Fristam PUMPS®

Engineered For Lasting Performance®

INSTRUCTION AND MAINTENANCE MANUAL:
FPH/FPHP-Style Pumps

3-A®

nqa. ISO 9001 Registered

ANAB ACCREDITED

SANITARY HIGH PRESSURE CENTRIFUGAL PUMPS

Description

This manual contains installation, operation, assembly, disassembly and repair instructions for the Fristam “FPH & FPHP” pumps. Please read this manual in its entirety before operating the pump.

The FPH & FPHP pumps are mounted to a heavy duty cast iron bearing block. This bearing block is coupled to a motor and mounted on a solid stainless steel adjustable baseplate.

The motors used on FPH & FPHP pumps are standard NEMA totally enclosed fan cooled (TEFC) motors. Replacement motors are readily available from local motor distributors.

The open design of the impeller facilitates cleaning. Due to close clearance between the impeller and the housing and cover, these pumps are very efficient.

Fristam Pumps have an internal mechanical seal which allows the pumped product to cool, lubricate and clean the front seal. The FPH & FPHP Series have similar operating characteristics to standard single impeller centrifugal pumps. The unit is NOT self-priming, it requires a flooded suction.

DANGER: BEGIN ALL PUMP MAINTENANCE BY DISCONNECTING THE ENERGY SOURCE TO THE PUMP. OBSERVE ALL LOCK OUT/TAG OUT PROCEDURES AS OUTLINED BY ANSI Z244.1-1982 AND OSHA 1910.147 TO PREVENT ACCIDENTAL START-UP AND INJURY.

Note: Check alignment between bearing block shaft and motor shaft before start-up.
See pages 7-8.

Table of Contents

Description 2

Table of Contents 3

Technical Information 4

Preventive Maintenance 5-6

Installation 6-8

Electrical Installation 8-9

Installation of Seal Flush for Double Mechanical Seal 9

Seal Replacement 10-12
- Pump Head Disassembly 10-11
- Pump Head Assembly 11-12

FPH & FPHP 3542 Seal Assembly 13

FPHP 722 Seal Assembly 14

Shaft or Bearing Replacement 15-17
- Bearing Block Disassembly 15-16
- Bearing Block Assembly 16-17
- Shaft Alignment 17
- Impeller Gap 17

FPH & FPHP 3542 Assembly Drawing 18-19

FPH & FPHP 3542 Part Number List 20

FPH 3552 Part Number List 21

FPHP 722 Assembly Drawing 22-23

FPHP 722 Part Number List 24

Troubleshooting 25-27

Pump Maintenance Record 28-29

Notice of Terms, Warranty Provisions Including Disclaimers, Claims and Limitation of Liability 31

Technical Information

Specifications

Maximum Inlet Pressure – FPHP 3542 & FPHP 722 ..... 1000 PSI
– FPH 3542 & FPH 3552 ..... 600 PSI
Temperature Range ..... -40°F - 400°F
Noise Level ..... 60 - 85 dB(A)

Materials

Primary Product Contact Components ..... AISI 316L
Casing Gasket ..... BUNA (standard)
Also Available in ..... Viton, EPDM
Surface Finish for Product Contact Surfaces ..... 32 Ra (standard)

Shaft Seals

Seal Types ..... Double Mechanical
Water Flush Pressure ..... 1-2 PSI
Water Consumption (seal flush) ..... 12 gph
Primary Stationary Seal Ring Material ..... Silicon Carbide
For FPHP 722 only ..... Tungsten Carbide
Primary Rotating Seal Ring Material ..... Silicon Carbide
For FPHP 722 only ..... Tungsten Carbide
O-ring Material ..... Viton (standard)
Also Available in ..... BUNA-N, EPDM

Motor Information

Uses standard NEMA rigid base motors. Options include washdown, high efficiency, explosion proof, chemical duty and IEC.

Voltage and Frequency

3 phase, 50 Hz, 208-220/330-415 VAC ..... 3000 RPM
3 phase, 60 Hz, 208-230/460 VAC ..... 3500 RPM
3 phase, 60 Hz, 575 VAC ..... 3500 RPM

Recommended Torque Values

	FPH and FPHP 3542/3552	FPHP 720
Impeller nut	40 ft.-lb.	40 ft.-lb.
Seal retaining ring bolts	4.5 ft.-lb.	4.5 ft.-lb.
Housing bolts	55 ft.-lb.	25 ft.-lb.
Bearing cap bolts	15 ft.-lb.	4 ft.-lb.
Bearing lock nut	50 ft.-lb.	50 ft.-lb.
Cover nut	45 ft.-lb.	45 ft.-lb.

Impeller Gap (impeller to housing measurement)

Pump Series	Feeler Gauge	Gap Tolerance
FPHP 700	.020" (.5 mm)	+/- .004" (.1 mm)
FPH/FPHP 3400 & 3500	.040" (1mm)	+/- .004' (.1 mm)

Preventive Maintenance

Lubrication Recommendations

Bearing Block Oil

#1 Bearing Block ..... ISO VG 46

3VR Bearing Block..... ISO VG 68

The oil level should be maintained to the center of the sight glass on the side of the bearing block. It is recommended that when the pump is first installed the oil is changed after the initial 20 hours of operation. After this, the oil should be changed every 2,000 hours or 3 months under normal operating conditions. Make sure the oil drain pipe and cap are properly tightened to prevent any oil leakage from the bearing block.

Maximum Operating Conditions for FPH and FPHP Series Pumps

FPH 3542

Inlet Pressure:..... 600 PSI (41 Bar)
Capacity:..... 700 gpm (159 m^3 /Hr.)
Discharge Head:..... 120 psi (8.2 Bar)
Power: ..... 50 HP

FPH 3552

Inlet Pressure:..... 600 PSI (41 Bar)
Capacity:..... 750 gpm (170 m^3 /Hr.)
Discharge Head:..... 190 psi (12.9 Bar)
Power: ..... 75 HP

FPHP 722

Inlet Pressure:..... 1000 PSI (68 Bar)
Capacity:..... 150 gpm (34 m^3 /Hr.)
Discharge Head:..... 60 psi (4.1 Bar)
Power:..... 10 HP

FPHP 3542

Inlet Pressure:..... 1000 PSI (68 Bar)
Capacity:..... 700 gpm (159 m^3 /Hr.)
Discharge Head:..... 120 psi (8.2 Bar)
Power:..... 50 HP

Recommended Seal Maintenance

Visually inspect mechanical seal daily for leakage.
Replace mechanical seal annually under normal duty.
Replace mechanical seal as often as required under heavy duty.

Elastomer Inspection

Inspect all elastomers when performing pump maintenance. We recommend replacing elastomers (o-rings and gaskets) during seal, pump shaft and/or motor replacement. If the impeller nut gasket fails, the threaded hole on the impeller nut and the threads on the end of the shaft will need to be cleaned. A wire brush is recommended for cleaning these threads.

Installation

Unpacking

Check the contents and all wrapping when unpacking the pump. Inspect the pump carefully for any damage that may have occurred during shipping. Immediately report any damage to the carrier. Remove the shaft guard and rotate the pump shaft by hand to make sure the impeller rotates freely. Keep the protective caps over the pump inlet and outlet in place until you are ready to install the pump.

Installing

Prior to actually installing the pump, ensure that:

- the pump will be readily accessible for maintenance, inspection and cleaning.
- adequate ventilation is provided for motor cooling.
- the drive and motor type is suitable for the environment where it is to be operated. Pumps intended for use in hazardous environments e.g., explosive, corrosive, etc., must use a motor and drive with the appropriate enclosure characteristics. Failure to use an appropriate motor type may result in serious damage and/or injury.
- check alignment between the motor and bearing block.

Piping Guidelines

- Ensuring proper piping support and alignment at both the suction inlet and discharge outlet can help prevent serious damage to the pump housing (Figure 1).
- Avoid abrupt transitions in the piping system (Figure 2).
- Avoid throttling valves in the suction piping.
- Keep suction lines as short and direct as possible.
- Ensure that the NPSH available in the system is greater than NPSH required by the pump.
- Avoid sump areas where sediments may collect (Figure 3).

