

OPERATOR'S MANUAL

FLOMAX 5

INCLUDING: OPERATION, INSTALLATION AND MAINTENANCE

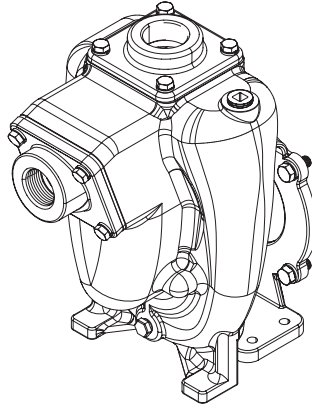
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FLOMAX® 5
(Cast Iron 1-1/2" X 1-1/2")

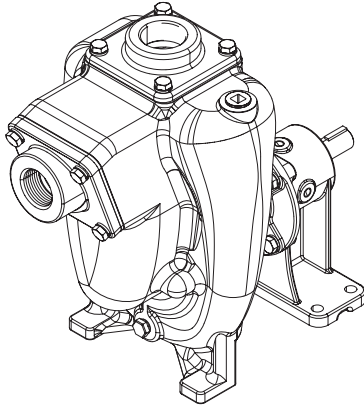


**READ THIS MANUAL CAREFULLY BEFORE INSTALLING,
OPERATING OR SERVICING THIS EQUIPMENT.**

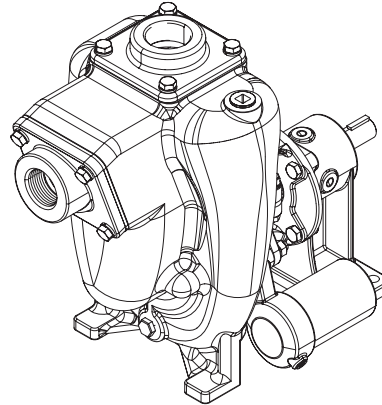
It is the responsibility of the employer to place this information in the hands of the operator. Keep for future reference.



CC Models

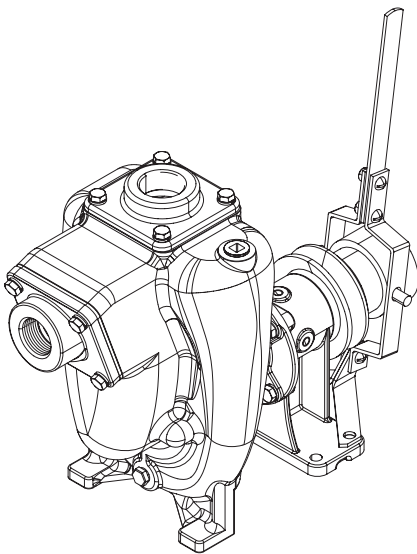


Standard Seal

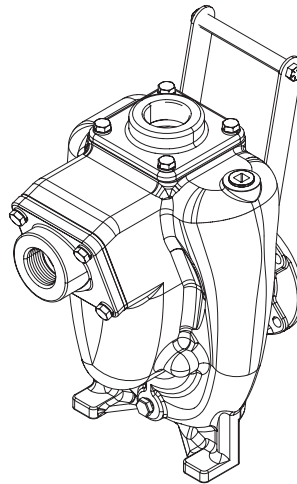


With Double Seal

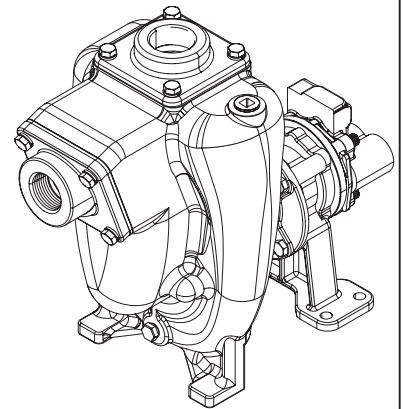
Pedestal Models



Clutch Models



**Pedestal Engine
Mount Models**



Hydraulic Models

Figure 1

GENERAL DESCRIPTION

FLOMAX 5:

1-1/2" x 1-1/2" Self Priming Pump Centrifugal Pump

Flomax® 5 pumps utilize a semi-open impeller design to allow for passage of larger solid sizes. Several seal options are available in addition to the standard type 2100 carbon / Ceramic / Viton mechanical seal.

SPECIFICATIONS

Suction And Discharge	1-1/2" x 1-1/2" NPT
Application	Agricultural, Commercial, Industrial, Marine, OEM
Materials of construction	Cast iron
Flow	
CC	Up to 145 gpm (548.8 lpm)
Hydraulic	Up to 175 gpm (662.4 lpm)
Double Seal	Up to 170 gpm (643.5 lpm)
Head Feet	
CC	Up to 100 ft (30.4 m)
Hydraulic	Up to 230 ft (70.1 m)
Double Seal	Up to 100 ft (30.4 m)
Suction lift	Up to a 25 ft (7.6 m)
Impeller	5" (127 mm) semi-open, Cast Iron and Balanced.
Motor	Up to 3 HP (2.24 kw)
Hydraulic Motor	0.22 cu.in. (3.60 ml) 0.37 cu.in. (6.06 ml) 0.45 cu.in. (7.3 ml)
Hydraulic System Pressure	Up to 2550 psi (175.8 bar)
Hydraulic Fluid Flow	Up to 11 gpm (41.6 lpm)
Maximum Solid Size	0.56" (14.2 mm) diameter
Drive Options	Close coupled 56C, Engine mount 5.5 HP, Engine mount 6.5 HP Close coupled 145TC Pedestal PumPAK® (without motor)
Seal	Standard carbon / Ceramic / Viton Special seal material combinations available (Consult factory)
Drive Sleeve	316 stainless steel
Options	5 blade impeller available for higher flows, Base plate, Double seal available for dry run applications
Features	Renewable wear plate, Stainless steel drive sleeve, Stainless steel fasteners.

OPERATING AND SAFETY PRECAUTIONS

READ, UNDERSTAND, AND FOLLOW THIS INFORMATION TO AVOID INJURY AND PROPERTY DAMAGE.



⚠ WARNING Be sure hoses and other components can withstand fluid pressures developed by this pump. Check any hoses for damage or wear. Be certain dispensing device is clean and in proper working condition.

⚠ WARNING **IMPROPER GROUNDING.** Can increase spark and electrical shock risk, resulting in severe injury or death. Ground pump and pumping system.

- The pumping system must be grounded when it is pumping, flushing, recirculating, or spraying flammable materials such as paints, solvents, lacquers, etc. or used in a location where surrounding atmosphere is conducive to spontaneous combustion. Ground the dispensing valve or device, containers, hoses, and any object to which material is being pumped.
- Secure pump, connections, and all contact points to avoid vibration and generation of contact or static spark. Consult local building codes and electrical codes for specific grounding requirements. After grounding, periodically verify continuity of electrical path to ground. Test with an ohmmeter from each component (e.g., hoses, piping, pump, clamps, motor, base plate, etc.) to ground to ensure continuity. Ohmmeter should show 0.1 ohms or less.

⚠ WARNING **HAZARDOUS PRESSURE.** Can result in serious injury or property damage. Do not service or clean pump while the system is pressurized.

⚠ WARNING **HAZARDOUS MATERIALS.** Can cause serious injury or property damage. Do not attempt to return a pump to the factory or service center that contains hazardous material. Safe handling practices must comply with local and national laws and safety code requirements. Obtain Material Safety Data Sheets on all materials from the supplier for proper handling instructions.

⚠ CAUTION Check pump seals, elastomers, and all wetted parts to assure compatibility before using commission of the product.

- Verify the chemical compatibility of the pump wetted parts and the substance being pumped, flushed or recirculated. Chemical compatibility may change with

temperature and concentration of the chemical(s) within the substances being pumped, flushed or circulated. For specific fluid compatibility, consult the chemical manufacturer.

⚠ CAUTION Maximum temperatures are based on mechanical stress of seals and elastomers only. Certain chemicals will significantly reduce maximum safe operating temperature. Consult the chemical manufacturer for chemical compatibility and temperature limits.

⚠ CAUTION Be certain all operators of this equipment have been trained for safe working practices, understand it's limitations, and wear safety goggles / equipment when required.

⚠ CAUTION Do not use the pump for the structural support of the piping system. Be certain the system components are properly supported to prevent stress on the pump parts.

⚠ CAUTION Prevent unnecessary damage to the pump. Do not allow pump to operate in a dry run condition or under cavitating conditions for extended periods.

⚠ CAUTION Use only genuine MP Pumps® replacement parts to assure compatible pressure rating and longest service life.

⚠ CAUTION The mechanical seal in the pump must not be operated dry.

⚠ CAUTION If a pump will be idle in freezing weather it should be drained or filled with the proper anti-freeze.

NOTICE Pump should be installed in the position consistent with the manufactures specifications.

NOTICE Re-torque all fasteners before operation. Creep of housing and gasket materials may cause fasteners to loosen. Re-torque all fasteners to insure against fluid leakage.

⚠ WARNING = Hazards or unsafe practices which could result in severe personal injury, death or substantial property damage.

⚠ CAUTION = Hazards or unsafe practices which could result in minor personal injury, product or property damage.

NOTICE = Important installation, operation or maintenance information.

IOM INFORMATION NEEDED FOR CE

⚠ CAUTION **NOISE HAZARD.** Long term noise exposure while in close proximity to an operating pump can lead to noise injuries and hearing loss. Noise cancelling PPE and/or sound insulation is recommended if long term exposure is unavoidable.

⚠ CAUTION **HIGH SURFACE TEMPERATURE:** High surface temperatures that can result in burns may develop near the mechanical seal of the pump. Allow sufficient time for pump to cool or use proper PPE before interacting with the pump.

⚠ WARNING **EXTREME ENVIRONMENT CONDITIONS.** Consult local building, electrical, and construction codes before installing pumps in environments prone to extreme weather and/or geological activity.

⚠ WARNING **FLAMMABLE SUBSTANCES.** Grease and oil used in double seal pump is flammable. Avoid exposing double seal pumps to high temperatures. Grease Flashpoint 500°F (260°C). Oil flash point 300°F (149°C).

⚠ WARNING **EXPLOSIVE ENVIRONMENTS.** Flomax is not ATEX Certified. Do not install pump in potentially explosive environments.

⚠ WARNING **LIFTING AND TRANSPORT HAZARDS.** Persons that cannot lift more than 50lb (23Kg) should not attempt to lift pump assemblies by hand. Do not attempt to transport pumps by hand for large distances or from high elevations. Pump and engine assemblies should not be lifted or transported by hand.

STORAGE PRECAUTIONS

Do not store filled with fluid at or below freezing temp of process fluid.

INSTALLATION

INSTALLATION FOR FLOMAX SELF PRIMING PUMPS:

For optimum performance, place pump as close to liquid source as possible to reduce suction lift to a minimum. For best results, pump should be installed not more than 15 feet above the liquid supply. Set the unit on solid footing and as nearly level as possible.

Pipe or hose of the same size as flanges provided should be used. Reinforced rubber suction hose is recommended because it provides greater flexibility and prevents collapsing due to vacuum in the suction line when pump is in operation. Suction line should be as short as possible and have as few elbows or bends as possible to keep friction loss at a minimum. Use pipe dope on all connections and make certain that all fittings are tight, particularly on the suction line where an air leak can prevent priming or reduce pump capacity.

A good suction strainer should be used. Suction strainers are available from your MP Distributor. Refer to the accessory section of the GENERAL PUMP PRICE LIST for the correct part number

INSTALLATION FOR FLOMAX PUMPAKS:

Be sure that the pump housing is filled with liquid before starting the pump. **THE MECHANICAL SEAL IN THE PUMP MUST NOT BE OPERATED DRY.**

Pipe or hose of the same size (or larger) as inlet and outlet openings should be used on the installation. When using pipe, avoid sharp bends and use long radius elbows wherever possible. This will keep friction loss at a minimum and allow the pump to operate more effectively. Use pipe dope on all connections and be sure all fittings are airtight, especially on the suction side of the pump. An air leak on the suction side of the pump will prevent proper operation. A section of non-collapsible hose between piping and pump may be used as a vibration dampener.

BEARING INSTALLATION (PEDESTAL MODELS):

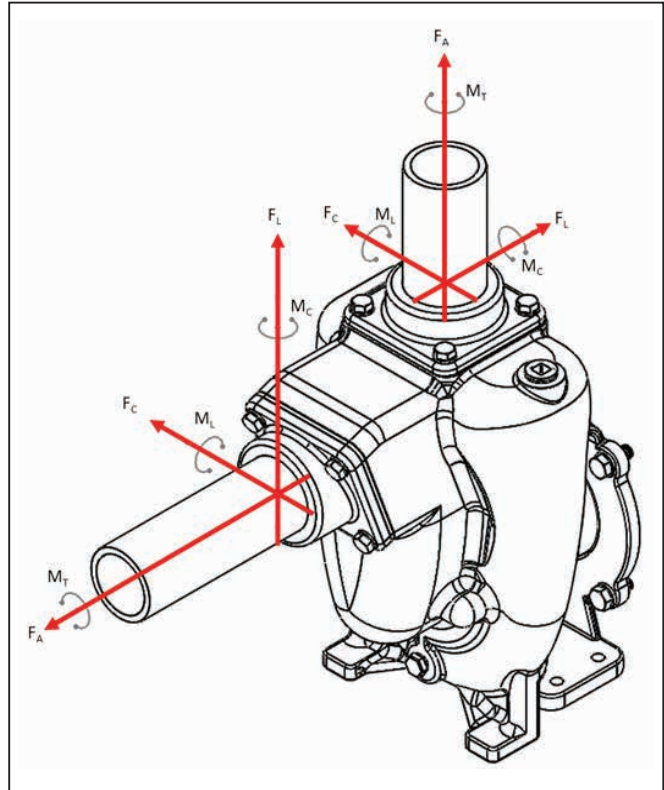
Check the shaft to insure that it rotates freely. Shafts should be aligned in accordance with the instructions of the coupling manufacturer. Final alignment must be performed after the pump has been completely installed and the pump and driver are at operating temperature. Proper shaft alignment is the responsibility of the installer.

Piping should include shutoff valves on both the discharge and suction to isolate the pump for maintenance. Provisions for suction and discharge pressure gages are recommended for trouble shooting. The suction line should be as short as possible, at least as large as the pump suction connection, include as few fittings as possible and those should be long radius to keep friction losses at a minimum.

Both suction and discharge piping should be supported independently of the pump. Never use excessive force to move the pipe into place. This may impose a strain that will result in misalignment between the pump and driver or otherwise adversely affect the operation of the pump. After connecting pipe to the pump rotate the shaft several times to check for rubbing or binding.

INSTALLATION FOR FLOMAX SELF PRIMING PUMPS

The permitted forces and moments on pump inlet and outlet.



