INSTALLATION & MAINTENANCE MANUAL

KF

ANSI
NEMA & IEC

HORIZONTAL END-SUCTION PUMPS

ANSI MODELS: KF2110, KF31510, KF3210, KF4310 & KF6410

Issued July, 2005

T. S. U.

♦♦♦♦ *Do not run dry* ♦♦♦♦
This pump is NOT self-priming. The pump must be filled with liquid before starting; otherwise severe damage may occur.

ANSIMAG®
"Simple by Design"

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1. Limited Warranty

One year limited warranty

Ansimag pumps are warranted by Ansimag to the original user against defects in workmanship and materials under normal use for one year after the date of purchase. Any part returned to an Ansimag-designated, authorized service location, shipping cost prepaid, will be evaluated for defects. Parts determined by Ansimag to be defective in material or workmanship will be repaired or replaced at Ansimag's option as the exclusive remedy.

Limitation of liability

To the extent allowable under applicable law, Ansimag's liability for consequential damages is expressly disclaimed. Ansimag's liability in all events is limited to and shall not exceed the purchase price paid.

Warranty disclaimer

Ansimag has made a diligent effort to illustrate and describe the products in this literature accurately; however, such illustrations and descriptions are for the sole purpose of identification and do not express or imply a warranty that the products are merchantable, or fit for a particular purpose, or that the products will necessarily conform to the illustration or descriptions.

Except as provided below, no warranty or affirmation of fact, expressed or implied, other than as stated in "LIMITED WARRANTY" is made or authorized by Ansimag.

Product suitability

Many states and localities have codes and regulations governing the sale, construction, installation and/or use of products for certain purposes, which may vary from those in neighboring areas. While Ansimag attempts to assure that its products comply with such codes, it cannot guarantee compliance, and cannot be responsible for how the product is installed or used. Before purchasing and using a product, please review the product application as well as the national and local codes and regulations, and be sure that product, installation, and use complies with them.

Warranty exclusions

Wear items that must be replaced on a regular basis are not covered under this warranty. Such items include, but are not limited to mouth rings/pads, thrust rings, O-rings, bushings and shafts.

Items that have been subject to extreme heat or have been used with abrasive or incompatible chemicals are not covered under this warranty.

EC Declaration of Conformity

Manufacturer: Sundyne Corporation

Details of Equipment:

Model Prefix	Alternative Model Description	Description	Harmonised Standards applied in order to verify compliance to the Directive
KF	ALA (PR, PS, QS, QT Couplings)	Magnetic Drive Sealless Centrifugal Pumps	MACHINERY DIRECTIVE 98/37/EEC: EN 292-1 Safety of Machinery - Basic Concepts, general principles of design. EN 292-2/A1 Technical principles and specifications (and amendment 1). EN 809 Pumps and pump units for liquids - Common Safety Requirements. ATEX DIRECTIVE 94/9/EC: EN 13463-1 Non-Electrical equipment for potentially explosive atmospheres. Part 1: Basic method and requirements. EN 13463-5 Non-electrical equipment intended for use in potentially explosive atmospheres. Part 5: Protection by constructional safety 'c'.
KF	ALI (PR, PS, QS, QT Couplings)		
K	ALA (A, B,C Couplings)		
K	ALI (A, B, C Couplings)		
KM	ALA (AA, AB Couplings)		
KM	ALI (AA, AB Couplings)		
KV	VALA		
KV	VALI		
KP	SPALA		
KP	SPALI		

Directives to which the above equipment complies to:

Machinery Directive

Directive relating to Machinery (98/37/EC)

ATEX Directive

Directive on equipment and protective systems intended for use in potentially explosive atmospheres (94/9/EC)

Group II Categories 2 and 3 (gas)

Notified body:

Intertek Testing and Certification Ltd
Intertek House
Cleeve Road, Leatherhead,
Surrey, KT22 7SB
UK

Certification Numbers: **ITS03ATEX11180**

ATEX Technical Construction File Number: ATEX-ANSIMAG-001

Year in Which CE Mark was affixed: 1996

We certify that Plastic Lined magnetically driven bareshaft, close-coupled, and separately mounted pumps manufactured by the Sundyne Corporation meet the requirements of the above Directives, when installed, operated and maintained in accordance with our published Installation and Operating Manual. Plastic Lined magnetic drive pumps must not be put into service until all the conditions relating to safety noted in these documents have been met.

Authorised Signatories on behalf of Sundyne Corporation:

Name: Jeff Wiemelt **Position:** Vice President and General Manager of Sundyne Corporation, The Americas

Name: Kerry Kramlich **Position:** Pump Engineering Manager

Date of issue: 16th June 2003 **Place of Issue:** United Kingdom

SAFETY WARNING

Genuine parts and accessories have been specifically designed and tested for use with these products to ensure continued product quality and performance. Testing cannot be performed on all parts nor on accessories sourced from other vendors, incorrect design and/or fabrication of such parts and accessories may adversely affect the performance and safety features of these products. Failure to properly select, install or use authorised Sundyne parts and accessories is considered misuse, and damage or failure caused by misuse is not covered by Sundyne's warranty. Additionally, modification of Sundyne products or removal of original components may impair the safety of these products and their effective operation.

EUROPEAN UNION MACHINERY DIRECTIVE (CE mark system)

This document incorporates information relevant to the Machinery Directive 98/37/EC. It should be read prior to the use of any of our equipment. Individual maintenance manuals which also conform to the EU Directive should be read when dealing with specific models.

EUROPEAN UNION ATEX DIRECTIVE

This document incorporates information relevant to the ATEX Directive 94/9/EC (Directive on equipment and protective systems intended for use in potentially explosive atmospheres). It should be read prior to the use of any of our equipment.

Compliance to the Directive is based on Atmospheres having pressures up to but not exceeding 350psi and temperatures ranging from –120 °F to + 250 °F depending on the model.

As indicated in the ATEX Directive 94/9/EC, it is the responsibility of the user of the pump to indicate to Sundyne Corporation the Zone and Corresponding group (Dust or Gas) that the pump is to be installed within. Should the pump be put into service in a potentially explosive atmosphere, the user of the pump must put the grounding connector into use.

CAUTION

Read all instructions before removing pump from shipping container or preparing it for operation. It is important to install and operate the pump correctly to eliminate any possible mishap that may be detrimental to property or personnel. Keep this manual for future reference.

2. PUMP IDENTIFICATION (Pumps with NEMA & IEC/JIS Motors)

Every pump and wet end only unit shipped has a serial number, model number, and code number stamped on a stainless steel identification tag. This plate is riveted on a bracket or casing. Please confirm all information stamped on the plate as soon as pump is received. Any discrepancy between the order and the information stamped on plate must be reported to your local dealer. If pump is purchased with a factory supplied motor, the motor nameplate must also be checked to verify motor's compatibility with pump and with order. Pay special attention to voltage, HP, RPM, and frequency information. Maintenance instructions in this manual are based on KF Series ANSI models equipped with NEMA or IEC/JIS motors. Because Ansimag keeps permanent records for all pumps by serial number, this number should be included with all correspondence. The model number, including impeller diameter, together with the pump code number define the type of pump in detail.

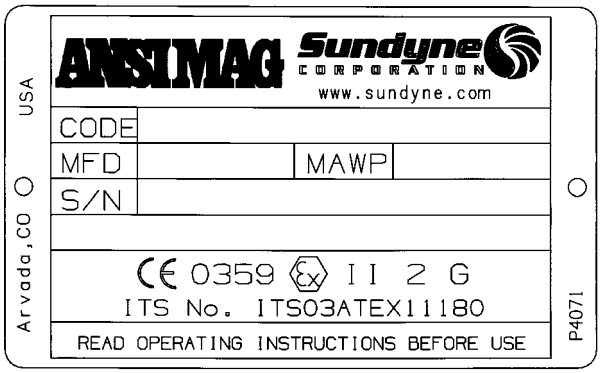


Figure 2-1 Name Plate

2-b. PUMP CODE

PUMP CODE	KF	6410	C	03	PR	1	2	1	1	1	A

SERIES

KF-Series	KF

HYDRAULICS

NEMA		IEC		JIS	
2110	**2210**	i2110	**i2110**	j2110	**j2110**
31510	**31510**	i31510	**i31510**	j31510	**j31510**
3210	**3210**	i3210	**i3210**	j3210	**j3210**
4310H	**4310H**	i4310H	**i4310H**	j4310	**j4310**
438	**438**	i438	**i438**	j4310H	**j4310H**
6410	**6410**	i6410	**i6410**	j438	**j438**
4310	**4310**	4310	**j4310**	j6410	**j640**

CONFIGURATION

Close Couple	**C**
Long Couple	**L**
Wet End Only	**W**
Wet End Less Casing	**NC**

MOTOR FRAME

Nema		IEC		JIS	
182/184TC	**03**	100/112 IEC & JIS	**32**	180M JIS	**50**
213/215TC	**04**	132 IEC & JIS	**33**	180L JIS	**51**
254/256TC	**05**	160 IEC & JIS	**34**	200 JIS	**52**
284/286TC	**06**	180 IEC	**35**	200 JIS 4 Pole	**53**
284/286TSC	**07**	200 IEC	**36**	225 JIS 2 Pole	**54**
324/326TC	**08**	225 IEC 4 Pole	**37**	250 JIS 2 Pole	**55**
324/326 TSC	**09**	225 IEC 2 Pole	**38**		
364/365TSC	**10**				
405TSC	**11**	Wet End	**00**		

DRIVE SIZE

PR-25HP	**PR**	KL – 40 HP	**KL**
PS – 50HP	**PS**	KN – 75HP	**KN**
QS – 80 HP	**HS**		
QT – 100 HP	**QT**		

O-RING

Viton	**1**
EPDM	**2**
PTFE Coated Viton	**3**
Gortex	**4**
Silicone	**5**

WEAR PARTS

SIC/CFR PTFE	**1**
SIC/SIC	**2**

WETTED MATERIAL

ETFE	**1**
ETFE w/GFR Cont. Shell	**3**

PUMP CASE MATERIAL

CI/ETFE	**1**

PUMP CASE FLANGE

ANSI #150	**1**
ANSI #300	**2**

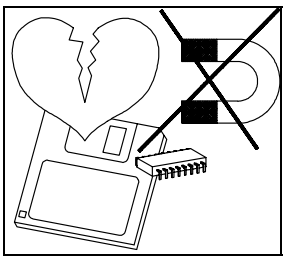
THIRD PARTY CERTIFICATION

None	**0**
ATEX / CE	**A**

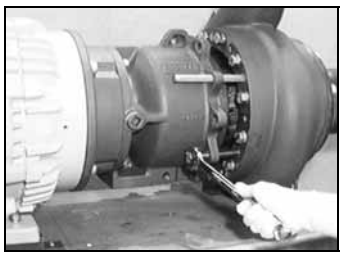
Note: Please use pump code together with model number when ordering.
Note: CFR mouth ring is not available for the KF 6410

3. SAFETY CHECK LIST

☑ **Warning! Magnetic Field Hazard.** Magnetic drive pumps contain some of the world's strongest magnets. These magnets are located in the impeller and outer drive magnet assemblies. The powerful magnetic fields could adversely affect persons who are assisted by electronic devices that may contain reed switches, and these people should not handle magnetic pumps or their parts. Pacemakers and defibrillators are examples of these devices.



Magnetic Field Hazard



DO Use jackscrews

DON'T use hands!

☑ **Warning! Magnetic Forces Hazard.** Use only the recommended disassembly and assembly procedures when separating the wet end from the drive end. These procedures are found in Sections 7-a and 8-a. The magnetic forces are strong enough to abruptly pull the drive end and wet end together. Be very careful to keep fingers away from mating faces of wet end and drive end to avoid injury.

☑ **Warning! Hot Surfaces Hazard.** These pumps are designed to handle liquids at temperatures up to 250^{o}F and will become hot on the outside. This creates a hazard of burns to personnel coming in contact with the equipment.

☑ **Warning! Rotating Parts Hazard.** The pump contains parts which rotate during operation. Before operation the pump must have the coupling guard secured in place and be completely assembled. To prevent injury during maintenance the pump and/or driver must be disconnected and locked out from the power source. Local safety standards apply.

☑ **Warning! Chemical Hazard.** The pumps are designed to handle all types of chemical solutions. Many are hazardous to personnel. This hazard could take the form of leaks and spills during maintenance. Plant procedures for decontamination should be followed during pump disassembly and part inspection. Keep in mind there is always the possibility of small quantities of liquid being trapped between pump components.

☑ **Caution! Magnetic field sensitive items.** Do not put **magnetic field sensitive items** such as credit cards, floppy diskettes or magnetic tapes near the impeller or drive magnet assemblies.

☑ **Caution! Magnetic Tools**. Do not use steel or iron tools near magnets. Steel tools such as wrenches and screwdrivers are easily attracted to magnets and can break them on contact.

4. PRINCIPLES OF MAGNETIC DRIVE PUMPS

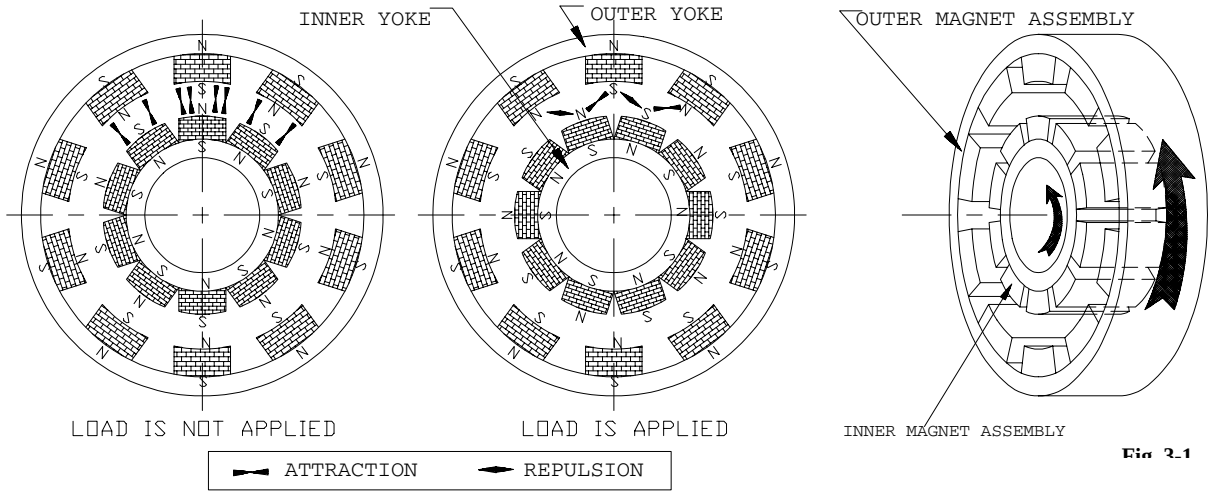


Fig. 4-1

A magnetic coupling consists of two magnet assemblies. One is the outer assembly (the driver magnet) and the other is the inner assembly (the driven magnet). The outer assembly is connected to a motor and the inner assembly is directly or indirectly attached to a pump impeller. As Figure 4-1 shows, at rest, magnet components of the outer assembly are aligned with their counterparts in the inner assembly. When load (torque) is applied, the coupling deflects angularly and the magnets create a force of simultaneous attraction and repulsion. This force is used to transfer torque from the motor to the impeller.

This **permanent-permanent magnet coupling** creates neither slippage nor induction currents during rotation. If excessive torque is applied, the magnets will de-couple. The magnets will not re-couple unless the pump is stopped. There is no energy loss in this permanent-permanent coupling unless an electrically conductive containment shell is placed between the outer and inner magnets. If an electrically conductive material is used for the containment shell, eddy-currents will be generated which will cause some energy loss. **Ansimag's KF Series pumps use only non-conductive containment shells.** Ansimag's KF Series pumps have an inner magnet assembly which is attached directly onto the impeller. The magnets are shown in Figure 4-2 behind the impeller.

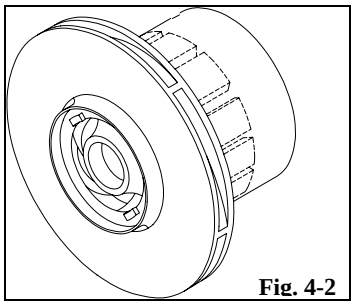
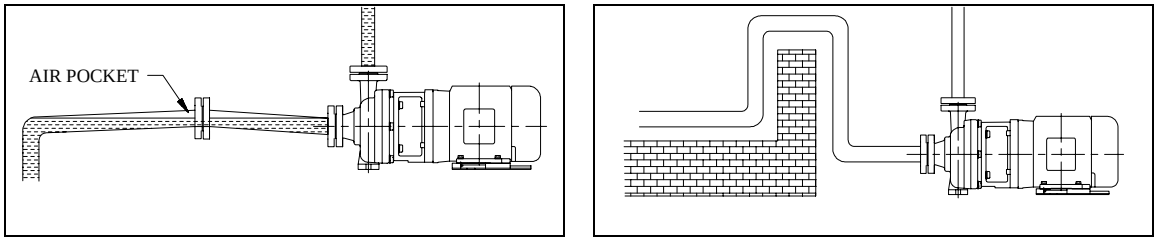


Fig. 4-2

5. PUMP INSTALLATION

5-a. PIPING

1. Install the pump as close as possible to the suction tank. Pumps are designed to push, not pull, liquid.
2. Ansimag recommends supporting and restraining both the suction and discharge pipes near the pump to avoid the application of forces and moments to the pump casing. All piping should line up with the pump flanges naturally to minimize any bending moments at the pump nozzles.
3. To minimize friction the suction line should have a short straight run to the pump, and be free of fittings, for a length equivalent to or larger than ten (10) times its diameter.
4. The suction line size should be at least as large as the pump's suction port or one size larger if the suction line is so long that it significantly affects NPSH available. **Never reduce the suction piping size**.
5. The suction line should have no high points since these can create air pockets.
6. The NPSH available to the pump must be greater than the NPSH required. Screens and filters in the suction line will reduce the NPSH available, and must be considered in the calculations.
7. **Caution: Do not install a check valve in the suction line even if a check valve is installed in the discharge line. The suction line check valve could shut off before the discharge line check valve closes. This would cause water hammer, which may burst the containment shell.**
8. The discharge piping should be equal in size to the pump outlet port.
9. A stop valve and a check valve should be installed in the discharge line. The stop valve is used when starting and stopping the pump, and to isolate the pump for maintenance. It is advisable to close the stop valve before stopping the pump. The check valve will protect the pump from water hammer damage. These recommendations are especially important when the static discharge head is high.