Figure 1

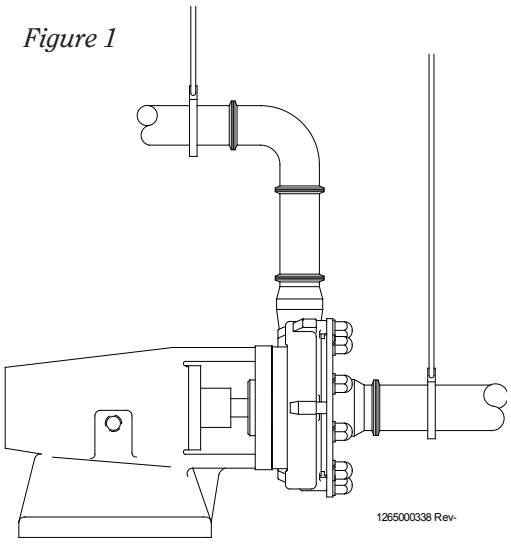


Figure 2

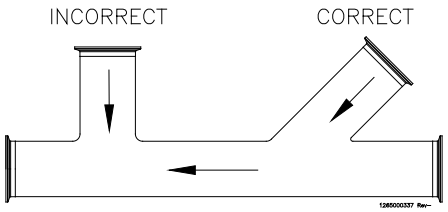
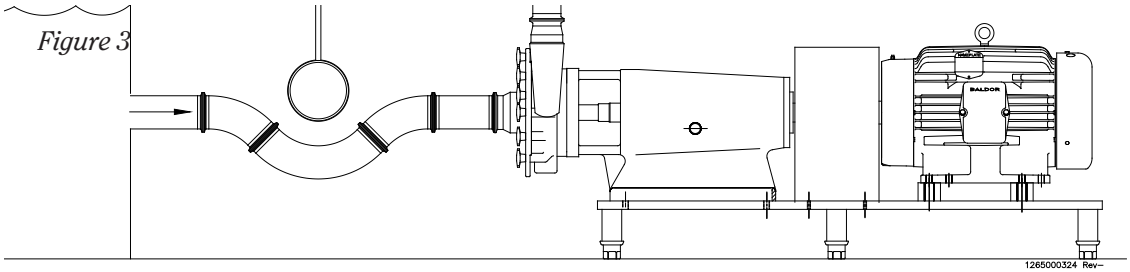
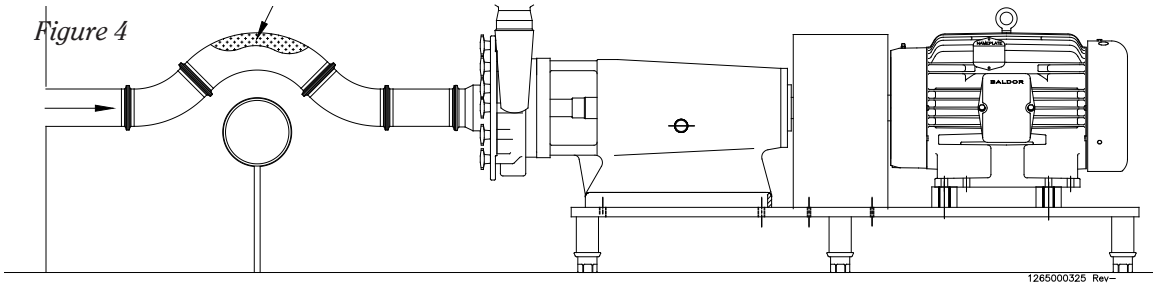


Figure 3



• Avoid the formation of air pockets in the piping (Figure 4).

Figure 4



•Avoid abrupt closure of shut-off valves, this may cause hydraulic shock which can cause severe damage to the pump and system.

• Avoid elbows in the suction line if possible. When necessary they should be located 5 pipe diameters away from the pump inlet, and have a bend radius greater than 2 pipe diameters (Figure 5).

• Check valves in discharge line should be a minimum of 5 ft. away from the pump outlet (Figure 5).

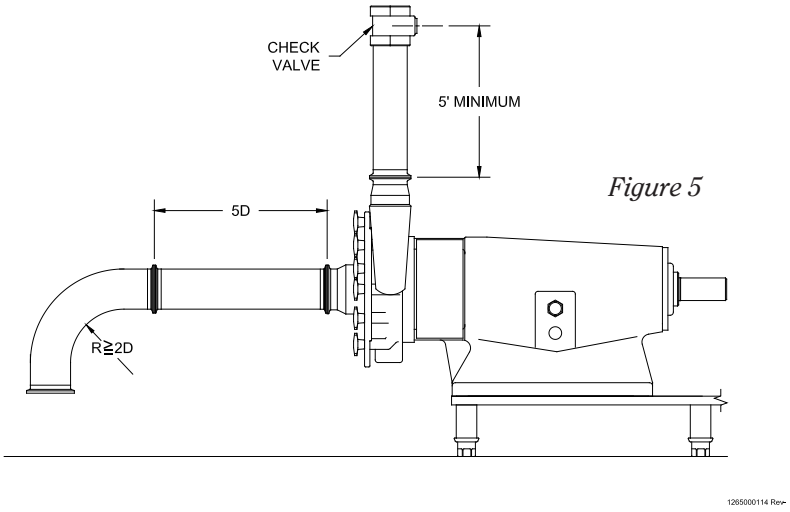
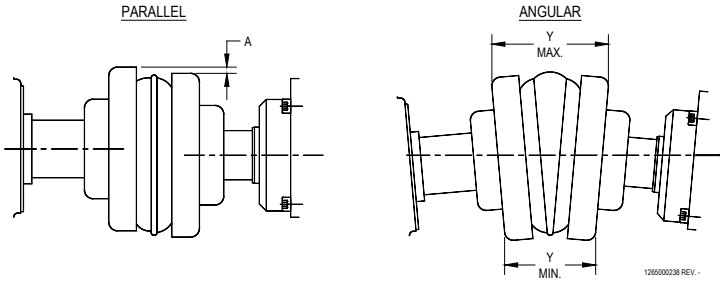


Figure 5

Alignment

In most cases, the pump will be shipped with a drive unit mounted on a common baseplate. The drive and pump are aligned at the factory; however, this alignment should be checked after installation (Figure 6). Misalignment between the pump and drive can result in premature bearing failure or other damage. If the pump is not shipped with a drive unit, use a flexible coupling between the pump and drive unit. Align the pump and drive unit according to the coupling requirements.

Figure 6



Checking alignment

Remove the wire ring from the coupling sleeve and let it hang between the sleeve and one of the flanges.

To check the parallel alignment place a straight edge across the two coupling flanges and measure the maximum offset at various points around the periphery of the coupling without rotating the coupling. If the maximum offset exceeds the figure shown under "Parallel" in the table, realign the shafts.

Sleeve Size	Type E			Type H		
	Parallel A	Angular Y max. - Y min.	Y*	Parallel A	Angular Y max. - Y min.	Y*
6	.015	.070	2.375	.010	.016	2.375
7	.020	.081	2.563	.012	.020	2.563
8	.020	.094	2.938	.015	.025	2.938
9	.025	.109	3.500	.017	.028	3.500
10	.025	.128	4.063	.020	.032	4.063
11	.032	.151	4.875	.022	.037	4.875
12	.032	.175	5.688	.025	.042	5.688
13	.040	.195	6.688	.030	.050	6.625
14	.045	.242	7.750	.035	.060	7.750

Dimensions are in inches.
*The "Y" dimension is shown for reference

Check the angular alignment with a micrometer or caliper. Measure from the outside of one flange to the outside of the other ("Y") at intervals around the periphery of the coupling. Determine the maximum and minimum dimensions without rotating the coupling. The difference between the maximum and minimum must not exceed the figure given under "Angular" in the table. If a correction is necessary, be sure to recheck the parallel alignment.

Replace the wire ring on the O.D. of the coupling sleeve.

Table 1: Sure-Flex Coupling Maximum Allowable Misalignment

Electrical Installation

We use standard duty TEFC motors unless otherwise specified. Many motor options are available: washdown, flameproof, explosion proof, hostile duty or chemical duty.

Have an electrician connect the motor using sound electrical practices. Provide adequate protection. Pumps fitted with mechanical seals must not run dry, not even momentarily. Determine the direction of rotation by watching the motor fan, which must turn clockwise.

The selected motor should meet the requirements of the specified operating conditions. A change in conditions (for example, higher viscosity, higher specific gravity, lower head losses) can overload the motor. When changing operating conditions or whenever there is any doubt, please contact Fristam Pumps, Inc., for technical assistance.

Pump Operations

Start-up instructions

- Remove any foreign matter that may have entered the pump.
- Do not use the pump to flush the system!
- Fill bearing block with oil, as directed on page 5, before starting the pump.

Check pump for proper rotation as indicated on the pump. Proper motor direction is clockwise when looking at the fan end of the motor. (NOTE: When checking the direction of rotation, the pump must be full of liquid.)

- Never run the pump dry, even momentarily. Seal damage can result.

Note: Maximum inlet pressure to the pump should not exceed 600 psi for the FPH 3542 and FPH 3552. Maximum inlet pressure to the pump should not exceed 1000 psi for the FPHP 722 and FPHP 3542 models.

Shut-down instructions

- Shut off the power supply to the pump.
- Close the shut-off valves in the suction and discharge piping.
- Drain and clean the pump as required.
- Protect the pump against dust, heat, moisture and impact damage.

Installation of Seal Flush for Double Mechanical Seal

Set up the seal flush for the mechanical seal as shown in (Figure 7). Use only about 12 gallons per hour of water at a pressure of 1-2 PSI. Excessive flow of water through the seal increases the pressure inside the seal, causing the seal to wear prematurely.

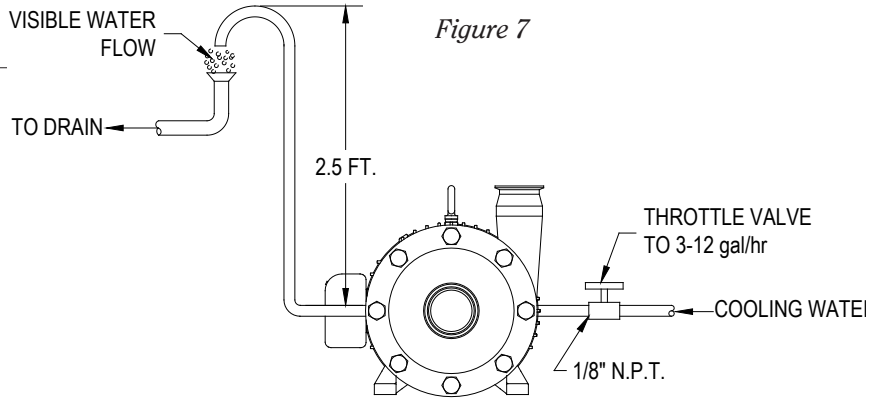


Figure 7

Pipe the exit side of the water flush with 2-5 feet physical height of tubing. This ensures that some water is always in the stationary seal and the seal never runs dry.