LEGENDS

F_L	-	Longitudinal shear force
F_C	-	Circumferential shear force
F_A	-	Axial tension or compression force
M_L	-	Longitudinal bending force
M_C	-	Circumferential bending force
M_T	-	Torsional moment

ALLOWABLE NOZZLE LOADS

Nozzle Size (in)	Small Flomax Flanges					
	Force lbs (N)			Moment ft*lbs (N*m)		
	FL	FC	FA	ML	MC	MT
1.5"	405 (1800)	405 (1800)	303 (1350)	100 (135)	149 (203)	129 (176)
2"	540 (2400)	540 (2400)	405 (1800)	177 (240)	266 (360)	230 (312)

MOTOR MOUNTING

Check rotation of the driver to be sure it coincides with the required rotation of the pump. When viewed from the driver end the rotation of the pump is CLOCKWISE.

A Pumpak shaft sleeve is machined to precisely fit the shaft of your driver. No provision is made for drive key and none is required.

Loosen the drive clamp fasteners but do not remove. **NOTE:** If the driver shaft is keyed, remove the key before attempting to install the Pumpak. Slide the Pumpak assembly onto the driver shaft, aligning the capscrew holes in the adaptor with the tapped holes in the driver mounting face until the adaptor contacts the mounting face.

Install fasteners and tighten to secure Pumpak assembly to the driver. First center then tighten the drive clamp assembly to lock the shaft sleeve onto the driver shaft.

After all fasteners are tight including the drive clamp assembly, remove the Assembly shim from the suction connection. The shim was in place to establish clearance between the face of the impeller and pump housing. Rotate the driver slowly by hand to make certain that there is no rubbing.

Mounting Pumpak

Loosen impeller clamp nuts.

Do not use drive shaft key. Remove key if installed on drive shaft.

Slide PUMPAK assembly onto the drive shaft. **WARNING!** If PUMPAK does not slide freely STOP DO NOT HAMMER or force PUMPAK. Be sure impeller clamp is loose. PUMPAK assemblies should slide on with hand pressure. Check for and remove any burrs from drive shaft or bore of sleeve. Align holes in adapter with holes in driver mounting face and slide PUMPAK until adaptor contacts mounting face.

Attach capscrews and lockwashers and tighten to secure PUMPAK assembly to driver. Tighten impeller clamp nuts to lock impeller onto drive shaft.

TO ADJUST IMPELLER CLEARANCE:

NOTE: A shipping spacer was inserted at the factory for the purpose of establishing the proper clearance between the face of impeller and the wear plate.

1. Remove strip stock spacer only after tightening the impeller.
2. Clearance between the impeller and wear plate is now set to approximately 0.020".
3. Turn over slowly to make certain pump rotates freely.
4. Loosen impeller clamp to adjust clearance between impeller and wear plate using a feeler.
5. Gauge in place of spacer. After clearance has been established, tighten impeller clamp to lock impeller to shaft.

Torque Specifications		
Size	Stainless Steel (ft-lbs)	Steel GR5 (ft-lbs)
5/16" - 18"	10 - 14	14 - 20
3/8" - 16"	20 - 26	26 - 32
1/2" - 13"	34 - 42	70 - 80
1/2" - 20"	40 - 48	N/A
5/8" - 11"	75 - 85	N/A

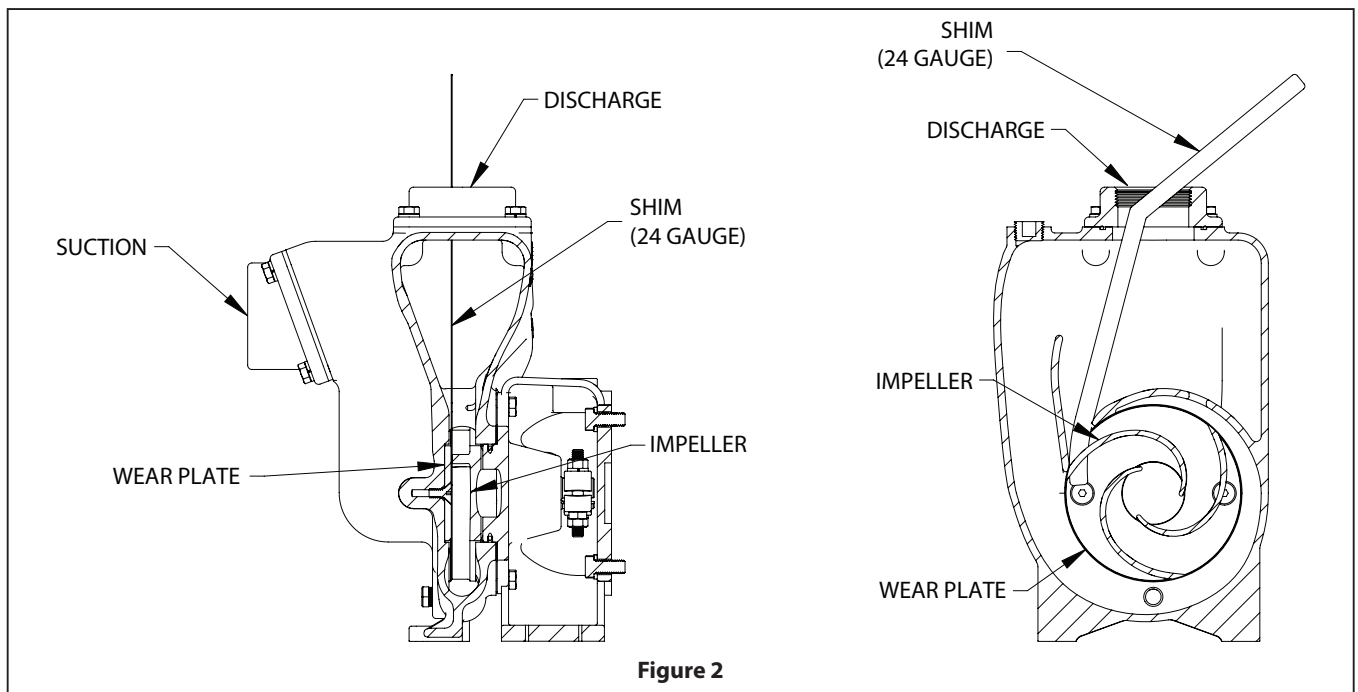


Figure 2

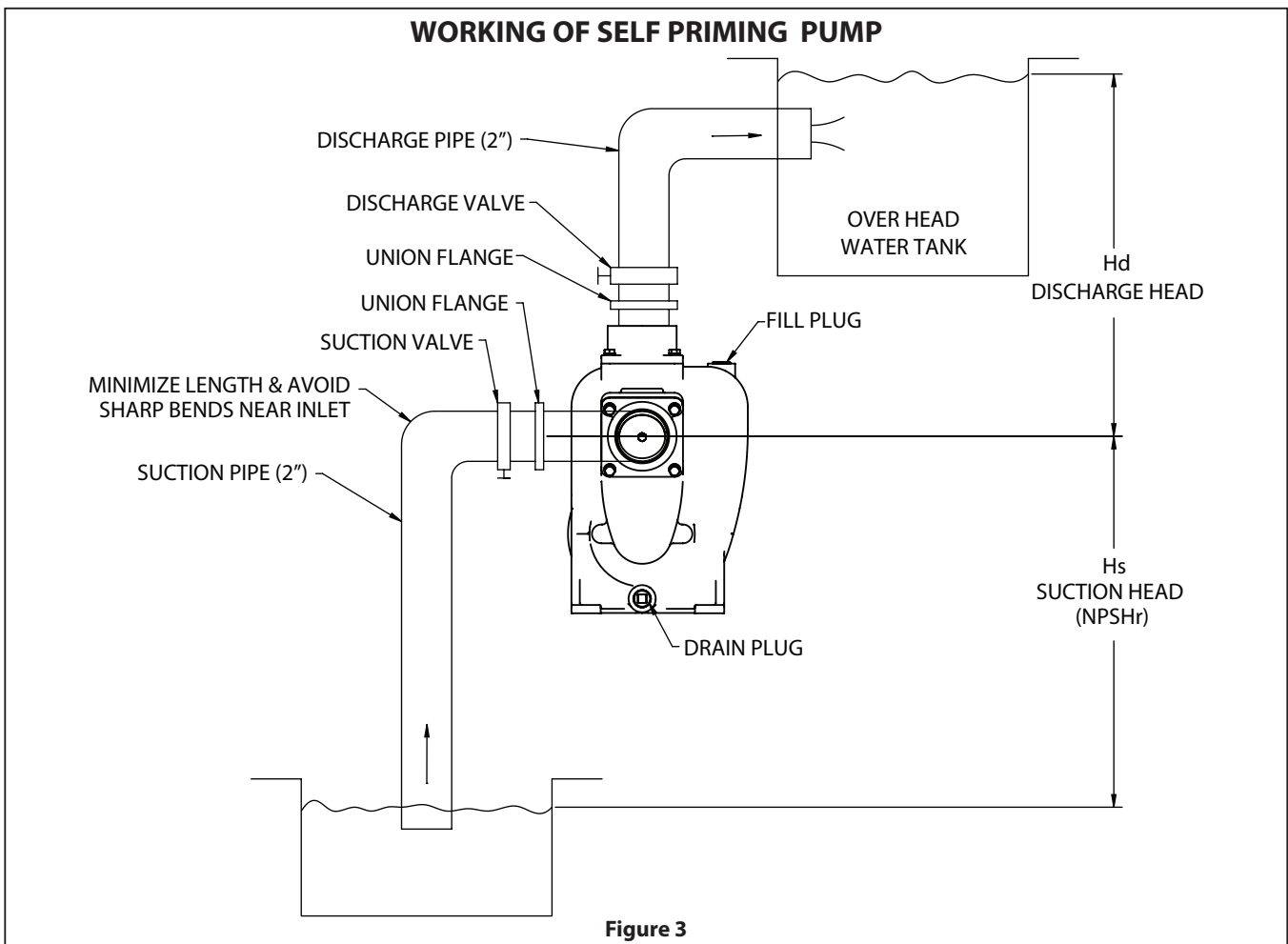


Figure 3

OPERATING INSTRUCTIONS

The FLOMAX pump is a self-priming centrifugal pump and only requires priming prior to its initial start. The pump will retain sufficient liquid for self priming thereafter.

Provision for a priming plug can be made by using a close nipple and tee on the discharge opening.

A pipe plug installed in the top opening of the tee is easily removed when necessary to prime pump. Prime pump by filling pump housing with liquid

If pump fails to prime or stops pumping, check for the following possible causes:

1. No liquid in the pump housing.
2. Air leak in the suction line due to loose connections or pin holes in the hose.
3. Collapsed suction line or clogged strainer.
4. Seal worn and leaking air.
5. Worn impeller - too much clearance between impeller and wear plate.
6. Pump not running fast enough.
7. Suction lift is too high.
8. Trying to prime against too high a discharge head

Inspect the Pumpak as soon as it is received to make certain that no parts are missing or have been broken in shipment. Damage should be reported immediately to the shipping company. **CAUTION: Do not disturb the assembly shim** in the opening of the pump housing until after the Pumpak has been completely assembled to the driver.

The Pumpak utilizes a single self-adjusting type mechanical seal that is lubricated and cooled by the liquid in the pump.

NOTE: The pumps must never be operated without liquid in the housing.

WORKING OF SELF PRIMING PUMP:

A centrifugal pump operates through the transfer of rotational energy from one or more driven rotors, called impellers. The action of the impeller increases the fluid's velocity and pressure and directs it towards the pump outlet.

WEAR AND INSPECTION POINTS

Shaft: Inspect threads, keyways and shoulders. Replace if damaged.

Ball bearings (Pedestal and hydraulic models): Replace if worn, loose, or rough and noisy when rotated. If dirty, clean with solvent, dry and coat with a good lubricant. New bearings should not be unwrapped until ready for use.

Impellers: Replace if excessively worn or corroded. The impeller should have been statically and dynamically balanced at the factory, and static and dynamic balance must be maintained for proper operation of your equipment.

Mechanical seals: Should be inspected for, lack of lubrication, misalignment, overheating, abrasive materials damage, and corrosion.

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

Pedestal Style: Inline shaft to shaft spacing is dependent upon the coupling being used. Check the alignment carefully between the pump and the drive.

SEAL REPLACEMENT INSTRUCTIONS

DISASSEMBLE THE PUMP:

Drain the system of liquid, break suction and discharge pipe unions, and, if necessary, remove all piping from the suction and discharge openings. Remove the fasteners holding the pump adaptor to the driver, loosen the drive clamp assembly, and remove the PUMPAK.

To disassemble, remove the washers and hexnuts holding the motor adaptor to the housing. Remove the housing. The impeller, drive sleeve, seal bellows, and the spring assembly will now slide forward free of the pump adaptor.

The seal seat and seat cup will remain in the pump adaptor. If not damaged or worn, do not remove. If necessary, remove from the adaptor counter bore with a piece of wood or a screwdriver handle inserted through the adaptor from the drive end. A sharp tap or two is usually sufficient to knock out the seal seat. Use caution in removing the seal seat so as not to crack a ceramic seat.

REMOVE IMPELLER

Remove seal bellows and spring assembly. On some models, spring keeper can also be removed now before removing impeller.

NOTE: The seal bellows will be bonded to the shaft sleeve and will require some patience and caution in removal in order not to damage the seal bellows and cage.

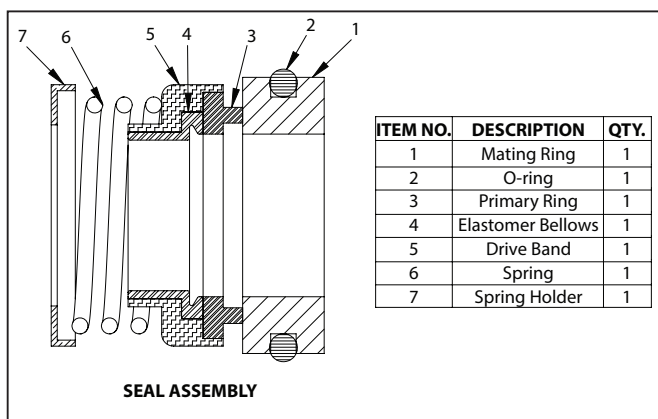
MP Pumps rebuild kits include a new drive sleeve to avoid the possibility of damaging the drive sleeve. See back of manual for list of seal kits and corresponding rebuild kits. Impellers are also available if wear or damage is present.

Remove locknut from shaft; unscrew the impeller from the shaft sleeve counter-clockwise from the impeller end.

INSPECTION:

Check all parts for wear. For ease of reassembly shaft sleeve should have all nicks and burrs removed. Clean with light crocus cloth. Replace damaged parts with new parts.

