontal Correction (Side to Side)

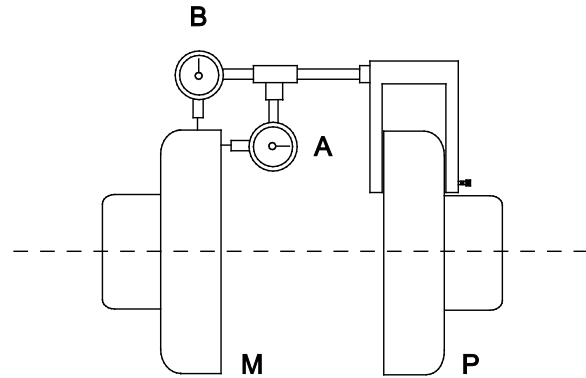
- Zero indicator *B* on the left side of the coupling half *M*, 90° from top dead center (9 o'clock).
- Rotate indicators through top dead center to the right side, 180° from the start (3 o'clock). Observe needle and record reading.
- Negative Reading** – Coupling half *M* is to the left of coupling half *P*. Correct by sliding driver evenly in the appropriate direction.
Positive Reading – Coupling half *M* is to the right of coupling half *P*. Correct by sliding the driver evenly in the appropriate direction.

NOTE: Failure to slide motor evenly will affect horizontal angular correction.

- Repeat steps 1–3 until indicator *B* reads .002 in (.05 mm) or less.
- Re-check both horizontal and vertical readings to ensure adjustment of one did not disrupt the other. Correct as necessary.

Complete Alignment

A unit is in complete alignment when both indicators *A* (angular) and *B* (parallel) do not vary by more than .002 in (.05 mm) as measured at four points 90° apart.



MOTOR END PUMP END
Figure 1 – Alignment – Two-Dial Indicator Method

Vertical Correction (Top to Bottom)

- Zero indicators *A* and *B* at top dead center (12 o'clock) of coupling half *M*.
- Rotate indicator to bottom dead center (6 o'clock). Observe the needles and record the readings.
- Make corrections as outlined previously.

Horizontal Correction (Side to Side)

- Zero indicators *A* and *B* on the left side of coupling half *M*, 90° from top dead center (9 o'clock).
- Rotate indicators through top dead center to the right side, 180° from the start (3 o'clock). Observe the needle, measure and record the reading.
- Make corrections as outlined previously.
- Re-check both vertical and horizontal readings to ensure adjustment of one did not disrupt the other. Correct as necessary.

NOTE: With experience, the installer will understand the interaction between angular and parallel and will make corrections appropriately.

Laser Alignment

This method can be used in place of the dual-dial indicator method. Please follow the instructions given by the laser equipment manufacturer.



Alignment Troubleshooting

Operate the pump for at least an hour or until it reaches final operating temperature. Shut the pump down and recheck alignment while the pump is hot. Piping thermal expansion may change the alignment. Realign pump as necessary. See the following table for possible alignment issues.

Table 2 – Alignment Troubleshooting

PROBLEM	POSSIBLE CAUSE	RECOMMENDED REMEDY
Can't obtain horizontal (side to side) alignment, angular or parallel.	Driver feet bolt-bound.	Loosen pump hold-down bolts and slide pump and driver until horizontal alignment is achieved.
	Baseplate not leveled properly, possibly twisted.	Determine which corner(s) of the baseplate are high or low and remove or add shims at the appropriate corner(s) and realign.
Can't obtain vertical (top to bottom) alignment, angular or parallel.	Baseplate not leveled properly, possibly bowed.	Determine if center of baseplate should be raised or lowered and correct by evenly adding or removing shims at the center of the baseplate.

Existing Grouted Baseplates

When a pump is being installed on an existing grouted baseplate, the procedure is somewhat different from the previous section, "New Grouted Baseplates."

1. Mount the pump on the existing baseplate.
2. Level the pump by putting a level on the discharge flange. If not level, adjust the footpiece by adding or deleting shims between the bearing frame and baseplate.
3. Check initial alignment between the pump and driver with a straight edge and correct as needed.
4. Run piping to the suction and discharge flanges of the pump.
5. Perform final alignment.
6. Recheck alignment after pump is hot.

5.4 MECHANICAL SEAL

When the pump is intended to be equipped with a mechanical seal, it is Wilfley's standard practice to install the mechanical seal in the pump prior to shipment. Specific order requirements may specify that the seal be shipped separately or that none be supplied. It is the pump installer's responsibility to determine if a seal was installed. If a seal was supplied but not installed, the seal and installation instructions will be shipped with the pump.

5.5 COUPLING

The coupling should be installed as advised by the coupling manufacturer. Pumps are shipped without the spacer installed. If the spacer has been installed to facilitate alignment, then it must be removed prior to checking rotation. Remove protective material from the coupling and any exposed portions of the shaft before installing the coupling.

5.6 COUPLING AND V-BELT GUARDS



*Power must **never** be applied to the driver when the coupling guard is not installed.*

Wilfley coupling guards are safety devices intended to protect workers from inherent dangers of the rotating pump shaft, motor shaft and coupling. It is intended to prevent entry of hands, fingers or other body parts into a point of hazard by reaching through, over, under or around the guard. No standard coupling guard provides complete protection from a disintegrating coupling. Wilfley cannot guarantee its guards will completely contain an exploding coupling. The Wilfley coupling conforms to the U.S.A. standard ASME B15.1, "Safety Standard for Mechanical Power Transmission Apparatus."