It is possible to inject steam through the stationary seal (within the pressure requirements). We do not recommend using steam alone for the cooling/lubricating of the seal.

It is desirable to have the flush water on the outlet side visible. This allows an easy check to see that the flush water is on, and also if the seal is functioning properly. In a malfunctioning seal the flush water will disappear, becomes discolored or shows an unusual increase in flow. If these conditions exist, check the seal and replace if necessary.

Seal Replacement

Begin all pump maintenance by disconnecting the energy source to the pump. Observe all lock out/tag out procedures as outlined by ANSI Z244.1-1982 and OSHA 1910.147 to prevent accidental start-up and injury.

Tools Required for Seal Replacement:

15/16" socket wrench
Pliers (channel locks)
One pair tack pullers (impeller pullers)
One set of feeler gauges
7/16" wrench
3/4" wrench
1" wrench
Chain wrench
Soft faced mallet

Note: The reference numbers listed in the text (#) refer to the FPH &FPHP 3542 and FPH 3552 assembly drawing on pages 18-19 and the part lists on pages 20-21.

Pump Head Disassembly

Disconnect the suction and discharge piping. Drain all fluid from the pump prior to disassembly.

WARNING Loosen the cover nuts (2) with the 1" wrench. Remove cover nuts, flat washers (43) (if supplied), cover (45) and cover gasket (3).

Loosen the four guard screws (42) securing the coupling guard (41) to the baseplate. Remove the coupling guard. Place the chain wrench on the pump shaft near the coupling to keep the shaft from rotating while loosening the impeller nut (1) with the 15/16" socket wrench. Remove the impeller nut and impeller gasket (44). Remove the impeller (6) and impeller key (7) from the pump shaft.

Remove the rotating seal assembly which includes: the impeller gasket (44), seal driver (9), rotating seal (10), seal spring (11) and rotating seal o-ring (8). To remove this assembly from the shaft, place the tack pullers on both sides of the assembly and pull toward the end of the impeller shaft. Be careful not to drop this assembly as the seal face could be damaged. Remove the o-ring (46) and the gapping spacer (47) from the shaft.

To remove the stationary seal (48) and the flush seal components, the pump housing needs to be removed. First remove the two water pipes (54) on either side of the pump housing using pliers or channel locks. Next, remove the four pump housing bolts (13) and lock washers (12), which attach the pump housing (5) to the bearing block (55), using the 3/4" wrench. Carefully slide the pump housing off the end of the pump shaft, ensuring that the stationary seals (which are mounted in the pump housing) do not contact the pump shaft. Note: the stationary seals may be damaged if they make hard contact with the pump shaft.

Place the pump housing on its hub. Remove the stationary seal (48) by placing your fingers on the ID of the stationary seal and pulling it toward the front of the pump housing. The stationary seal o-ring (14) should come out with the stationary seal.

To remove the flush seal components, turn the housing over and place it on the housing studs. Remove the four retaining ring bolts (22) on the pump housing with the 7/16" wrench. Remove the retaining ring (21), stationary flush seal (19) and flat gasket (18) from the pump housing.

Now remove the rotating water flush components from the pump shaft, which include: the rotating flush seal ring (20), the flush seal o-ring (23), the flush seal spring (25) and the flush seal drive ring

(24). The flush seal driver (26) may be left on the pump shaft.

You are now ready to install the new seal and reassemble the pump head.

Pump Head Assembly

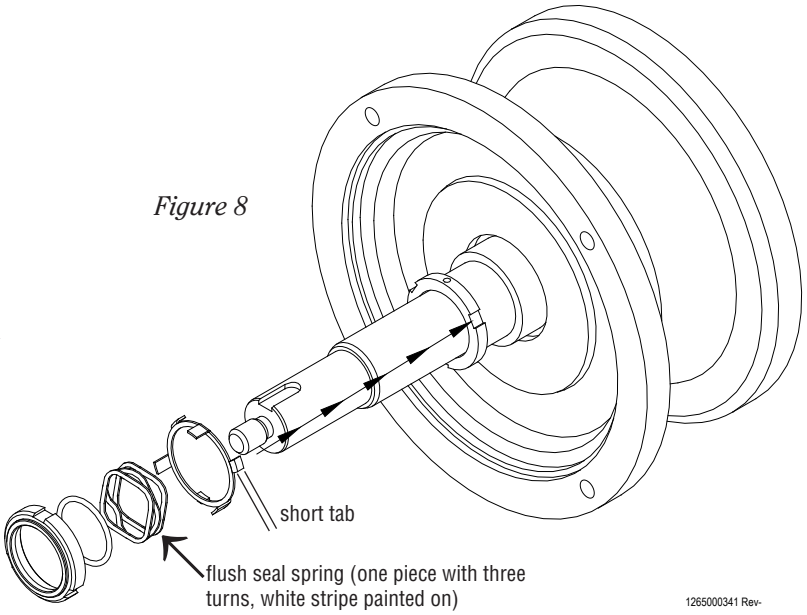
Note: when installing the new seal components make sure that you use all of the components supplied with the replacement seal kit. Using some of the old components may reduce seal life.

Start the seal assembly by sliding the new flush seal drive ring (24) onto the pump shaft with the shorter tabs facing the flush seal driver (26) as shown in Figure 8. Align the tabs with the slots in the seal driver. Slide the new flush seal spring (25) onto the pump shaft and position it against the flush seal drive ring. The flush seal spring has a painted white stripe on all models except the 722 so that it is not confused with the single seal spring. Lubricate the new flush seal o-ring (23) with a food grade lubricant. Place the o-ring inside the rotating flush seal ring (20) and slide the assembly onto the pump shaft. Align the tabs in the flush seal drive ring with the slots in the flush seal ring.

With the pump housing still sitting on the housing studs, place the new stationary seal flat gasket (18) and stationary flush seal (19) into the pump housing. Replace the retaining ring (21) onto the hub of the pump housing and install the four retaining ring bolts (22). Tighten with the 7/16" wrench to recommended torque (see page 4).

Turn the pump housing over and place it on the pump housing hub. Lubricate the stationary seal o-ring (14) (if it is not EPDM) with a food grade lubricant and place it onto the stationary seal (48). Place the stationary seal and o-ring into the bottom of the pump housing. Align the notch in the stationary seal with the pin (49) in the pump housing and press the stationary seal into the pump housing until it snaps into place. Wipe the seal face clean with a soft cloth to remove any oil or grit.

Figure 8



You are now ready to install the pump housing (5). Carefully slide the pump housing over the pump shaft (39) and push it against the bearing block, (55) ensuring that the stationary seals (which are mounted in the pump housing) do not contact the shaft. Note: the stationary seals may be damaged if they make hard contact with the pump shaft.

Install the four pump housing bolts (13) with lock washers (12) through the bearing block into the pump housing. Tighten them with the 3/4" wrench to recommended torque (see page 4).

Next install the gapping spacer (47) and the new o-ring (46). (Note: it is important to use the same gapping spacer that was removed, as this is unique to your pump.) Lubricate the new seal driver o-ring with a food grade lubricant and place it on the gapping spacer. Slide the gapping spacer and the o-ring on to the pump shaft. Note: for the FPHP 722, the seal driver o-ring is installed into the I.D. of the seal driver and not placed on the shaft at this time.

Now install the new rotating seal assembly (Figure 9) which includes: the impeller gasket (44), seal driver (9), rotating seal (10), seal spring (11) and rotating seal o-ring (8) (and the seal driver o-ring on the FPHP 722). First install the seal spring into the rotating seal between the pins and the front seal face. Next, install the rotating seal o-ring into the rotating seal. Align the pins on the rotating seal with the grooves on the seal driver and press the two components together. Lubricate the impeller gasket (if it is not EPDM) with a food grade lubricant such as Haynes CIP-Lube and place it into the groove on the seal driver. Slide the rotating seal assembly onto the shaft so the face of the rotating seal meets the face of the stationary seal.

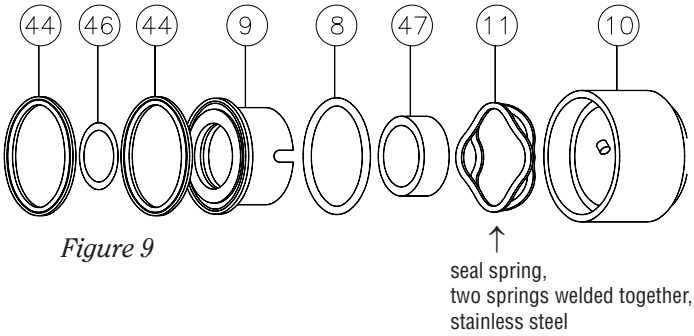


Figure 9

Place the impeller key (7) into the shaft keyway and slide the impeller (6) onto the pump shaft. Locate the new impeller nut gasket (44) and lubricate it (if it is not EPDM) with a food grade lubricant such as Haynes CIP-Lube and place it onto the impeller nut (1). Thread the impeller nut with gasket onto the shaft. Place the chain wrench on the shaft (39) near the coupling to keep the shaft from rotating while tightening the impeller nut with the 15/16" socket wrench to recommended torque (see page 4).

Place the new cover gasket (3) into the groove on the pump cover and install them onto the pump housing. Thread the cover nuts (2) and lock washers (12) onto the housing studs. Tighten the cover nuts by tapping on them with the soft faced mallet. Use the cross tightening technique shown in Figure 10. Note: the FPHP and FPH 3542 and FPH 3552 models have 10 cover nuts and the FPHP 722 have eight.

Remove the chain wrench and rotate the impeller shaft to ensure the impeller moves freely. If it does not, recheck your assembly to make sure gaskets aren't pinched and everything is seated properly.