Inspect the seal seat and washer, seat cup, and seal bellows for grooves, cuts, scuffmarks, or other deterioration. If any of the parts are damaged, a complete new assembly should be installed.



inspect the lapped sealing face of carbon washer (Part 3) for wear which would necessitate replacement.

Inspect lapped sealing face of floating seat (Part 4) in adapter housing counterbore for scuffing or cracks. If necessary to replace, press out old seat and ring, and proceed as outlined in paragraph on MOUNTING ADAPTER.

If spring and/or bellows (Part 1 and 2) are damaged and require replacement, lubricate the impeller sleeve with a clean light oil and slide parts off sleeve.

REASSEMBLY:

All dirt and foreign matter should be removed. Recommend only using new seals and elastomers when reassembling a pump.

Lubricate seal seat cup with liquid soap (P-80 emulsifier) or clean grease and press seal seat into adaptor counter bore, seating it firmly and squarely. Use caution so as not to mar the lapped face of the seal seat.

Assemble shaft sleeve; seal spring keeper, impeller and impeller nut. Before installing seal bellows and spring assembly, lubricate the shaft sleeve and rubber bellows with liquid soap (P-80 emulsifier) or clean grease and press bellows and spring assembly onto the shaft sleeve. The spring should engage the spring keeper at the impeller end of the shaft sleeve.

To be properly positioned the washer must be firmly against the rubber bellows member and the driving lugs of the washer properly engaged. The raised shoulder on the seal washer should be facing away from the impeller to contact the lapped surface of the seal seat in the adaptor.

Slide impeller and seal assembly into the adaptor. Install drive clamp assembly on the shaft sleeve but do not tighten.

Make sure the shim is installed between the impeller and the wear plate. Do not remove the shim material before the drive sleeve clamp has been tightened to the motor drive shaft.

INSTRUCTIONS FOR SET SCREW TYPE SEAL:

Do not remove the seal retaining clips. Slide the seal into place on the shaft. The end of the shaft will be recessed approximately $0.080" \pm .020"$ from the end of the seal. The proper seal working height is achieved when the seal faces are set flush with the seal clips in place.

With the seal clips still in place tighten the seal fasteners with a ball end allen wrench. It is important that the allen wrench not rest upon the seal housing during tightening as this may affect the position of the seal on the shaft. After the seal fasteners have been tightened the seal clips should be removed and saved.

Do not use the seal shim with setscrew type seal.

For bellows seal install the seal spacer on the backside of the impeller. Use a light grease or similar tacky material. Thread impeller onto shaft. Install jam nut. Place O-Ring onto seal plate. Install impeller/bearing housing assembly into pump housing. Install lock washers and hex nuts. Rotate the shaft several times to check for rubbing or binding.

BEARING REPLACEMENT INSTRUCTIONS (PEDESTAL MODELS)

The pump utilizes a single self-adjusting type mechanical seal that is lubricated and cooled by the liquid in the pump.

THE PUMP MUST NEVER BE OPERATED WITHOUT LIQUID IN THE HOUSING.

Check rotation of the driver to be sure it coincides with the required rotation of the pump. When viewed from the driver end the rotation of the pump is CLOCKWISE.

The pump's grease lubricated bearings are sealed. They have been pre-lubricated at the factory and require no further lubrication or maintenance for the life of the bearing.

Electric motors or other rotating equipment used to drive the pump should be lubricated in accordance with the manufacturer's instructions.

DISASSEMBLY:

Drain the housing by removing the drain plug. Remove the hex nuts and lock washers from the housing studs. Slide the bearing housing / impeller assembly out of the housing. It may be necessary to rotate the driver shaft out of the way.

With the bearing / impeller assembly on a bench secure shaft, unthread impeller nut then unthread impeller. Remove the seal from the shaft. Lift off the seal plate. Place the seal plate face down on the bench and press the seal seat out.

Remove the snap ring from the backside of the bearing housing. With a soft mallet, loosen the shaft assembly by tapping the impeller end then slide the bearing assembly from the housing. Press the bearings from the shaft.

ASSEMBLY:

Press bearings onto the shaft. Slide the shaft / bearing assembly into the bearing housing and install the snap ring. Place seal housing face up on bench. Lubricate non-PTFE seal seat with water-soluble lubricant and gently press into seal housing. If pinned seat is used be certain that pin is in place, lined up with groove in seal seat. Place seal housing onto pilot of bearing housing. Lubricate shaft with water-soluble lubricant. Slide seal onto shaft.

MAINTENANCE

The FLOMAX pump is of simple construction with only one moving part. The impeller on the FLOMAX 5 is threaded to a stainless steel drive sleeve. The sleeve slips over the drive shaft and is locked to the drive shaft with a two-piece clamp. This means you use a standard drive shaft - no special tapers or threads. It's easy to adjust or remove the impeller. FLOMAX pumps are available with either a self-lubricated shaft seal, or a grease lubricated shaft seal. The self-lubricated seal is lubricated by the liquid in the pump. Operating the pump dry will seriously damage the seal.

To lubricate the grease lubricated seal, turn the wing nut on the grease cup to the left - counter clockwise. If the pump is to be left standing idle for any length of time in freezing conditions, the pump housing should be drained. Draining is provided for by a drain plug located at the base of the pump housing.

DISASSEMBLY

Disconnect power (or spark plug wire) to prevent accidentally starting.

Disconnect lines and drain pump housing.

TO REMOVE PUMP HOUSING

Remove capscrews and nuts holding pump housing to mounting base (where used).

Remove nuts and lockwashers holding pump housing to the adapter.

Loosen the housing and remove carefully to prevent tearing gaskets.

TO REMOVE IMPELLER

If pump is equipped with a grease lubricated seal, relieve pressure in grease cup by turning wing handle to the right - clockwise.

Remove impeller clamp nuts and clamp to unlock impeller drive sleeve from drive shaft.

Use two "jimmy" bars or large screwdrivers diagonally across from each other between adapter and end of drive sleeve.

Pry the sleeve off the drive shaft.

Before removing the seal from the impeller, inspect the carbon washer. If nicked or worn - replace it with a new one. Inspect the seal seat (still in the pump adapter). If no nicks, scratches or cracks appear and surface is clean and smooth, there is no need to replace it. If replacement is necessary, remove adapter by removing four hex nuts and washers. Place adapter on flat surface, with impeller side down. Press out seal seat by using wooden end of a screw driver or similar tool.

TO REPLACE IMPELLER

On the two-piece impeller it is not necessary to remove the seal. Place impeller drive sleeve between two pieces of wood in a vise. Hold impeller sleeve carefully so you do not damage the seal assembly. Hold firmly and unthread impeller by turning counterclockwise - left hand. Replace with a new impeller. Be sure seal spring fits over hub on back of impeller.

TO REMOVE ADAPTER

Remove the four nuts and lockwashers. Loosen and remove adapter.

TO REMOVE WEAR PLATE

After pump housing has been removed from the adapter, inspect the wear plate. If wear plate is badly worn, it should be replaced. To remove wear plate, loosen and remove acorn nuts and gaskets on the outside of the pump housing.

CAUTION: When replacing wear plate, be sure to use new gaskets under acorn nuts to seal against air leaking in on suction side during priming cycle.

INSPECTION

After pump has been disassembled, check all parts over carefully for wear or damage. When ordering parts for your pump, be sure to specify model and serial numbers shown on name plate.

REASSEMBLY

MOUNTING ADAPTER

Before mounting adapter, clean counterbore cleanser. Clean and lubricate with light oil the synthetic rubber member on seal seat and press (do not drive) the assembly into the adapter counterbore, seating it firmly and squarely. Install adapter. Install lockwashers and tighten four nuts evenly.

CAUTION: In handling, avoid dropping seat and take particular care not to scratch the lapped face.

MOUNTING SELF-LUBRICATED SEAL ASSEMBLY

Mount seat and seat ring (Part 4 and 5) as outlined above. Inspect impeller sleeve for nicks and burrs. Polish sleeve with fine emery or crocus cloth. Then clean and lubricate with a clean light oil.

Slip the coil spring (Part 1) onto the impeller sleeve making certain that it is seated properly on the shoulder of the impeller.

Lubricate the inside of the washer and bellows assembly (Part 2 and 3) with a clean light oil and slide it onto the impeller drive sleeve only until it clears the chamfer.

Slide the seal bellows and washer assembly onto the impeller drive sleeve. Push the seal down over the drive sleeve with even pressure. Pull the seal head back up to the position where there is no spring load. This insures proper assembly on the drive sleeve.

Before sliding the impeller onto the drive shaft, wipe the lapped sealing faces of the floating seat (Part 4) in the adapter counterbore and the carbon washer (Part 3) on the bellows assembly perfectly clean. Then lubricate both faces with a clean light oil.

NOTE: The assembly of impeller and seal to the drive shaft should take place as soon as the bellows assembly is slipped on the impeller sleeve so as to avoid bonding of the bellows to the sleeve at improper working height.

CAUTION: Foreign matter between sealing faces will cause leakage and shorten the life of the seal.

MOUNTING GREASE LUBRICATED SEAL ASSEMBLY

Apply P80 to seal seat bore in seal housing and around O-ring on carbon seal seat. Then press seal seat, by hand, into seal seat bore making sure marked side of seal seat is down. Clean and inspect for cracks, chips and deformities.

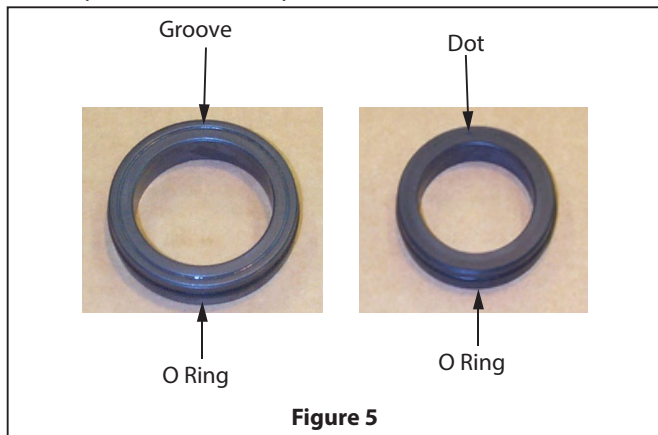


Figure 5

Place gasket over studs and O-ring into groove then install seal housing over studs with seal facing up with ¼ NPT holes at 2 o'clock and 7 o'clock position. Inspect and wipe clean if needed. Apply P80 to impeller drive sleeve and to interior of seal bellows, and push onto drive sleeve with seal pusher with silicon carbide seal facing downward towards impeller. The silicon carbide face is a matte light gray. The carbon face is a very dark gray/black. See the picture below. Some seals have the same primary seal face and therefore the direction does not matter.

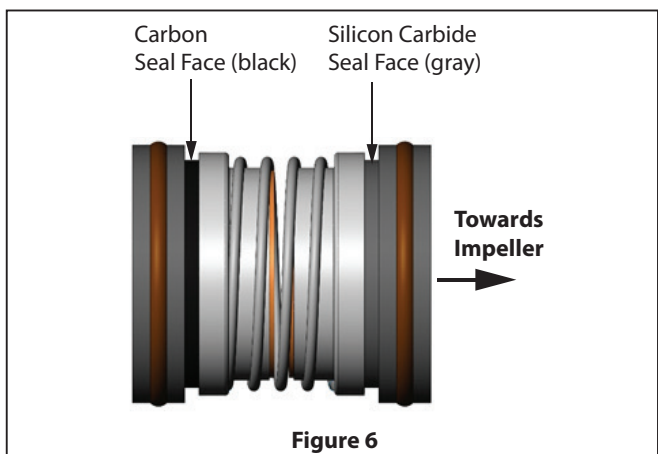


Figure 6

Install seal spring over drive sleeve onto backside of silicon carbide seal. Apply P80 to interior seal bellows of carbon seal and push over drive sleeve with seal pusher carbon face up. Inspect and wipe clean, if necessary. Install gasket over studs onto seal housing. Apply P80 to seal seat bore of adapter and around O-ring on seal seat. Push seal seat, by hand, into seal bore – clean and inspect.

Install O-ring into adaptor groove. Apply P80 to O-ring. Place adapter onto seal housing gasket, handle hole up, and attach using 6 hex nuts and lock washers. Assemble clamp assembly over drive sleeve. Leave loose.

Apply Gasoila onto threads of grease fitting and install to lower pipe fitting hole at 10 o'clock position in seal housing and tighten by hand. NOTE: Do not get sealant into grease fitting. Apply Gasoila to 1/8" NPT plug and install into pipe fitting at 5 o'clock position. Apply Gasoila to pressure release valve threads and install into upper pipe fitting hole at the 10 o'clock position.

Fill seal cavity with grease until it comes out of the reservoir hole. Assemble grease reservoir into adaptor as shown below. Place smaller O-ring over the piston. Place the large O-ring over the reservoir cover. Install the piston into the adaptor hole. Place the spring within the piston. Thread the cover into the adaptor.

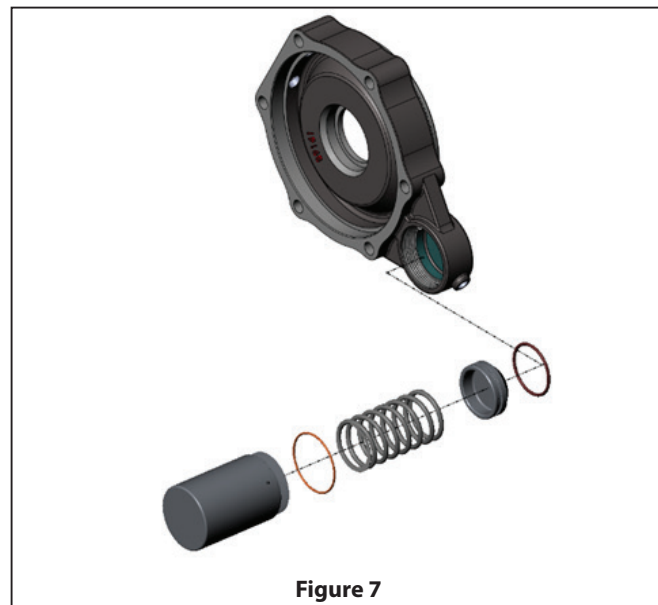


Figure 7

Continue filling seal cavity until high-pressure grease reservoir is full. **NOTE:** When grease reservoir is full it will spit out of the pressure release valve.