6.0 START-UP INSTRUCTIONS

1. Use your Wilfley pump only for the specific application for which it was sold and in the manner prescribed by A.R. Wilfley and Sons, Inc. Wilfley pumps operate with the fluid pumped open to (in contact with) the atmosphere. Use added precautions (and appropriate safeguards) when handling



- volatile, flammable or toxic fluids to prevent venting of fumes without adequate ventilation.
2. The Wilfley slurry pump has no lift capability and, therefore, must be set below the supply so that the material to be pumped will flow into it by gravity. A hopper bottom, intake sump or tank should be provided. Intake pipe from sump should slope and be as short as possible. Do not pump from one pump directly into a second pump, but provide an intake sump for each pump.
 3. The pump should be securely bolted down on a solid, vibration-free, nonflexible foundation and the shaft should be level. Bolting down ordinarily will not distort the bearing alignment. Allow ample room for changing of pump parts because these parts are sometimes very heavy. Support the piping independently and be sure to consider thermal expansion and loading.
 4. All flanges are 125# American Standard. The discharge line should have sufficient spring to allow the discharge keeper to be raised about one half inch.
 5. Intake pipe may be connected to either or both sides of the pump and need not be disturbed to change the pumping parts or the bearing unit.
 6. Provide valves close to the pump in both intake and discharge lines when intake of pump is connected directly to a high tank and in all cement or clay slurry installations.
 7. Direction of rotation is counterclockwise when looking at the case. **CHECK ROTATION OF THE DRIVE SYSTEM WITH THE COUPLING OR BELT DRIVE DISCONNECTED FROM THE PUMP. STARTING THE PUMP BACKWARDS WILL AFFECT PUMP PERFORMANCE.**
 8. Rotate the pump by hand. There should be some drag due to the Check Valve being engaged. If unable to rotate the pump, check Wear Adjustment section per instruction number 2.
 9. Check oil level by looking at oil level sight glass located on both sides of the pump. If level is below the middle of the sight glass, fill with SAE 20 non-detergent oil. Do not overfill because oil will leak out along shaft if level is too high.
 10. On direct-driven pumps, check the alignment between the pump and the drive system.
 11. Use proper eye and face protection when examining adjusting, maintaining or in any other way working with a pump. Operate the pump with the guard firmly attached. Read all instruction tags on the pump. Stand at a safe distance during start-up.
 12. Outside corrosion may damage the pump. Protect pump from corrosive materials.
 13. Use only factory-supplied spare parts. Pumps need periodic maintenance. Replace worn or faulty parts and keep moving parts appropriately clean and oiled or greased. Use the appropriate tool for any given operation.
 14. The Wilfley pump must be correctly speeded for the proper functioning of the centrifugal seal and check valve. Ask the engineering department at A.R. Wilfley and Sons, Inc. If you have any questions or problems concerning operation, maintenance, application or anything else concerning your Wilfley pump. A good reference book to have is published by the Hydraulic Institute and is titled "Hydraulic Institute Standards." It can be obtained by writing to 122 E. 42nd Street, New York, NY, 10017.

7.0 GENERAL SERVICE AND MAINTENANCE

1. Lubrication:
 - a. Recommend using 300-second viscosity turbine oil or SAE 20.
 - b. Keep oil level to the middle of the sight glass. Do not overfill.

Table 3 – Acceptable Oils

Chevron	GTS Oil 68
Exxon	Terresstic EP 68
Gulf	Gulf Harmony 68
Mobil	Mobil DTE26 300 SSU 100°F (38°C)
Phillips	Mangus Oil Grade 315
Phillips	MM Motor Oil SAE 20-20W



Table 4 – Lubricating Oil Requirements

	Process Liquid Temp. < 300°F
ISO Grade	VG 68
Approx. SSU at 100°F (38°C)	300
DIN 51517	C68
Kinem. Viscosity at 105°F (40.6°C) in mm ² /sec	68

2. Wear Adjustment:

- a. This adjustment controls the clearance between the impeller and the follower plate and takes care of any drop in efficiency or capacity caused by wear.

CAUTION: Never adjust the clearance while pump is running.

- b. To make this adjustment: loosen outer draw bolt nut; move the bearing unit and impeller as a unit to rear of pump by turning inner draw bolt nut until the impeller touches the follower plate; back off 1/4" turn and lock in position by tightening outer draw bolt nut.
 - c. Excessive wear to metal parts will result from adjustments made too often. As a general rule, adjust clearance not more than four times during the life of the follower plate.
 - d. All adjustments should be made while turning pump over by hand.
3. Every time pump is re-assembled, the follower plate gaskets (3A) should be replaced.
4. Periodic Servicing:

The following table contains recommended service checks that should be performed on a periodic basis.

Table 5 – Recommended Service Checks

	At Install	After First Start-Up	Every Wk	Every Mo	Every 3 Mo.
Flow, Pressure, Temp. (a)		X	X		
Visual (b)		X	X		
Noise Vibration		X	X		
Oil Level	X	X	X		
Oil Change					X

- a. **Flow, Pressure and Temperature:** All flow, pressure and temperature gauges should be monitored to ensure that the pump is operating within specified limits. If the frame temperatures are monitored, this temperature generally should not exceed 160°F (71.1°C).
- b. **Visual:** Periodic visual inspection should be made of the pump and its installation.

This inspection should include the following:

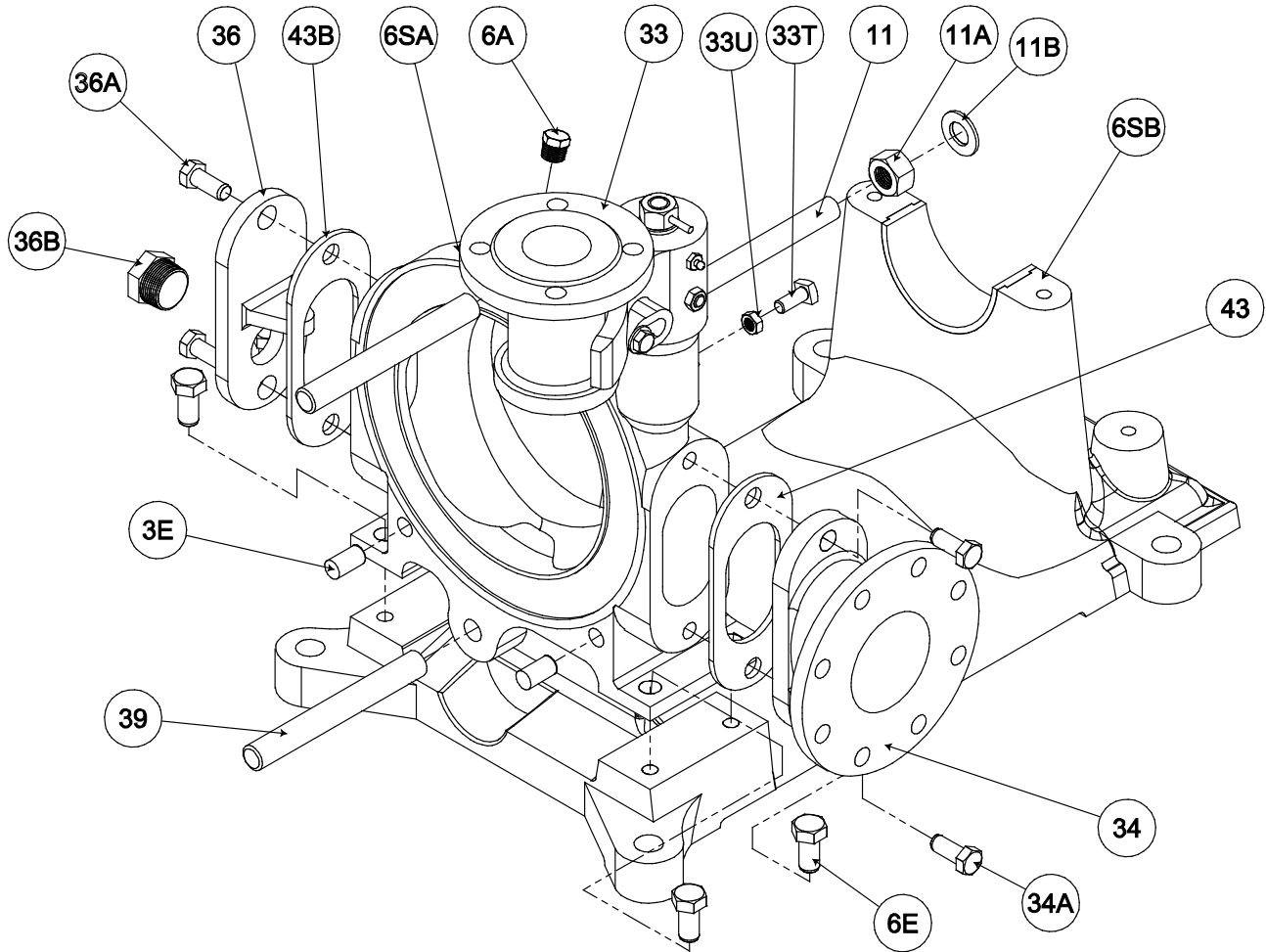
1. All mounting supports should be secure.
2. All external nuts, bolts and fittings should be tight.
3. All suction and discharge piping should be secure.
4. All surfaces and joints should show no signs of leakage.

8.0 GENERAL INSTRUCTIONS FOR ORDERING PARTS

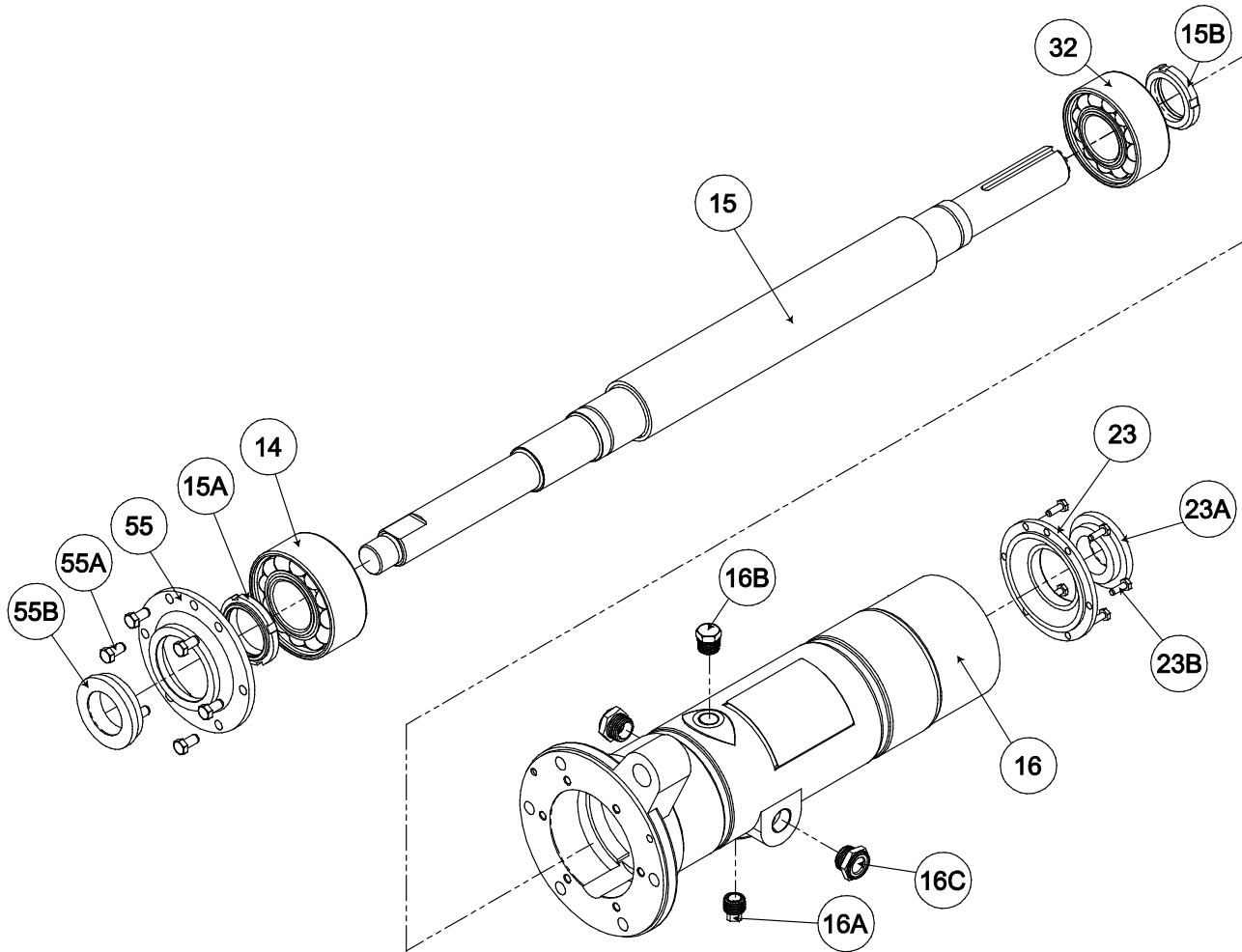
- Give serial number of pump or bearing unit.
- Give size and model of pump.
- Give part numbers.
- Give the diameter of impellers, whether special or standard.
- Special impellers and other parts should be clearly specified.