Replace the coupling guard and tighten the guard screws. Reconnect the suction and discharge piping.

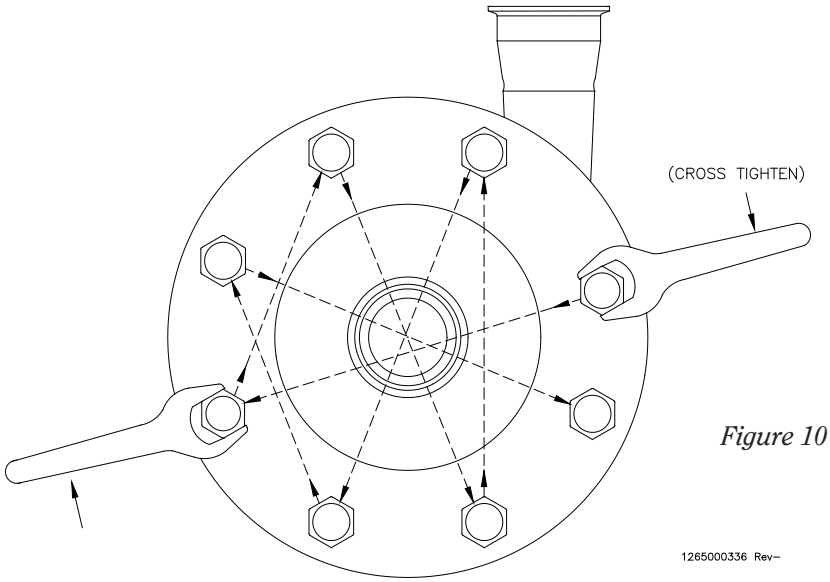
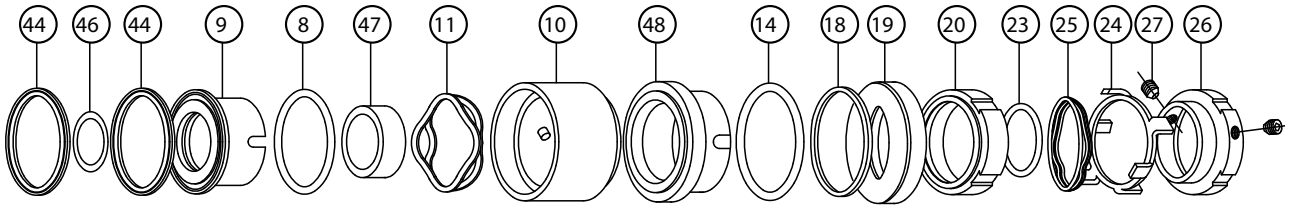


Figure 10

FPH & FPHP Seal Assembly



DESCRIPTION

44	IMPELLER NUT GASKET	18	FLAT GASKET	21	RETAINING RING
46	SEAL DRIVER O-RING	19	STATIONARY WATER SEAL	22	RETAINING RING BOLTS
9	SEAL DRIVER	20	ROTATING WATER SEAL RING		
8	ROTATING SEAL O-RING	23	FLUSH SEAL O-RING		
47	GAPPING SPACER	25	FLUSH SEAL SPRING (WHITE)		
11	SEAL SPRING	24	FLUSH SEAL DRIVE RING		
10	ROTATING SEAL	27	SET SCREW		
48	STATIONARY SEAL	26	SEAL DRIVER		
14	STATIONARY SEAL O-RING	54	WATER PIPE		

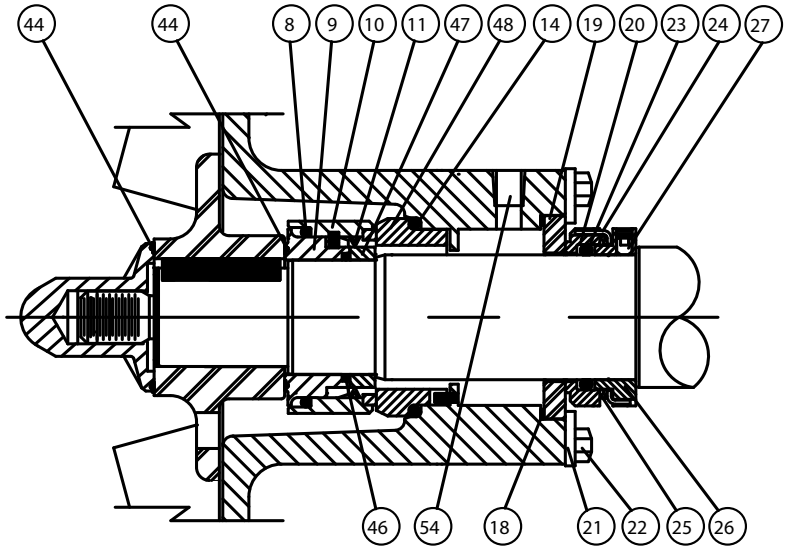
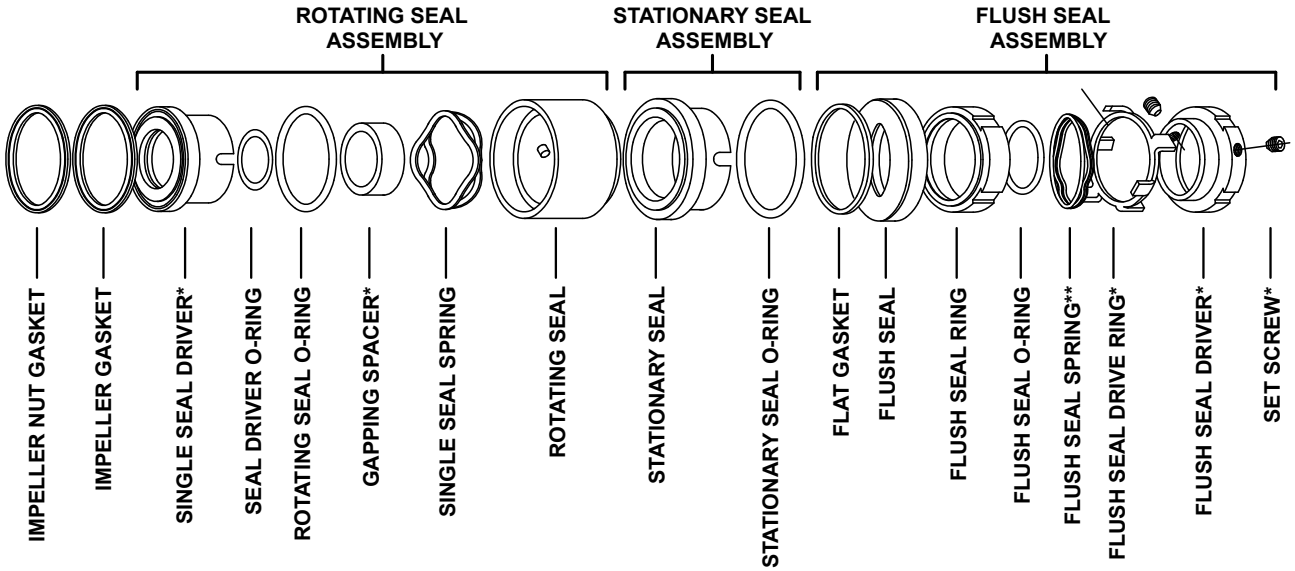


Figure 11: FPH & FPHP Seal Assembly

FPH & FPHP Seal Assembly
Alternate View



***NOT SUPPLIED IN WEAR PARTS KIT**

DWG # 1265000668

****FLUSH SEAL SPRING HAS A WHITE STRIPE ON THE OUTSIDE EDGE (EXCEPT MODEL 722); ROTATING SEAL SPRING DOES NOT**

Figure 12: FPHP 722 Seal Assembly

Shaft or Bearing Replacement

Begin all pump maintenance by disconnecting the energy source to the pump. Observe all lock out/tag out procedures as outlined by ANSI Z244.1-1982 and OSHA 1910.147 to prevent accidental start-up and injury.

Tools Required for Shaft or Bearing Replacement:

3/32” Allen wrench
3/16” Allen wrench
Pliers (channel locks)
Snap-ring pliers
Soft-faced hammer (5 lb. dead blow)
1/2” wrench
15/16” socket wrench
Spanner wrench
Shaft alignment tool
Flame torch (optional)
Bearing heater (optional)
Arbor press (optional)

Bearing Block Disassembly

To replace the bearings or pump shaft in the bearing block, first disassemble the pump head as described under pump head disassembly in the seal replacement section (pages 10-11).

Next, drain the oil from the bearing block by removing the drain plug cap (32) with the pliers or channel locks. Unbolt the bearing block from the baseplate by removing the bearing block mounting bolts (53) with the 15/16” wrench. Slide the bearing block away from the motor and remove the rubber coupling sleeve. Loosen the set screws on the coupling flange (40) with the 3/16” Allen wrench. Remove the coupling flange and coupling key from the pump shaft.

Remove the flush seal driver (26) by loosening the two set screws (27) with the 3/32” Allen wrench and sliding the flush seal driver off the shaft.

Remove the front and rear bearing block caps by removing the bearing cap bolts (15) with the 1/2” wrench. Discard the used bearing cap O-rings.

Remove the snap ring (50), which secures the radial bearing (52) from the shaft with the snap-ring pliers. Tap the impeller end of the pump shaft with the soft-faced hammer to remove the shaft assembly from the bearing block. Support the shaft while tapping so that it does not fall and become damaged.