MOUNTING SEVERE-SERVICE SEAL ASSEMBLY

The MP PUMPS Severe-Service Seal is a precision assembly requiring care in installation. To insure proper operation it is necessary to install this seal as follows:

1. Thoroughly clean the seal seat cavity in the pump adapter.
2. Lubricate the seal seat O-Ring with light oil and carefully install the seat into the seal cavity that is inside the adapter.
3. Using a soft clean cloth, clean and lubricate both seal faces with light oil.
NOTE: Any foreign matter between seal faces will cause leakage and shorten seal life.
4. Complete assembly of seal and pump - see above.
5. Rotate by hand before start up.

MOUNTING IMPELLER

Do not use drive key between drive shaft and impeller sleeve. The clamp will drive the sleeve. Slide the impeller sleeve onto the drive shaft. Replace impeller clamp and capscrews, lockwashers and nuts.

Before tightening clamp adjust clearance between back face of impeller and adapter allowing from 0.015" (0.381 mm) to 0.020" (0.508 mm) clearance. Tighten impeller clamp to lock impeller onto drive shaft. This automatically sets face clearance of impeller when housing is mounted.

MOUNTING PUMP HOUSING

Replace gaskets on pump housing and mount housing on the adapter. Replace two lockwashers and nuts on studs diagonally across from each other and tighten. Turn drive shaft over slowly by hand and listen at outlet opening on housing for any rubbing of impeller on the housing or wear plate.

The clearance between the impeller and wear plate can be checked with a feeler gauge. Normal clearance is 0.015" (0.381 mm) to 0.020" (0.508 mm). If clearance exceeds 0.025" (0.635 mm) readjust impeller. If the impeller rubs use an additional gasket to space impeller.

After clearance has been established, replace lockwashers and nuts on remaining studs and tighten. If capscrews and nuts are used to hold housing to mounting base, replace these and tighten.

PARTS LIST / FLOMAX 5 CC (56C and 145TC)

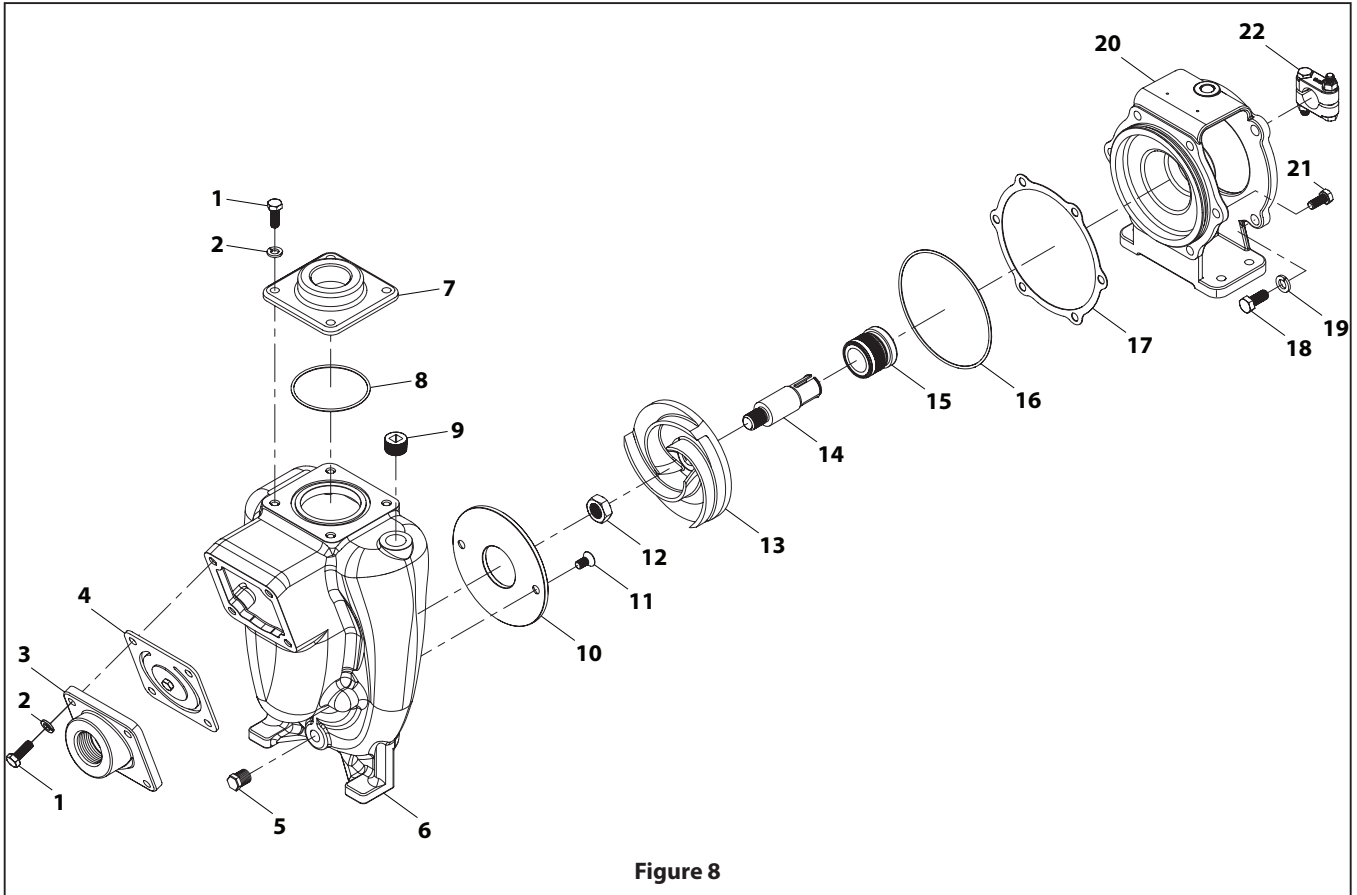


Figure 8

PARTS LIST / FLOMAX 5 (56C and 145TC)

Item	Description (size)	Qty	Part No.	Mtl
1	Cap Screw (HH 5/16"-18" x 7/8")	8	MP21242	304 SS
2	Lockwasher (5/16" x 18")	10	MP21238	304 SS
3	Suction Flange (1.5" NPT)	1	MP22263	Cast Iron
4	Flapper Assembly	1	MP23022	Buna
5	Pipe Plug (1/4" NPT)	1	MP41475	Steel
6	Housing	1	MP22251	Cast Iron
7	Discharge Flange (1.5" NPT)	1	MP22266	Cast Iron
8	O-Ring (AS-149)	1	MP37141	Viton
9	Pipe Plug (1/2" NPT)	4	MP37140	Zinc Plated Steel
10	Wear Plate	1	MP22260	Steel
	Wear Plate (B:FLO S)	1	MP22259	Bronze
11	Screw (FHS 5/16"-18" x 5/8")	8	MP37137	304 SS
12	Hex Jam Nut	10	MP22655	304 SS

Item	Description (size)	Qty	Part No.	Mtl
13	Impeller (5.0")	1	MP22292	Bronze
	Impeller (5.0")	1	MP22293	Cast Iron
14	Drive Sleeve (7/8") (145TC)	1	MP25664	303 SS
	Drive Sleeve (5/8") (56TC)	1	MP22253	303 SS
15	See Table for seal options			
16	O-Ring (AS-568-158)	1	MP34555	Viton
17	Gasket	1	MP22255	Lexide Ni-2085
18	Capscrew (3/8"-16" x 7/8")	4	MP21251	304 SS
19	Lockwasher (3/8" X 1/8")	4	MP21266	304 SS
20	Adaptor	1	MP25904	Cast Iron
21	Capscrew (5/16"-18" x 3/4" Patch)	6	MP24965	304 SS
	Clamp Assembly (3/4" and 5/8")	1	MP23002	303 SS
22	Clamp Assembly (7/8")	1	MP23003	303 SS

SEAL TYPE OPTIONS

Seal PN	Seal Type	Shaft Dia.	Mating Ring	Material		
				Primary Ring	Elastomer	Components
MP22273	21	1"	Ceramic	Carbon	Viton	316 SS
MP22560	21	1"	Silicon Carbide	Silicon Carbide	Viton	18-8 SS

PARTS LIST / FLOMAX 5 PEDESTAL

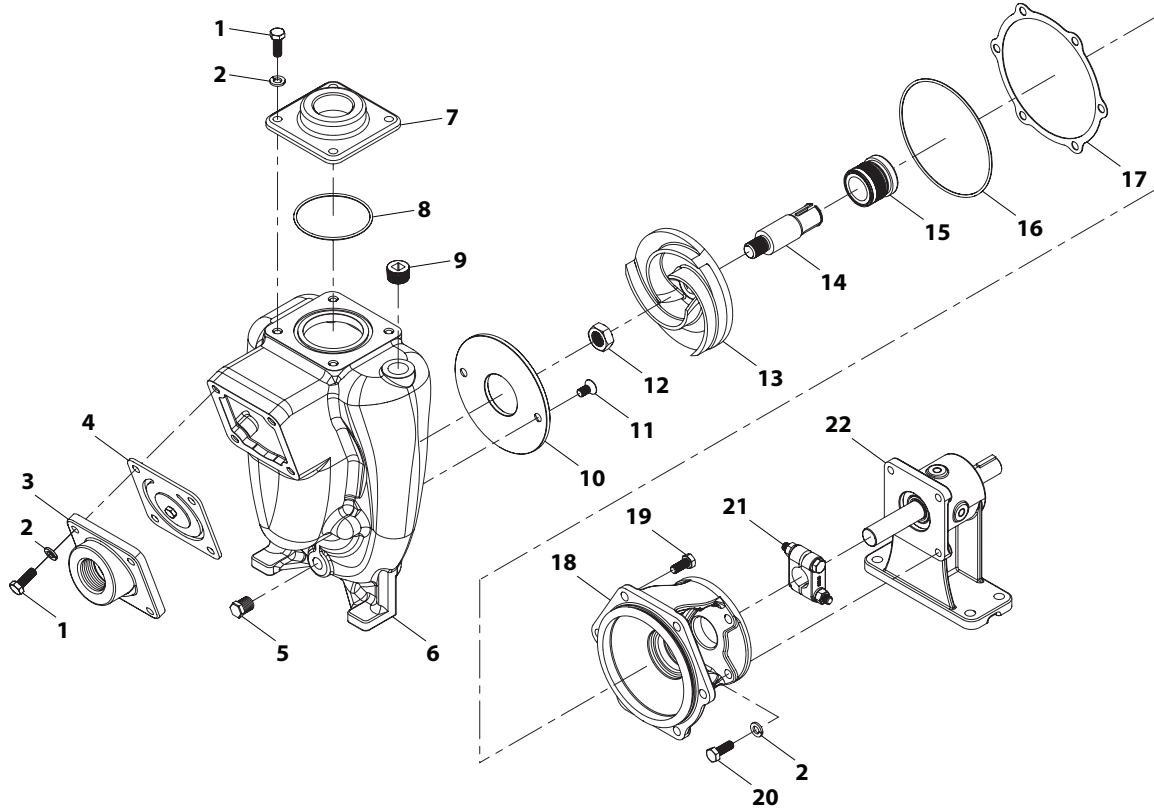


Figure 9

PARTS LIST / FLOMAX 5 PEDESTAL

Item	Description (size)	Qty	Part No.	Mtl
1	Cap Screw (HH 5/16"-18" x 7/8")	8	MP21242	304 SS
2	Lockwasher (5/16" x 18")	14	MP21238	304 SS
3	Suction Flange (1.5" NPT)	1	MP22263	Cast Iron
4	Flapper Assembly	1	MP23022	Buna
5	Pipe Plug (1/4" NPT)	1	MP41475	Steel
6	Housing	1	MP22251	Cast Iron
7	Discharge Flange (1.5" NPT)	1	MP22266	Cast Iron
8	O-Ring (AS-149)	1	MP37141	Viton
9	Pipe Plug (1/2" NPT)	1	MP37140	Zinc Plated Steel
10	Wear Plate	1	MP22260	Steel
11	Screw (FHS 5/16"-18" x 5/8")	2	MP37137	304 SS
12	Hex Jam Nut	1	MP22655	304 SS

Item	Description (size)	Qty	Part No.	Mtl
13	Impeller (5.0")	1	MP22293	Cast Iron
14	Drive Sleeve (3/4")	1	MP22286	303 SS
15	See table for seal options			
16	O-Ring (AS-568-158)	1	MP34555	Viton
17	Gasket	1	MP22255	Lexide Ni-2085
18	Adapter	1	MP22247	Cast Iron
19	Capscrew (5/16"-18" x 3/4" Patch)	6	MP24965	304 SS
20	Capscrew SS (HH 5/16"-24" x 0.88")	4	MP21278	304 SS
21	Clamp Assembly (3/4" and 5/8")	1	MP23002	303 SS
22	Pedestal Assembly	1	MP26142	Cast Iron

SEAL TYPE OPTIONS

Seal PN	Seal Type	Shaft Dia.	Mating Ring	Material		
				Primary Ring	Elastomer	Components
MP22273	21	1"	Ceramic	Carbon	Viton	316 SS

PARTS LIST / FLOMAX 5 PEDESTAL (DOUBLE SEAL)