9.0 MODEL Kpro ASSEMBLY PROCEDURES

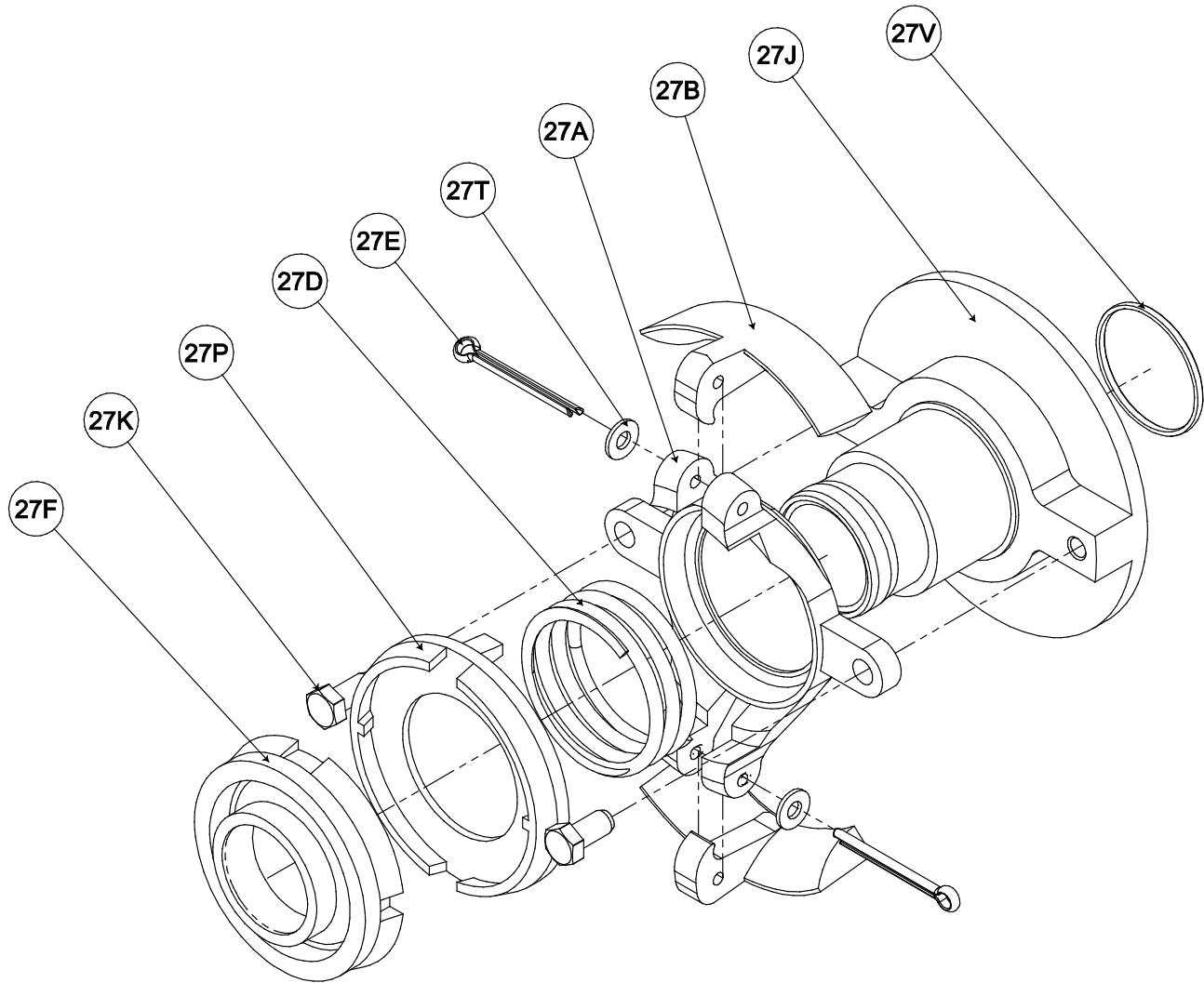


1. To assemble intake chamber (6SA) on frame base (6SB):
 - a. Position intake chamber on frame base mounting pads in alignment with mounting holes.
 - b. Install intake chamber capscrews (6E) in tapped holes in frame base.
 - c. Install case stud bolts (39) in tapped holes in front face of intake chamber.
2. To assemble intake chamber (6SA):
 - a. Pins (3E) and plug (6A) on the intake chamber are preinstalled at the factory.
 - b. Install capscrews (36A), blind intake flange (36) and gasket (43B) on intake chamber.
 - c. Install capscrews (34A), Intake Spool (34) and gasket (43) on intake chamber (Do this only on 1" through 2 1/2" discharge pumps only).
 - d. Install draw bolt (11), inner draw bolt nut (11A) and draw bolt washer (11B) on intake chamber.
 - e. Install discharge keeper assembly (33). See Step 9.