Stand the pump shaft on end (impeller end down) and slowly heat the inner race of the radial bearing (52) with the flame torch until it drops off the shaft. Loosen the bearing lock nut (35) with the spanner wrench. Remove the bearing lock nut and lock nut washer (34) from the shaft. Press the thrust bearings (33) off the shaft using caution to prevent damaging the shaft in the process (Figure 13). Remove the outer race of the radial bearing from the bearing block.

Bearing Block Assembly

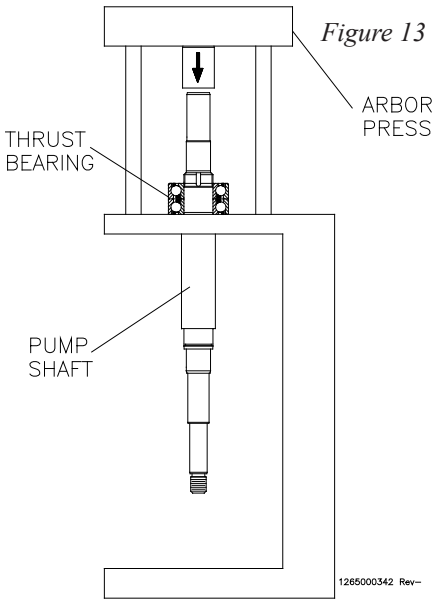


Figure 13

Replace the pump shaft if necessary. Heat the new thrust bearings (33) on a bearing heater to 230ºF (Do not heat the bearing above 250ºF or bearing damage may result) and slide onto the shaft in a back-to-back arrangement (see assembly drawing page 18-19 or 22-23). Slide the bearings onto the shaft quickly as the bearings cool rapidly when they come in contact with the shaft. A light film of oil on the shaft may ease assembly. Replace bearing lock nut washer (34) and lock nut (35). Note that the tab on the bearing lock nut washer fits into the slot on the shaft. Tighten the bearing lock nut with the spanner wrench to the proper torque (see page 4). The bearings should be able to rotate freely but not wobble. (Do not overtighten.)

Heat the inner race of the radial bearing (52) to 230ºF and slide onto the shaft. Allow the shaft/bearing assembly to cool to room temperature while keeping the assembly covered to prevent dirt from getting into the bearings. Recheck tightness of the bearing lock nut (35) to ensure thrust bearings (33) are tight and still rotate freely. Bend one of the tabs on the bearing lock nut washer (34) into a slot of the bearing lock nut with a screw driver. This keeps the bearing lock nut secure during pump operation.

Press the outer race of the new radial bearing (52) into the bearing block. Now you are ready to install the shaft assembly into the bearing block. Slide the impeller end of the shaft into the motor end of the bearing block. Move the shaft forward until the thrust bearings meet the bearing block. Press or tap the outer race of the thrust bearings (33) into the bearing block. Support the impeller end of the shaft so the inner race of the radial bearing clears the rollers secured in the outer race. Do not press on the shaft or the inner race of the thrust bearings or bearing damage may result. It may be easier to install the shaft assembly into the bearing block with the bearing block standing on end. Allow clearance for the impeller end of the shaft to protrude through the face of the bearing block. Replace the snap ring (50) for the radial bearing with the snap-ring pliers.

With the pump shaft assembly installed, you are now ready to install the bearing caps (37 & 51). Inspect the labyrinth seals (16) and replace if damaged or worn. The labyrinth seals are press fit into the bearing caps. Press the old seals out and press the new labyrinth seals into the bearing cap, preferably with an Arbor press. Make sure the drain port on the labyrinth seals will be in the downward position when the bearing caps are mounted on the bearing block.

Note: it is normal for some of the outer o-ring on the labyrinth seal to shear off when it is pressed into the bearing cap.

Generously lubricate the inside O-rings on the labyrinth seals with a food grade lubricant and press the labyrinth seal/bearing cap assemblies onto the pump shaft. Replace the bearing cap bolts and tighten with the 1/2” wrench to the proper torque (see page 4).. Ensure the rotating part (rotor) of the labyrinth is positioned against the stationary part (stator) as you finish cross-tightening the bearing cap bolts. Replace the oil plug cap and fill the bearing block with oil to the center of the sight glass. See lubrication recommendations, page 5.

Replace the coupling key and the coupling flange (40).

Shaft Alignment

The bearing block can now be returned to the baseplate and aligned with the motor. Align the bearing block over the bearing block mounting holes in the baseplate and loosely thread the bearing block mounting bolts (53). Mount the shaft alignment tool between the pump and motor and align the shafts. Note that shims may be required under the mounting feet of the motor. The shafts should not have more than .020" parallel misalignment and .094" angular misalignment. Once the shafts are aligned, tighten the bearing block mounting bolts securely with the 15/16" wrench to the proper torque (see page 4). Replace the rubber coupling sleeve and slide the two coupling flange halves together. Tighten the set screws on the coupling flange (40) with the 3/16" Allen wrench. Slide the flush seal driver (26) onto the pump shaft. Make sure that it is tight against the shaft step and tighten the two set screws with the 3/32" Allen wrench.

The pump head may now be assembled as described on pages 11-12.

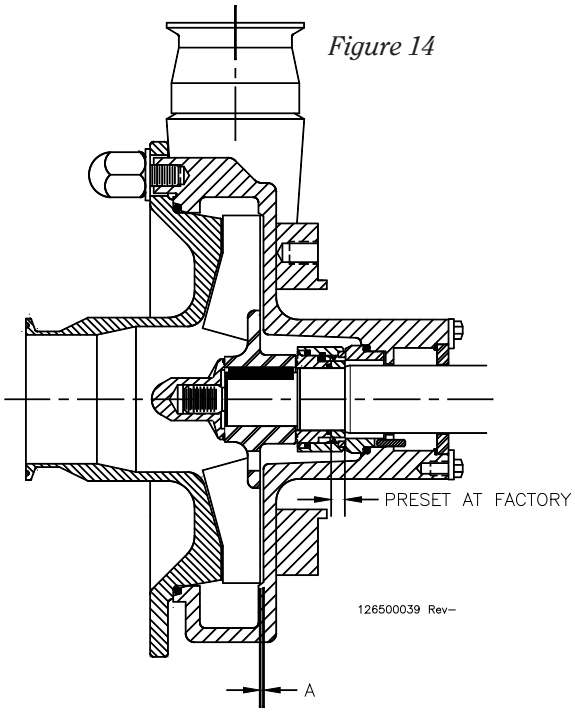
Setting the Impeller Gap

If you have removed the pump shaft (39) from the bearing block for any reason (such as replacing the shaft or bearings), you must check the gap.

The gap is measured between the impeller (6) and pump housing (5) using feeler gauges. (NOTE: Due to polishing and balancing the impeller, the gap behind each impeller blade may vary. The gap should be checked behind each blade and the smallest value should be used as your gap setting.) The correct gap dimensions are listed on page 4.

If the gap isn't correct please contact Fristam Pumps.