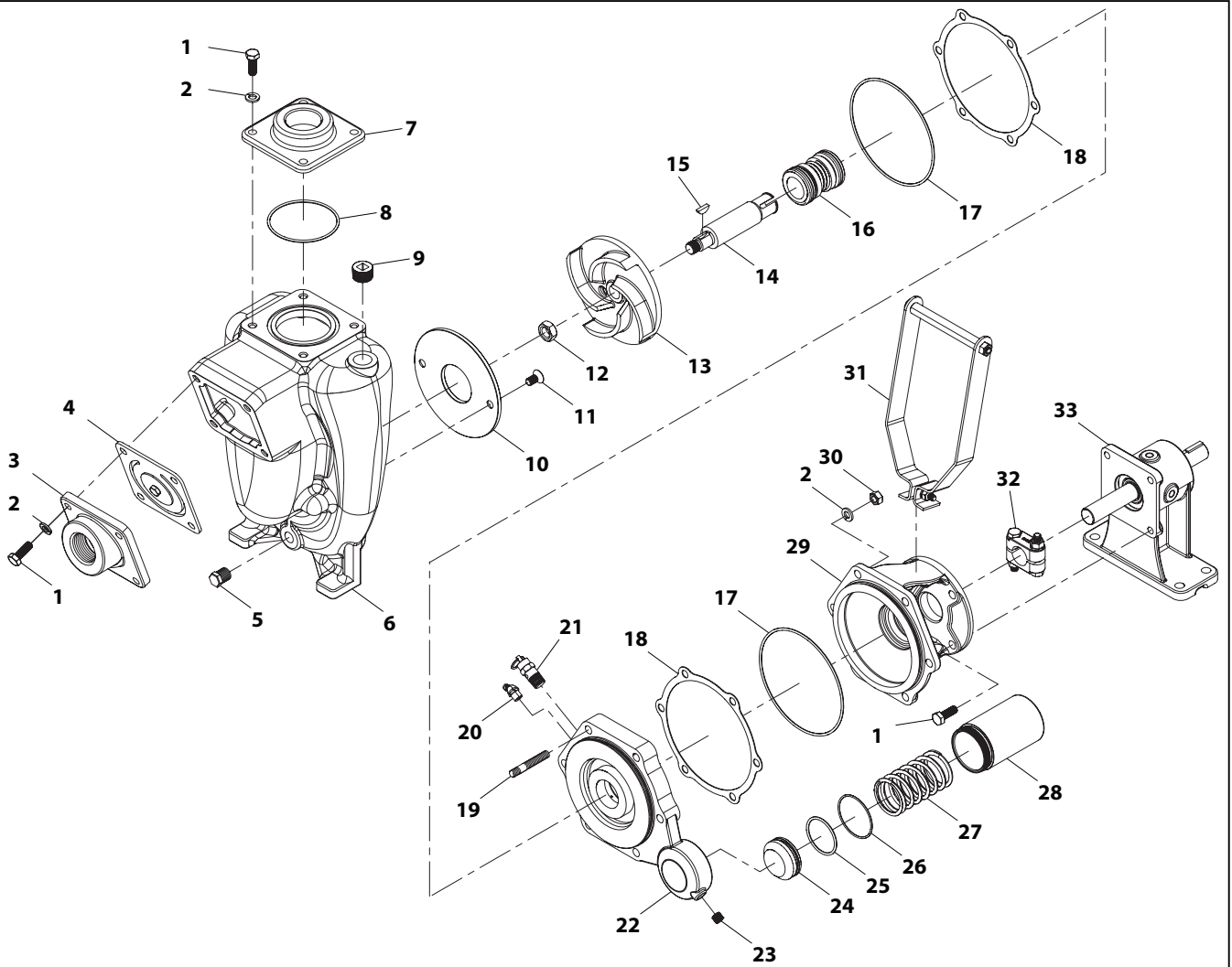


Figure 10

PARTS LIST / FLOMAX 5 PEDESTAL (DOUBLE SEAL)

Item	Description (size)	Qty	Part No.	Mtl
1	Cap Screw SS (HH 5/16"-18" X 7/8")	4	MP21242	304 SS
2	Lockwasher SS (5/16" x 1/8")	16	MP21238	303 SS
3	Suction Flange	1	MP22263	Cast Iron
4	Drive SI (SS 3/4" FLO S SDS)	1	MP33205	316 SS
5	Pipe Plug (1/4" NPT)	1	MP41475	Steel
6	Housing	1	MP22251	Cast Iron
7	Flange	1	MP22266	Cast Iron
8	O-Ring (As-568-149)	1	MP37141	Viton
9	Pipe Plug (1/2" NPT)	1	MP37140	Zinc Plated Steel
10	Wear Plate	1	MP22260	Steel
11	Screw (FHS 5/16" - 18" x 5/8")	1	MP37137	304 SS
12	Hex Jam Nut (1/2" - 20")	1	MP22621	304 SS
13	Impeller	1	MP28512	Cast Iron
14	Drive SI (SS 3/4" FLO S SDS)	1	MP33205	316 SS
15	Woodruff Key (7/8" x 3/16")	1	MP22321	304 SS
16	See Table For Seal Options			
17	O-Ring (As-568-158)	2	MP34555	Viton

Item	Description (size)	Qty	Part No.	Mtl
18	Gasket	2	MP22255	Lexide Ni-2085
19	Stud (5/16" - 18" x 2.13")	6	MP33201	303 SS
20	Grease Fitting (1/8" NPT)	1	MP22208	Zinc Plated Steel
21	Relief Valve (1/4" NPT)	1	MP31733	Brass
22	Adapter	1	MP38357	Cast Iron
23	Pipe Plug	1	MP30824	Steel
24	Piston	1	MP38360	Aluminum T-3 2011
25	O-Ring (As-568-129)	1	MP38362	Viton
26	O-Ring (As-568-032)	1	MP38363	Viton
27	Spring	1	MP38358	Music Wire
28	Reservoir	1	MP38361	Aluminum T-3 2011
29	Adapter	1	MP22247	Cast Iron
30	Hexnut (5/16"-18" x 1/2")	8	MP21284	303 SS
31	Handle Kit	1	MP39768	Zinc Plated Steel
32	Clamp Assembly	1	MP23002	303 SS
33	Pedestal Assembly	1	MP26142	Cast Iron

SEAL TYPE OPTIONS

Seal PN	Seal Type	Shaft Dia.	Mating Ring	Material		
				Primary Ring	Elastomer	Components
MP33176	31	1"	Silicon Carbide	Silicon Carbide	Viton	300 SS

PARTS LIST / FLOMAX 5 CLUTCH

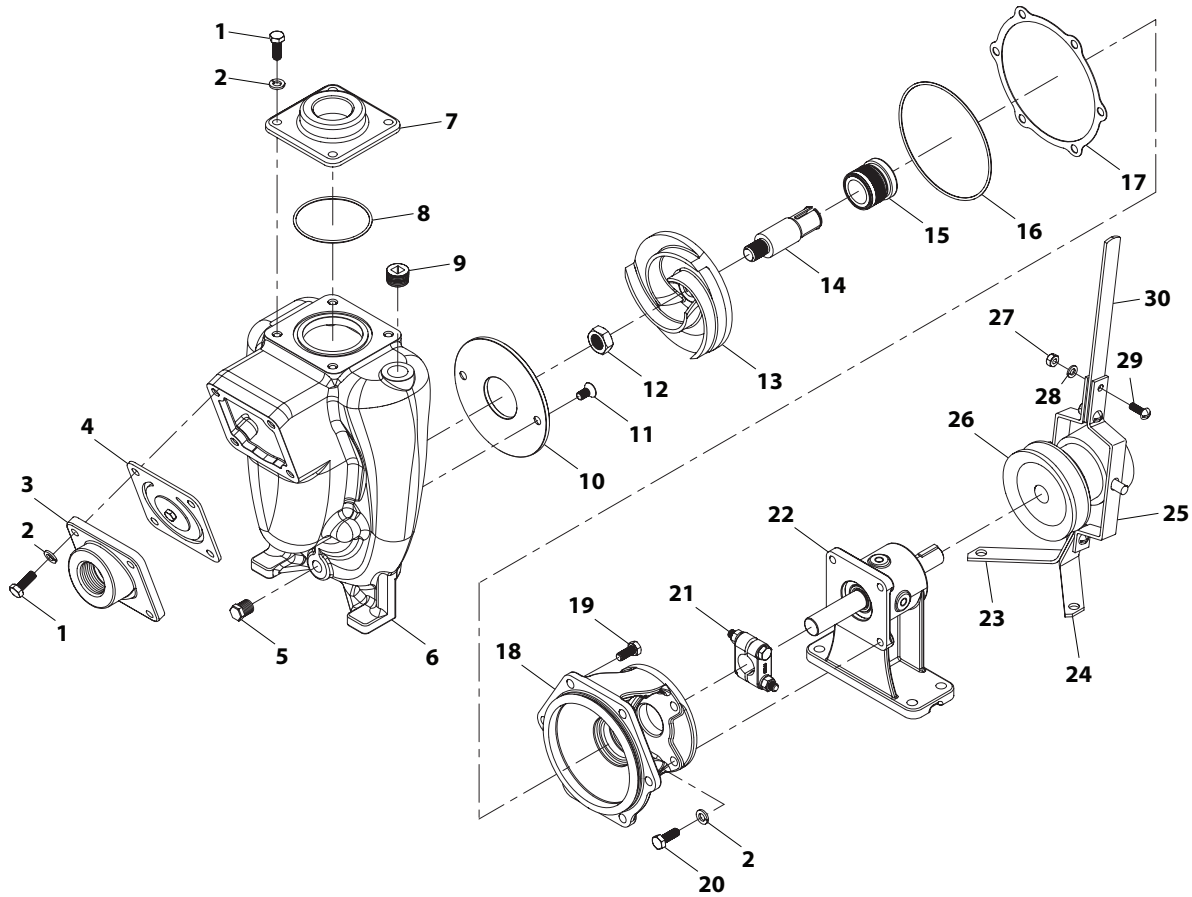


Figure 11

PARTS LIST / FLOMAX 5 CLUTCH

Item	Description (size)	Qty	Part No.	Mtl
1	Cap Screw (HH 5/16"-18" x 7/8")	8	MP21242	304 SS
2	Lockwasher (5/16" x 18")	14	MP21238	304 SS
3	Suction Flange (1.5" NPT)	1	MP22263	Cast Iron
4	Flapper Assembly	1	MP23022	Buna
5	Pipe Plug (1/4" NPT)	1	MP41475	Steel
6	Housing	1	MP22251	Cast Iron
7	Discharge Flange (1.5" NPT)	1	MP22266	Cast Iron
8	O-Ring (AS-149)	1	MP37141	Viton
9	Pipe Plug (1/2" NPT)	1	MP37140	Zinc Plated Steel
10	Wear Plate	1	MP22260	Steel
11	Screw (FHS 5/16"-18" x 5/8")	2	MP37137	304 SS
12	Hex Jam Nut	1	MP22655	304 SS
13	Impeller (5.0")	1	MP22293	Cast Iron
14	Drive Sleeve (3/4")	1	MP22286	303 SS
15	See table for seal options			
16	O-Ring (AS-568-158)	1	MP34555	Viton
17	Gasket	1	MP22255	Lexide Ni-2085

Item	Description (size)	Qty	Part No.	Mtl
18	Adapter	1	MP22247	Cast Iron
19	Capscrew (5/16"-18" x 3/4" Patch)	6	MP24965	304 SS
20	Capscrew SS (HH 5/16"-24" x 0.88")	4	MP21278	304 SS
21	Clamp Assembly (3/4" and 5/8")	2	MP23002	303 SS
22	Pedestal Assembly	1	MP26289	Cast Iron
23	Clutch Bracket (Right)	1	MP24434	Cold Rolled Steel
24	Clutch Bracket (Left)	1	MP24433	Cold Rolled Steel
25	Yoke	2	MP24430	Zinc Plated Steel
26	Clutch (A-B Belt)	1	MP28905	Steel
27	Hexnut (1/4" - 20")	3	MP21241	304 SS
28	Lockwasher (1/4")	3	MP33564	304 SS
29	Screw (1/4"-20" x 3/4")	3	MP21247	304 SS
30	Handle	1	MP24431	Zinc Plated Steel

SEAL TYPE OPTIONS

Seal PN	Seal Type	Shaft Dia.	Mating Ring	Material		
				Primary Ring	Elastomer	Components
MP22273	21	1"	Ceramic	Carbon	Viton	316 SS

PARTS LIST / FLOMAX 5 PEDESTAL ENGINE MOUNT

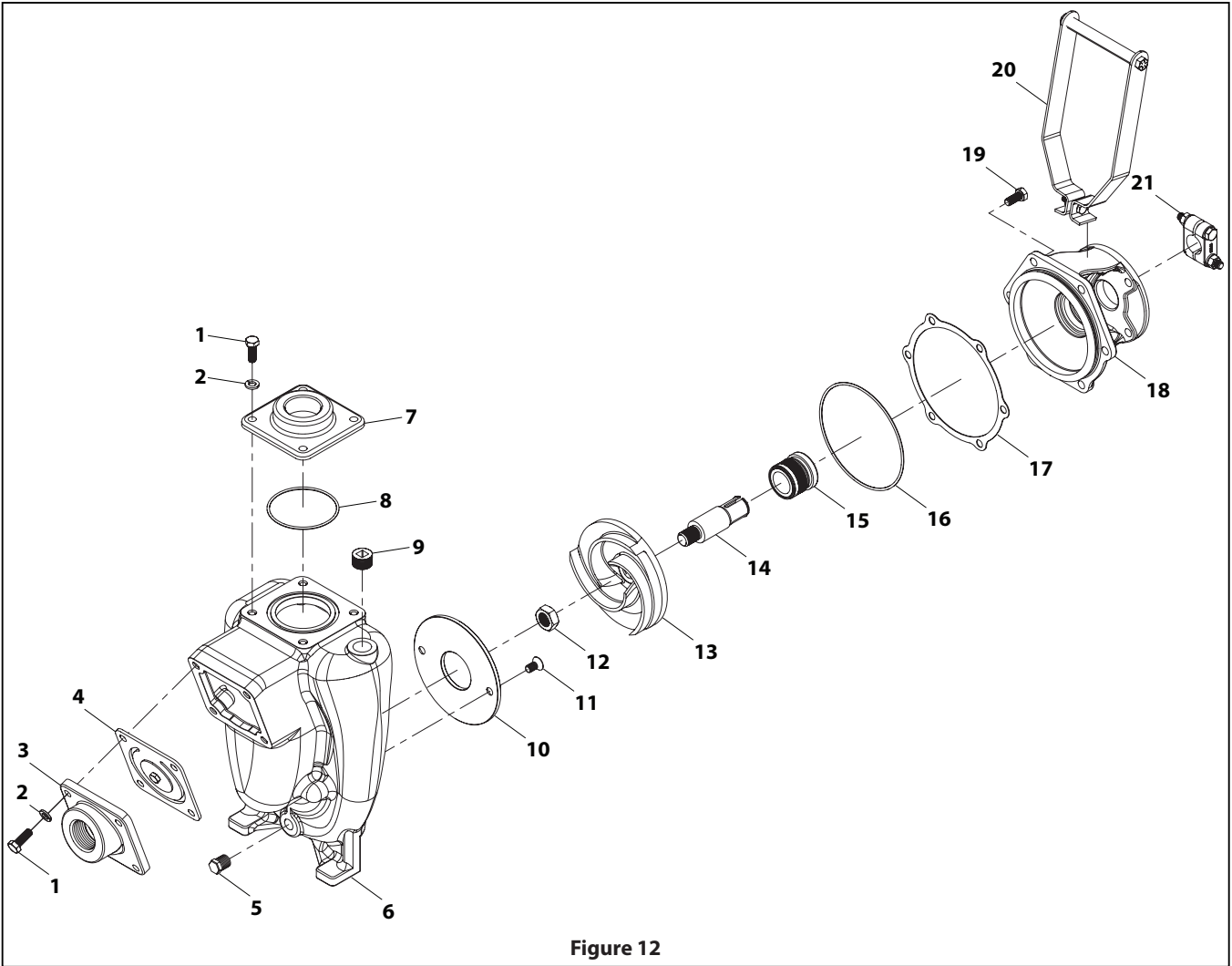


Figure 12

PARTS LIST / FLOMAX 5 PEDESTAL ENGINE MOUNT

Item	Description (size)	Qty	Part No.	Mtl
1	Cap Screw (HH 5/16"-18" x 7/8")	8	MP21242	304 SS
2	Lockwasher (5/16" x 18")	10	MP21238	304 SS
3	Suction Flange (1.5" NPT)	1	MP22263	Cast Iron
4	Flapper Assembly	1	MP23022	Buna
5	Pipe Plug (1/4" NPT)	1	MP41475	Steel
6	Housing	1	MP22251	Cast Iron
7	Discharge Flange (1.5" NPT)	1	MP22266	Cast Iron
8	O-Ring (AS-149)	1	MP37141	Viton
9	Pipe Plug (1/2" NPT)	1	MP37140	Zinc Plated Steel
10	Wear Plate	1	MP22259	Brass
11	Screw (FHS 5/16"-18" x 5/8")	2	MP37137	304 SS