NOT RECOMMENDED **NOT RECOMMENDED**

Fig. 5-1: Pump Installations

5-b. FOUNDATION

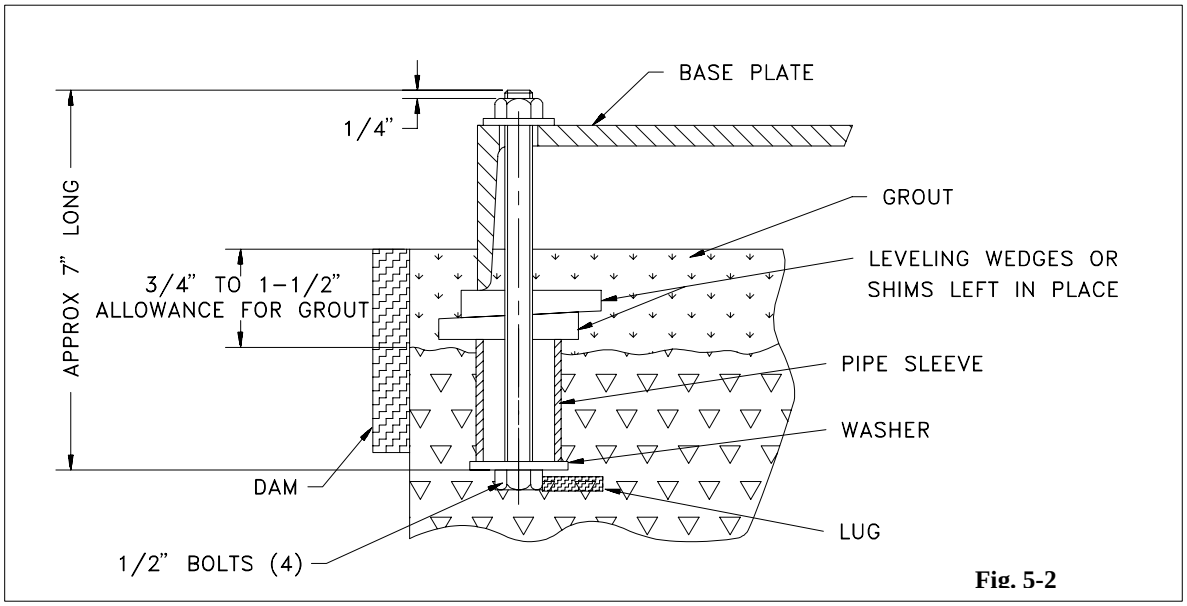


Fig. 5-2

1. The foundation should be sufficiently substantial to absorb vibration and form a permanent, rigid support for the base plate. This is essential for maintaining alignment of a long coupled unit. A concrete foundation should be satisfactory. Embed foundation bolts of the proper size (1/2" -13 x 7" recommended for ordinary installation) in the concrete, located by a drawing or template. Use a pipe sleeve larger than the bolt to allow enough base movement for final positioning of the bolts.

2. Support the base plate on rectangular metal blocks and shims, or on metal wedges with a small taper. Place the support pieces close to the foundation bolts. A spacing of 24" is suggested. Allow a gap of 3/4" to 1-1/2" between the base plate and the foundation for grouting.

3. Adjust the metal supports or wedges until the shafts of the pump and driver are level. Check the horizontal or vertical positions of the coupling faces as well as the suction and discharge flanges of the pump by means of a level. Correct the positions, if necessary, by adjusting the supports or wedges under the base plate as required.

4. When alignment is correct, tighten foundation bolts evenly but not too firmly. The units can then be grouted to the foundation. The legs of the base plate should be completely filled with grout and the leveling pieces, shims, or wedges should be grouted in place. The foundation bolts should not be tightened until the grout is hardened, usually about 48 hours after pouring.

NEVER OPERATE THE PUMP WITHOUT FIRST SECURING IT INTO POSITION!

5-c. INSTALLATION AND ELECTRICAL CONNECTIONS

Ansimag KF Series pumps are easily inspected without removing the casing from any piping, by separating the drive end from the wet-end. In a close-coupled pump this requires moving the motor, drive magnet and bracket backwards and away from the casing. To be able to do this the motor must have sufficient clearance behind the motor fan cover to move the motor backward approximately 12" [300 mm]. Close-coupled installations should feature the following:

1. Allow at least 12" [300 mm] of clearance behind the motor.
2. The base plate under the motor must be flat and long enough to allow for safe movement of the motor.
3. The motor electrical wiring should include a flexible section near the motor to allow movement of 12" [300 mm] for servicing of the pump without disconnecting piping. The recommended installation is illustrated in Figure 5-3.

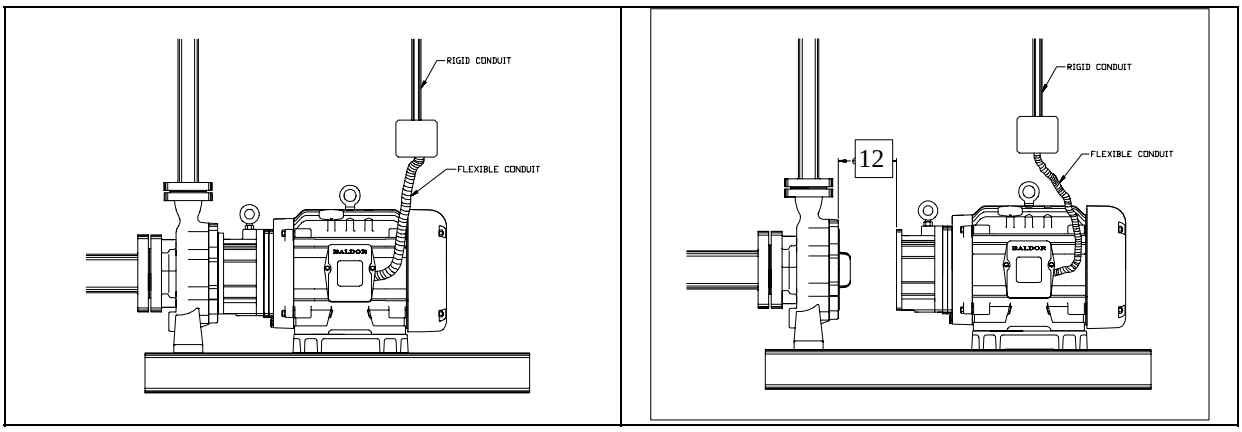


Fig.5-3: Flexible Electrical Connection on the Motor

5-d. EARTHING ARRANGEMENT

Pumps that have been supplied in accordance to the ATEX Directive (94/9/EC) will be identified by a label with the following symbol on it:

Such units are supplied with an earthing ground lug that is attached by a M6 screw (60-70 in-lb) and a lock washer (kit, P4107) to the bracket. Once the unit is installed and leveled, it should be wired to earth with a suitable earthing cable.

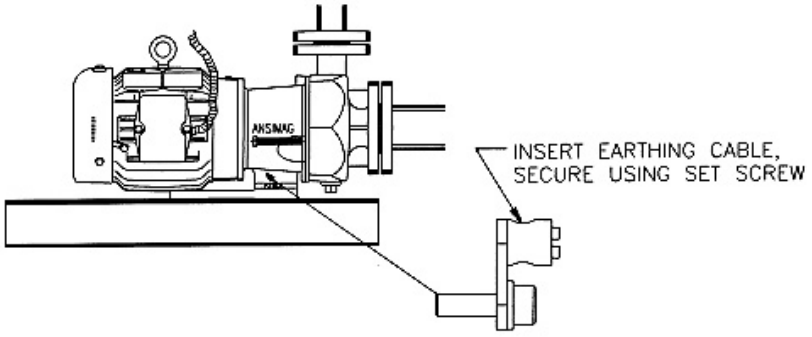


Fig.5-4: Earthing Arrangements

6. PUMP START UP AND SHUTDOWN

6-a. PRE-START CHECKLIST

Before initial start up and after inspections of the wet end of pump, perform the following inspections:

1. With the pump starter locked out, manually turn the motor fan or flexible coupling to insure that it rotates freely. For a motor mounted directly to the pump (close coupled), insert a screwdriver or other tool through the fan cover and rotate the fan. It should **rotate freely**.
2. Check all electrical connections with a wiring diagram. Make sure that the voltage, frequency and horsepower on the motor nameplate match the line circuit.
3. Check that flange bolts are tightened and that the drain cover is in place.

6-b. START UP AND OPERATION

Caution!: KF Series horizontal end suction models are not self-priming pumps! The pump must be filled with liquid by gravity from a flooded suction tank or primed by other methods such as injecting liquid from an outside source into the pump and suction line with an attached foot valve.

1. Make sure that the **pump is full of liquid** and the suction valve is open.
2. Fully open the discharge valve once and then close it, so that any air trapped in the pump and suction line can be purged.
3. With the pump full of liquid, check motor rotation by jogging the pump and motor for about 1/2 second. The proper rotation is clockwise as viewed from the motor fan end. Once proper motor rotation is confirmed jog the motor 5 or 6 more times. This process is very important to **fully wet sleeve bushing and pump shaft,** and to purge some of the air trapped in the pump and discharge line.
4. Open the discharge valve once and close it again so that more air can be released downstream.
5. Turn the pump on. **Open the discharge valve slowly**. It is important to open the valve very **slowly.** Sudden opening of the valve while air is trapped between the pump and the valve may cause water hammer.
6. Keep the suction valve fully opened. **Do not use the suction valve to adjust flow rate. Adjust the flow rate with the discharge valve only.**

   NOTE: Subsequent pump starts do not require motor jogging or valve position changes provided that the piping and pump have remained full of liquid.

Caution! Do not run the pump dry. The pump may be severely damaged. The pumps use slide bearings that are lubricated by the pumped product. No lubrication, no bearings. Even short periods of dry running could damage the pump.

Caution! Do not Dead Head. Although the radial loads on the bearings are not a concern, the liquid in the pump will rapidly increase in temperature. This will continue until the boiling point is reached. Some liquids boil at temperatures sufficient to melt pump components and destroy the magnets. Other liquids will flash into vapor. This vapor collects at the main bushing causing dry running.

Caution! Cavitation. Prolonged cavitation may cause pitting on the pump components. Short term severe cavitation, such as that caused by a closed suction may damage the pump bearings.

Caution! Water Hammer. Sudden changes in fluid velocity can cause large, rapid pressure surges. These pressure surges can damage the pump, piping and instrumentation. Typical causes are rapidly closing valves. Check valves on the suction can also cause water hammer if the liquid has time to reverse direction before the valve closes.

Recommended! Power Monitors. We recommend installing a Sundyne power monitor on all pumps. These devices are very effective at protecting the pumps from dry running, cavitation or when frequent overload is expected. They are also very effective for stoppage during tank unloading applications.

- Dry Running
- Closed Valve
- Clogged Suction Filter
- Pump Seizure
- Severe Cavitation
- Excess (High) Flow

6-c.SHUTDOWN

If the pump is to be shut down for any reason, use the following procedure:

1. Close the discharge valve slowly to prevent water hammer.

2. Shut off the motor.

3. Close the suction valve.

Safety

TEMPERATURE CLASSIFICATION - (ATEX DIRECTIVE 94/9/EC)

The maximum surface temperature of a metallic magnetic drive pump is the **highest** temperature ascertained from any one of the following conditions:

1. The temperature of the pumped liquid, plus 20°C.

or

2. The ambient temperature plus 20°C.

or

3. The ambient temperature plus 39°C (only in the case of separately mounted pumps with oil lubricated bearing assemblies)

or

4. The temperature of the heating medium being used in the heating jacket (if fitted)

The actual classification is calculated by obtaining the maximum surface temperature and than using the following table to obtain the relevant Temperature Class:

Temperature Class	Maximum Surface Temperature (°C)
T1	450 (842°F)
T2	300 (572°F)
T3	200 (392°F)
T4	135 (275°F)
T5	100 (212°F)
T6	85 (185°F)

Example:

The pump is pumping a liquid with a temperature of 120°C. The pump is close coupled and therefore does not have an external oil lubricated bearings. The maximum ambient temperature in which the pump may operate is 30°C

Condition 1 equates to 120°C + 20°C = 140°C
Condition 2 equates to 30°C + 20°C = 50°C
Condition 3 does not apply.
Condition 4 does not apply.

Thus the maximum surface temperature of the pump is 140°C which equates to a temperature classification of T3.

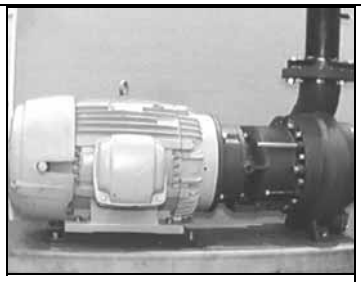
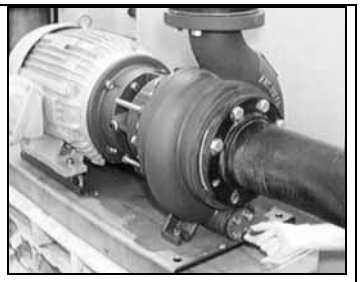
7. DISASSEMBLY AND MAINTENANCE

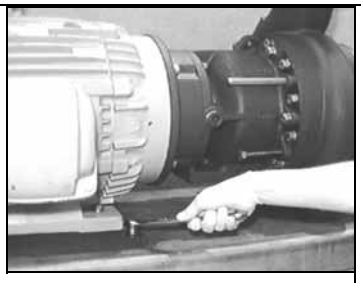
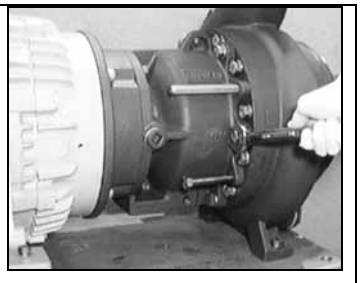
WARNING! Before disassembly, the pump must have the drive "locked out" and be flushed of all dangerous liquids. **Follow all Federal, State, Local and company regulations with regard to pump decontamination prior to disassembly and inspection**. Ansimag KF Series pumps are provided with a low point casing drain to maximize pump decontamination.

Both the long coupled and close coupled KF Series pumps can be pulled back from the casing. Therefore, if permitted by company regulations, pump disassembly and inspection can be conducted on site
.
Before inspecting, be sure to have a spare casing O-ring on hand to reinstall after the inspection is completed.

7-a. BASIC DISASSEMBLY FOR INSPECTION

Tools Needed: 15/16" wrench
3/4" wrench

1. Stop the pump, lock out the pump starter, shut off all the valves connected to the pump, and drain and decontaminate the pump. **Warning! Be sure pump is flushed of dangerous or hazardous liquids and all internal pressure is relieved before opening the pump for inspection.**		
	Fig. 7-1: KF Series Pump	**Fig. 7-2: Casing Drain**

2. Remove the bolts securing the bracket foot and motor or motor risers to the base. Then remove the 6 bolts (5/8-11x1.75) securing the pump bracket to the rear casing support.		
	Fig. 7-3: Unbolt Drive End from Base	**Fig. 7-4: Unbolt Bracket from Rear Support**

3. By using the two jackscrews, separate the magnetic coupling between the drive end and the wet end, then pull back the drive end at least 12" [300 mm].
Caution! You are separating the magnetic coupling.
LONG COUPLED PUMPS: Remove the coupling guard and coupling. Remove the bolts securing the bracket to the rear support. Again, use the two jackscrews to separate the bracket and bearing frame from the pump wet end. **Caution! You are separating the magnetic coupling.**

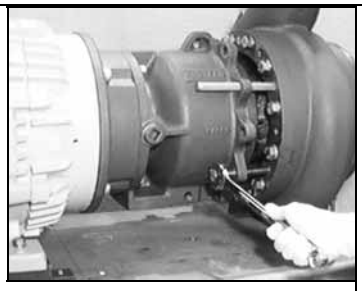


Fig. 7-5: Use Jackscrews to Pull Motor Back

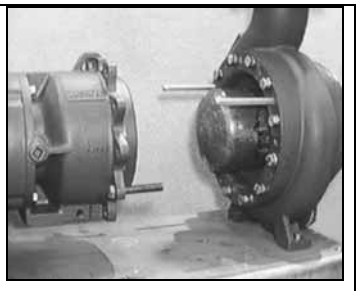


Fig. 7-6: Separate Motor from Pump Wet End

4. Remove the two jackscrews from the bracket and place them into two holes in the rear support, 180° apart. Using a 15/16" wrench, remove the 12, 5/8-11x2 bolts securing the rear support to the pump casing. Then use the jackscrews to separate the rear support from the pump casing.
Caution! Wear protective clothing, eyewear and gloves as required for the pumped liquid.
The impeller assembly contains very powerful magnets. Keep magnetic tools away from impeller.

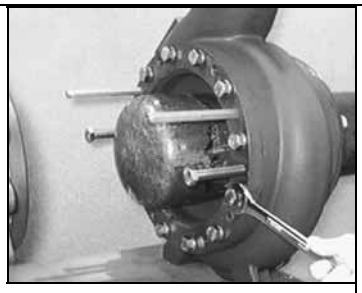


Fig. 7-7: Unbolt Rear Support from Pump Casing

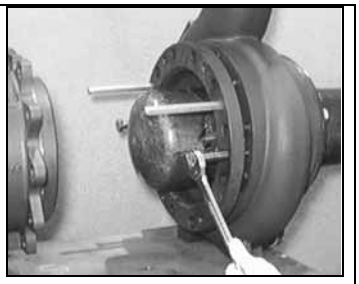


Fig. 7-8: Separate Rear Support from Pump Casing

5. Carefully pull out the containment shell along with the impeller and the shaft**. Caution! Magnetic attraction between the impeller and the rear support may cause the impeller to jump forward. When removing this assembly be sure to keep the eye of the impeller angled upwards so that the impeller can't jump forward and hit the casing or thrust ring.**

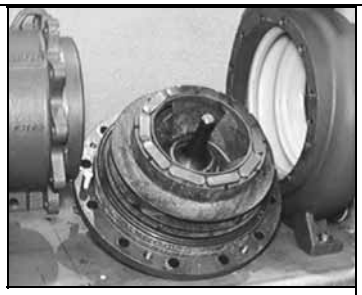


Fig. 7-9: Remove Containment Shell and Impeller.

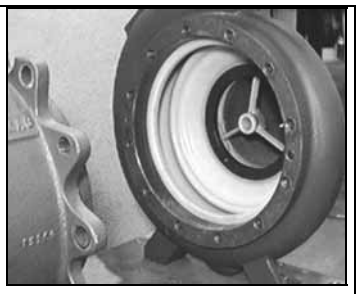


Fig. 7-10: View of Pump Casing and Thrust Ring

6. Remove the impeller from the containment shell. It will be easier if you carefully hold down the edge of the rear support while pulling up on the impeller. Then carefully remove the shaft from the containment shell**. Caution! If the shaft is dropped on a hard surface such as concrete the impact may cause the shaft to break.**

Fig. 7-11: Remove Impeller from Containment Shell.

Fig. 7-12: Remove Shaft from Containment Shell.