Figure 14



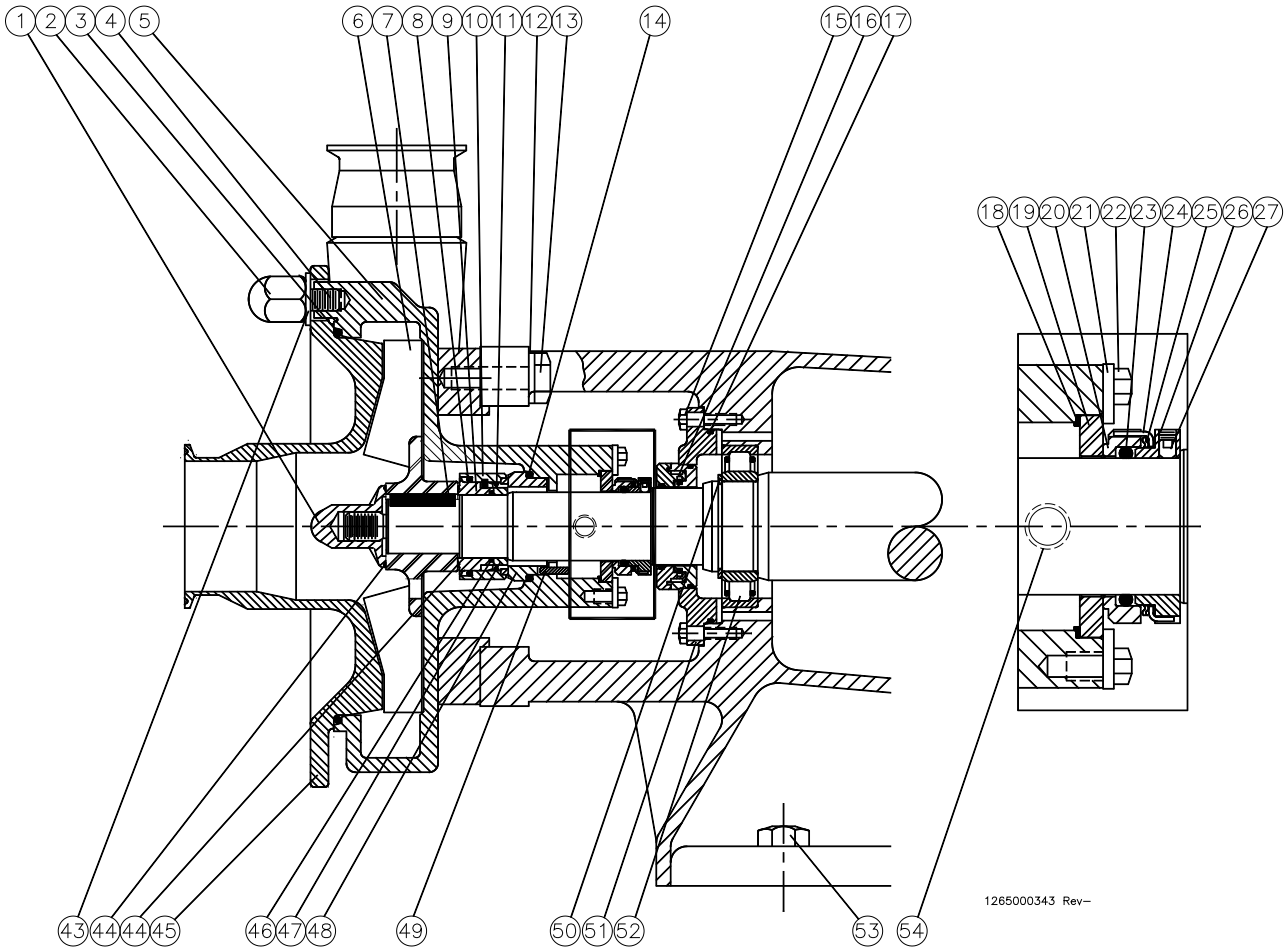
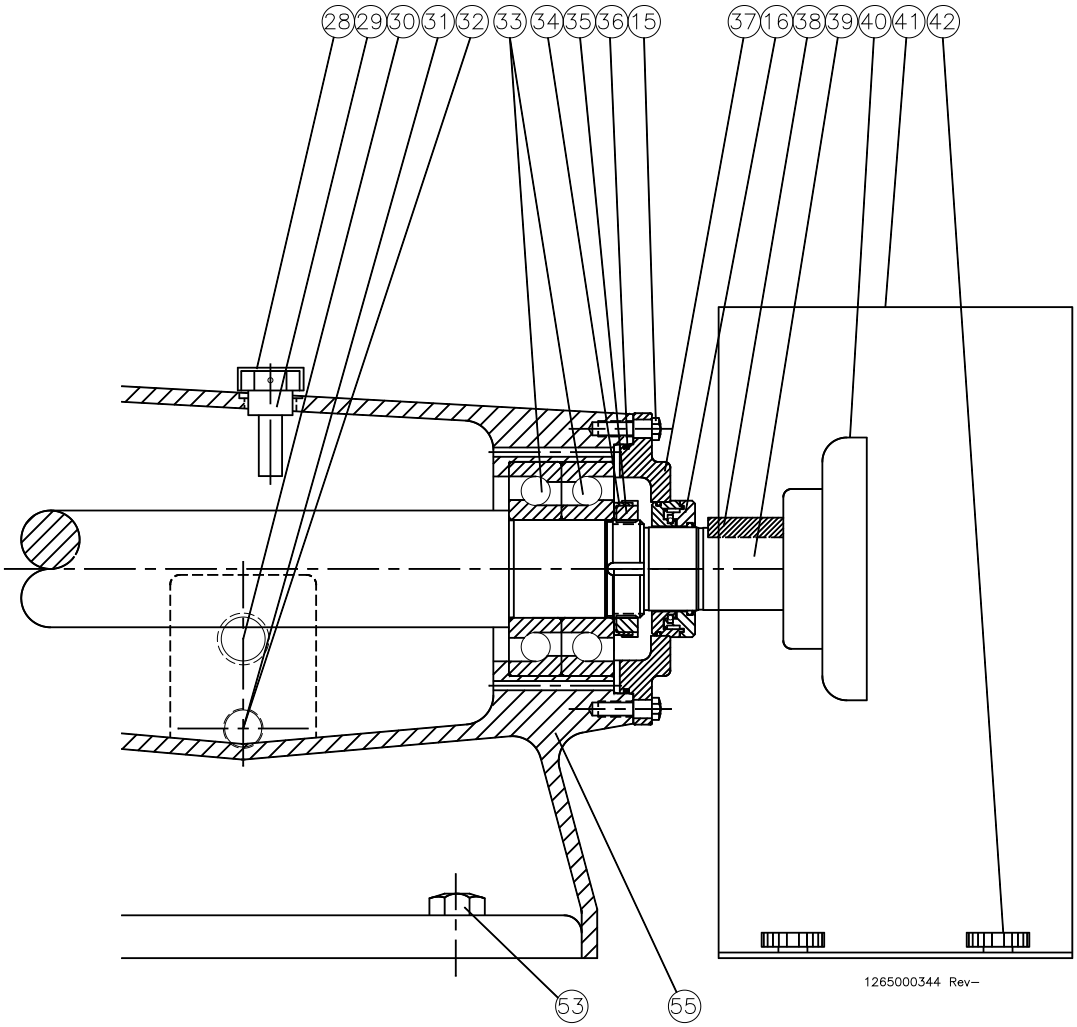


Figure 15: FPH & FPHP 3542 and FPH 3552 Assembly

1. Impeller Nut
2. Cover Nut
3. Cover Gasket
4. Housing Stud
5. Pump Housing
6. Impeller
7. Impeller Key
8. Rotating Seal o-ring
9. Seal Driver
10. Rotating Seal
11. Seal Spring
12. Lock Washer
13. Pump Housing Bolt
14. Stationary Seal o-ring
15. Bearing Cap Bolt
16. Labyrinth Seal
17. O-ring
18. Flat Gasket
19. Stationary Flush seal
20. Rotating Flush seal
21. Seal Retaining Ring
22. Seal Housing Bolt
23. Flush seal o-ring
24. Flush seal Drive Ring
25. Seal Spring
26. Seal Driver
27. Set Screw
28. Breather Cap
29. Oil Breather
30. Sight Glass



31. Drain Plug Nipple
32. Drain Plug Cap
33. Thrust Bearing
34. Bearing Lock Washer
35. Bearing Lock Nut
36. O-ring
37. Rear Bearing Cap
38. Coupling Key
39. Pump Shaft
40. Coupling Flange
41. Coupling Guard
42. Guard Screw
43. Flat washer
44. Impeller Nut Gasket & Impeller Gasket
45. Cover
46. O-ring
47. Gapping Spacer
48. Stationary Seal Ring
49. Housing Pin
50. Snap Ring
51. Front Bearing Cap
52. Radial Bearing
53. Mounting bolt
54. Water Pipe
55. Bearing Block

FPH/FPHP 3542

Item No.	Description	Part No.	Qty.
1	Impeller nut	1954000005	1
2	Cover nuts	1103000022	10
3	Cover gasket (viton)	1180000336	1
4	Housing stud	1103000001	10
5	FPH/FPHP 3542 housing	1448610004	1
6	Impeller	1448630223	1
7	Impeller key	1315000023	1
8	O-ring (viton)	1180000030	1
9	Seal driver	1811000021	1
10	Rotating seal ring (silicon carbide)	1810600155	1
11	Seal spring	1820000025	1
12	Lock washer	1104000031	4
13	Pump housing bolt	1101000102	4
14	O-ring (viton)	1181000099	1
15	Bearing cap bolt	1101000096	10
16	Labyrinth seal	1812000023	2
17	Front bearing cap o-ring	1180000148	1
18	Flat gasket	1181000047	1
19	Stationary water seal - ceramic	1815600093	1
20	Rotating water seal ring	1810600056	1
21	Seal retaining ring	1148000023	1
22	Seal housing bolt	1101000086	4
23	O-ring (viton)	1180000329	1
24	Water seal drive ring	1811000027	1
25	Water seal spring	1820000016	1
26	Water seal driver	1811000023	1
27	Set screw	1101000112	2

Item No.	Description	Part No.	Qty.
28	Breather cap	1248000009	1
29	Oil breather	1248000007	1
30	Sight glass	1248000018	2
31	Drain plug nipple	1226000006	1
32	Drain plug cap	1226000007	1
33	Thrust bearing (set)	1173000004	1
34	Bearing lock washer	1104000016	1
35	Bearing lock nut	1306000005	1
36	Rear bearing cap o-ring	1180000149	1
37	Rear bearing cap	1303000009	1
38	Coupling key	1315000008	1
39	Pump shaft	1321000181	1
43	Flat washer	1104000005	10
44	Impeller nut gasket (viton)	1181000098	2
45	FPH 3542 cover	1448620336	1
45	FPHP 3542 cover	1448620337	1
46	Seal driver o-ring	1180000086	1
47	Gapping spacer (7.7 mm)	1224000046	1
47	Gapping spacer (8.0 mm)		1
48	Stationary seal ring (silicon carbide)	1815600196	1
50	Snap ring	1148000005	1
51	Front bearing cap	1303000008	1
52	Radial bearing	1173000012	1
54	Water pipe	1910000007	2
55	Bearing block	1310600038	1

** = impellers are available in a variety of sizes. Please check with Fristam Pumps*

FPH 3552

Item No.	Description	Part No.	Qty.
1	Impeller nut	1954000005	1
2	Cover nuts	1103000022	10
3	Cover gasket (viton)	1180000336	1
4	Housing stud	1103000001	10
5	FPH 3552 housing	1458610004	1
6	Impeller	1458630243	1
7	Impeller key	1315000023	1
8	O-ring (viton)	1180000030	1
9	Seal driver	1811000021	1
10	Rotating seal ring (silicon carbide)	1810600155	1
11	Seal spring	1820000025	1
12	Lock washer	1104000031	4
13	Pump housing bolt	1101000102	4
14	O-ring (viton)	1181000099	1
15	Bearing cap bolt	1101000096	10
16	Labyrinth seal	1812000023	2
17	Front bearing cap o-ring	1180000148	1
18	Flat gasket	1181000047	1
19	Stationary water seal - ceramic	1815600093	1
20	Rotating water seal ring	1810600056	1
21	Seal retaining ring	1148000023	1
22	Seal housing bolt	1101000086	4
23	O-ring (viton)	1180000329	1
24	Water seal drive ring	1811000027	1
25	Water seal spring	1820000016	1
26	Water seal driver	1811000023	1
27	Set screw	1101000112	2