Item	Description (size)	Qty	Part No.	Mtl
12	Hex Jam Nut	1	MP22655	304 SS
13	Impeller (5.0")	1	MP22292	Bronze
14	Drive Sleeve (3/4")	1	MP22286	303 SS
15	See table for seal options			
16	O-Ring (AS-568-158)	1	MP34555	Viton
17	Gasket	1	MP22255	Lexide Ni-2085
18	Adapter	1	MP22247	Cast Iron
19	Capscrew (5/16"-18" x 3/4" Patch)	6	MP24965	304 SS
20	Handle Kit	1	MP39768	Zinc Plated Steel
21	Clamp Assembly (3/4" and 5/8")	1	MP23002	303 SS

SEAL TYPE OPTIONS

Seal PN	Seal Type	Shaft Dia.	Mating Ring	Material		
				Primary Ring	Elastomer	Components
MP22273	21	1"	Ceramic	Carbon	Viton	316 SS

PARTS LIST / FLOMAX 5 HYDRAULIC (0.37)

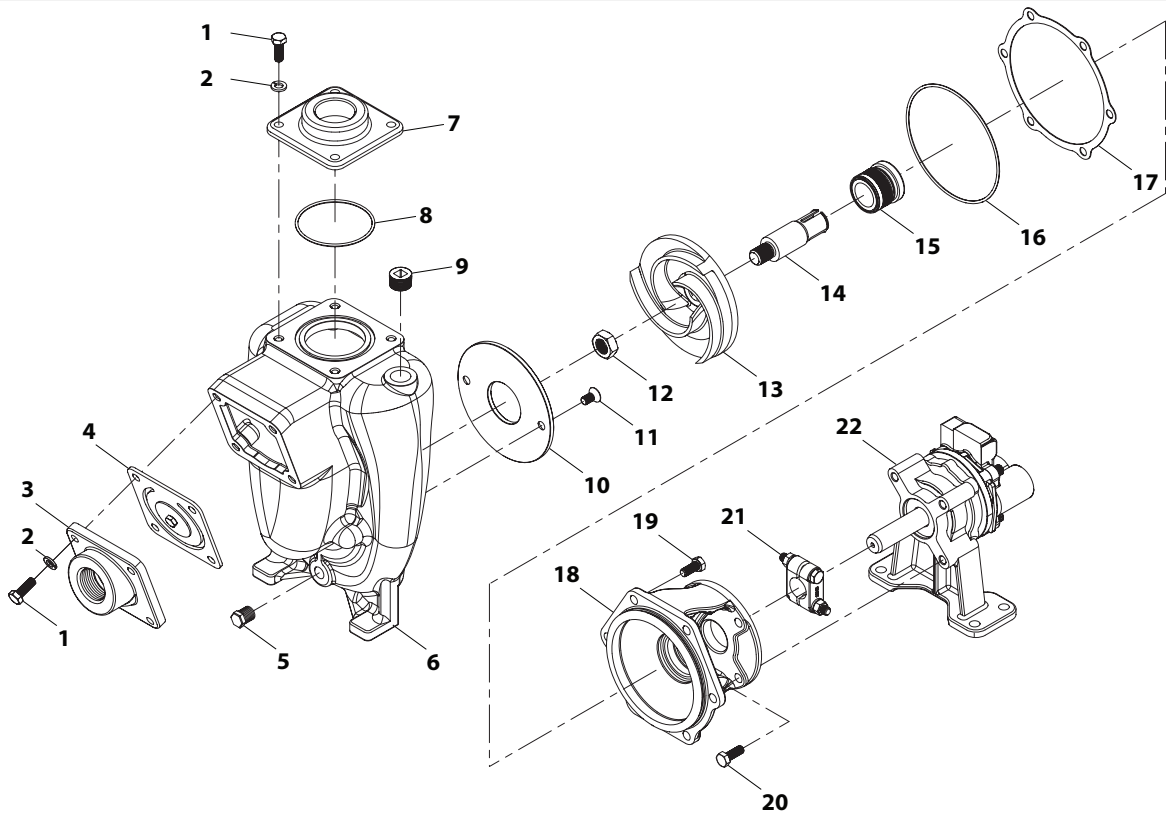


Figure 13

PARTS LIST / FLOMAX 5 HYDRAULIC (0.37)

Item	Description (size)	Qty	Part No.	Mtl
1	Cap Screw (HH 5/16"-18" x 7/8")	8	MP21242	304 SS
2	Lockwasher (5/16" x 18")	10	MP21238	304 SS
3	Suction Flange (1.5" NPT)	1	MP22263	Cast Iron
4	Flapper Assembly	1	MP23022	Buna
5	Pipe Plug (1/4" NPT)	1	MP41475	Steel
6	Housing	1	MP22251	Cast Iron
7	Discharge Flange (1.5" NPT)	1	MP22266	Cast Iron
8	O-Ring (AS-149)	1	MP37141	Viton
9	Pipe Plug (1/2" NPT)	1	MP37140	Zinc Plated Steel
10	Wear Plate	1	MP22260	Steel
11	Screw (FHS 5/16"-18" x 5/8")	2	MP37137	304 SS
12	Hex Jam Nut	1	MP22655	304 SS

Item	Description (size)	Qty	Part No.	Mtl
13	Impeller (5.0")	1	MP22293	Cast Iron
14	Drive Sleeve (3/4")	1	MP22286	303 SS
15	See table for seal options			
16	O-Ring (AS-568-158)	1	MP34555	Viton
17	Gasket	1	MP22255	Lexide Ni-2085
18	Adapter	1	MP22247	Cast Iron
19	Capscrew (5/16"-18" x 3/4" Patch)	6	MP24965	304 SS
20	Capscrew SS (HH 5/16"-24" x 0.88")	4	MP21278	304 SS
21	Clamp Assembly (3/4" and 5/8")	1	MP23002	303 SS
22	Pedestal Assembly	1	MP36447	Cast Iron

SEAL TYPE OPTIONS

Seal PN	Seal Type	Shaft Dia.	Mating Ring	Material		
				Primary Ring	Elastomer	Components
MP22273	21	1"	Ceramic	Carbon	Viton	316 SS

SERVICE KITS

PUMP MODEL	PUMP DESCRIPTION	SEAL KIT	IMPELLER KIT	BEARING KIT
MP26549	FM5PMP C:1.5-1 56C FA 4.1	MP51310	----	----
MP30405	FM5PMP C:1.5-1 56C FA 4.1BI	MP51310	----	----
MP31443	FM5PMP C:1.5-1 56C FA 4.62	MP51310	----	----
MP30209	FM5PMP C:1.5-1 56C XP FA 4.1	MP51310	----	----
MP35016	FM5PMP C:1.5-1 56C XP FA 4.62	MP51310	----	----
MP33754	FM5PMP C:1.5-3 143TC XP FA 4.1 WBA	MP51310	----	----
MP31375	FM5PMP C:1.5-3 145TC 1750 FA 5.0	MP51310	MP51316	----
MP33854	FM5PMP C:1.5-3 145TC 1750 FA 5.0 T-2 STC	----	MP51316	----
MP35319	FM5PMP C:1.5-3 56C 575V FA 4.1	MP51310	----	----
MP26297	FM5PMP C:1.5-3 56C FA 4.1	MP51310	----	----
MP38248	FM5PMP C:1.5-3 56C FA 4.1 FLUSH	MP51310	----	----
MP34379	FM5PMP C:1.5-3 56C FA 4.62	MP51310	----	----
MP35800	FM5PMP C:1.5-3 56C FA 4.62 WBA	MP51310	----	----
MP36463	FM5PMP C:1.5-3 56C FA 4.62SI	MP51310	----	----
MP31705	FM5PMP C:1.5-3 56C FA 5.0BI	MP51310	----	----
MP27563	FM5PMP C:1/2-1 56C 1750 FA 5.0	MP51310	----	----
MP50073	FM5PMP C:1/2-1 56C 1750 FA 5.0 BI BWP	MP51310	----	----
MP29568	FM5PMP C:1/2-1 56C 1750 FA 5.0 WBA	MP51310	----	----
MP50461	FM5PMP C:1/2-3 56C 1750 575 FA 5.0HF	MP51310	----	----
MP38005	FM5PMP C:1/2-3 56C 1750 FA 5.0 WBA	MP51310	----	----
MP39154	FM5PMP C:1/2-3 56C 1750XP FA 5.0 WBA	MP51310	----	----
MP34224	FM5PMP C:1-1 56C FA 4.1 WBA	MP51310	----	----
MP39899	FM5PMP C:1-3 56C 1750 FA 5.0 WBA	MP51310	----	----
MP33959	FM5PMP C:1-3 56C FA 4.1	MP51310	----	----
MP34614	FM5PMP C:1-3 56C FA 4.1 WBA	MP51310	----	----
MP39830	FM5PMP C:2-1 56C 5.0 WBA	MP51310	----	----
MP26550	FM5PMP C:2-1 56C FA 4.62	MP51310	----	----
MP36877	FM5PMP C:2-3 145TC 1750 FA 5.0	MP51310	MP51316	----
MP38057	FM5PMP C:2-3 145TC 4.62 WBA	MP51310	----	----
MP35771	FM5PMP C:2-3 145TC 50HZ CE 5.0BI WBA	MP51310	----	----
MP36335	FM5PMP C:2-3 145TC 575V 4.62SI	MP51310	----	----
MP30190	FM5PMP C:2-3 145TC FA 4.1	MP51310	----	----
MP26300	FM5PMP C:2-3 145TC FA 4.62	MP51310	----	----
MP32048	FM5PMP C:2-3 145TC FA 4.62BI BWP	MP51310	----	----
MP37885	FM5PMP C:2-3 145TC FA 4.66 T-31 DS	MP51312	----	----
MP36034	FM5PMP C:2-3 145TC XP FA 4.62	MP51310	----	----
MP34228	FM5PMP C:2-3 56C 5.0	MP51310	----	----
MP39448	FM5PMP C:2-3 56C 50HZ 5.0 WBA	MP51310	----	----
MP38355	FM5PMP C:2-3 56C 575V FA 5.0	MP51310	----	----
MP50052	FM5PMP C:2-3 56C FA 4.47 T-31 DS	MP51312	----	----
MP31244	FM5PMP C:3-1 56C MTO FA 5.0	MP51310	----	----
MP51255	FM5PMP C:3-1 56C MTO FA 5.0BI BWP	MP51310	----	----
MP30176	FM5PMP C:3-3 145TC FA 4.62	MP51310	----	----
MP26301	FM5PMP C:3-3 145TC FA 5.0	MP51310	MP51316	----
MP34364	FM5PMP C:3-3 145TC FA 5.0 T-21 SSC	----	MP51316	----
MP37025	FM5PMP C:3-3 145TC MD 5.0 WBA	MP51310	MP51316	----
MP50887	FM5PMP C:3-3 145TC XP FA 4.62	MP51310	----	----
MP37023	FM5PMP C:3-3 145TC XP FA 5.0 WBA	MP51310	MP51316	----
MP22872	FM5PMP C:3-3 182T 5.0 WBA 21312	MP51310	MP51311	MP51315
MP36676	FM5PMP C:3-3 182T XP 5.0 WBA	MP51310	MP51311	MP51315
MP37094	FM5PMP C:3-3 56C FA 4.47 T-31 DS	MP51312	----	----
MP39434	FM5PMP C:3-3 56C FA 5.0	MP51310	----	----
MP27679	FM5PMP C:PED 4.1	MP51310	----	MP51315