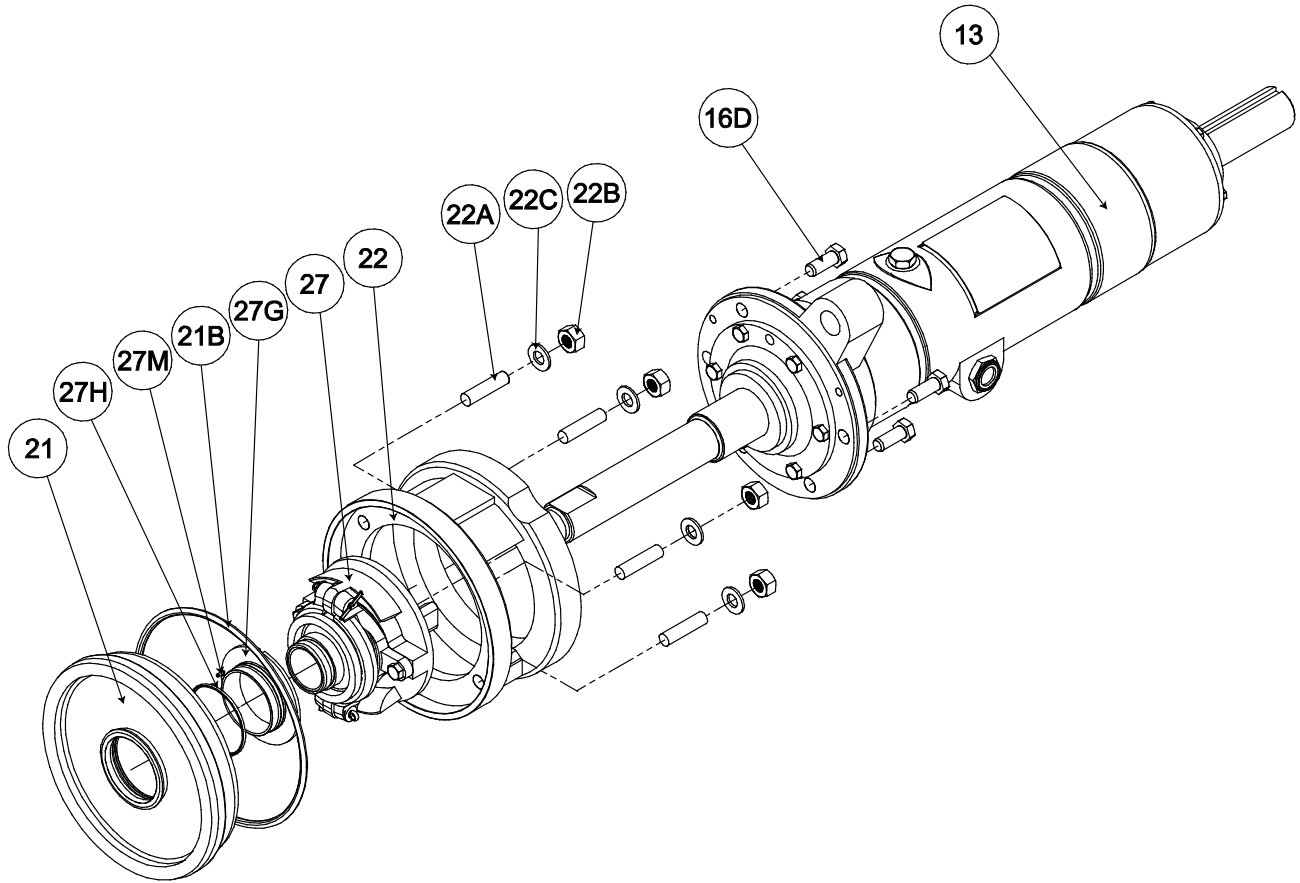
3. To assemble bearing Unit (13):

- a. Heat thrust bearing (14) and radial bearing (32) to temperature of 175°–200°F using bearing induction heater. (Do not heat both bearings at the same time.)
- b. Install thrust bearing on shaft (15) against front bearing shoulder.
- c. Install thrust bearing locknut (15A) on shaft.
- d. Install radial bearing (32) and radial bearing locknut (15B) on rear of shaft in the same manner as thrust bearing.
- e. Carefully insert shaft and bearing into long cylinder (16). This can most easily be done by standing long cylinder on end.
- f. Install front bearing cap oil seal (55B) in front bearing cap (55). Install the inboard bearing isolator in the front bearing cap.
- g. Install front bearing cap on long cylinder using front bearing cap machine screw (55A).
- h. Install outboard bearing isolator (23A) in rear bearing cap (23).
- i. Install end cap (23) on long cylinder using end cap capscrews (23B).



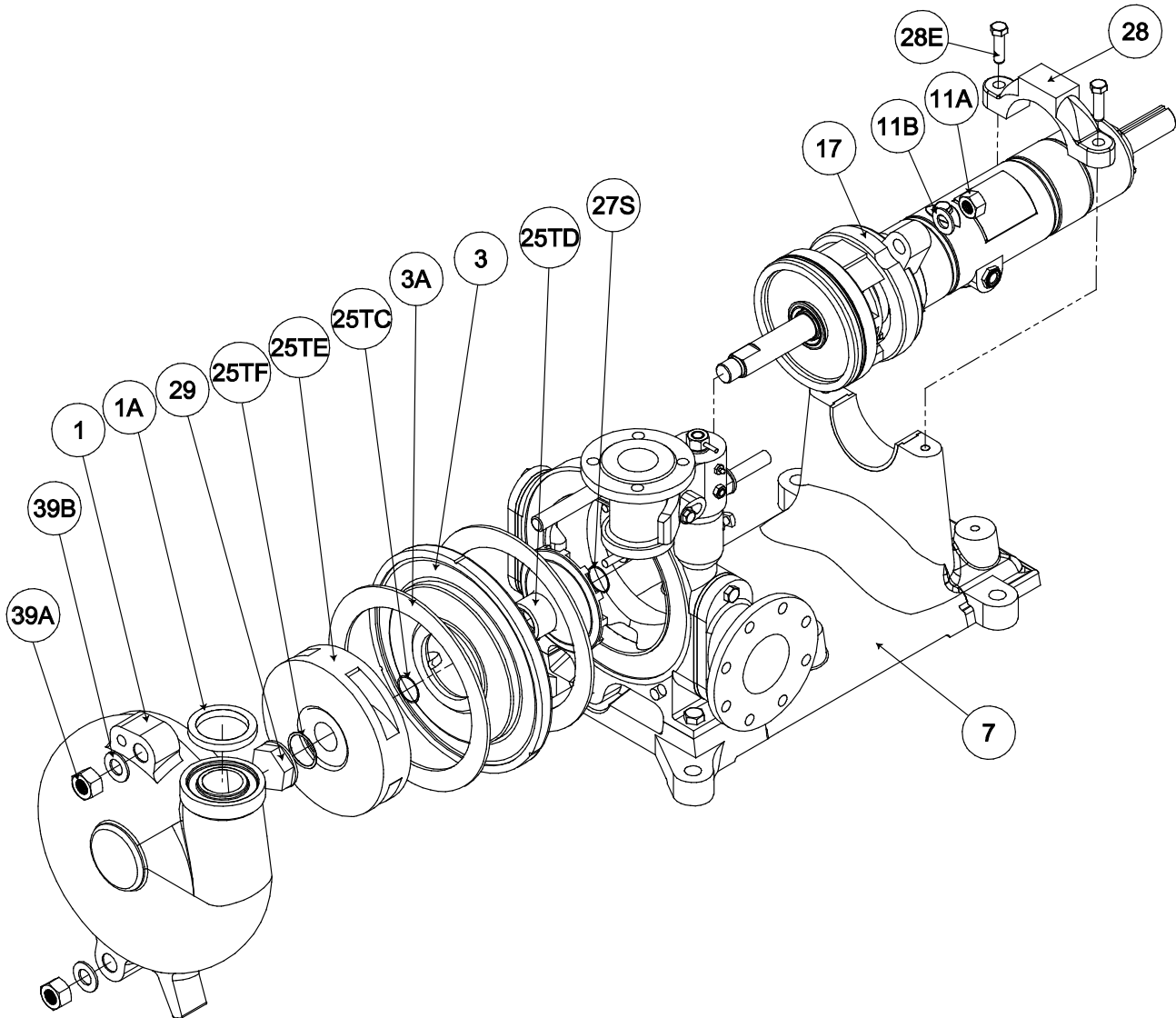
4. To assemble check valve assembly (27):