7. If the shaft is difficult to remove, slip the magnet removal tool, PT0439, over the shaft until it contacts the back thrust ring. With the containment shell oriented as shown in Fig. 7-13 (dome side up), firmly tap the assembly on the floor. **Caution! If the shaft is dropped on a hard surface such as concrete the impact may cause the shaft to break.**

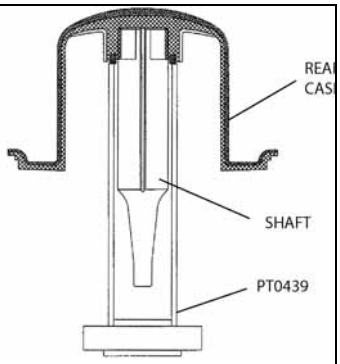


Fig. 7-13: Remove Shaft with PT0439.

7-b. INSPECTION CHECKLIST

All wear parts in the KF Series pumps are pure sintered silicon carbide (SiC). Because of SiC's extreme hardness, true wear will not occur. However it is still important to inspect the pump after the initial 500 hours or three months of operation, whichever comes first, to make sure there is no damage due to solids in the liquid, cavitation or dry running. Inspect again in six to twelve months, depending on the results of the first inspection.

Before inspecting, be sure to have a spare casing O-ring on hand to reinstall after the inspection is completed. To inspect the pump interior, be sure that the pump has **first been flushed of all dangerous liquids.**

Operating conditions vary so widely that recommending one schedule of preventive maintenance for all centrifugal pumps is not possible. In the case of magnetic drive pumps, particularly of non-metallic pumps, **traditional maintenance techniques such as vibration monitoring are not useful or reliable for wet end preventive maintenance.** These techniques are effective only for bearing frames (non-liquid contact components) and for motor bearings. For best maintenance results, keep a record of actual operating data such as flow, pressure, motor load, and hours of operation. The length of the safe operation period will vary with different applications and can be determined only from experience.

The inspection checklist is as follows:

1. Check for cracks in **silicon carbide parts** such as the thrust ring and shaft.

2. Check for signs of melting or deforming in the **shaft support, main bushing** and the **socket of the containment shell** where the pump shaft is held. Dry-running during initial startup or during operation may cause heat-related deflection or wear of these parts.

3. Inspect the **casing liner** to be sure there are no signs of abrasion or cuts deeper than 0.05" [1.3 mm]. Liner cracks may occur if the lining is corroded or placed in an extremely cold place, or if a chemical penetrates the liner and corrodes the outside metal casing. Most liner damage can be spotted visually. To detect hairline cracks, a 15-20 KV electrostatic discharge tester is recommended, which is often used to test lined pipe.

4. The SiC main bushing will not exhibit wear under normal operation. Polishing on SiC surfaces is a normal condition of running and does not require replacement. However, the inner surface must be checked for cracks, chips or scratches. Verify that the main bushing is tightly pressed into the impeller. It should be impossible to dislodge the main bushing by hand. Check for signs of melting around the circumference of the **main bushing**.

5. Check the **mouth ring/pads** face for wear. The lubrication flutes are reliable indicators of mouth ring wear. They should be at least 1/32" [0.8mm] deep. A part replacement procedure is described in Section 7-c.

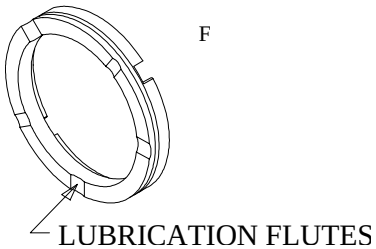


Fig. 7-13

6. Check the **impeller vanes** for material trapped inside. If any of the five flow paths become clogged, a hydrodynamic imbalance may cause excessive wear to the mouth ring/pads and main bushing.

7. Check the **inner magnet encapsulation** for cracks or grooves in excess of 1/32" [0.8mm]. Fluid inside the magnet area may cause swelling which could wear on the containment shell.

8. **Check for slurry.** If the pumped liquid contains slurry, it may build up near the back of the main bushing. This build-up may cause clogging of the journal bearing area of the main bushing and create a dry-run condition. Estimate the rate of build-up from the first inspection and schedule the unit for future maintenance accordingly.

9. Inspect the **containment shell** for signs of abrasion. Replace if scratches or grooves in the inner surface are deeper than 1/32" [0.8mm]. Also replace if the outside has grooves deeper than 0.020 [0.5mm] inches. Inspect the back **thrust ring** for chips or cracks.

7-c.PARTS REPLACEMENT PROCEDURES

1a **Bushing removal** is accomplished using the Ansimag KF Bushing Removal Arbor (PT0437), shown in Figure 7-14.
This arbor is plastic to avoid damaging the SiC main bushing.

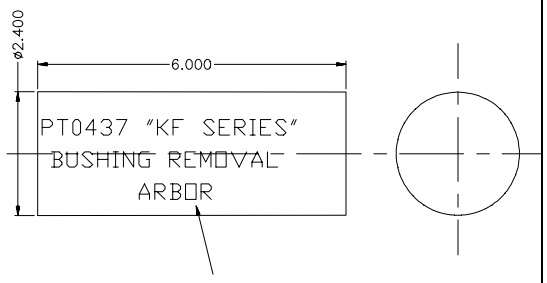


Fig. 7-14: Bushing Removal Arbor

1b Place the impeller assembly vertically on the bed of the arbor press. Insert the arbor into the eye of the impeller. Slowly press the main bushing out using an arbor press. Do not allow the main bushing to fall onto a hard surface since this may damage the SiC parts.

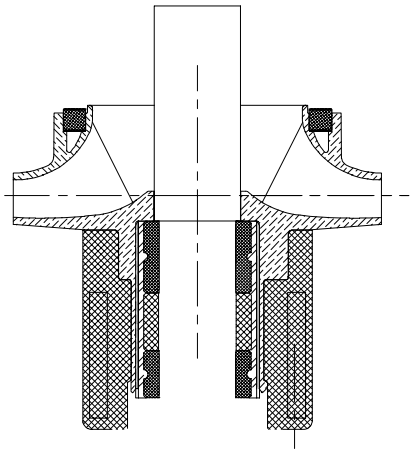


Fig. 7-15: Main Bushing Removal

2a **Impeller Removal** is accomplished using the Ansimag Magnet Removal Tool (PT0439). This tool conveniently and safely allows the removal of the inner magnet assembly from the impeller.

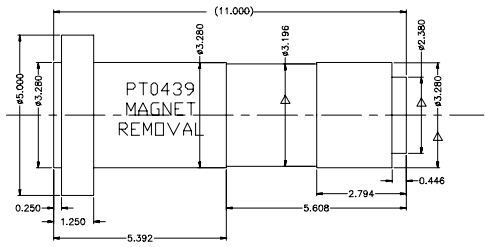


Fig. 7-16: Magnet Removal Tool

2b First insert the Magnet Removal Tool into the bushing bore of the impeller, as shown in Figure 7-17. Be sure that the tool goes all the way to the bottom of the bushing bore.

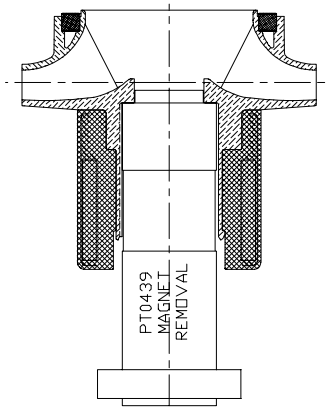


Fig. 7-17: Magnet Removal Tool

2c Then while holding the tool in place, drop the impeller assembly from a height of 2' to 3' [.67 to 1 m] onto the exposed face of the Magnet Removal Tool. Be sure to hold the impeller assembly vertically, with the mouth ring/pads facing upward and the tool facing downward.

Caution! If the impeller has been in service, droplets of pumpage may spray upwards. Cover the impeller with a plastic bag before dropping the assembly.

Fig. 7-18: Magnet Removal Tool Placed in Bushing Bore

2d The Magnet Removal Tool pushes against the shoulder of the impeller, and the momentum of the drop causes the inner magnet assembly to slip down and off the impeller.

Fig. 7-19: Inner Magnet and Impeller Separated

3. To remove the **mouth ring** from the impeller eye use a screwdriver or other flat bladed tool after removing the o-ring. **Note:** The silicon carbide mouth rings should be removed only if inspection shows that replacement is required. **Removal is likely to damage the SiC mouth ring.**
Mouth ring pads are removed by prying with pliers or screwdriver
.
KF mouth ring removal

1. Cut exposed TFE O-ring.
2. Pull out the O-ring sections with pliers.
3. Carefully use screwdriver to loosen and remove.

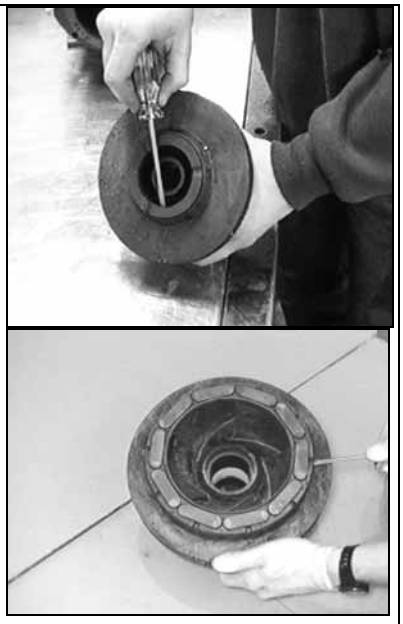


Fig.7-20: Remove Mouth Ring/Thrust Pads

4. To remove the **containment shell** from the rear support simply pull the two components apart; they are joined in a slip fit. But if necessary, gently tap the domed section with a rubber hammer to separate the two components.

8. WET END ASSEMBLY

8-a WET-END ASSEMBLY

1. Insert the containment shell into the rear support. If necessary tap it into place with a soft hammer until it is evenly seated.

   Insert the larger end of the pump shaft into the socket of the containment shell, aligning the groove in the shaft with the raised projection in the socket.
   Caution!: If the pump shaft is dropped on a hard surface such as concrete the impact may cause the shaft to break.

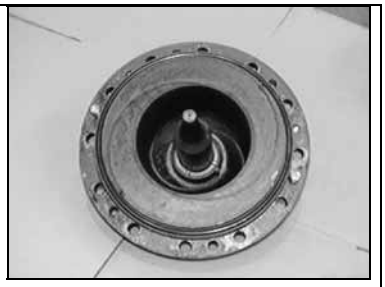


Fig. 8-1: Shaft in Containment Shell Socket

2. Slowly place the impeller assembly (including the main bushing and mouth ring/thrust pads) onto the shaft and into the containment shell. Refer to Section 8-b for details of impeller assembly. It is important to avoid chipping of the main bushing during contact with the shaft.

   Place the casing O-ring into the O-ring groove of the containment shell.

3. **Caution! Magnet attraction between the impeller and the rear support may cause the impeller to jump forward.**
   To avoid this, gently pull the impeller forward until it reaches its magnetically neutral position. At this position it will feel like the impeller is hovering on the shaft.

4. Use the two guide bolts to help support the containment shell and impeller assembly, and then line up the end of the shaft with the bore of the shaft support in the pump casing and fit together. Make sure the arrow imprinted on the rear support is pointed up.

Caution! The containment shell, rear support and impeller assembly weighs approximately 65 pounds. Obtain assistance lifting this into place.

Caution! Take care to engage the front of the shaft into the front shaft support.

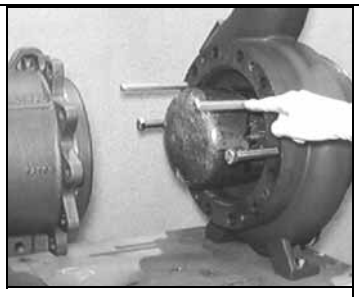


Fig. 8-2: Guide Bolts to Support Containment Shell Assembly

Fig. 8-3: Fit Casings Together

5. Push the assembly in until the faces of the rear support and pump case are within approximately .060 inches. Gently rotate the rear support back and forth to seat the o-ring. Avoid tapping on the rear support, since this could cause the casing O-ring to dislodge. Install the twelve 5/8-11X2" hex bolts and lockwashers and tighten until snug only.These bolts will be tightened after assembly to the bracket, and confirming that the feet sit flat.

IF IMPELLER ASSEMBLY IS ALREADY COMPLETE, SKIP TO SECTION 9.

Note: If the work is being performed in the shop, it is recommended to lay the pump case on its suction flange, taking care not to scar the plastic flange facing. Place the impeller assembly into the pump case with the mouth ring resting on the front shaft support. Carefully lower the rear support with the containment shell, shaft and o-ring onto the pump base, taking care to engage the shaft into the bushing and then into the front shaft support. Install the twelve 5/8-11X2" hex bolts and lockwashers and tighten until snug only. These bolts will be tightened after assembly to the bracket and confirming that the feet sit flat.

8-b. IMPELLER ASSEMBLY

The parts shown in Figure 8-4 are the wet end's only rotating parts. From left to right the parts are:

- Mouth ring / thrust pads
- Impeller
- Inner magnet assembly
- Main bushing

Assemble as follows:

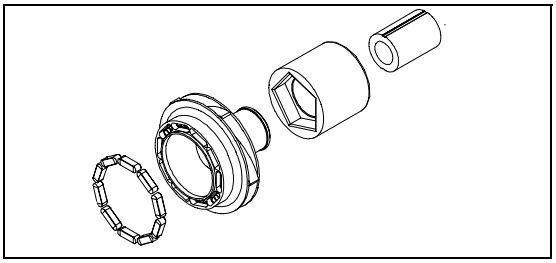


Fig.8-4: Impeller Assembly

1. The impeller and inner magnet assembly comes as two separate parts. First place the impeller on the arbor press, with the suction end facing down. Then, position the socket of the inner magnet assembly over the impeller. Rotate the inner magnet assembly to align the two polygons. Use the white Magnet/Bushing Arbor tool (PT0438) and the arbor press to press the inner magnet assembly onto the impeller.

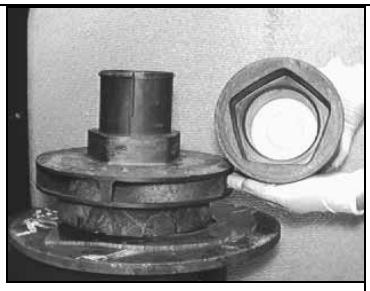


Fig. 8-5: Line up Polygon of Inner Magnet Assembly with Polygon of Impeller

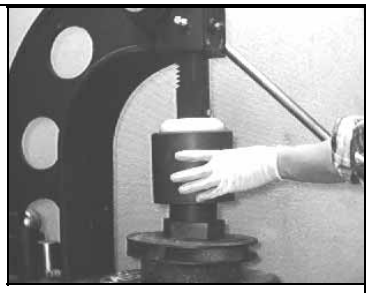


Fig. 8-6: Use PT0438 Tool to Press Inner Magnet Assembly onto Impeller

2. Figure 8-7 shows the inner magnet assembly completely pressed onto the impeller.

   To insert the main bushing, align the two molded keys in the impeller bore with the two keyways on the main bushing (P2263). **Note: Be sure to insert the end with the wider bushing first.**

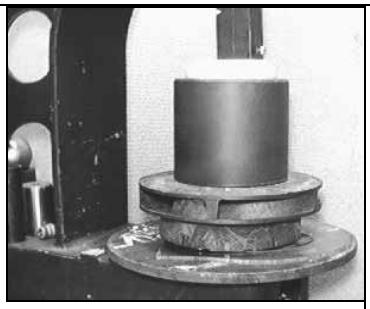


Fig. 8-7: Inner Magnet Assembly and Impeller Form Single Unit

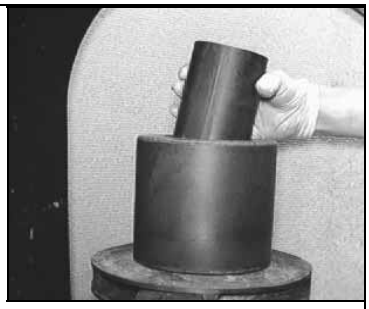


Fig. 8-8: Line up Main Bushing with Keyway

3. The main bushing is inserted using the same white PT0438 tool discussed in Step 1. Place the PT0438 tool onto the back of the main bushing and press the main bushing into the impeller bore. Press until firm resistance is felt. The tool has a shoulder which prevents too-deep insertion of the bushing.

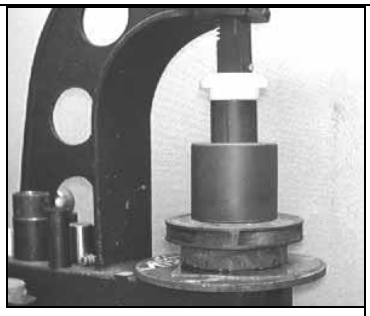


Fig.8-9: Insert Main Bushing into Impeller with PT0438 Tool

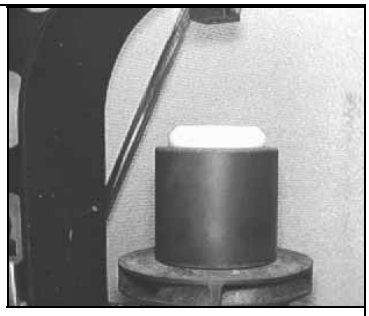


Fig.8-10: Main Bushing Inserted all the way into Impeller

Caution: Do not use a hydraulic press, since you can not feel when the cone-shaped side hits the bottom of the bore!

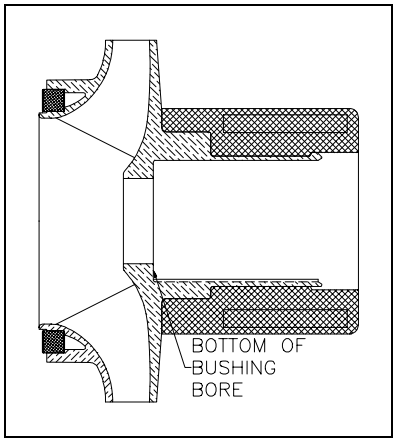


Fig. 8-11

4. For all models except KF6410, align the notches in the back of the mouth ring with the driving dogs in the impeller, press-fit mouth ring with O-ring attached into the mouth ring seat in the eye of the impeller. The O-ring is used as a locking ring.

   Model KF6410 uses ten thrust pads, each with a white Teflon (PTFE) strip bonded to the bottom of the pads, in place of a mouth ring. Therefore no O-ring is required. Instead, each pad is inserted, Teflon strip first, into a pocket.
   Thrust pads are installed with the slightly chamfered ends facing outwards.