SERVICE KITS

PUMP MODEL	PUMP DESCRIPTION	SEAL KIT	IMPELLER KIT	BEARING KIT
MP34496	FM5PMP C:PED 4.48 DS OIL	----	MP51313	MP51315
MP25382	FM5PMP C:PED 4.62	MP51310	----	MP51315
MP36610	FM5PMP C:PED 4.84 DS GREASE	MP51312	MP51313	MP51315
MP36626	FM5PMP C:PED 4.84 DS OIL SSWP	----	----	MP51315
MP21312	FM5PMP C:PED 5.0	MP51310	MP51311	MP51315
MP39356	FM5PMP C:PED 5.0 SSI	MP51310	----	MP51315
MP24321	FM5PMP C:PED 5.0BI	MP51310	----	MP51315
MP29302	FM5PMP C:PED 5.0BI BWP	MP51310	----	MP51315
MP39055	FM5PMP C:PED SSC 5.0	----	MP51311	MP51315
MP30706	FM5PMP C:PED/CL 24V 5.0 3/4	MP51310	MP51311	----
MP29303	FM5PMP C:PED/CL 3/4 5.0BI BWP	MP51310	----	MP51315
MP24549	FM5PMP C:PED/CL 5.0	MP51310	MP51311	MP51315
MP26953	FM5PMP C:PED/CL NO CL 5.0	MP51310	MP51311	MP51315
MP38372	FM5PMP C:PED/CL NO CL 5.0BI	MP51310	----	MP51315
MP36472	FM5PMP C:PED/HYD .22 DISP 5.0	MP51310	MP51311	----
MP36471	FM5PMP C:PED/HYD .22 DISP W/FC 5.0	MP51310	MP51311	----
MP36587	FM5PMP C:PED/HYD .37 DISP 5.0	MP51310	MP51311	----
MP36036	FM5PMP C:PED/HYD .37 DISP W/FC 5.0	MP51310	MP51311	----
MP36004	FM5PMP C:PED/HYD .45 DISP 5.0	MP51310	MP51311	----
MP51251	FM5PMP C:PED/HYD .45 DISP SSC W/FC 5.0	----	MP51311	----
MP36473	FM5PMP C:PED/HYD .45 DISP W/FC 5.0	MP51310	MP51311	----
MP50288	FM5PPK C:CCMTR 5/8 4.47 T-31 DSC GREASE	MP51312	----	----
MP26060	FM5PPK C:CCMTR 5/8 FA 4.1	MP51310	----	----
MP30988	FM5PPK C:CCMTR 5/8 FA 4.1BI	MP51310	----	----
MP29460	FM5PPK C:CCMTR 5/8 FA 4.1BI BWP	MP51310	----	----
MP28845	FM5PPK C:CCMTR 5/8 FA 4.1SI SSWP	MP51310	----	----
MP26092	FM5PPK C:CCMTR 5/8 FA 4.62	MP51310	----	----
MP29719	FM5PPK C:CCMTR 5/8 FA 4.62BI BWP	MP51310	----	----
MP25979	FM5PPK C:CCMTR 5/8 FA 5.0	MP51310	----	----
MP30338	FM5PPK C:CCMTR 5/8 FA 5.0BI BWP	MP51310	----	----
MP39542	FM5PPK C:CCMTR 5/8 SL 5.0BRI SSWP	MP51310	----	----
MP35755	FM5PPK C:CCMTR 7/8 4.84 T-31 DS GREASE	MP51312	----	----
MP26820	FM5PPK C:CCMTR 7/8 FA 4.1	MP51310	----	----
MP39491	FM5PPK C:CCMTR 7/8 FA 4.1SI SSWP	MP51310	----	----
MP26299	FM5PPK C:CCMTR 7/8 FA 4.62	MP51310	----	----
MP31690	FM5PPK C:CCMTR 7/8 FA 4.62BI	MP51310	----	----
MP35149	FM5PPK C:CCMTR 7/8 FA 4.62BI BWP	MP51310	----	----
MP38286	FM5PPK C:CCMTR 7/8 FA 4.75BI	MP51310	----	----
MP26074	FM5PPK C:CCMTR 7/8 FA 5.0	MP51310	MP51316	----
MP38024	FM5PPK C:CCMTR 7/8 FA 5.0 SSC	----	MP51316	----
MP28629	FM5PPK C:CCMTR 7/8 FA 5.0 T-2 STC	----	MP51316	----
MP26934	FM5PPK C:CCMTR 7/8 FA 5.0BI	MP51310	----	----
MP28940	FM5PPK C:CCMTR 7/8 FA 5.0BI BWP	MP51310	----	----
MP29959	FM5PPK C:CCMTR 7/8 FA 5.0SI SSWP	MP51310	----	----
MP30648	FM5PPK C:PEM 3/4 4.1	MP51310	----	----
MP38092	FM5PPK C:PEM 3/4 4.6	MP51310	----	----
MP39632	FM5PPK C:PEM 3/4 4.62 W/BASE	MP51310	----	----
MP36278	FM5PPK C:PEM 3/4 4.84 T-31 DSC GREASE	MP51312	MP51313	----
MP21302	FM5PPK C:PEM 3/4 5.0	MP51310	MP51311	----
MP36339	FM5PPK C:PEM 3/4 5.0 T-21 CCS	----	MP51311	----
MP21306	FM5PPK C:PEM 3/4 5.0 W/BASE	MP51310	MP51311	----
MP21306	FM5PPK C:PEM 3/4 5.0BI BWP	MP51310	----	----