Item No.	Description	Part No.	Qty.
28	Breather cap	1248000009	1
29	Oil breather	1248000007	1
30	Sight glass	1248000018	2
31	Drain plug nipple	1226000006	1
32	Drain plug cap	1226000007	1
33	Thrust bearing (set)	1173000004	1
34	Bearing lock washer	1104000016	1
35	Bearing lock nut	1306000003	1
36	Rear bearing cap o-ring	1180000149	1
37	Rear bearing cap	1303000009	1
38	Coupling key	1315000008	1
39	Pump shaft	1321000181	1
43	Flat washer	1104000005	10
44	Impeller nut gasket (viton)	1181000098	2
45	FPH 3552 cover	1458620501	1
46	Seal driver o-ring	1180000086	1
47	Gapping spacer (7.7 mm)	1224000042	1
47	Gapping spacer (8.0 mm)		1
48	Stationary seal ring (silicon carbide)	1815600196	1
50	Snap ring	1148000005	1
51	Front bearing cap	1303000008	1
52	Radial bearing	1173000012	1
54	Water pipe	1910000007	2
55	Bearing block	1310600038	1

** = impellers are available in a variety of sizes. Please check with Fristam Pumps*

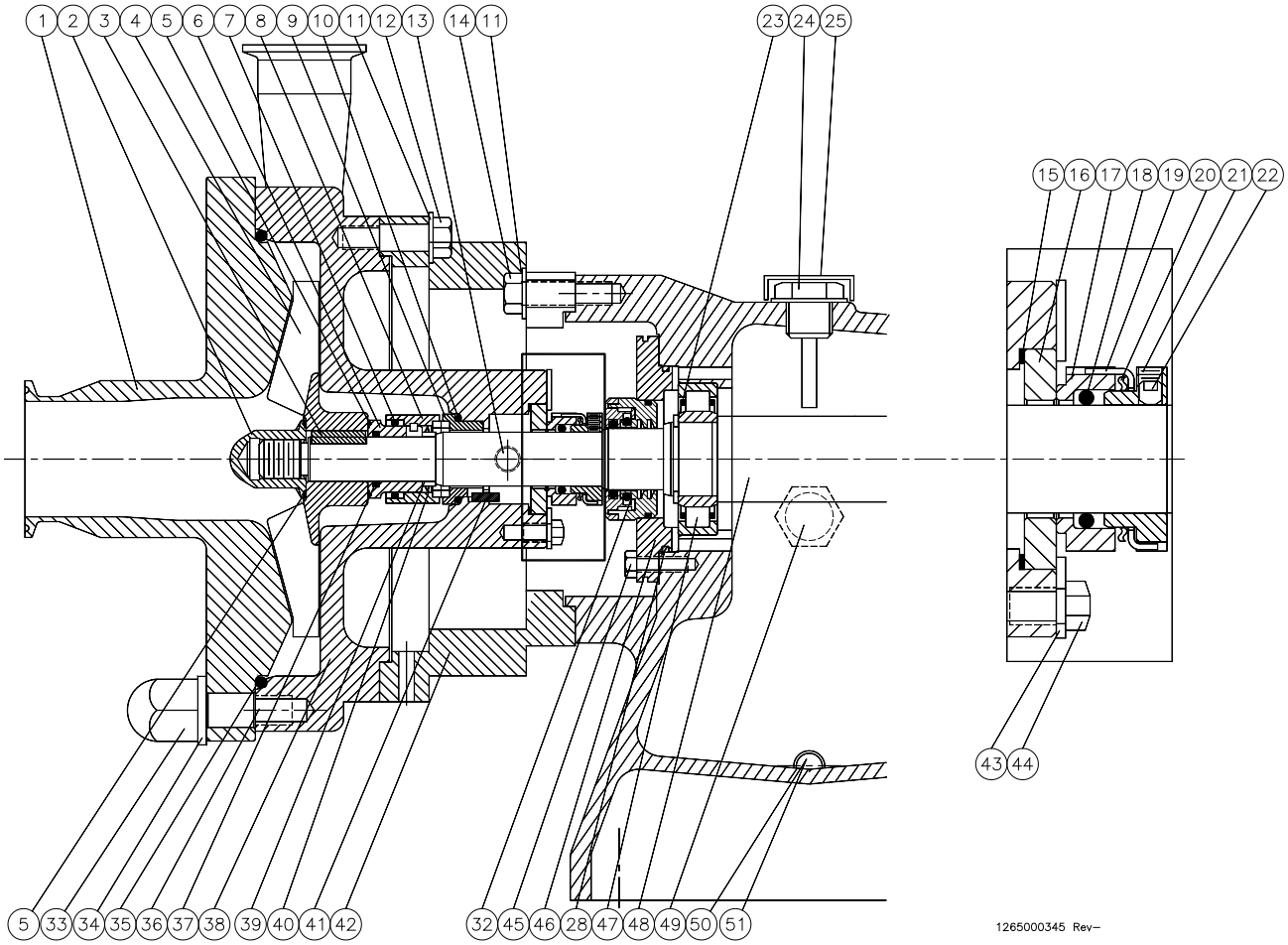
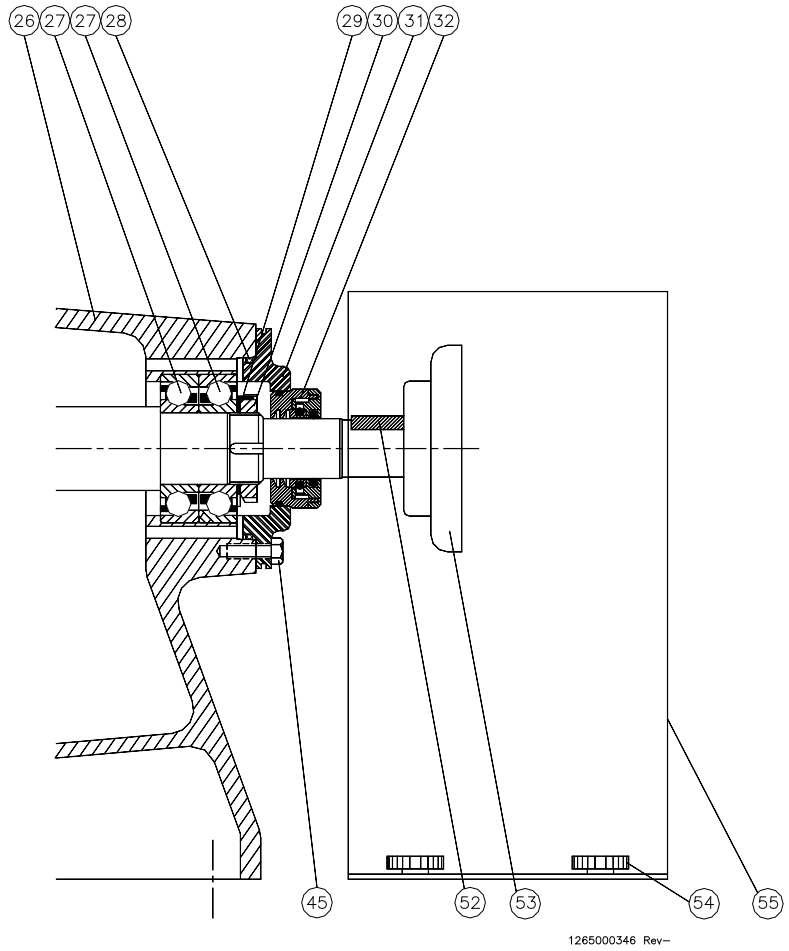


Figure 16: FPHP 722 Assembly

1. Pump Cover
2. Impeller Nut
3. Impeller Key
4. Impeller
5. Impeller Gasket
6. Seal Driver
7. Rotating Seal o-ring
8. Rotating Seal
9. Stationary Seal
10. Stationary Seal o-ring
11. Lock Washer
12. Flange Bolt
13. Water Pipe
14. Bearing Block Bolt
15. Flat Gasket
16. Stationary Flush seal
17. Rotating Flush seal Ring
18. Flush seal o-ring
19. Flush seal Drive Ring
20. Seal Spring
21. Seal Driver
22. Set Screw
23. Snap Ring
24. Oil Breather
25. Breather Cap
26. Bearing Block
27. Thrust Bearing
28. O-ring
29. Bearing Lock Washer
30. Bearing Lock Nut



31. Rear Bearing Cap
32. Labyrinth Seal
33. Cover Nut
34. Flat Washer
35. Cover Gasket
36. Housing Stud
37. O-ring
38. Housing
39. Gapping Spacer
40. Seal Spring
41. Housing Pin
42. Flange Adapter
43. Seal Retaining Ring
44. Seal Housing Bolt
45. Bearing Cap Bolt
46. Front Bearing Cap
47. Radial Bearing
48. Pump Shaft
49. Sight Glass
50. Drain Plug Nipple
51. Drain Plug Cap
52. Coupling Key
53. Coupling Flange
54. Guard Screw
55. Coupling Guard