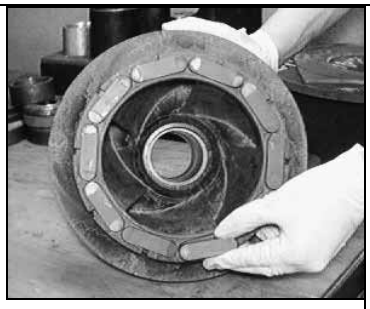


Fig.8-12: Press-Fit Mouth Ring/Thrust Pads into Impeller

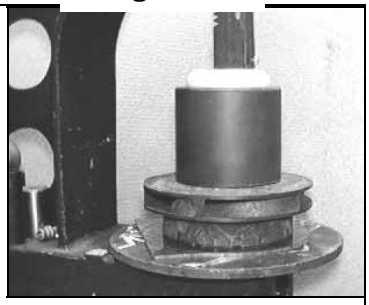


Fig.8-13: Press Mouth Rings/Thrust Pads onto Impeller

5. For the KF6410 model only, use a straight edge to confirm that the mouth ring pads are level with respect to each other. Measure each pad in turn. Height measurement of adjacent pads should be within 0.020" [0.5 mm] of each other

Fig.8-14: Measure Thrust Pad Levels

9. DRIVE END ASSEMBLY-Pumps with NEMA Motor (with C-face)* -IEC/JIS Motor (B5 with "D" flange only)*

9-a. MOUNTING MOUNTING PLATE , OUTER DRIVE AND FOOT

If practical, place the motor vertically on a worktable or floor so that shaft is pointing upwards. Be sure to cover the work surface with corrugated cardboard or similar material to prevent damage to the fan cover. **Caution:** Motors with plastic fan covers may be damaged in the vertical orientation

DRIVE END MOUNTING : NEMA or IEC/JIS Motor Frame Mounting:

1. Mount the motor mounting plate to the motor flange using the 4 bolts provided. NEMA motors use socket head cap screws from the pump side while IEC/JIS mounting uses hex bolts from the motor side. The bolt size varies with motor frame. Do not tighten the bolts more than snug at this time.

2. With the motor shaft key installed (an instant adhesive works well to hold the key in place), test the fit of the outer drive to insure that it will side freely onto the motor shaft. Then remove the outer drive.

3. Slide the round end of the bracket over the motor shaft and onto the motor mounting plate. Secure the bracket with 4, 5/8"-11 x 1.75" hex bolts. Do not tighten the bolts more than snug at this time.

4. Mount the bracket foot to the bottom of the bracket using 3, 5/8"-11 x 1.50" (3.25" for KF6410) hex head screws and lockwashers. The KF6410 model uses a riser between the bracket and foot. **Torque to 80 ft-lb [110 N*m].**

5. Slide the outer drive into the bracket and onto the motor shaft, making sure that the shaft key is in place. The outer drive must be positioned so that the notch on its outer diameter aligns with the front face of the bracket. This will position the outer drive 1-1/16" from the bracket face as shown in Figure 9-1.

6. The outer drive hub is secured to the shaft with 3, 5/8-11 x 0.75" hex socket set screws, oriented 60^{o} apart. A 5/16" hex key must be used to tighten the setscrews. **Torque to 60 ft-lb [82 N*m].**

7. For NEMA motors frame sizes 213/215 and larger and IEC/JIS motors with frames 160 and larger*, install motor risers on the back feet of the motor. This will prevent unwanted vibrations at the motor fan end.
   - **Ansimag recommends using NEMA C-face with base motors for 213/215 frames and larger and IEC/JIS B3/B5 (foot/flange) motors for 160 frame size and larger. These motors allow mounting of risers which greatly increase the safety when handling heavy motors.**

8. Stand the motor and bracket assembly horizontally on a flat work surface. Adjust the fit between parts to ensure that the both risers on the motor back feet and both feet of the bracket are flat on the work surface. Tighten the bolts between the motor and motor mounting plate and between the bracket and motor mounting plate in a star pattern to the following values.
   ½-13 and 12mm – 40 ft lb (54 N*m), 5/8-11 and 16 mm – 80 ft-lb (110N*m)

   The motor drive end is now ready to mount to the wet-end.

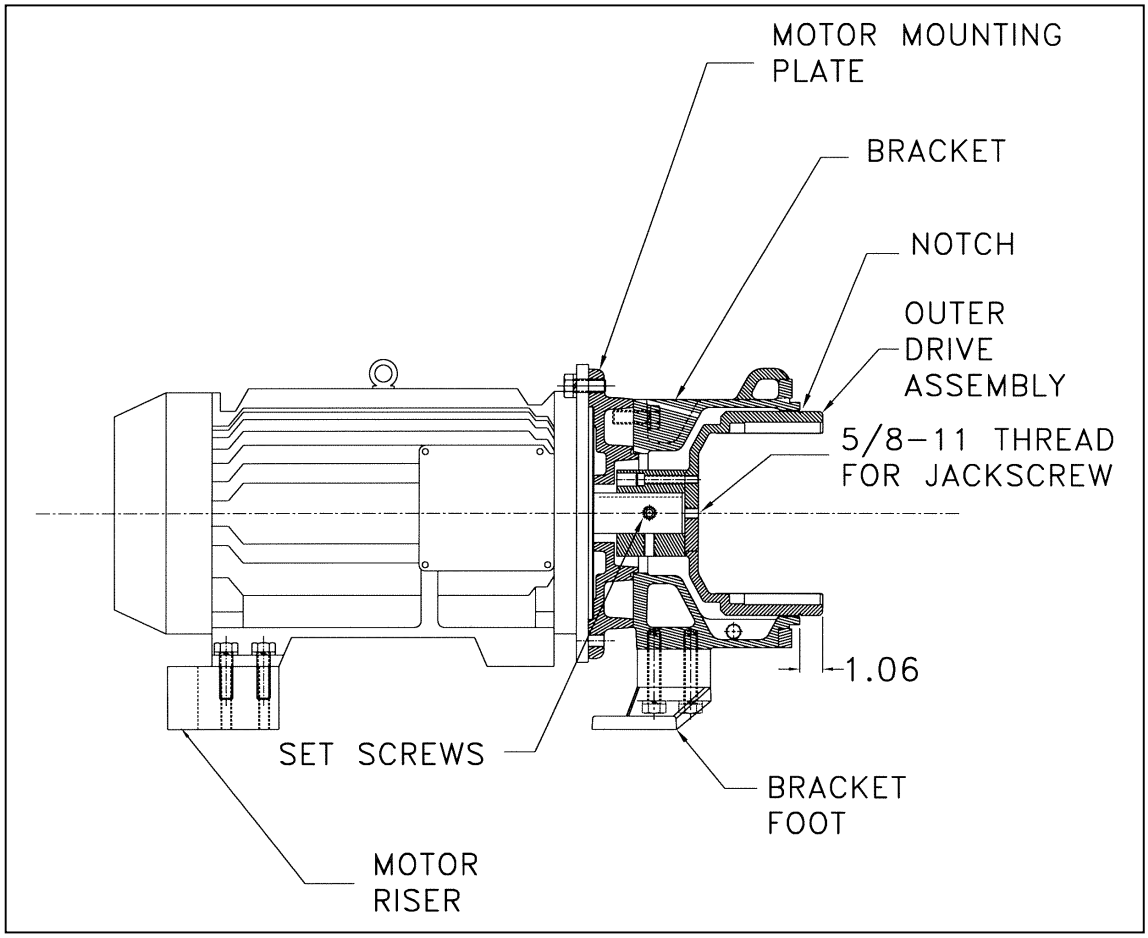


Fig. 9-1: DRIVE END ASSEMBLY, NEMA or IEC/JIS MOTORS

9-b. MOUNTING DRIVE END TO WET END

1. Line up the rear casing end of the wet end with front of the bracket and outer drive. **To control the magnet coupling forces during assembly advance the jackscrews to their full forward position.** This will prevent the parts being "slammed" together by the magnet attraction during assembly. For additional safety, guide bolts from the wet end should engage the corresponding holes in the bracket flange. This will prevent the outer drive contacting the containment shell. Back out the jackscrews a couple of turns at a time in an alternating pattern, until the bracket flange mates with the rear casing support.

2. Attach the bracket to the rear support with 6, 5/8-11 x 1.50" hex head screws and lockwashers. Ensure that all feet are sitting flat on the work surface. **Now torque the twelve rear support to pump case bolts in a star pattern in increasing torque increments to 80 ft-lb [110 N*m]. Torque the six bracket to rear support bolts in a star pattern to 80 ft-lb (110 N*m).**

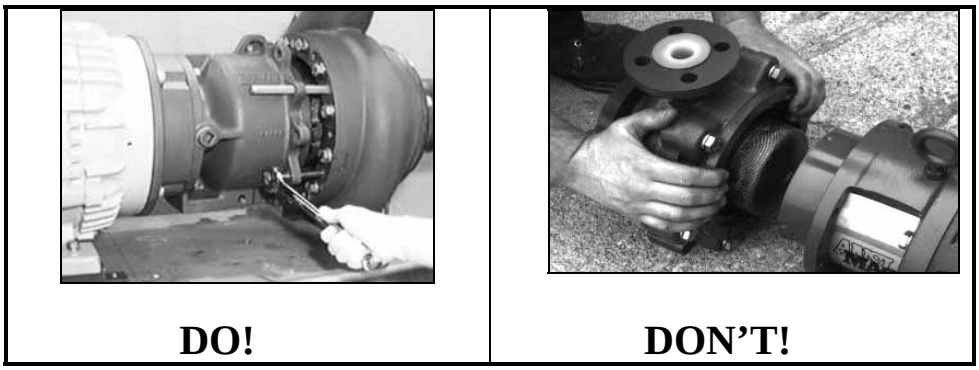


Fig.: 9-2 Use jackscrews for assembly or disassembly

CAUTION: KEEP FINGERS AWAY FROM MATING FACES TO AVOID INJURY!

10. TRIMMING & BALANCING IMPELLERS

10.1 TRIMMING

1. Install Ansimag impeller arbor PT0448 (see Fig 10-1) into the jaws of the lathe by the ∅2.25" end. Verify that the TIR < 0.002" [0.051] at the free end.

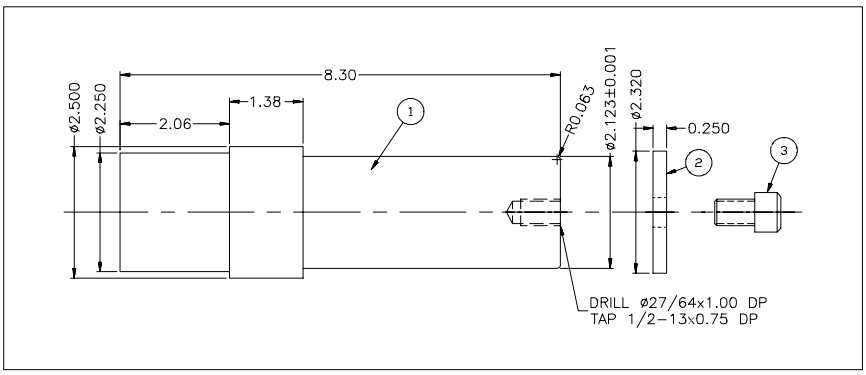


Fig.10-1: KF Impeller Trimming Arbor

2. Place the impeller assembly (impeller, magnet and main bushing) onto the free end of the arbor, as shown in Fig 10-2, being careful to avoid chipping the SiC bearings. Install the washer with the 1/2-13 socket head cap screw. Lightly tighten the screw (just enough to avoid slip while machining). Be aware of the magnetic attraction between the impeller and lathe jaws.

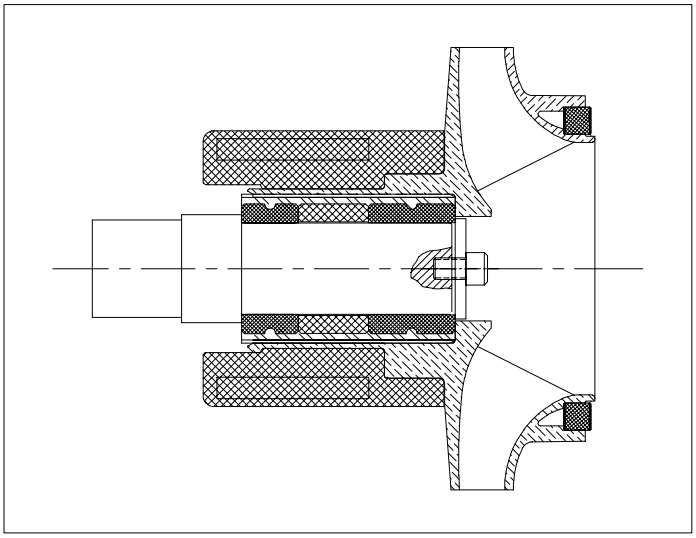


Fig.10-2: KF Impeller on Arbor

3. Adjust the lathe speed to 500 RPM.

4. Slowly take roughing cuts up to 1/8" [3.2 mm] diameter at a time across the impeller, proceeding from the impeller eye towards the lathe chuck (to avoid loosening the main bushing). After each cut across the impeller, carefully remove all trimmed TEFZEL chips for a clean start on the next cutting approach. As you near the desired trimming diameter, take smaller and slower cuts for a smoother finish. Proceed to steps 6 and 7, unless the impeller to be trimmed is for the KF6410 model with a 7.25" trim [184 mm].

Trimming KF6410 to 7.25"

5. The 7.25" trim for the KF6410 requires machining a 45° tapered profile. Note: All other trims are straight across, parallel to the axis of rotation. This is shown in Fig. 10-3.

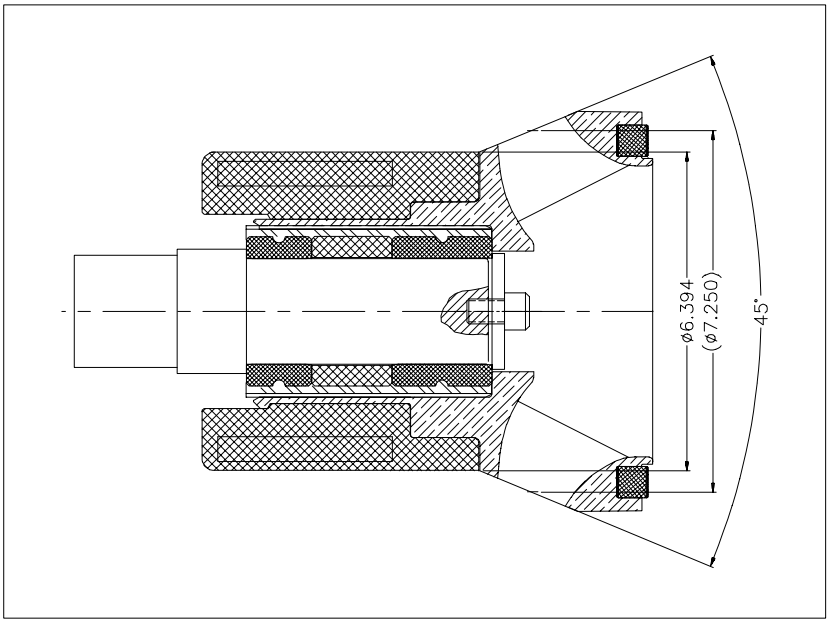


Fig.10-3: KF6410 Impeller 7.25" Trim

6. After finalizing the diameter, deburr with a knife or file the outer edges of the shrouds to approximately 0.025" x 45° [0.5 mm x 45°]. Do not chamfer on the lathe.

7. Remove the impeller assembly from the arbor and clean up any loose material with a knife.

10.1 BALANCING IMPELLER / INNER DRIVE ASSEMBLIES

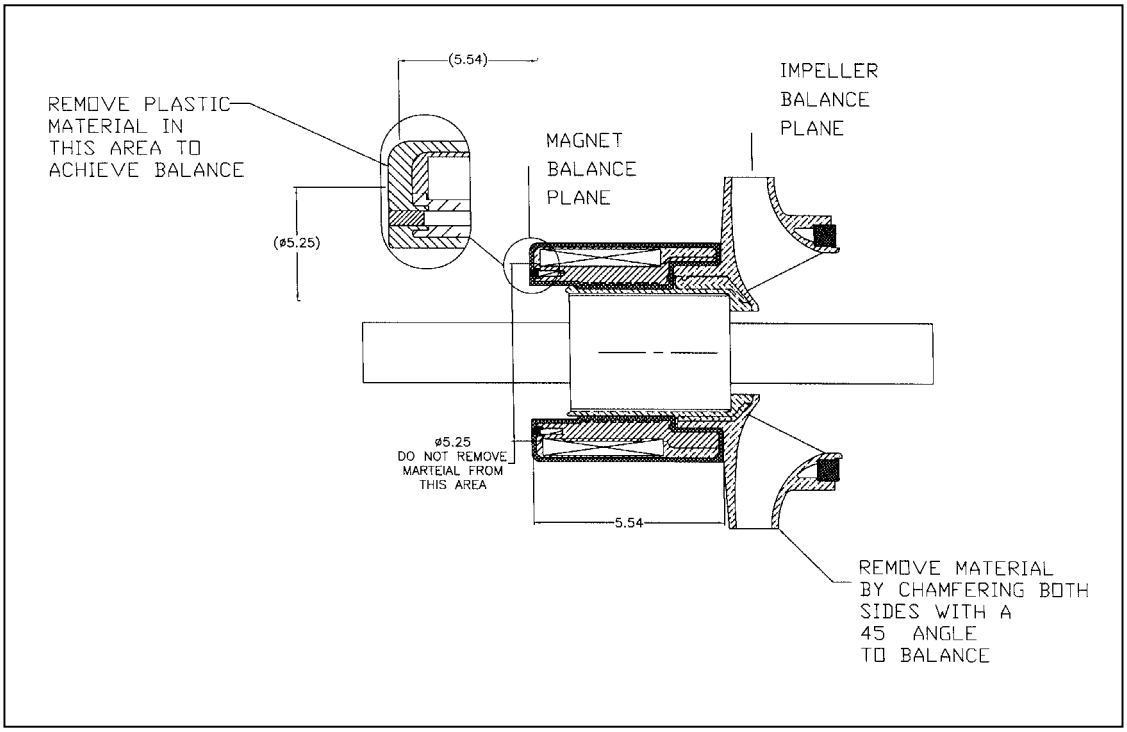
1. All impeller / inner drive assemblies operating at a rotational speed greater then 1800 rpm must be balanced. The impeller must be trimmed to size before balancing. The impeller assembly must be two plane balanced.
2. Balancing is accomplished by removing plastic material from the back of the inner drive assembly and from the impeller shrouds. The inner drive assemblies have additional ETFE plastic added to the back face solely for the purpose of balancing. Figure 10.4 shows the area where material may be removed for balancing.

   Caution! Do not remove too much material or the integrity of the plastic encapsulation of the metal components may be compromised.