DIMENSIONAL DATA

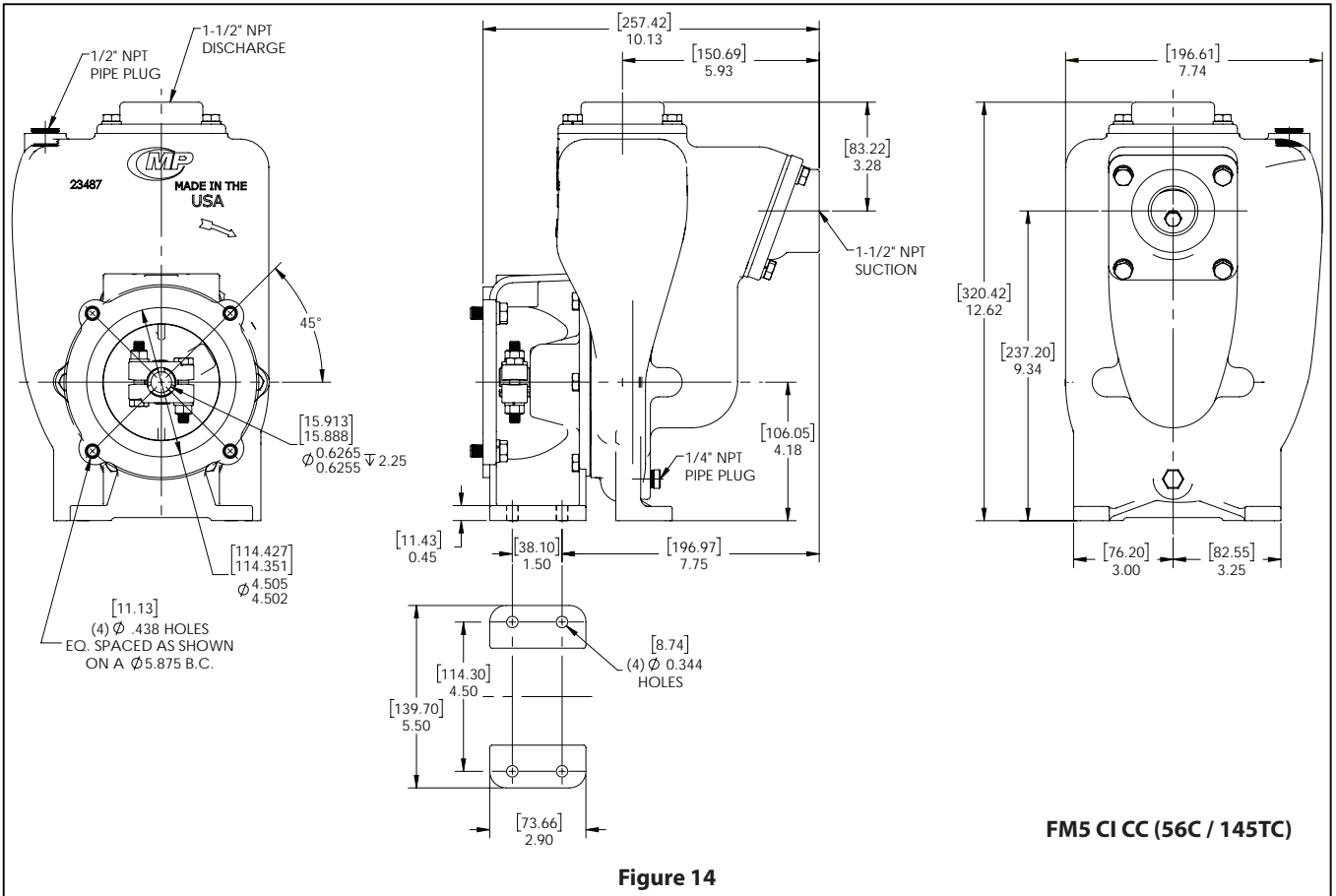


Figure 14

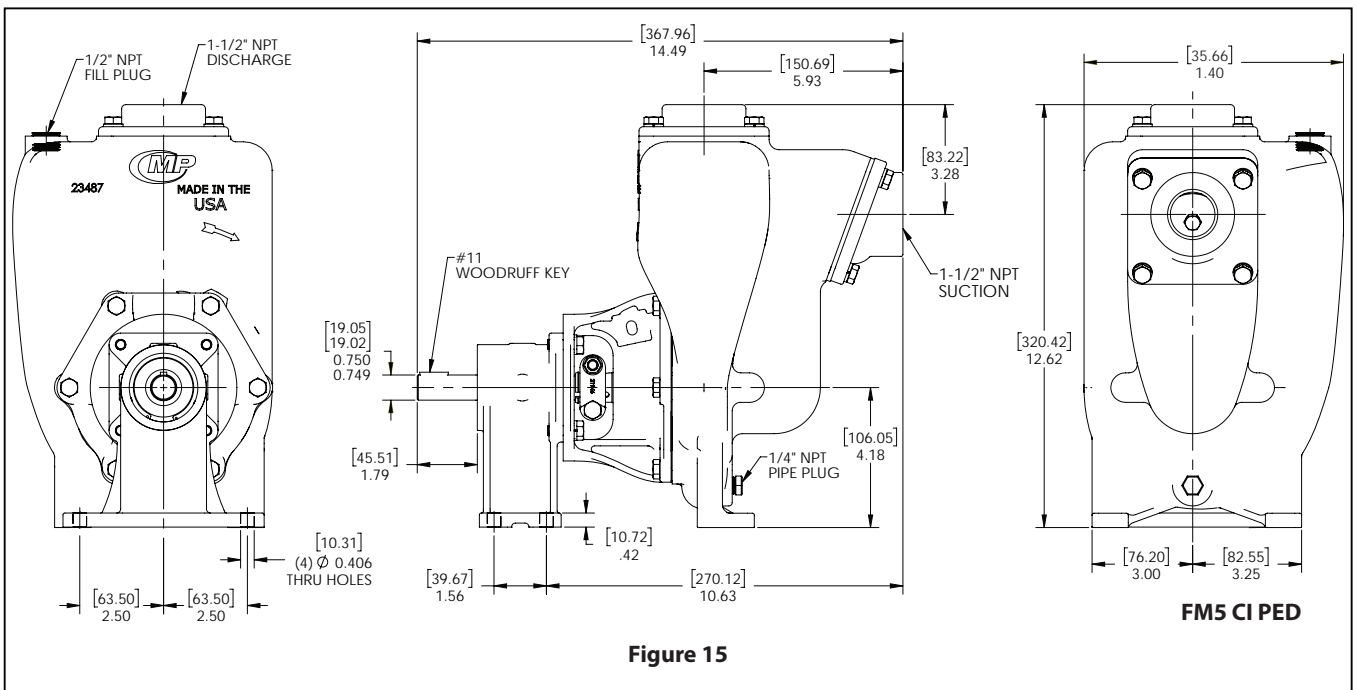
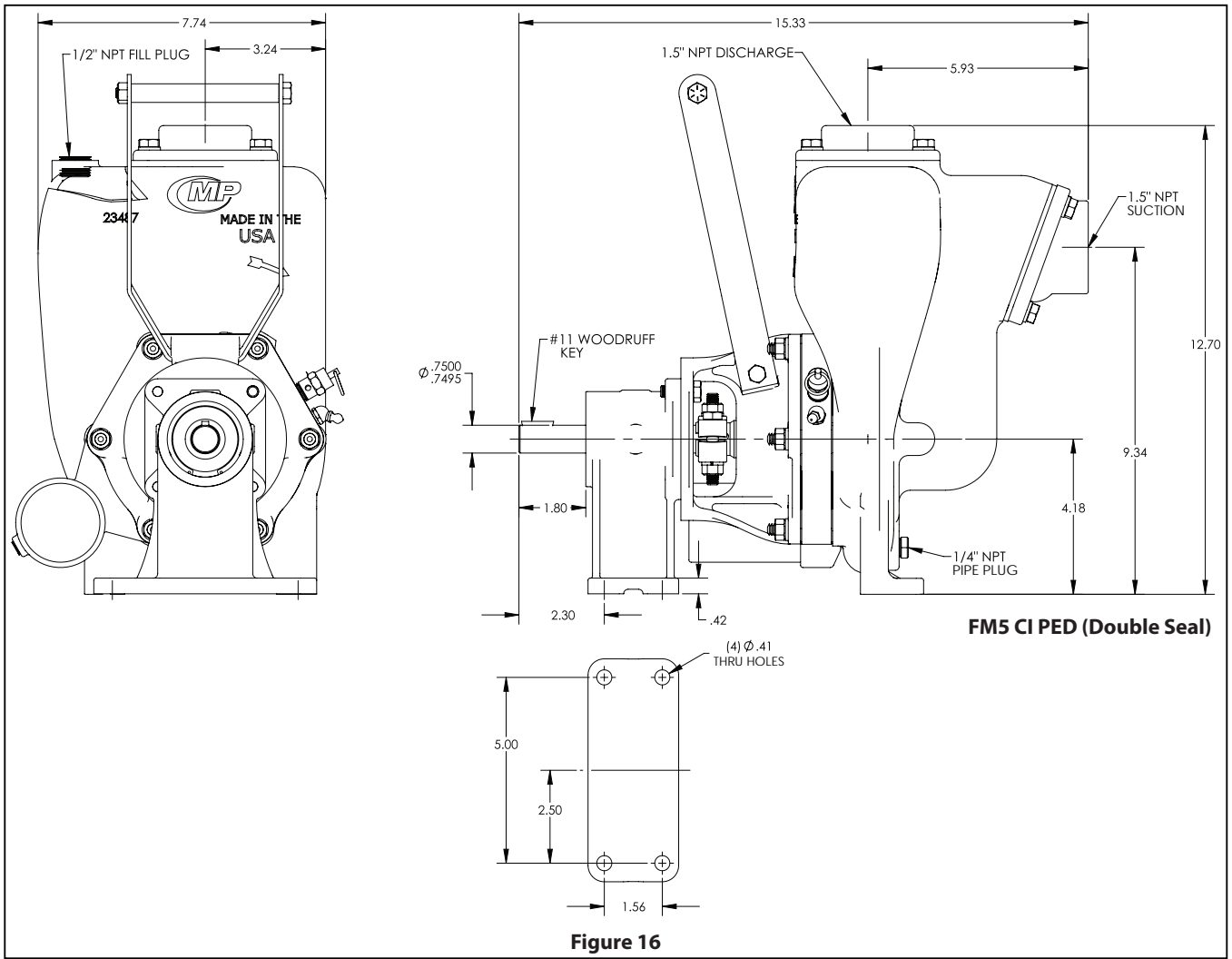
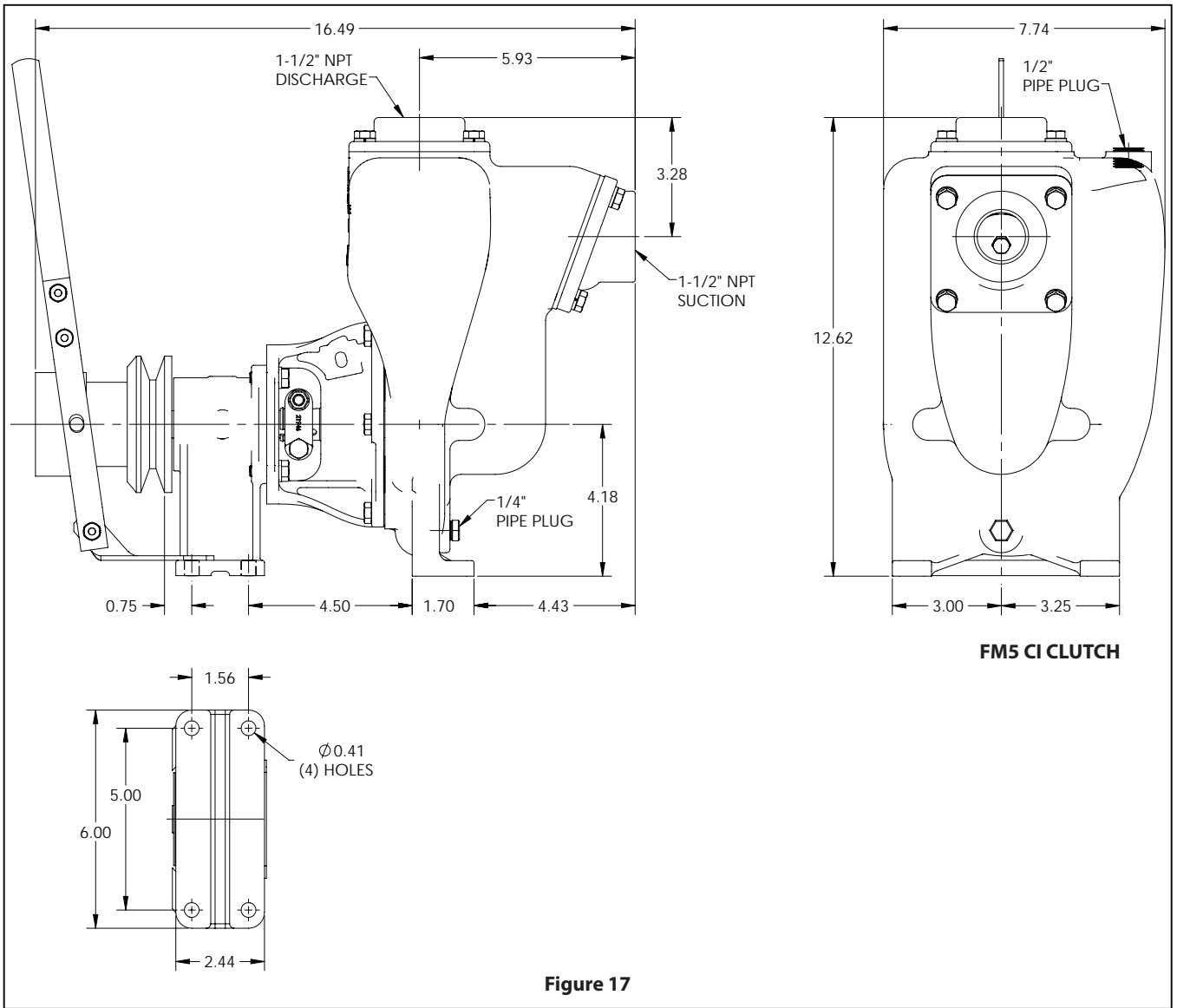
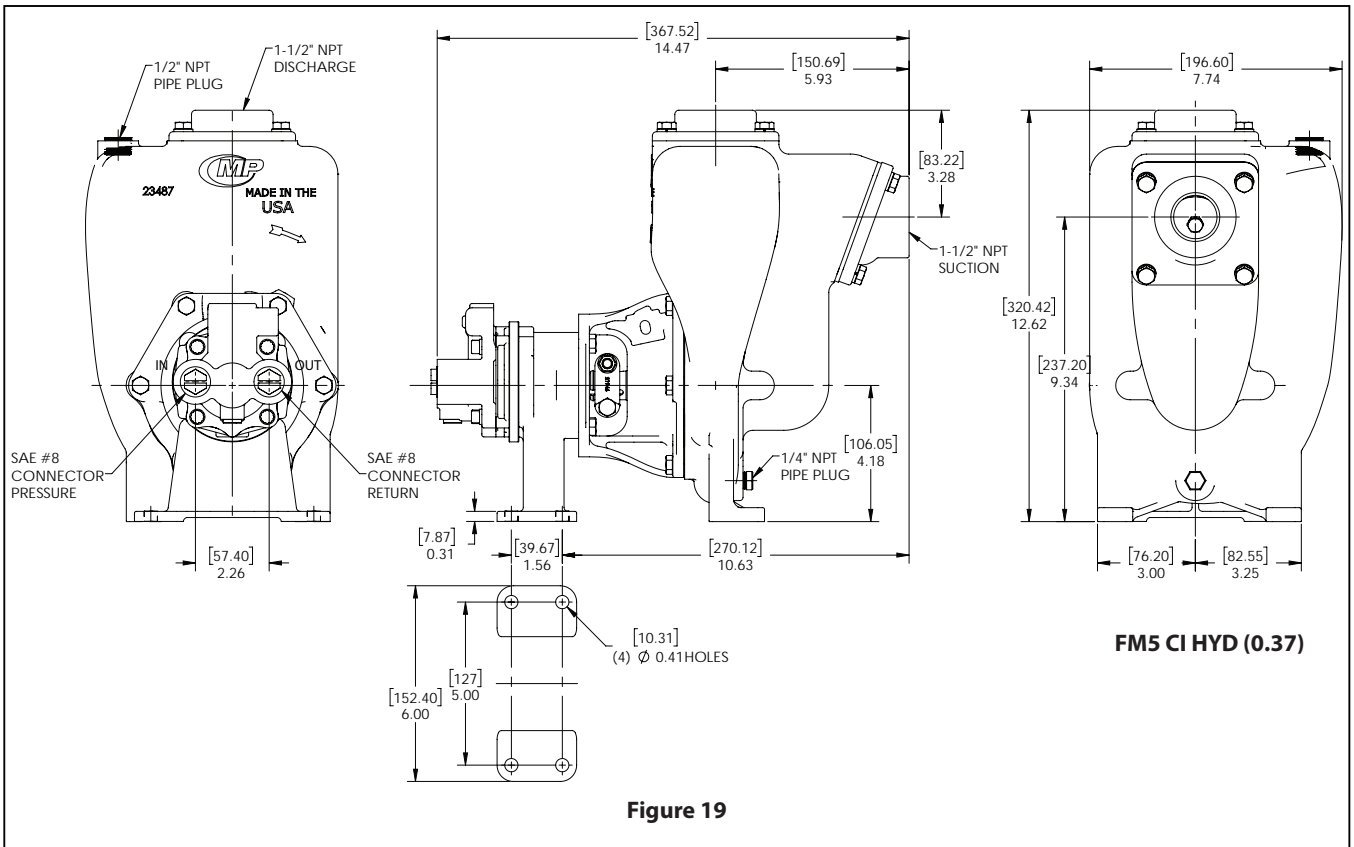
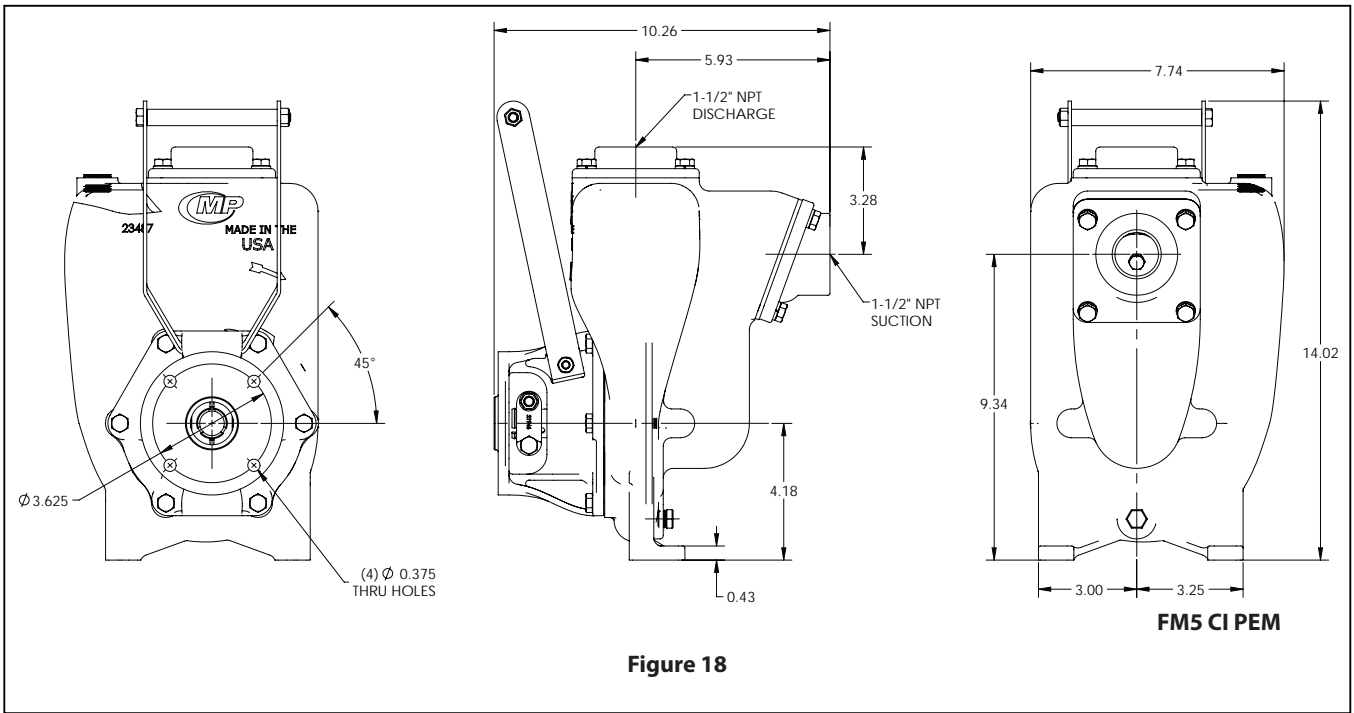


Figure 15







TROUBLESHOOTING

PROBLEM	PROBABLE CAUSE	REMEDY
No liquid delivered.	1. Pump not primed.	1. Reprime pump, check that pump and there are no obstructions in the suction line.
	2. Discharge valve closed	2. Check discharge valve.
	3. Suction line clogged.	3. Remove obstructions.
	4. Wrong direction of rotation.	4. Change rotation to concur with direction indicated on bearing housing or pump casing.
	5. Total head is too high	5. Re-evaluate head conditions.
	6. Driver is not operating at rated speed.	6. Check electric motor voltage; check engine rpm
	7. Pump is vapor bound	7. Provide additional pressure on liquid being pumped by elevating liquid source.
	8. Foot valve or suction pipe opening not submerged enough	8. Consult factory for proper depth. Use baffle to eliminate vortices.
Pump not producing rated flow or head.	1. Air leak through gasket.	1. Replace gasket.
	2. Air leak through stuffing box.	2. Replace or adjust packing/mechanical seal.
	3. Impeller partly clogged.	3. Back flush pump to clean impeller.
	4. Worn suction side plate or wear rings.	4. Replace defective parts as required.
	5. Pump is not properly primed.	5. Reprime pump, check that pump and there are no obstructions in the suction line. Check NPSHa to ensure that there is enough liquid for pump operation.
	6. Driver is not operating at rated speed.	6. Check electric motor voltage; check engine rpm
	7. Pump is vapor bound	7. Provide additional pressure on liquid being pumped by elevating liquid source. or consider installing an air release valve in the discharge line to remove the air to allow the pump to become dynamic.
	8. Insufficient suction head.	8. Ensure that suction line shutoff valve is fully open and line is unobstructed.
	9. Worn or broken impeller.	9. Inspect and replace if necessary.
Pump starts then stops pumping.	1. Excessive air in liquid.	1. Clean and tighten all suction connections; relocate suction inlet in liquid source.
	2. Defective packing or seal.	2. Replace packing or seal.
	3. Pump is vapor bound.	3. Provide additional pressure on liquid being pumped by elevating liquid source. or consider installing an air release valve in the discharge line to remove the air to allow the pump to become dynamic.
	4. Air or vapor pockets in suction line.	4. Rearrange piping to eliminate air pockets.
	5. Air leak in suction line.	5. Repair leak.
Bearings run hot.	1. Improper alignment.	1. Re-align pump and drive.
	2. Improper lubrication.	2. Check lubricate for suitability and level.
	3. Lube cooling.	3. Check cooling system

PROBLEM	PROBABLE CAUSE	REMEDY
Pump is noisy or vibrates.	1. Improper pump/driver alignment.	1. Align shafts.
	2. Partly clogged impeller causing imbalance.	2. Back-flush pump to clean impeller.
	3. Broken or bent impeller or shaft.	3. Replace as required.
	4. Foundation not rigid.	4. Tighten bolts of pump and motor or adjust stilts
	5. Worn bearings.	5. Replace.
	6. Suction or discharge piping not anchored or properly supported.	6. Anchor per Hydraulic Institute Standards Manual recommendation.
	7. Pump is cavitating.	7. Check NPSHa, Air leaks to ensure that there is enough liquid for pump operation.
Excessive leakage from stuffing box/seal chamber.	1. Worn mechanical seals.	1. Replace worn parts.
	2. Overheating mechanical seal.	2. Check lubrication and cooling lines.
	3. Shaft sleeve scored.	3. Remachine or replace as required
Motor requires excessive power.	1. Head lower than rating; pumps too much liquid.	1. Consult factory. Install throttle valve, trim impeller diameter.
	2. Speed is too high.	2. Electric motor wiring is wrong. Replace motor.
	3. Wrong direction of rotation.	3. Check wiring diagram.
	4. Impeller is clogged.	4. Back flush pump to clean impeller.
	5. Impeller is binding.	5. Relieve strain on casing; adjust impeller clearance.
	6. Driver and pump are misaligned.	6. Realign driver with pump.
	7. Power frame shaft is bent.	7. Replace shaft.
	8. Worn suction side plate or wear rings.	8. Replace defective parts as required.
	9. Liquid heavier than expected.	9. Check specific gravity and viscosity.
	10. Stuffing box too tight.	10. Readjust packing. Replace if worn.
	11. Rotating parts bind.	11. Check internal wearing parts for proper clearances
Pump fails to prime or loses its prime.	1. Air leaks in suction line.	1. Clean and tighten all suction connections; relocate suction inlet in liquid source.
	2. Suction strainer is clogged. Suction lift is too high.	2. Clean debris from strainer. Re-evaluate pump requirements and correct suction conditions.
	3. Defective priming valve.	3. Replace valve.
	4. Defective seal.	4. Replace seal.
Insufficient pressure.	1. Excessive air in liquid.	1. Clean and tighten all suction connections; relocate suction inlet in liquid source.
	2. Driver is not operating at rated speed.	2. Check electric motor voltage; check engine rpm
	3. Wrong direction of rotation.	3. Change rotation to concur with direction indicated on bearing housing or pump casing.
	4. Total head is too high.	4. Re-evaluate head conditions.
	5. Worn suction side plate or wear rings.	5. Replace defective parts as required.
	6. Broken or bent impeller or shaft.	6. Replace as required.
	7. Air leak through gasket.	7. Replace gasket.
	8. Liquid is vaporizing	8. Provide additional pressure on liquid being pumped by elevating liquid source. Check temperature of liquid being pumped'