FPHP 722

Item No.	Description	Part No.	Qty.
1	FPHP 722 cover w/2" fitting	1424620673	1
2	Impeller nut	1954000000	1
3	Impeller key	1315000002	1
4	Impeller	1424630051	1
5	Impeller nut gasket (viton)	1181000089	2
6	Seal driver	1811000010	1
7	O-ring (viton)	1181000036	1
8	Rotating seal ring (tungsten carbide)	1810600030	1
9	Stationary seal ring (tungsten carbide)	1815600080	1
10	O-ring (viton)	1180000344	1
11	Lock washer	1104000036	8
12	Flange bolt	1101000105	4
13	Water pipes	1910000000	2
14	Bearing block bolt	1101000106	4
15	Flat gasket	1181000069	1
16	Stationary water seal	1815600177	1
17	Rotating water seal ring	1810600015	1
18	O-ring (viton)	118000056	1
19	Water seal drive ring	1811000016	1
20	Seal spring	1820000026	1
21	Seal driver	1811000024	1
22	Set screw	1101000018	2
23	Snap ring	1148000012	1
24	Oil breather	1248000007	1
25	Breather cap	1248000009	1
26	Bearing block	1310600037	1
27	Thrust bearing	1173000003	2

Item No.	Description	Part No.	Qty.
28	O-ring (viton)	1180000122	2
29	Bearing lock washer	1104000023	1
30	Bearing lock nut	1306000008	1
31	Rear bearing cap	1303000007	1
32	Labyrinth seal	1812000024	2
33	Cover nut	1103000022	8
34	Flat washer	1104000005	8
35	Cover gasket (viton)	1180000335	1
36	Housing stud	1103000017	8
37	O-ring (viton)	1180000119	1
38	FPHP 722 housing w/1.5" fitting	1424610001	1
39	Gapping spacer	1224000051	1
40	Seal spring	1820000044	1
41	Housing pin	1891000008	1
42	Flange adapter	1310600055	1
43	Seal retaining ring	1148000021	1
44	Seal housing bolt	1101000086	4
45	Bearing cap bolt	1101000021	8
46	Front bearing cap	1303000006	1
47	Radial bearing	1173000010	1
48	Pump shaft	1321000180	1
49	Sight glass	1248000018	2
50	Drain plug nipple	1226100001	1
51	Drain plug cap	1226100002	1
52	Coupling Key	1315000044	1

** = impellers are available in a variety of sizes. Please check with Fristam Pumps*

Trouble Shooting

Fristam pumps are relatively maintenance free; however, in the event a problem arises, the trouble-shooting chart below should help you with most pump related problems. If a motor problem arises, please contact your local motor repair representative.

This troubleshooting chart has been prepared assuming the installed pump is suitable for the application. Symptoms of cavitation can result when a pump is not properly applied. Examples of these symptoms are noisy operation, insufficient discharge and vibration. If these conditions are present, check the system and re-evaluate the application. If you need assistance, contact Fristam Pumps at 1-800-841-5001 or 608-831-5001.

Situation	Possible Causes
	(see the following pages, pages 25-27)
Pump does not deliver liquid	1, 2, 4, 8, 10, 11, 14, 16, 29, 30
Not enough capacity delivered	2, 3, 4, 5, 8, 10, 11, 14, 16, 20, 21, 29
Pump loses prime after starting	2, 3, 4, 5
Pump requires too much power	9, 12, 13, 16, 19, 24
Leaking seal	7, 18, 23, 24, 25
Seal fails prematurely	6, 7, 18, 20, 23, 24, 25, 26, 27
Pump vibrates or is noisy	2, 12, 15, 16, 17, 18, 19, 20, 21, 26, 28, 29, 31 32,33
Motor bearings fail prematurely	15, 18, 20, 26, 28, 29
Pump overheats and seizes	1, 15, 19, 20, 26, 28
Leaking from the cover	22

Possible Suction Problems	Possible Solutions
1. Pump inlet is not flooded.	1a) Adjust piping so the pump inlet is flooded. b) Install a foot valve to keep liquid in the suction piping.
2. Net positive suction head available (NPSHA) is not sufficient.	2a) Raise the level of liquid on the inlet side of the pump or lower the pump. b) Use larger pipe on the inlet side of the pump. c) Eliminate restrictions in suction line where possible. d) Check inlet pipe for obstructions. e) Shorten the inlet piping, move pump. f) Lower the temperature of the liquid.
3. Too much air or gas in liquid	3a) Install air relief valve. b) Turn pump head so discharge is at 45° angle.

4. Air pocket in suction line	4. Adjust pipe to eliminate pocket.
5. Air entering the pump through seal area	5. Check seal for proper installation, replace seal if defective.
6. Seal flush water not on	6. Turn on water to seal flush.
7. Seal water flush pressure too high	7. Adjust water flow to seal flush to 10-12 gph at 1-2 psi.

Possible Mechanical Situations

8. Drive speed too low	8. Qualified persons should ensure that the power supplied matches the drive power.
9. Drive speed too high	9. Qualified persons should ensure that the power supplied matches the drive power.
10. Direction of shaft rotation incorrect	10. Reverse rotation.
11. Total head of system higher than design head of pump	11a) Check for restrictions in the piping. b) Use larger diameter pipe. c) Use a larger diameter impeller. d) Check application with Fristam Pumps
12. Total head of system lower than pump design head	12a) Install throttling valve in discharge line. b) Trim diameter impeller. c) Check with Fristam Pumps
13. Specific gravity of liquid greater than expected	13. Use larger motor, check application with Fristam Pumps
14. Viscosity of liquid greater than expected	14a) Increase piping diameter and eliminate restrictions. b) A larger drive or pump may be required, check application with Fristam Pumps
15. Operation at a very low capacity for pump model chosen	15. Check application with Fristam Pumps
16. Foreign matter in pump	16. Remove pump cover and clear foreign matter.
17. Pump foundation not rigid	17. Provide firmer foundation for the pump.
18. Bent shaft	18. Replace shaft (pgs. 15-17 for directions).
19. Impeller rubbing on pump housing or cover	19a) Check gap of the impeller. Make sure the gapping spacer is installed. b) Replace defective components. c) Make sure impeller nut is tightened properly.
20. Motor worn or damaged	20. Take motor to authorized service center.
21. Pump damaged	21. Remove pump cover and inspect for damage. Replace defective parts.
22. Cover gasket defective, permitting leakage	22. Replace cover gasket.

23. Shaft worn or scored	23. Replace impeller shaft.
24. Seal improperly installed	24. Check seal installation, replace defective components.
25. Type of seal incorrect for operating conditions	25. Replace seal with correct type of seal, check with your local representative or Fristam Pumps
26. Impeller out of balance, causing vibration	26. Balance the impeller or contact Fristam Pumps
27. Dirt or grit in seal flush liquid leading to scoring of shaft or seal surfaces	27. Use clean source of water for seal flush.
28. Lack of lubrication in motor bearing	28. Lubricate motor bearings.
29. Obstructed piping	29. Remove obstruction in pipe, check for closed valve.
30. Power is not being supplied	30. Have qualified person check electrical connections.
31. Piping being supported by the pump	31. Support the piping independently from the pump.
32. Pump and motor shaft not aligned	32. Realign.
33. Bearing failure	33. Replace pump bearings.

Pump Maintenance Record

Date	Service Performed	By

Pump Maintenance Record

Date	Service Performed	By

Notes

NOTICE OF TERMS, WARRANTY PROVISIONS INCLUDING DISCLAIMERS, CLAIMS AND LIMITATION OF LIABILITY

Prices and all terms and conditions of sale are established in current price sheets and are subject to change without notice. All orders are subject to acceptance by Fristam Pumps USA Limited Partnership.

Each Fristam Pumps item is warranted to be free from manufacturing defects for a period of one (1) year from the date of shipment, providing it has been used as recommended and in accordance with recognized piping practice, and providing it has not been worn out due to severe service, such as encountered under extremely corrosive or abrasive conditions.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY OTHER WARRANTIES EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE. ALL OTHER WARRANTIES WHATSOEVER, EXPRESSED OR IMPLIED BY LAW OR OTHERWISE, ARE HEREBY EXCLUDED.

All claims must be in writing and mailed or delivered by purchaser within thirty (30) days after purchaser learns the facts upon which such claim is based. Any claim not made in writing and within the time period specified above shall be deemed waived.

PURCHASER'S SOLE AND EXCLUSIVE REMEDY AND FRISTAM PUMPS MAXIMUM LIABILITY FOR CLAIMS ARISING HEREUNDER OR FOR NEGLIGENCE FOR ANY AND ALL LOSSES AND DAMAGES RESULTING FROM ANY CAUSE SHALL BE EITHER THE REPAIR OR REPLACEMENT OF DEFECTIVE ITEMS OR, AT FRISTAM PUMPS' OPTION, THE REFUND OF THE PURCHASE PRICE FOR SUCH ITEMS. IN NO EVENT, INCLUDING IN THE CASE OF A CLAIM FOR NEGLIGENCE, SHALL FRISTAM PUMPS BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING LOSS OF PROFITS.

No person, including any representative, employee or agent of Fristam Pumps, is authorized to assume on behalf of Fristam Pumps any liability or responsibility in addition to or different from that described in this provision. Any and all representations, promises, warranties or statements that are in addition to or different from the terms of this provision are of no force or effect.

If any provision of this Notice is held to be invalid, such provision shall be severed and the remaining provisions shall continue to be in force.

Fristam PUMPS®

Engineered For Lasting Performance®

© Copyright 2016 - Fristam Pumps USA Limited Partnership
Drawing # 1250000011 Rev B Updated 2/4/16
Part # 1050000036
Visit www.fristam.com for a current list of literature.

2410 Parview Road • Middleton, WI 53562-2524
1-800-841-5001 • 608-831-5001
www.fristam.com
Email: fristam@fristampumps.com