- a. Install check valve spider (27A) on check valve sleeve with hex head screws (27P).
- b. Install check valve spring (27D) in pocket of check valve spider (27A).
- c. Install check valve packing diaphragm plate (27P) against check valve spring and compress until packing diaphragm plate is seated on check valve spider (27A).
- d. Install check valve weight (27B) in slot and secure with check valve cotter pin (27E) and check valve cotter pin washer (27T). Do the same with the other weight.
- e. Attach check valve spider assembly to check valve sleeve (27J) using check valve spider machine screws (27K).
- f. Slide check valve packing diaphragm (27F) on barrel of check valve sleeve and seat in pocket of check valve packing diaphragm plate.
- g. Install check valve sleeve o-ring (27V) in check valve sleeve.



5. To assemble seal assemblies onto bearing unit:

- a. Install short cylinder (22) on long cylinder using long cylinder capscrews (16D).
- b. Slide check valve assembly (27) on shaft until seated on shaft shoulder.
- c. Install stationary seal o-ring (27G) and o-ring (27H) onto expeller plate (21)
- d. Install drive screw (27M) in expeller plate.
- e. Install Stationary seal face (27G) in expeller plate; ensure the notch in the seal face aligns with the Drive Screw.
- f. Install the expeller plate o-ring (21B) on the expeller plate.
- g. Install the expeller plate onto the short cylinder using the short cylinder capscrews (21). Do not fully tighten at this time.



6. To assemble bearing unit into intake chamber:

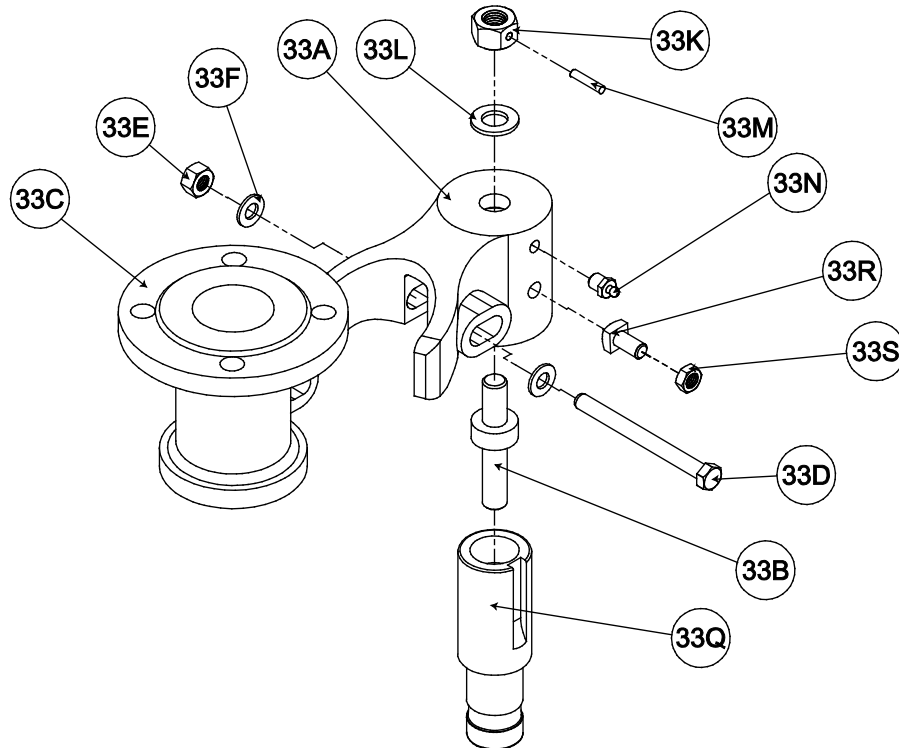
- a. Install bearing unit (17) in rear bore of intake chamber. Align draw bolt (11) with draw bolt lug on long cylinder. Set washer (11B) onto draw bolt and screw on hex nut (11A).
- b. Install pedestal cap (28) on frame base with pedestal cap capscrews (28E). Tighten only finger tight at this time.

7. To assemble wetted parts:

- a. Install o-ring (27S) onto shaft; ensure it is seated in the groove on the check valve sleeve. Then slide on expeller (25TD).
- b. Install follower plate gaskets (3A), one on the follower plate (3) and the other on the intake chamber. An adhesive may be used.
- c. Install follower plate (3) on two follower plate pins (3E). Use "C" clamp to hold follower plate in place prior to installing the impeller.
- d. Install impeller o-ring (25TC) on shaft. Slide impeller onto shaft and ensure that the impeller o-ring (25TC) is seated in the groove.