3. Material removal for balancing is most easily accomplished by use of a high speed, light duty, electric die grinder. Typically, these grinders have a 1/8" collet and operate at 20,000 to 30,000 rpm. Use a 1/4" diameter, double cut, cylindrical with radius end carbide burr.

4. Obtain a balancing arbor, PT0444, from Ansimag. The arbor is designed for mounting the impeller between the bearings of the balancing machine. The drive belt can be positioned adjacent to the magnet end. Before installing the impeller on the arbor verify that the arbor is in dynamic balance.

Fig.10-4: KF Impeller Mounted on Balancing Arbor



5. Remove the main bushing, if present. Press the balancing arbor into the impeller bore as shown in the figure above. The arbor is sized to replace the bushing during the balancing operation. Mount the arbor with impeller on the balancing machine. The balance or correction planes are the center of the added plastic and the center of the impeller discharge. The allowable unbalance at each plane is defined in the table below:

Table 10.1: Allowable Unbalance for KF Impeller per ISO 1940, G6.3

	Magnet Balance Plane	Impeller Balance Plane
Allowable residual unbalance	24.9 g-mm or 0.98 g-in	58.6 g-mm or 2.31 g-in
correction radius	2.81 in. or 71.4 mm	1/2 trim diameter
Allowable unbalance mass	0.35g @ 2.81 in	.50g @ Impeller O.D.

Note: Maximum correction at the magnet plane is 18 g-in or 470 g-mm.

6. Material removal at the magnet end is accomplished by grinding away the plastic. Up to 180^{o} s of arc or approximately 18 g-in (470 g-mm) can be balanced by removing material. If the impeller shows an initial unbalance of more than 18 g-in, remove it from the arbor. Remove the magnet from the impeller and reassemble at a different orientation of the polygon. Proceed with balancing. Blend the ends of the removed sections to minimize turbulence and solids accumulation.

7. Material removal at the impeller end should begin by chamfering the shroud edges. Material can be removed up to 180 degrees. If chamfering is insufficient to achieve balance, remove shroud material to form a flat. This will not effect the impeller performance. Blend the ends of the removed sections to minimize turbulence and solids accumulation.

8. Deburr the impeller using a sharp knife. Ensure that the unbalance is within the amounts specified above.

9. Reinstall the bushing.

11. BEARING FRAME DISASSEMBLY & MAINTENANCE

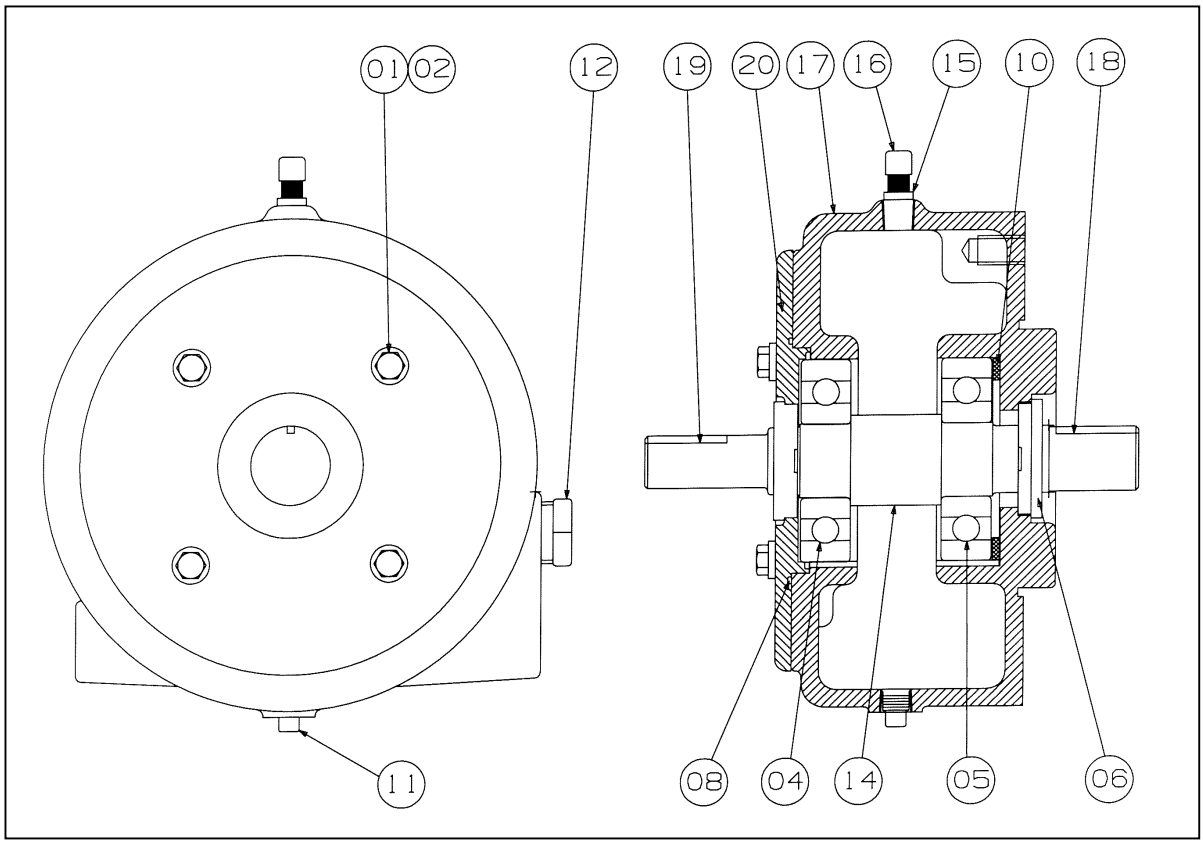
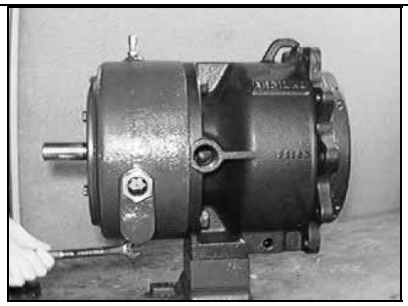


Fig. 11-1: Bearing Frame Assembly

11-a. DISASSEMBLY

Tools Needed:
Adjustable wrench
T handle long 5/16" Allen wrench
Socket wrench with extension

1. Remove the coupling guard. Disconnect the flexible coupling between the motor shaft and bearing frame shaft. Drain the oil from the bearing frame using the drain plug on the bottom (11). Unbolt the bearing frame foot from the base plate.	
	Fig. 11-2: Drain Plug

2. Unbolt the four bolts that connect the bracket to the pump rear support. Decouple the bearing frame (and outer drive) from the pump rear casing (and inner drive) using the two jackscrews provided. **Caution: Secure bearing frame assembly before proceeding, by bolting it to the work surface using the holes in the foot.**

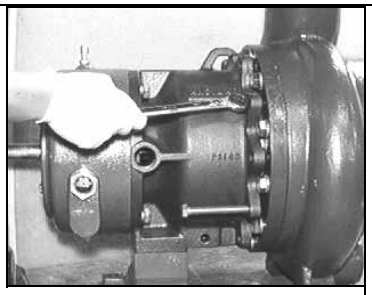


Fig. 11-3: Unbolt Bracket from Pump

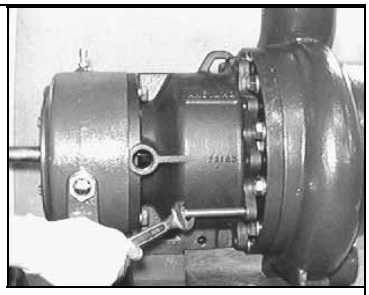


Fig. 11-4: Use Jackscrews to Decouple Drives

3. To disconnect the outer drive from the shaft, first remove the 1" NPT plug to expose the three setscrews that secure the outer drive to the shaft. Remove the set screws with the T handle long 5/16" Allen wrench.

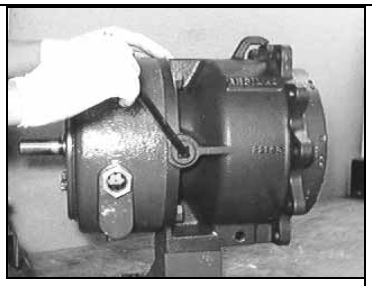


Fig. 11-5: Remove 1" Plug to Expose Set Screws

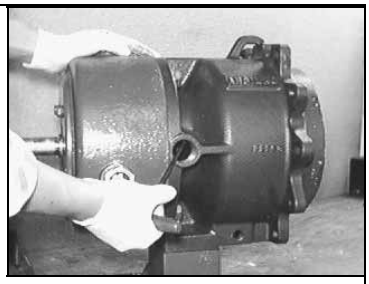


Fig. 11-6: Remove Set Screws

4. Thread one of the two jackscrews used in Step 2 into the center hole of the outer drive. This will help separate the outer drive from the shaft. The outer drive should then slide off the shaft by hand. Do not use other methods to force the outer drive off the shaft since this could damage the bearings or labyrinth seal. **Caution: Use nonmetallic tools to avoid personal injury or damage to the parts.**

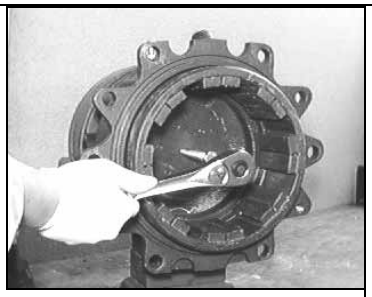


Fig. 11-7: Use Jackscrew to Help Separate Outer Drive from Shaft

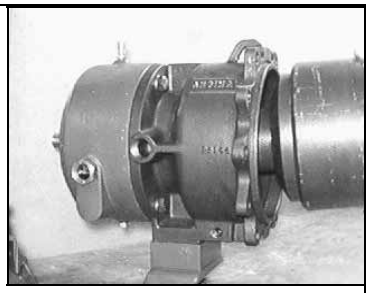


Fig. 11-8: Slide Outer Drive off Shaft

5. Separate the bearing frame assembly from the bracket. First, remove the four bolts holding the two sections together. Then pry apart.

Caution: Support the bearing frame so that it does not fall during this step.

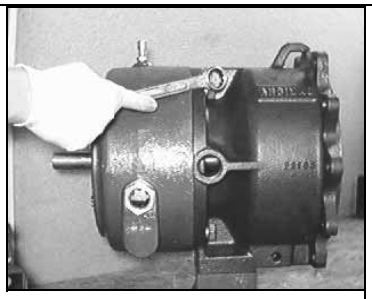


Fig. 11-9: Separate Bearing Frame and Bracket

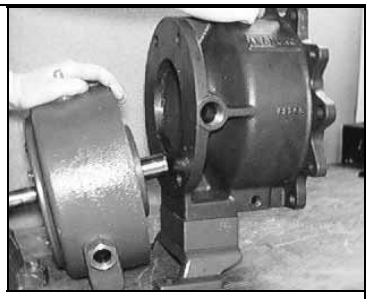


Fig. 11-10: Bearing Frame and Bracket

6. Unbolt and pry off the bearing frame cap.

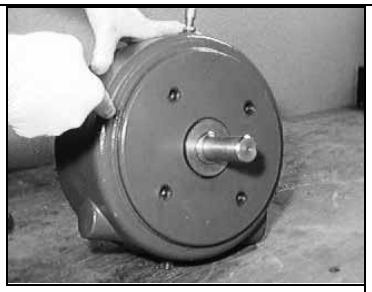


Fig. 11-11: Pry off Bearing Cap

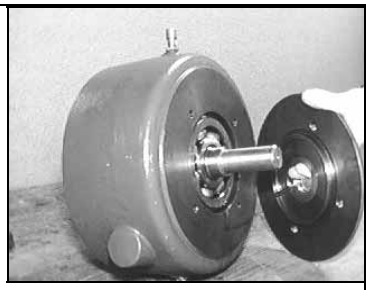


Fig. 11-12: Remove Bearing Cap

7. Extract the shaft by carefully pulling the shaft towards the motor end. It may be necessary to lightly tap the pump side of the shaft with a hammer against a brass rod to unseat the shaft assembly. Note that there is a tight fit between the shaft assembly and the bearing frame.

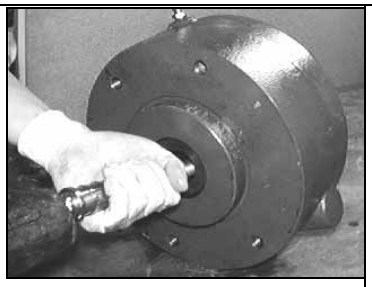


Fig. 11-13: Tap Out Shaft Assembly

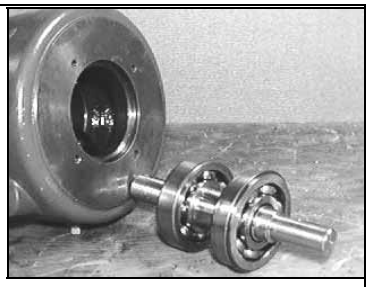


Fig. 11-14: Remove Shaft Assembly

11-b. INSPECTION & MAINTENANCE OF BEARING FRAME

The following components should be inspected and replaced as needed:

Bearings: The bearings should be cleaned if they are dirty. If they seem to be noisy or rough when rotated they need to be replaced. Check for pits or grooves in the outer housing of the bearings and replace the bearing unit if any are found. The oil should be changed whenever the bearings are replaced.

Shaft Assembly: Check all rotating smooth machined surfaces for wear and scoring, and replace the shaft assembly if necessary.

Labyrinth seals: Replace the labyrinth seals if they are worn or damaged or if the O-rings are worn.

Oil: Ansimag recommends flushing the bearing housing to remove dirt, grit and other impurities that may have entered the bearing housing during shipment or installation. The recommended lubricant is ISO VG68 Synthetic Lubricant. Make the first oil change after 400* hours of operation for new bearings if the pump is operating under normal conditions, i.e. experiencing only moderate temperature changes, humidity and dirt. Check the level and condition of the oil through the sight glass on the bearing frame. Check for unusual noise, vibration, and bearing frame oil temperatures.

Approximate amount of oil required: 54 fl.oz. or 1.7 qt. [1.6 L]

Schedule for Oil Changes**:**	Oil temps below 160 F	=	36 months
	Oil temps between 160 F and 200 F	=	24 months
	Oil temps between 200 F and 250 F	=	12 months

* Maintenance intervals are based on a clean reservoir protected from contamination. Drain and change oil if reservoir becomes contaminated. Subsequent first oil change should be done at 200 hours, and then regular maintenance intervals apply.

11-c. ASSEMBLY OF THE BEARING FRAME

[If shaft assembly and labyrinth seals are already assembled skip to Step 5]

1. Start by lightly lubricating the labyrinth seals on the outside O-ring. Install the labyrinth seal with the expulsion port at the 6 o'clock position facing down, since it works by gravity.

Fig. 11-15: Labyrinth Seal w/ Port at 6 o'clock

2. To install the labyrinth seal into the bearing cap use an arbor press and wide flat arbor (necessary to distribute the load over the entire face). The OD of the seal is stepped - insert the smaller diameter into the bearing cap. Press in only as far as the first step will allow, and avoid angular misalignment. Small pieces of the O-ring may shear off at the outer surface of the bearing cap. Discard any of this residual material from the outer O-ring.

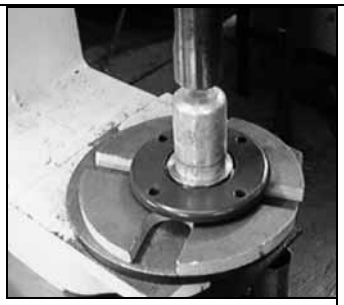


Fig. 11-16: Install Labyrinth Seal in Bearing Cap

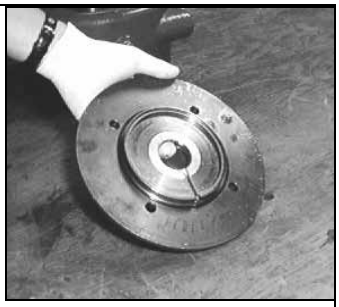


Fig. 11-17: Labyrinth Seal in Bearing Cap

3. To install the labyrinth seal into the bearing frame housing cavity, use an arbor press and wide flat arbor (necessary to distribute the load over the entire face) with the seal facing the pump side. Insert the smaller diameter of the seal into the cavity. Press it in only as far as the first step will allow, and avoid angular misalignment. Small pieces of the O-ring may shear off - discard any of this residual material from the O-ring.

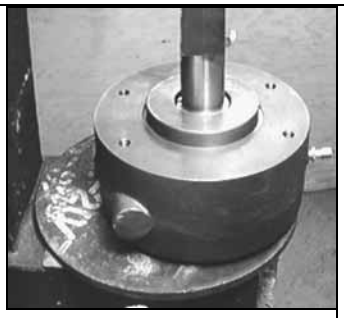


Fig. 11-18: Install Labyrinth Seal in Cavity

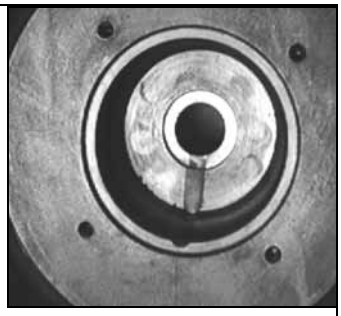


Fig. 11-19: Labyrinth Seal in Cavity

4. To fabricate the shaft assembly, be aware that the bearing with the lock ring is installed on the motor side. Place the bearing with the lock ring facing down (when the shaft assembly is held upright, with the motor side on the bottom). With an arbor press, insert the smaller-diameter shaft end first, until the shaft bottoms out in the bearing. Avoid angular misalignment. Place the other bearing on the larger-diameter shaft end and press the shaft in until the shaft shoulder bottoms out against the bearing inner race. Be sure to support the bearing at the inner diameter (race) to avoid damaging the bearing.

