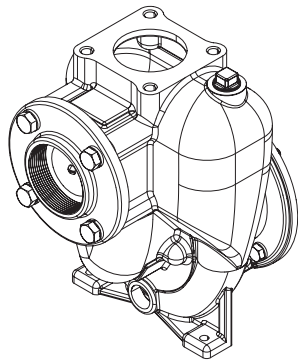


## FLOMAX® 15 (Stainless Steel and Bronze 3" X 3")



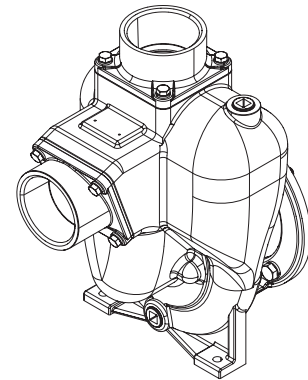
**READ THIS MANUAL CAREFULLY BEFORE INSTALLING,  
OPERATING OR SERVICING THIS EQUIPMENT.**

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

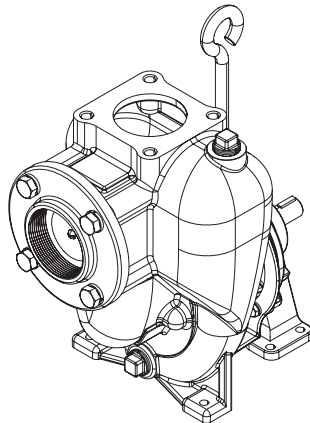


**Stainless Steel**

**PumPAK Models**

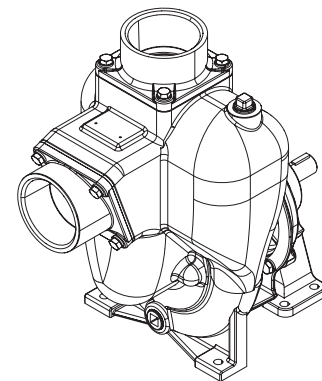


**Bronze**

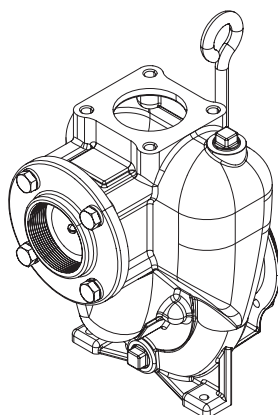


**Stainless Steel**

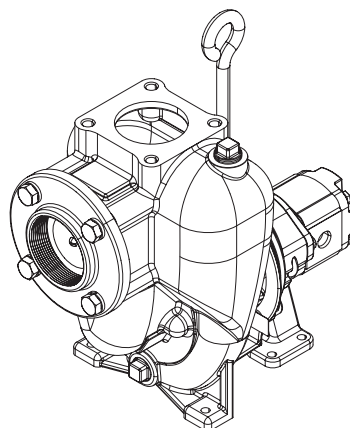
**Pedestal Models**



**Bronze**

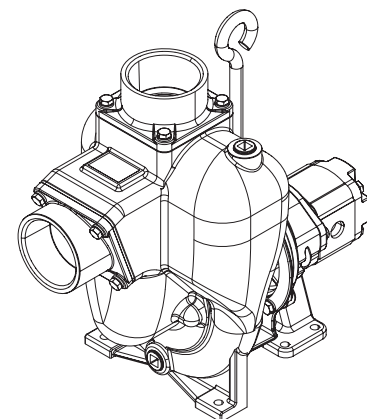


**Pedestal Engine  
Mount Models  
(Stainless Steel)**



**Stainless Steel**

**Hydraulic Models**



**Bronze**

Figure 1

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## GENERAL DESCRIPTION

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### **FLOMAX 15:**

#### **3" x 3" Self Priming Pump Centrifugal Pump**

Flomax® 15 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.