- e. Install o-ring (25TF) and impeller nut (29) on shaft. Tighten impeller nut. Ensure that the impeller is not tightened against the follower plate.
 - f. Install case (1) on intake chamber over case stud bolts (39). Then install case stud bolt washers (39) and case stud bolt nuts (39A).
8. To set impeller clearance:
- a. To set impeller clearance, loosen outer draw bolt nut and turn inner draw bolt nut clockwise until impeller drags on follower plate. Loosen inner draw bolt nut 1/4 turn and tighten outer draw bolt nut.
 - b. Tighten pedestal cap capscrews.
 - c. Tighten short cylinder capscrews.
 - d. Tighten expeller plate screw.
9. To assemble crane assembly (37) (3" through 8" Kpro pumps only):
- a. Install crane pin (37A) in reamed hole in top left side of intake chamber.
 - b. Slide primary crane arm (37A) over crane pin.
 - c. Insert crane hinge pin ball (37E) in pocket in lower half of yoke in primary crane arm.
 - d. Insert large end of secondary crane arm (37F) in yoke end of primary crane arm.
 - e. Insert crane hinge pin (37D) into aligned bore.
 - f. Install secondary crane arm pin (37G).
 - g. Install crane hook (37H) through crane hook hole in case.
 - h. Inert crane hook in hole of secondary crane arm.
 - i. Install crane hook washer (37K) and 2 nuts (37J) on crane hook.



10. To assemble discharge keeper assembly:

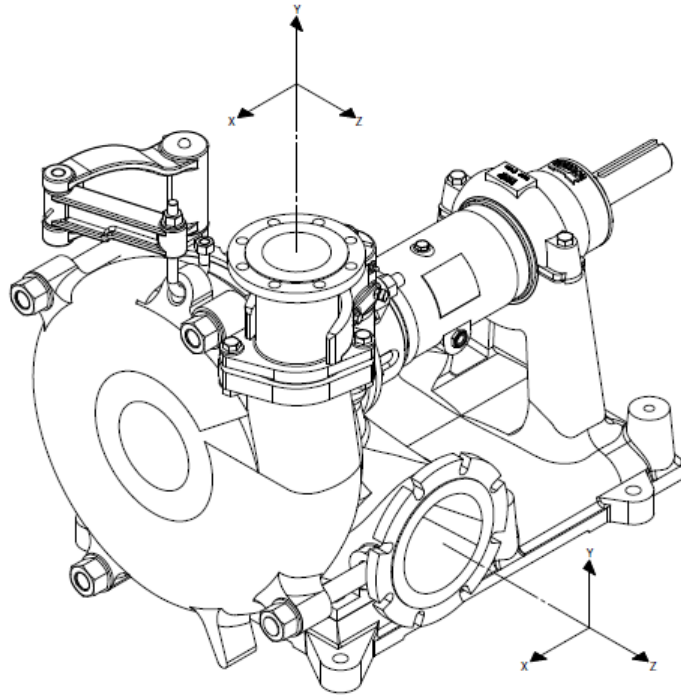
- a. Install yoke setscrew (33R) in keeper yoke (33A).
- b. Install yoke setscrew jam nut (33S) on setscrew. Align 2 sides of square head parallel to axis of keeper yoke bore.
- c. Thread keeper bolt (33B) into keeper pin (33A) 1/16" below surface of pin.
- d. Install assembled keeper pin and bolt in keeper yoke:
 - i. Lubricate keeper pin.
 - ii. Align keyway in keeper pin with square head on keeper yoke setscrew.
 - iii. Slide keeper pin into bore of keeper yoke.
 - iv. Install keeper bolt washer (33L) and keeper bolt nut (33K) on keeper bolt. Draw nut up snugly.
 - v. Install keeper bolt nut pin (33M).
- e. Install discharge keeper sleeve (33C) (1Kpro through 5Kpro pumps) or discharge keeper slip joint assembly (33CA) (6Kpro and 8Kpro pumps).
- f. Install discharge keeper sleeve bolt (33D), washers (33F) and nut (33E).
- g. On 3Kpro and above, bolt keeper sleeve to discharge flange on case. On 1Kpro through 2-1/2Kpro, tighten down keeper sleeve by tightening keeper bolt.

Note: For 6Kpro and 8Kpro pumps, draw bolt type discharge keeper (K33CA) is also available but does not use yoke.

Note: Do not overtighten case discharge flange bolts (1B). The case gasket (1A) seal will be destroyed.



10.0 MODEL Kpro PUMPS – MAXIMUM ALLOWABLE NOZZLE LOADS



SIZE	NOZZLE	F _X (lbs)	F _Y (lbs)	F _Z (lbs)	F _R (lbs)	M _X (lbs)	M _Y (lbs)	M _Z (lbs)	M _R (lbs)
1	Discharge	80	100	65	144	170	130	85	230
	Suction	160	130	200	287	340	260	170	461
1.5	Discharge	80	100	65	144	170	130	85	230
	Suction	160	130	200	287	340	260	170	461
2	Discharge	80	100	65	144	170	130	85	230
	Suction	160	130	200	287	340	260	170	461
2.5	Discharge	80	100	65	144	170	130	85	230
	Suction	160	130	200	287	340	260	170	461
3	Discharge	120	150	100	217	350	265	175	473
	Suction	440	360	550	791	1340	1020	685	1818
4	Discharge	160	200	130	287	460	370	250	663
	Suction	560	460	700	1008	1700	1300	870	2310
5	Discharge	220	275	180	396	670	510	342	910
	Suction	850	700	110	1560	2600	1900	1300	3500
6	Discharge	280	350	230	504	850	650	435	1155
	Suction	1200	1000	1500	2166	3700	2800	1800	4977
8	Discharge	425	555	350	778	1300	950	650	1736
	Suction	1500	1200	1800	2632	4500	3400	2200	6054