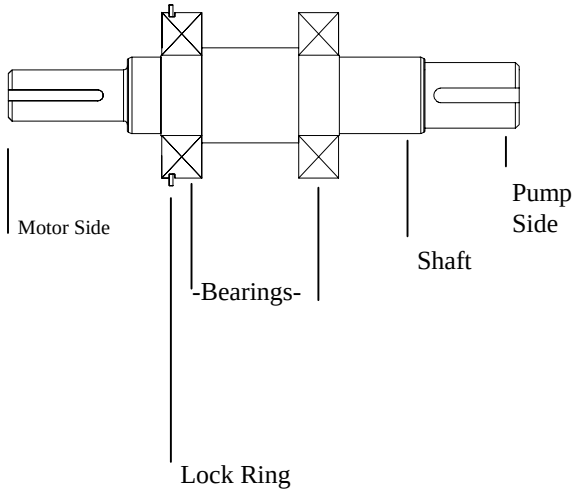
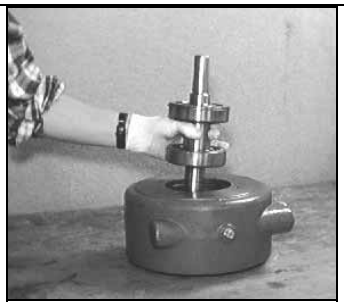


Fig. 11-20: Shaft Assembly

5. To press the fabricated shaft assembly into the bearing frame carefully stand the bearing frame upright on the pump side end. Lightly lubricate the first step on both ends of the shaft to allow it to slide through the labyrinth seal bore without damaging the seal O-

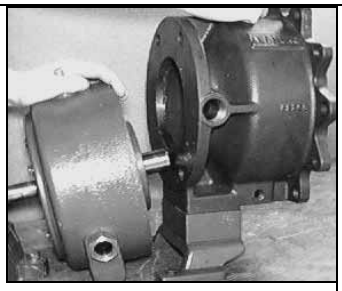


ring. Drop in the carbon steel wave washer. Insert the shaft assembly (with the larger diameter pump end first) by aligning the bearing with the bearing seat and lightly tapping the end of the shaft with a brass hammer until the shaft assembly bottoms out in the bearing seat.

Fig. 11-21: Insert Shaft Assembly into Bearing Frame

Fig. 11-22: Tap Shaft Assembly into Place

6. Bolt the pump side of the bearing frame to the bracket. First stand the bearing frame upright, with the motor side facing down. Support the bearing frame so that the weight of the bearing frame does not rest on the shaft and possibly damage it. Place the motor end of the bracket on top of the pump end of the bearing frame. Bolt the bearing frame and bracket together using four supplied 1/2-13 UNC bolts.



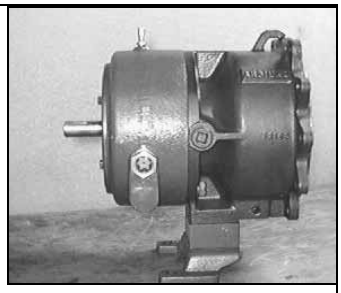


Fig. 11-23: Bracket and Bearing Frame

Fig. 11-24: Bolt Bracket to Bearing Frame

7. To press on the bearing frame cap lightly apply a small bead of grease in the O-ring groove in the bearing cap. Install the O-ring. The grease will keep the O-ring from falling out of its seat when the bearing cap is bolted down. Install the bearing cap over the shaft and bolt down with the four supplied 3/8-16 UNC bolts. Rotate the shaft to insure that the shaft spins freely. Make sure that the labyrinth seal rotors on both ends of the bearing frame are seated against the stator by pressing them together with hand pressure.

8. Secure the bearing frame on a level plane before filling with oil. Remove the breathing tube and fill until the oil level is in the middle of the bull's eye in the sight glass. If the bearing frame is filled on an uneven surface or tilted afterward, oil will fill the labyrinth seal. Oil will slowly leak out of the seal port at the 6 o'clock position until the labyrinth seal is fully purged.

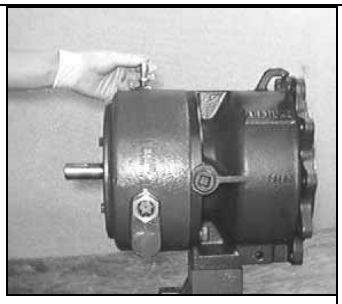


Fig. 11-25: Remove Breathing Tube

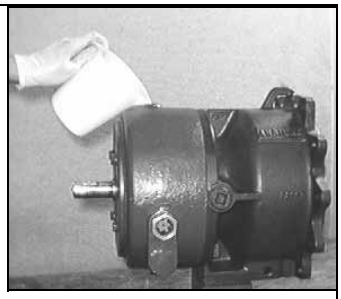


Fig. 11-26: Fill Bearing Frame with Oil

9. When installing the outer drive, first be sure key is placed into keyway of the bearing frame shaft. Then slide the outer drive into the bracket, and onto the shaft until the groove on the outside of the outer drive lines up with the front edge of the bracket. This is shown in Figure 9-1. Stick the 5/16" Allen key through the 1" NPT hole in the side of the bracket, to tighten all three set screws to 30 ft-lbs. **Retorque all three set screws to 60 ft-lbs [82 N-m].**

12. PARTS LISTS

PART LIST 1

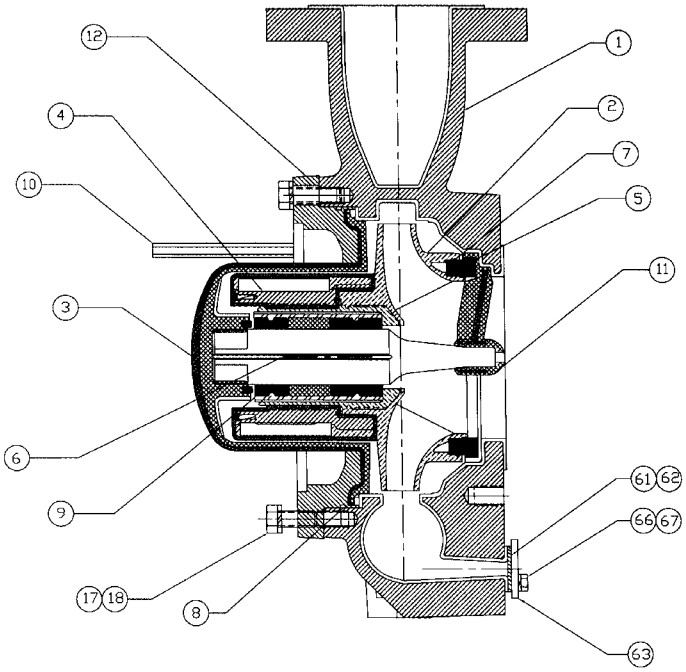


Figure 12-1 KF Wet End Cross Section

WET END PARTS ONLY - KF, KFi , KFj PUMPS

☑ Recommended Spare Parts for all levels of service.

		PART NAME	Qty	KF2110 Kfi2110 KFj2110	KF31510 KFi31510 KFj31510	KF3210 KFi3210 KFj3210	KF4310 KFi4310 KFj4310	KF6410 KFi6410 KFj6410
☑	**1**	Casing - 150# ANSI Flanges Ductile Iron w/ ETFE Lining	1	P2663A	P2685A	P2686A	P2687A	P1974A
		Casing - 300# ANSI Flanges Ductile Iron w/ ETFE Lining	1	P2663B	P2685B	P2686B	P2687B	P1974B
		Casing - PN16 ISO Flanges Ductile Iron w/ ETFE Lining	1	P2663C	P2685C	P2686C	P2687C	P1974C
		Casing - 10kg/cm^2 JIS Flanges Ductile Iron w/ ETFE Lining	1	P2663D	P2685D	P2686D	P2687D	P1974D
☑	**2**	Impeller - CFR-ETFE	1	P2525	P2683		P2684	P2351
☑	**3**	Containment Shell CFR-ETFE w/PTFE & Composite GFR-ETFE w/PTFR & Composite	1	P2460A P2460B				
☑	**4**	Inner Drive Assembly 8 mag. (P drive) 16 mag. (Q drive)	1	P2347A P2347B				
☑ ** *	**5**	Mouth Ring /Thrust Pads CFR-PTFE	1	K0570	P2750		P2751	NA
		Silicon Carbide	1	K0509	P2661		P2672	P2259***
☑	**6**	Pump Shaft -SiC	1	P2151				
**	**7**	O-ring (mouth ring)	1	K0707	P2961A		P2961B	NA

PART LIST 1, continued

		PART NAME	Qty	KF2110 Kfi2110 KFj2110	KF31510 KFi31510 KFj31510	KF3210 KFi3210 KFj3210	KF4310 KFi4310 KFj4310	KF6410 KFi6410 KFj6410
☐	8	Casing O-ring	1					
		Viton^{R}				P2475A		
		EPDM				P2475B		
		Teflon^{R} Coated/Viton^{R}				P158777		
		Gore-Tex^{R} wrapped Teflon^{R}/Viton^{R}				P2475C		
		Silicone				P2475D		
☑	9	Main Bushing	1					
		Silicon carbide w/CFR-ETFE				P2263		
☐	10	Guide Bolts	2			P2530		
		303 Stainless Steel						
☑	11	Shaft Support/Thrust Ring	1					
		ETFE/SiC/Hastelloy		P2680	P2681		P2682	P2243
☐	12	Rear Support	1			P2166		
		Ductile Iron						
	18	Hex bolts, Rear Support/Pump Case	12			HH5/8X2.00		
	17	Lock Washer, Rear Supt.Pump Case	12			HL5/8		
*	61	Teflon^{R} Gasket, Drain	1			P1953T		
	62	Neoprene Gasket, Drain	1			P1953N		
*	63	Drain Cover						
		ANSI 150# Flanges	1			P2895A		
		ANSI 300# Flanges	1			P2895B		
		ISO PN 16 Flanges	1			P2895C		
		JIS 10 Flanges	1			P2895D		
	66	Lock Washer, Drain						
		ANSI Flanges	4			HL1/2		
		ISO or JIS Flanges	4			HLM12		
*	67	Hex Bolts, Drain Cover						
		ANSI Flanges	4			HH1/2X1.25		
		ISO or JIS Flanges	4			HHM12X30		

* These parts are included when ordering pump cases.
** This item included when ordering mouth ring assembly.
*** One set of ten thrust pads.

Exploded View of Pump Wet End

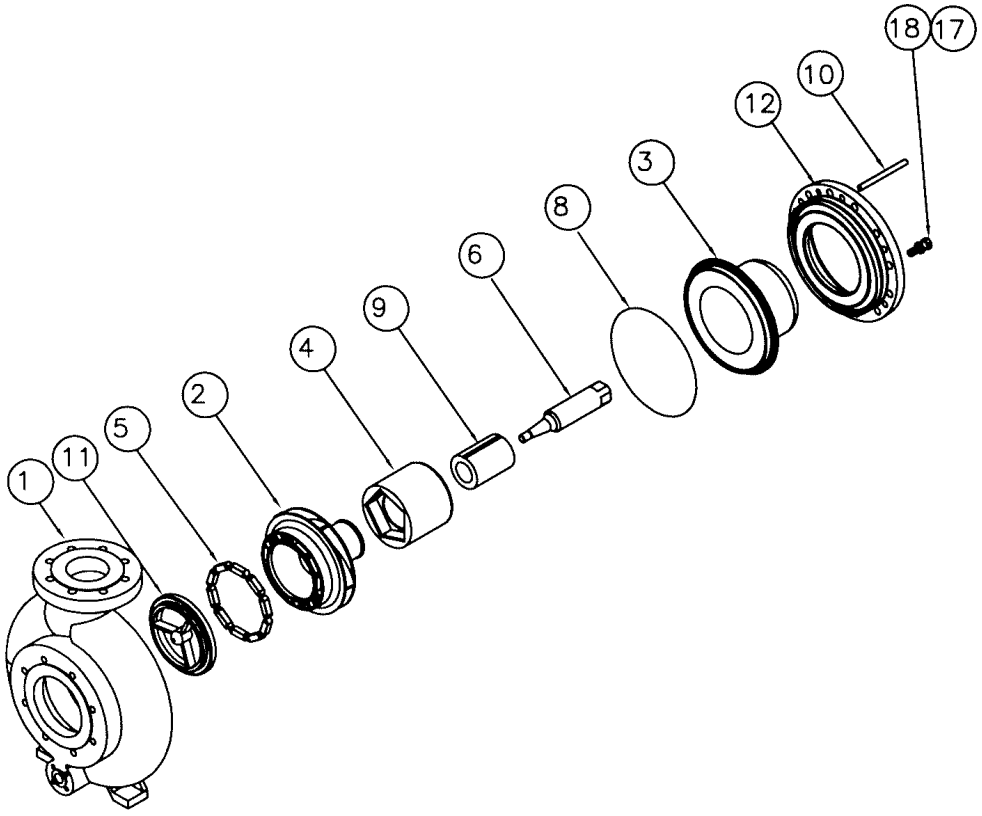


Figure 12-2 Exploded View of Pump Wet End

PART LIST 2
DRIVE END PARTS - ANSI KF6410 PUMP WITH NEMA, IEC OR JIS MOTORS

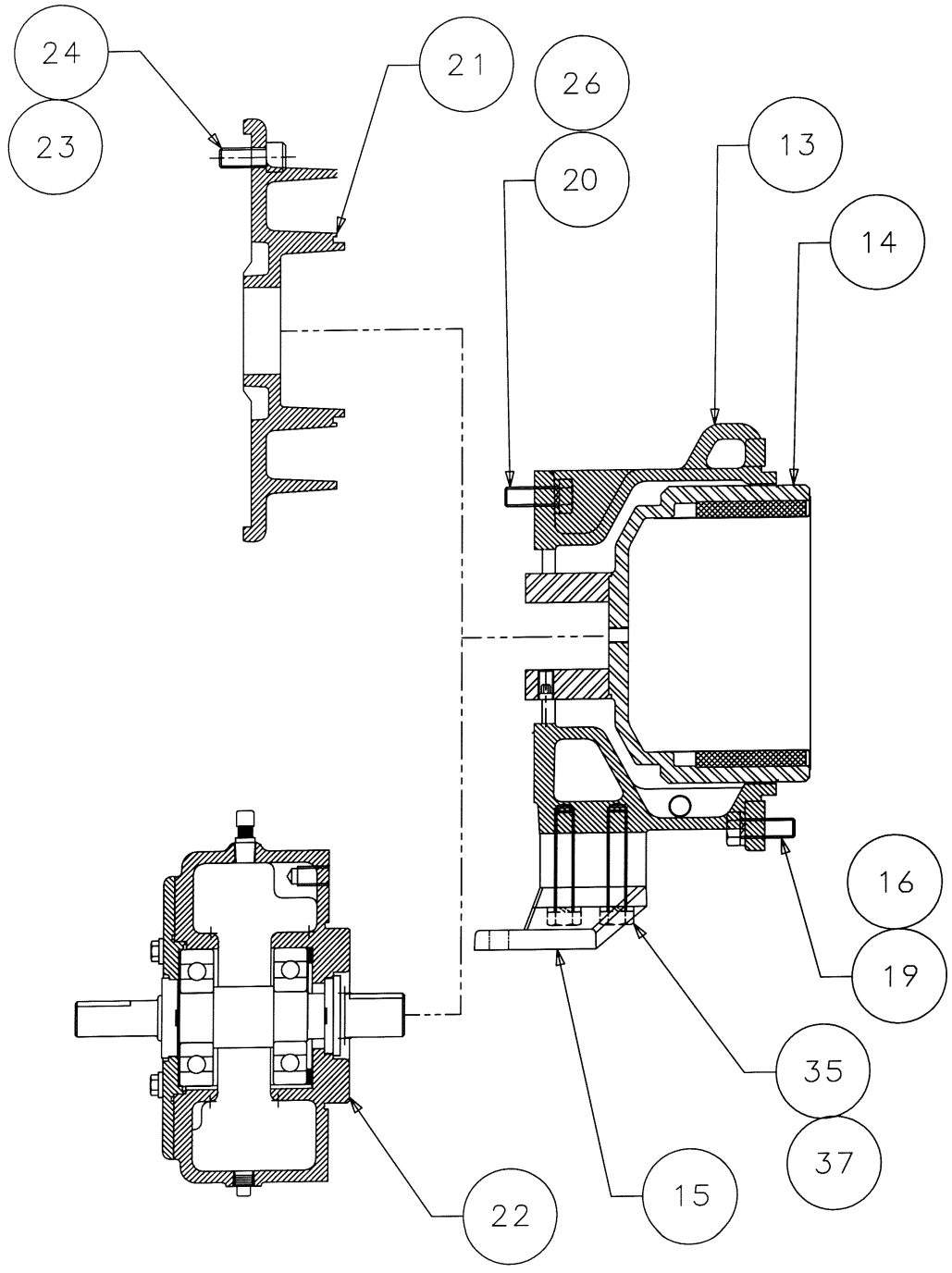


Figure 12-3 KF Drive End Cross Section

PART LIST 2, continued

	PART NAME	Q y	All Except KF 6410	KF6410 Only
13	Bracket for close coupled, NEMA		P2164	
14	Outer Drive – NEMA			
	close coupled, 182/184TC (R drive)	1	P2291A	
	close coupled, 213/215TC (R drive)	1	P2291B	
	close coupled, 254/256TC (R drive)	1	P2291C	
	close coupled, 284/286TSC (R drive)	1	P2291C	
	close coupled, 284/286TC (R drive)	1	P2291L	
	close coupled, 254/256TC (S drive)	1	P2291D	
	close coupled, 284/286TC (S drive)	1	P2291E	
	close coupled, 284/286TSC (S drive)	1	P2291D	
	close coupled, 324/326TC (S drive)	1	P2291F	
	close coupled, 324/326 TSC (S drive)	1	P2291E	
	close coupled, 364/365 TSC (S drive)	1	P2291E	
	close coupled, 405TSC (S drive)	1	P2291F	
	close coupled, 324/326TC (T drive)	1	P2291G	
	close coupled, 405TSC (T drive)	1	P2291G	
	long coupled (R drive)	1	P2291H	
	long coupled (S drive)	1	P2291I	
	long coupled (T drive)	1	P2291J	
	Outer Drive - IEC Frame			
	close coupled, 100/112 (R drive)		P2694A	
	close coupled, 132 (R drive)		P2694B	
	close coupled, 160 (R drive)		P2694C	
	close coupled, 180 (R Drive)		P2694K	
	close coupled, 160 (S drive)		P2694D	
	close coupled, 180 (S drive)		P2694E	
	close coupled, 200 (S drive)		P2694F	
	close coupled, 225 (4 Pole) (S drive)		P2694H	
	close coupled, 225 (2 Pole) (S drive)		P2694F	
	close coupled, 250 (2 Pole) (S drive)		P2694H	
	close coupled, 225 (4 Pole) (T drive)		P2694G	
	close coupled, 250 (2 Pole) (T drive)		P2694G	
	Outer Drive - JIS Frame			
	close coupled, 100L/112M (R drive)	1	P2694A	
	close coupled, 132S/M (R drive)	1	P2694B	
	close coupled, 160M (R drive)	1	P2694C	
	close coupled, 180M (R drive)	1	P2694K	
	close coupled, 160L (S drive)	1	P2694D	
	close coupled, 180M (S drive)	1	P2694E	
	close coupled, 180L (S drive)	1	P2694F	
	close coupled, 200 (2 Pole) (S drive)	1	P2694F	
	close coupled, 200 (4 Pole) (S drive)	1	P2694L	
	close coupled, 225 (2 Pole) (S drive)	1	P2694J	
	close coupled, 250 (2 Pole) (S drive)	1	P2694F	
	close coupled, 180L (T drive)	1	P2694J	
	close coupled, 200 (2 Pole) (T drive)	1	P2694G	
	close coupled, 180L/200 (T drive)	1	P2694J	
	close coupled, 200 (4 Pole) (T drive)	1	P2694G	
	close coupled, 225 (2 Pole) (T drive)	1	P2694J	
	close coupled, 250 (2 Pole) (T drive)	1	P2694J	
15	Bracket Foot		P2168	
16	Lock Washer, Bracket/Rear Support		HL5/8	
19	Hex bolts,Bracket/Rear Support		HH5/8X1.50	
20	Hex bolts, Bracket/Motor Mounting Plate (NEMA) (IEC & JIS)	4	HH5/8X2.00 HHM16X45	