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## SPECIFICATIONS

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<b>Suction And Discharge</b> .....	3" x 3" NPT
<b>Application</b> .....	Agricultural, Industrial, Marine, OEM
<b>Materials of construction</b> .....	Stainless Steel and Bronze
<b>Flow</b>	
PumPAK Models .....	Up to 320 gpm (1211.3 lpm)
Hydraulic .....	Up to 318 gpm (1203.7 lpm)
<b>Head Feet</b>	
PumPAK Models .....	Up to 145 ft (44.1 m)
Hydraulic .....	Up to 183 ft (55.7 m)
<b>Suction lift</b> .....	Up to a 25 ft (7.6 m)
<b>Impeller</b> .....	6" (152.4 mm) semi-open
<b>Motor</b> .....	Up to 7.5 HP (5.59 kw)
<b>IEC Mounts</b> .....	Up to 13 HP (9.69 kw)
<b>Hydraulic Motor</b> .....	0.73 cu.in./rev
<b>Hydraulic System Pressure</b> .....	Up to 1700 psi (117.2 bar)
<b>Hydraulic Fluid Flow</b> .....	Up to 15 gpm (56.7lpm)
<b>Maximum Solid Size</b> .....	0.625" (15.8 mm) diameter
<b>Drive Options</b> .....	Close coupled 184TC Pedestal PumPAK® (without motor)
<b>Seal</b> .....	Standard carbon / Ceramic / Viton Special seal material combinations available (Consult factory)
<b>Drive Sleeve</b> .....	316 stainless steel
<b>Options</b> .....	Hydraulic motors with flow control.
<b>Features</b> .....	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):

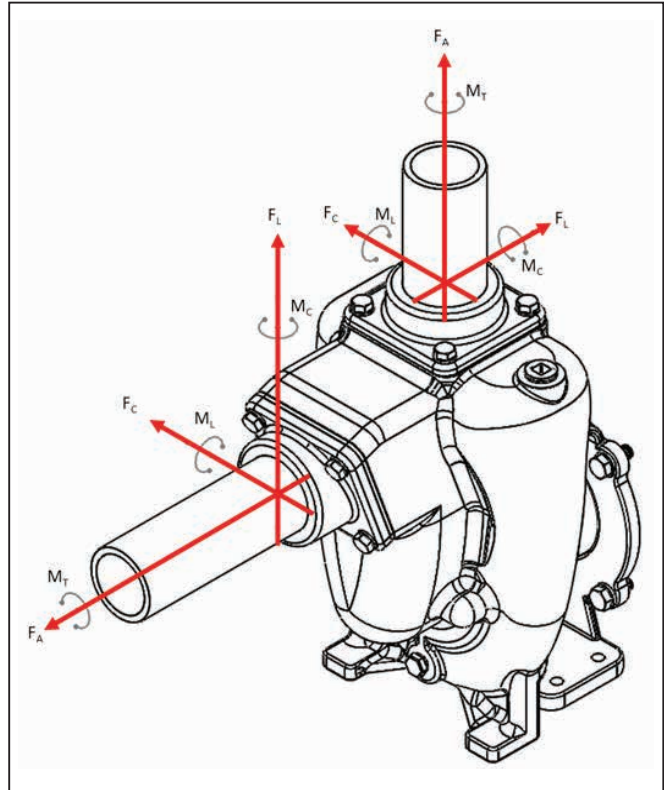
Check the shaft to insure that it rotates freely. Shafts should be aligned in accordance with the instructions of the coupling manufacturer. Final alignment must be performed after the pump has been completely installed and the pump and driver are at operating temperature. Proper shaft alignment is the 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)	FLOMAX 15 FLANGE					
	Force lbs (N)			Moment ft*lbs (N*m)		
	FL	FC	FA	ML	MC	MT
3"	809 (3600)	809 (3600)	607 (2700)	398 (540)	597 (810)	518 (702)