11.0 TROUBLESHOOTING GUIDE

PROBLEM	POSSIBLE CAUSE	SOLUTION
A. Low capacity	1. Pump intake not flooded.	1. Pump must have positive intake head. Does not have suction characteristics.
	2. Impeller / follower plate slippage seal clearance is too great, which causes recirculation resulting in loss of discharge head and capacity. Incorrect slippage seal clearance is indicated when horsepower does not reduce at lower capacities.	1. Adjust slippage seal clearance. Metal wetted parts can be adjusted while pump is running. For rubber wetted parts, pump must be stopped.
	3. Wetted parts worn excessively.	1. Check pump impeller and follower plate seals for excessive wear. Replace parts if 1/16" to 1/8" slippage seal clearance cannot be achieved or hole is worn through impeller shrouds or body of follower plate.
	4. Pump speed too low.	1. Check V-belts for slippage due to improper belt tension. Adjust to proper tension.
	5. Improper pump impeller diameter.	1. Check pump impeller specification to insure impeller is proper size as recommended by Wilfley for the pumping conditions.
	6. Clogged intake or discharge piping.	1. Flush piping.
	7. Increase in viscosity of slurry resulting in increased friction loss in pump and piping.	1. Reduce viscosity to original pumping conditions. 2. Contact Wilfley Engineering Department for recommendations of larger pump size to handle froth / foam conditions.
	8. Nature of pumped solution results in froth or foam.	1. Add defoamers. 2. Contact Wilfley Engineering Department for recommendations of larger pump size to handle froth / foam conditions.
B. Pump leaks while running.	1. Intake head on pump is too great for expeller (pump) speed.	1. Throttle intake to pump to originally designed intake head conditions. 2. Contact Wilfley Engineering Department to recheck pump speed. With speed increase, impeller diameter may have to be changed to smaller diameter to maintain original pump capacity.
	2. Clearance between follower plate and expeller faces increases due to wear. Clearance should be 3/32" maximum.	1. Replace worn pump impeller / expeller or follower plate or both.
	3. Worn short cylinder head.	1. Replace short cylinder head if hole is worn through face of part.
	4. Leakage through short cylinder gland ring packing.	1. Tighten gland ring nuts. 2. Check for worn gland packing ring and wear on short cylinder seal face for gland packing ring. Replace worn parts.
	5. Bent pump shaft causing impeller / expeller misalignment with follower plate.	1. Replace Pump Shaft.



PROBLEM	POSSIBLE CAUSE	SOLUTION
C. Pump leaks when shut down.	1. Check valve inoperative because of clogging with solids.	1. Disassemble Check valve assembly and clean thoroughly. 2. Install water flushing line in short cylinder into check valve area. Some applications require continuous water supply.
	2. Check valve packing diaphragm may be torn or incorrectly installed.	1. Replace torn check valve packing diaphragm. 2. Insure that check valve packing diaphragm is properly seated in check valve packing diaphragm plate.
	3. Excessive intake head on pump can overcome check valve spring pressure, causing leakage at shutdown.	1. Reduce intake head to original design operating condition.
D. Pump vibration while running.	1. Pump impeller out of balance by wear.	1. Replace pump impeller.
	2. Loose pedestal cap screws.	1. Tighten screws.
	3. Loose gland stud bolt nuts.	1. Tighten nuts.
	4. Rubbing contact between impeller and follower plate slippage seals.	1. Adjust draw bolt to eliminate rubbing contact of seals.
	5. Out-of-balance conditions due to bent pump shaft.	1. Replace pump shaft.
E. Excessive wear on wetted parts.	1. Pump speed too high resulting in increased fluid velocity.	1. Pump may be too small for application. Contact Wilfley Engineering Department for verification of operating conditions versus pump size.
	2. Intake head to pump may be too high resulting in increased fluid velocity.	1. Throttle intake to pump to original operating conditions.
	3. Type of material used in wetted parts unable to withstand the abrasion of the pumping application.	1. Consult Wilfley Engineering Department to select a more abrasion-resistant material for the wetted parts.
F. Pump surges	1. Pump may be overspeeded, resulting in widely fluctuating intake head to cause surging.	1. Consult Wilfley Engineering Department for recommendations to reduce pump speed.
	2. Widely fluctuating feed flow into pump sump tank.	1. Stabilize feed flow into pump sump tank.
G. Air binding	1. Frothing condition of pumped fluid.	1. Use defoamer. 2. Consult Wilfley Engineering Department. Larger pump may be required to handle increased volume due to froth condition.
	2. Air trapped in intake chamber.	1. Install standpipe vent in boss provided on top of intake chamber.
H. Impeller failure	1. Improper handling of brittle abrasion-resistant parts.	1. Avoid careless handling of brittle pump parts during storage and pump assembly.
	2. Tramp material entering pump.	1. Install screening devices to eliminate tramp material from entering pump sump tank. Screen maintenance is important to detect and eliminate holes worn in the screen.



PROBLEM	POSSIBLE CAUSE	SOLUTION
I. Bearing failure	1. Contamination of bearings.	1. Check and replace front bearing cap oil seal if defective. 2. Replace pump shaft when oil seal journal is scored sufficiently to cause damage to oil seal lip.
	2. Improper lubrication of bearings.	1. Use only bearing lubricants recommended by A.R. Wilfley and Sons, Inc. or bearing manufacturer. Use 300-second viscosity turbine oil or SAE/20 non-detergent motor oil. 2. Maintain proper oil level in long cylinder. Recommended oil level is the middle of the oil sight glass in long cylinder. Avoid excess use of lubricant.
	3. Excessive load on radial (rear) bearing.	1. Check and adjust V-belts to proper tension on V-belt driven pumps. 2. Check alignment of drive coupling on direct driven pumps.
J. Pump case and follower plate failure due to fracture.	1. Uneven torquing of case stud bolt nuts.	1. Tighten opposite nuts alternately a small amount at a time until equal torquing is achieved.
	2. Pump case improperly aligned with follower plate.	1. During installation of pump case, insure that sealing face of case is parallel to sealing face of follower plate and follower plate gasket before tightening case stud bolt nuts.