PART LIST 2, continued

	PART NAME	Qty	All Except KF 6410	KF6410 Only
21	Motor Mounting Plate - NEMA frame			
	close coupled, 182/184 TC	1	P2170A	
	close coupled, 213/215TC	1	P2170A	
	close coupled, 254/256TC	1	P2170B	
	close coupled, 284/286TSC	1	P2170C	
	close coupled, 284/286TC	1	P2170D	
	close coupled, 324/326TSC	1	P2170E	
	close coupled, 364/365TSC	1	P2170E	
	close coupled, 324/6TC	1	P2170F	
	close coupled, 405TSC	1	P2170F	
	Motor Mounting Plate - IEC frame			
	close coupled, 100/112	1	P2689A	
	close coupled, 132	1	P2689B	
	close coupled, 160/180	1	P2689C	
	close coupled, 200	1	P2810	
	close coupled, 225 (4 Pole)	1	P2811	
	close coupled, 225 (2 Pole)	1	P2812	
	close coupled, 250 (2 Pole)	1	P2813	
	Motor Mounting Plate - JIS frame			
	close coupled, 100/112	1	P2689A	
	close coupled, 132	1	P2689B	
	close coupled, 160	1	P2689C	
	close coupled, 180	1	P2810	
	close coupled, 200 (2 Pole)	1	P2812	
	close coupled, 200 (4 Pole)	1	P2811	
	close coupled, 225 (2 Pole)	1	P2951	
	close coupled, 250 (2 Pole)	1	P2951	
22	Bearing Frame Assembly- ANSI (long coupled only)	1	P2489	
23	Lock Washer , Motor Mntng Pl/Motor			
	IEC & JIS 100/112 & 132	4	HLM12	
	IEC 160/180 & JIS 160	4	HLM16	
	IEC 200 thru 250 & JIS 180 thru 250	8	HLM16	
24	Bolts, Motor Mounting Plate/Motor			
	NEMA 182/184TC thru 284/286TC	4	HS1/2X1.25	
	NEMA 325/325TSC thru 405TSC	4	HS5/8X1.50	
	IEC & JIS 100/112 & 132	4	HHM12X35	
	IEC 160/180 & JIS 160	4	HHMX16X45	
	IEC 200 thru 250 & JIS 180 thru 250	8	HHMX16X45	
25	Jackscrews	1	HH5/8X4.00FT	
26	Lock Washer, Bracket/Motor Mntng Pl	4		
	(NEMA)		HL5/8	
	(IEC & JIS)		HLM16	
27	Bolt, Motor Riser			
	NEMA, Close Coupled			
	182/184TC	1	N/A	N/A
	213/215TC	1	HH3/8X1.25	Consult Factory
	254/256TC	1	HH1/2X1.25	HH1/2X3.25
	284/286TC	1	HH1/2X.25	HH1/2X3.25
	284/286TSC	1	HH1/2X1.25	N/A
	324/326TC	1	N/A	HH1/2X1.25
	324/326TSC		N/A	N/A
	364/365TSC		N/A	N/A
	405TSC		N/A	N/A
	IEC Close Coupled			
	100/112		N/A	N/A
	132		N/A	N/A
	160	2	HH1/2X1.25	Consult Factory
	180	2	HH1/2X1.25	Consult Factory
	200	2	N/A	HH1/2X1.25
	225 (2 Pole)	2	HH1/2X1.25	N/A
	225 (4 Pole)	2	HH1/2X1.25	HH1/2X1.25
	250 (2 Pole)	2	HH1/2X1.25	N/A

PART LIST 2, continued

	PART NAME	Qty	All Except KF 6410	KF6410 Only
27 (cont')	Bolt, Motor Riser			
	NEMA, Close Coupled			
	JIS Close Coupled			
	100/112		N/A	N/A
	132		N/A	N/A
	160	2	HL1/2	Consult Factory
	180L	2	HH1/2X1.25	Consult Factory
	180M	2	HH1/2X1.25	Consult Factory
	200L (2 Pole)	2	HHM12x30	N/A
	200L (4 Pole)	2	HHM12x30	HH1/2X1.25
	225 (2 Pole)	2	HHM16x30	N/A
	225 (4 Pole)	2	HHM16x30	HH1/2X1.25
	250 (2 Pole)	2	HH1/2X1.25	N/A
28	Lockwasher, Motor Riser			
	NEMA, Close Coupled			
	182/184TC		N/A	N/A
	213/215TC	2	HL3/8	Consult Facotry
	254/256TC	2	HL1/2	HL1/2
	284/286TC	2	HL1/2	HL1/2
	284/286TSC	2	HL1/2	N/A
	324/326TC	2	N/A	HL1/2
	325/326TSC		N/A	N/A
	364/365TSC		N/A	N/A
	405TSC		N/A	N/A
	IEC Close Coupled			
	100/112		N/A	N/A
	132		N/A	N/A
	160	2	HL1/2	Consult Factory
	180	2	HL1/2	Consult Factory
	200	2	N/A	HL1/2
	225 (2 Pole)	2	HL1/2	N/A
	225 (4 Pole)	2	HL1/2	HL1/2
	250 (2 Pole)	2	HL1/2	N/A
	JIS Close Coupled			
	100/112		N/A	N/A
	132		N/A	N/A
	160	2	HL1/2	Consult Factory
	180L	2	HL1/2	Consult Factory
	180M	2	HL1/2	Consult Factory
	200L (2 Pole)	2	HLM12	N/A
	200L (4 Pole)	2	HLM12	HL1/2
	225 (2 Pole)	2	HLM16	N/A
	225 (4 Pole)	2	HLM16	HL1/2
	250 (2 Pole)	2	HLM16	N/A
30 &	Motor Risers			
	NEMA, Close Coupled			
	182/184TC		N/A	N/A
	213/215TC	1	P2852	Consult Factory
	254/256TC	1	P2815	P2815 + P2818
	284/286TC	1	P2816	P2816 + P2818
	284/286TSC	1	P2816	N/A
	324/326TC	1	P2817	P2815
	324/326TSC	1	P2817	N/A
	364/365TSC		N/A	N/A
	405TSC		N/A	N/A
	IEC Close Coupled			
	100/112		N/A	N/A
	132		N/A	N/A
	160	1	P2924	Consult Factory
	180	1	P2925	Consult Factory
	200	1	P2926	P2928
	225 (2 Pole)	1	P2929	N/A
	225 (4 Pole)	1	P2929	P2929
	250 (2 Pole)	1	P2930	N/A

PART LIST 2, continued

	PART NAME	Q y	All Except KF 6410	KF6410 Only
30 & 3 l (cont')	Motor Risers NEMA, Close Coupled			
	JIS Close Coupled			
	100/112		N/A	N/A
	132		N/A	N/A
	160		P2924	Consult Factory
	180L		P2925	Consult Factory
	180M		P2925	Consult Factory
	200L (2 Pole)		P2928	N/A
	200L (4 Pole)		P2928	P2928
	225 (2 Pole)		P2927	N/A
	225 (4 Pole)		Consult Factory	Consult Factory
	250 (2 Pole)		P2930	N/A
33	Pump Case Risers NEMA, Close Coupled			
	182/184TC-324/326TSC		N/A	N/A
	364/365TSC	1	P2854	N/A
	405TSC	1	P2855	N/A
	IEC, Close Coupled			
	100/112-200		N/A	N/A
	225 (2 Pole)		P2855	N/A
	225 (4 Pole)		P2855	N/A
	250 (2 Pole)		P2923	N/A
	JIS, Close Coupled			
	100-180M		N/A	N/A
	200L (2 Pole)	1	P2855	N/A
	200L (4 Pole)	1	P2855	N/A
	225 (2 Pole)	1	P2923	N/A
	225 (4 Pole)	1	Consult Factory	N/A
	250 (2 Pole)	1	P2923	N/A
34	Riser, Bracket Foot NEMA, Close Coupled			
	182/184TC – 324/326 TSC		N/A	P2462
	364/365TSC		P2964	N/A
	405TSC		P2462	N/A
	IEC, Close Coupled			
	100/112 – 200	1	N/A	P2462
	225 (2 Pole)	1	P2462	N/A
	225 (4 Pole)	1	P2462	P2462
	250 (2 Pole)	1	P2950	N/A
	JIS, Close Coupled			
	100/112 – 180M		N/A	P2462
	200 (2 Pole)		P2462	N/A
	200 (4 Pole)		P2462	P2462
	225 (2 Pole)		P2950	N/A
	250 (2 Pole)		P2950	N/A
35	Bolt, Bracket Foot NEMA, Close Coupled			
	182/184TC – 324/326TSC	3	HH5/8X1.50	HH5/8X3.25
	364/365TSC	3	HH5/8X2.25	N/A
	405TSC	3	HH5/8X3.25	N/A
	IEC, Close Coupled			
	100/112 – 200		HH5/8X1.50	HH5/8X3.25
	225 (2 Pole)		HH5/8X3.25	N/A
	225 (4 Pole)		HH5/8X3.25	HH5/8X3.25
	250 (2 Pole)		HH5/8X4.00	N/A
	JIS, Close Coupled			
	100/112 – 180M	3	HH5/8X1.50	HH5/8X3.25
	200 (2 Pole)	3	HH5/8X3.25	N/A
	200 (4 Pole)	3	HH5/8X3.25	HH5/8X3.25
	225 (2 Pole)	3	HH5/8X4.00	N/A
	250 (2 Pole)	3	HH5/8X4.00	N/A
37	Lockwasher, Bracket Foot		HL5/8	HL5/8
55	Earthing Kit, Grounding Lug	1	P4107	

Exploded View of Pump Drive End

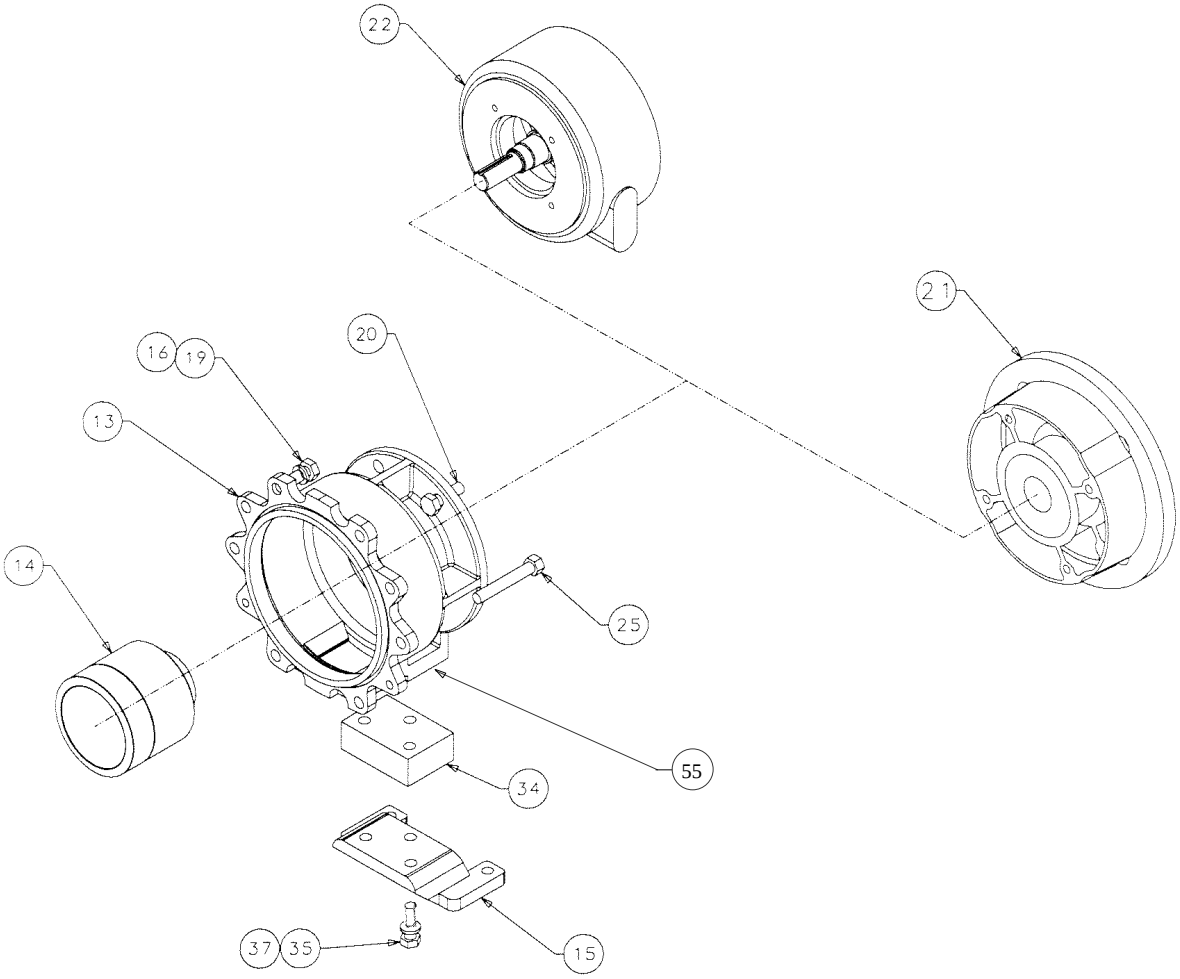
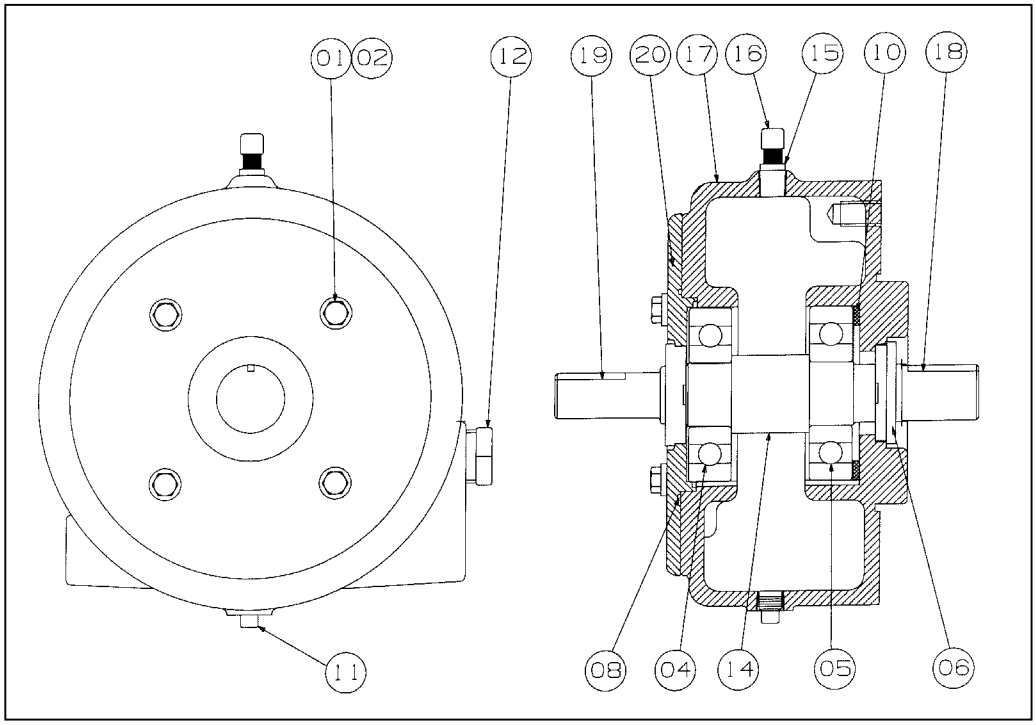


Figure 12-4 KF Drive End Exploded View

PART LIST 3

BEARING FRAME



Item	PART NAME	Qty	Part #
	Bearing Frame Assembly		P2489
1	Hex Bolt, 3/8-16x7/8 - 316SS	4	HH3/8X.88
2	Lock Washer 3/8 - 316SS	4	HL3/8
4	SFK Ball Bearing - #6408NRJ	1	P2491A
5	SFK Ball Bearing - #6408	1	P2491B
6	Inpro VBX Isolator 1518-A-10906-0	2	P2490
8	O-Ring - #159 - Buna-N	1	P2475E
10	Wave Washers - carbon steel	1	P2488
11	Plugs, 3/8 NPT - carbon steel	1	K3902
12	1" NPT Sight Window - Glass/Brass	1	K4002
14	Shaft - 303 stainless steel	1	P2470
15	Reducing Bushing - 1/4"x1/8"304SS	1	K3802
16	Breathing Tube, 1/8" - carbon steel	1	K3801
17	Bearing Frame - ductile iron	1	P2464
18	Key, 5/16x5/16x13/4, 304SS	1	P2492B
19	Key, 1/4x1/4x1-3/4, 304SS	1	P2492A
20	Bearing Cap, ductile iron	1	P2480

KF MAXIMUM DRIVE RATINGS hp (Kw)				
DRIVE	1450 rpm	1750 rpm	2950 rpm	3550 rpm
PR drive	11.0 (8.2)	13.3 (10.0)	22.1 (16.5)	27.0 (20.1)
PS drive	21.8 (16.3)	26.4 (19.7)	44.5 (33.2)	53.5 (39.9)
QS drive	32.7 (24.4)	39.4 (29.4)	66.5 (49.6)	80.0 (59.7)
QT drive	40.7 (30.4)	49.1 (36.6)	82.8 (61.8)	100.0 (74.6)

Note: 1. QT drive pumps limited to 200°F maximum operating temperature.
2. When selecting the KF drive combination always insure that the end of curve power is less than the maximum drive rating power. This is required even on pumps operating near shut-off.