## 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

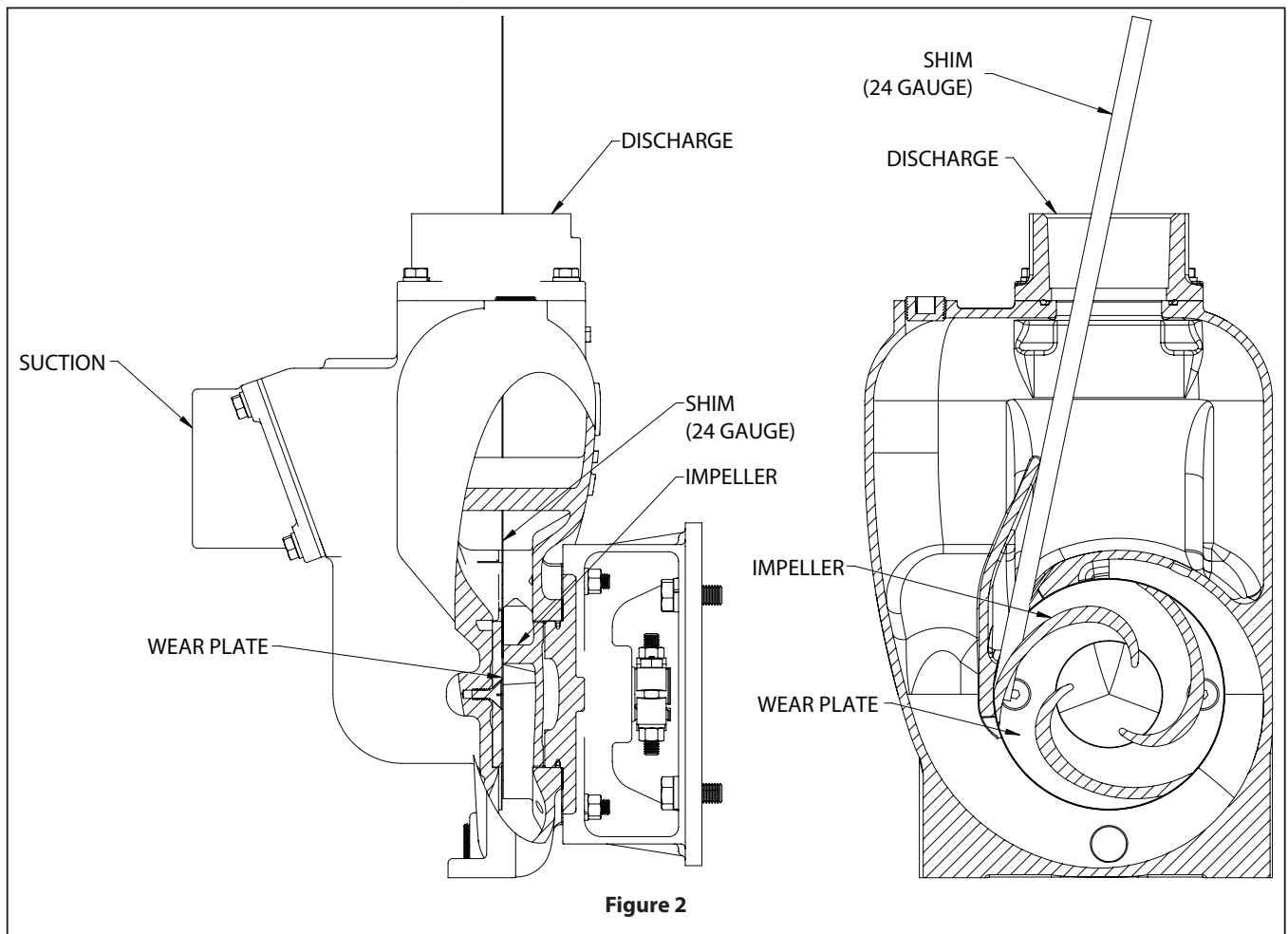
PUMPAK assembly to driver. Tighten impeller clamp nuts to lock impeller onto drive shaft.