13. SHIPPING WEIGHTS of PUMP & MOTOR MOUNTING

13-a. Maximum weights: Pumps with NEMA or IEC/JIS Motor Mounting [lb (kg)]

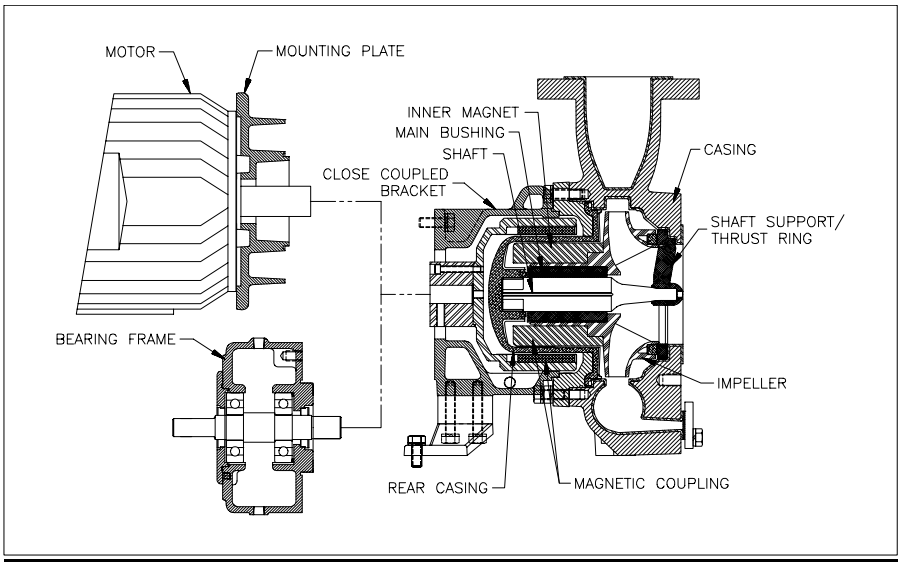
KF2110	KF31510	KF3210	KF4310	KF6410
309 [140]	325 [148]	345 [157]	360 [163]	395 [179]

13-b. Motor weight

Refer to motor manufacturer's catalog for motor weights.

14. PUMP SPECIFICATIONS

ANSIMAG KF SERIES PUMP SPECIFICATIONS
KF2110, KF31510, KF3210, KF4310 and KF6410
ISO Flanged Models KFi2110, KFi31510, KFi3210, KFi4310 and KFi6410
JIS Flanged Models KFi2110, KFi31510, KFi3210, KFi4310 and KFi6410



PUMP

- Horizontal End-Suction, Centerline discharge, Mag-drive Centrifugal pump.
- Synchronous drive, magnetically coupled for zero leakage applications.
- Non-metallic wetted parts.
- ANSI Horizontal End-Suction, Centerline discharge, Mag-drive Centrifugal pump.
- Fully meets ASME/ANSI B73.1-1991 dimensions frame mounted or with close coupled, zero alignment mounting.
- Maximum power 100 hp (75kW) @ 3550 rpm.
- Back pull out design.
- Exterior protection: polyamide epoxy primer with polyurethane topcoat (green).
- Maximum temperature: 250°F (121°C)
- Minimum temperature: -20°F (-30°C)
- Maximum Discharge pressure: 375 psi. (25.8 Bar)
- Slurry: 5% wt. 150 microns max. (0.005 in.)
- Maximum diameter solids: 1/32 in. (0.8 mm) max.
- Max. vapor pressure: consult factory for liquids with vapor pressure curve that passes above 8 psia (0.54 Bar) @ 90°F (32°C).
- Maximum viscosity: *

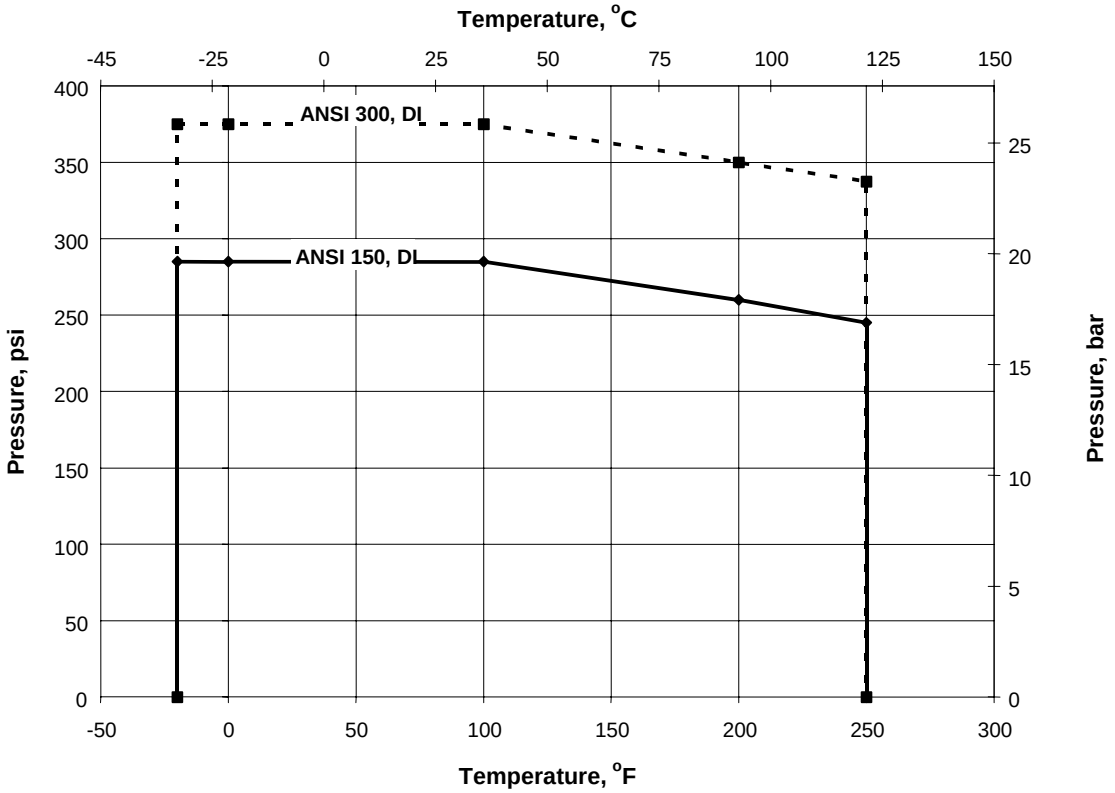
KF2110	900 SSU	198 centistokes
KF31510	1200 SSU	264 centistokes
KF3210	1700 SSU	370 centistokes
KF4310	2000 SSU	440 centistokes
KF6410	2200 SSU	480 centistokes

- Minimum flow: **

KF2110	15 gpm at 3600 rpm	3.4 m^3/h at 2900 rpm
KF31510	20 gpm at 3600 rpm	4.5 m^3/h at 2900 rpm
KF3210	25 gpm at 3600 rpm	5.6 m^3/h at 2900 rpm
KF4310	30 gpm at 3600 rpm	6.8 m^3/h at 2900 rpm
KF6410	15 gpm at 1750 rpm	3.4 m^3/h at 1450 rpm

* Note: Pump performance (flow, head and efficiency) will be greatly affected by the viscosity of liquid pumped. Maximum viscosities given above are approximate numbers. Please refer to the Hydraulic Institute's "Viscosity Correction" chart. A pump should not be used or should be used with caution if efficiency with the viscous liquid is less than 50% of efficiency with water.
** Note: Minimum flow data based on water. Consult factory for other liquids.

PRESSURE & TEMPERATURE CAPABILITY



CASING

- ANSI/ASME B73.1-1991 dimensions for flange and foot position.
- Self-venting and top centerline discharge.
- One piece solid ductile iron casing, lined with rotomolded ETFE fluoropolymer 0.125in. (3.0 mm) min.
- Foot supported for maximum resistance to piping loads.
- Flanges: ANSI/ASME B16.5 Class 150, standard. ANSI Class 300, optional
  ISO 2084 PN16 or JIS B 2210 10kg/cm^2, hole pattern optional.
- Drain flange: ½ in. ANSI/ASME B16.5 Class 150, standard or Class 300, optional.
  ISO 2084 PN16 or JIS B 2210 10kg/cm^2, hole pattern optional.

SHAFT SUPPORT/THRUST RING

- Streamlined and internally reinforced for all radial load conditions..
- Pure sintered silicon carbide thrust ring integral with shaft support.
- Reinforcement fully encapsulated and hermetically sealed at the factory.

IMPELLER

- Replaceable, closed type, one-piece construction.
- Manufactured with carbon fiber filled ETFE fluoropolymer.
- Coupled to inner magnet by oversized polygon with axial lock mechanism. U. S. Patented.
- Replaceable, sintered silicon carbide, mouth ring or thrust pads. Thrust pads are U. S. Patented.

INNER MAGNET

- Encapsulated with carbon fiber filled ETFE fluoropolymer.
    - Magnet assembly fully encapsulated and hermetically sealed at the factory.
    - Coupled to impeller by oversized polygon with axial lock mechanism. U. S. Patented.

MAIN BUSHING

- Rotating, two bearing design, sleeved with CFR-ETFE.
- Large bearing area for all loads and viscosities.
- Bearings in sintered silicon carbide (SiC), only.
- Press fit installation into impeller bore.

SHAFT

- Non-rotating, one piece, solid construction, sintered silicon carbide (SiC).
- Fully supported at both ends utilizing front shaft support and rear casing.
- Axial groove for improved lubrication and particulate bypass. U.S. Patented.

REAR CASING

- Exceeds ANSI/ASME B73.1 Pressure and Temperature Ratings for Class 150 flanges.
- Injection molded carbon fiber filled ETFE fluoropolymer backed by non-metallic reinforcement.
- Integral carbon fiber reinforce PTFE back thrust ring, optional sintered silicon carbide.
- No energy losses due to eddy currents from magnetic coupling.
- Fully confined casing O-ring.
- 2600 psi (178 Bar) burst pressure.

MAGNETIC COUPLING

- Four drive sizes with interchangeable hubs.
- Neodymium Iron Boron magnets for maximum strength.
- Designed for zero slippage and zero losses.
- Utilizes standard NEMA or IEC/JIS motors.
- Eliminates soft start devices.

KF MAXIMUM DRIVE RATINGS hp (Kw)				
DRIVE	1450 rpm	1750 rpm	2950 rpm	3550 rpm
PR drive	11.0 (8.2)	13.3 (10.0)	22.1 (16.5)	27.0 (20.1)
PS drive	21.8 (16.3)	26.4 (19.7)	44.5 (33.2)	53.5 (39.9)
QS drive	32.7 (24.4)	39.4 (29.4)	66.5 (49.6)	80.0 (59.7)
QT drive	40.7 (30.4)	49.1 (36.6)	82.8 (61.8)	100.0 (74.6)

Note: 1. QT drive pumps limited to 200°F maximum operating temperature.
2. When selecting the KF drive combination always insure that the end-of-curve power is less than the maximum drive rating power. This is required even on pumps operating near shut-off.

BEARING FRAME

- L_{10} life of 70,000 hrs.
- Fully ANSI/ASME B73.1-1991 dimensional.

CLOSE COUPLED BRACKET & MOUNTING PLATES

- Provides metal-to-metal fit to casing and motor.
- Eliminates the flexible coupling, bearing frame and tedious alignment procedure.
- Motor and pump alignment not effected by nozzle loads.
- Motors: NEMA C face from 182TC through 405TSC
  IEC B5 with D flange from 100/112 through 250 (B3/B5 required above 132 frame).
  JIS B5 with D flange from 100/112 through 250 (B3/B5 required above 132 frame).
- Drilled and tapped for leak monitoring sensor (3/8 NPT).

15. COMMON CONVERSIONS

Flow (capacity)

gpm (US)	M^3/h	l/min	gpm (UK)
1	0.2271	3.785	0.8327
4.403	1	16.6	3.666
0.2642	0.06	1	0.2200
1.201	0.2727	4.5458	1

GPM (US) x 0.2271 = m^3/h l/min x 0.2642 = GPM (US)
m^3/h x 4.403 = GPM (US) GPM (US) x 3.785 = l/min
m^3/h x 16.6 = l/min l/min x 0.06 = m^3/h

Head (pressure / vacuum)

Ft (H^2O)	m (H^2O)	PSI	Kg/cm^2	KPa	inch Hg	mmHg	bar
1	0.3048	0.4335	0.03048	2.989	0.8851	22.48	0.02987
3.281	1	1.422	0.100	9.807	2.904	73.76	0.3685
2.307	0.7031	1	0.07031	6.895	2.042	51.87	0.0690
32.83	10.01	14.23	1	98.07	29.04	737.6	3.685
0.3349	0.1020	0.1450	0.01020	1	0.2961	7.521	0.01
1.132	0.3450	0.491	0.03443	3.377	1	25.4	0.0339
0.04457	0.5339	0.01933	0.001356	0.1330	0.03937	1	0.005
33.5	2.714	14.50	0.2714	100	29.5	200	1

Ft (in water) x 0.3048 = m (in water) PSI x 2.307 = Ft (in water)
m (in water) x 3.2808 = Ft (in water) Ft (in water) x .433 = PSI

Kg/cm^2 x 0.328 = Ft (in water) PSI x 6.895 = KPa
Ft (in water) x 3.049 = Kg/cm^2 KPa x 0.1450 = PSI

Volume

Ft^3	m^3	liter	gallon (US)	gallon (UK)	Lbs of water
1	0.02832	28.32	7.481	6.229	62.44
35.31	1	1000	264.2	220.00	2205
0.03531	0.001	1	0.2642	0.2200	2.204
0.1337	0.003785	3.785	1	0.8327	8.347
0.1606	0.004545	4.548	1.201	1	10.025
0.01620	0.0004537	0.4537	.1198	0.09975	1

Temperature Conversions

°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	Δ°F	Δ°C
-60	-51	0	-18	60	15.6	120	48.9	180	82.2	240	116	300	149	360	182	1	0.6
-55	-48	5	-15	65	18.3	125	51.7	185	85.0	245	118	305	152	365	185	2	1.1
-50	-46	10	-12	70	21.1	130	54.4	190	87.8	250	121	310	154	370	188	3	1.7
-45	-43	15	-9.4	75	23.9	135	57.2	195	90.6	255	124	315	157	375	191	4	2.2
-40	-40	20	-6.7	80	26.7	140	60.0	200	93.3	260	127	320	160	380	193	5	2.8
-35	-37	25	-3.9	85	29.4	145	62.8	205	96.1	265	129	325	163	385	196	6	3.3
-30	-34	30	-1.1	90	32.2	150	65.6	210	98.9	270	132	330	166	390	199	7	3.9
-25	-32	35	1.67	95	35.0	155	68.3	215	102	275	135	335	168	395	202	8	4.4
-20	-29	40	4.44	100	37.8	160	71.1	220	104	280	138	340	171	400	204	9	5.0
-15	-26	45	7.22	105	40.6	165	73.9	225	107	285	141	345	174	405	207	10	5.6
-10	-23	50	10.0	110	43.3	170	76.7	230	110	290	143	350	177	410	210	11	6.1
-5	-21	55	12.8	115	46.1	175	79.4	235	113	295	146	355	179	415	213	12	6.7

°F=(9/5) x (°C+32) °C=(5/9) x (°F-32)

ADDENDUM 1 - VERSA-TOOL FOR SHAFT SUPPORT

VERSA-TOOL INSTRUCTION MANUAL

1. <u>ASSEMBLING THE SHAFT SUPPORT</u>

Insert the threaded shaft, Item 4, into the center hole of Item 2. Turning clockwise, screw Item 4 onto Item 2 until it protrudes approximately 1" from the other side of Item 2. Screw on the 5/8" acorn nut (1 pc.) onto Item 4. Select the shaft support adapter which corresponds to the shaft support to be installed. Push Item 1 onto the unthreaded end of Item 4. Insert the shaft support thrust ring side first onto Item 4 until it rests against Item 1. Bolt the Versa-tool Item 2 onto the casing, using 2, 5/8"-11 x 2.00 rear casing support bolts. To press in the shaft support, turn the acorn nut (Item 3) clockwise. Continue to turn until the shaft support is resting against the shoulder in the casing.

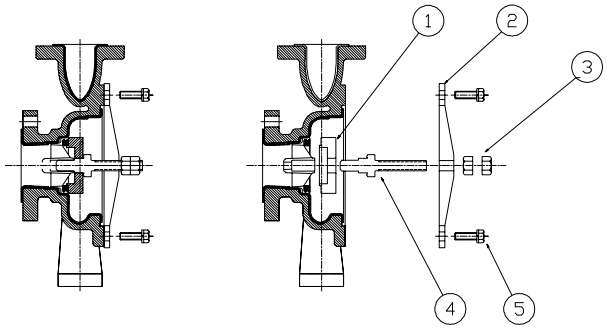


Fig. A1-1

2. <u>EXTRACTING THE SHAFT SUPPORT</u>

Slide Item 6 into the shaft support. Turn clockwise and pull back to engage the claws against the spokes on the shaft support. **Warning: To prevent damage to the shaft support, make sure Item 6 is fully engaged with the spokes on the shaft support.** Determine the type of casing and assemble Item 2 onto the threaded shaft of Item 6 until it rests flush against the back of the pump casing. (Note: these parts do not thread together as in Section 1, but should slide freely.) Align the bolt holes on Item 2 with any threaded holes in the casing and secure using Item 5 (2 pcs.).

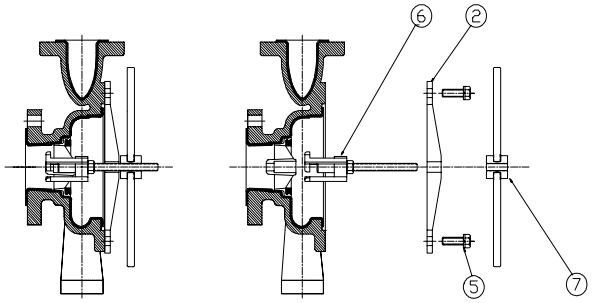


Fig. A1-2

Screw Item 7 onto Item 6 clockwise until it rests against Item 2. To extract the shaft support, continue turning Item 7. Item 6 will begin to pull forward, removing the shaft support with it. Continue turning until the shaft support is fully out from the casing.

3. <u>MEASURE THE DEPTH OF THRUST RING</u>

After assembling the shaft support, measure the depth between the thrust ring in the shaft support and the end of casing. Refer to Fig.A1-3 and the table below for the correct dimension. Measurements should be taken on at least (4) locations to ensure that the thrust ring is parallel with the face of the casing.

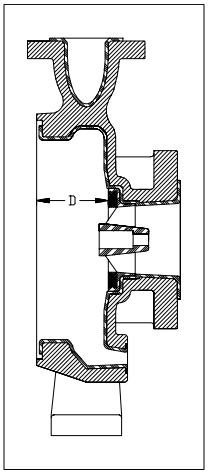


Fig. A1-3

KF2110 **2" x 1" x 10** **D=4.125"+/- 0.015**	**KF31510** **3" x 1.5" x 10"** **D=3.915"+/-0.015**	**KF3210** **3" x 2" x 10"** **D=3.915"+/-0.015**	**KF4310** **4" x 3" x 10"** **D=4.788"+/-0.015**	**KF6410** **6" x 4" x 10"** **D=5.466"+/-0.015**

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