### 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



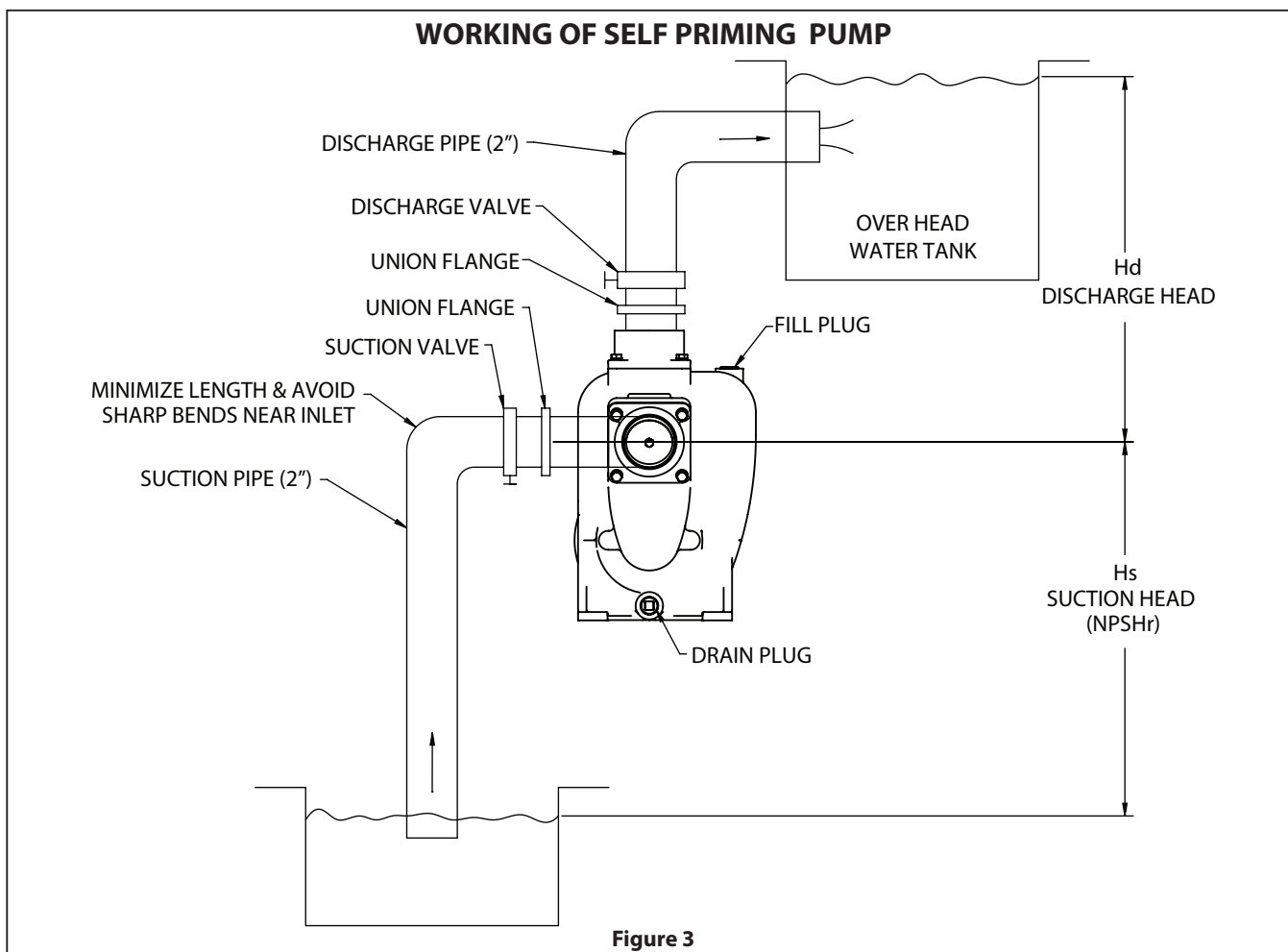


Figure 3

## 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.

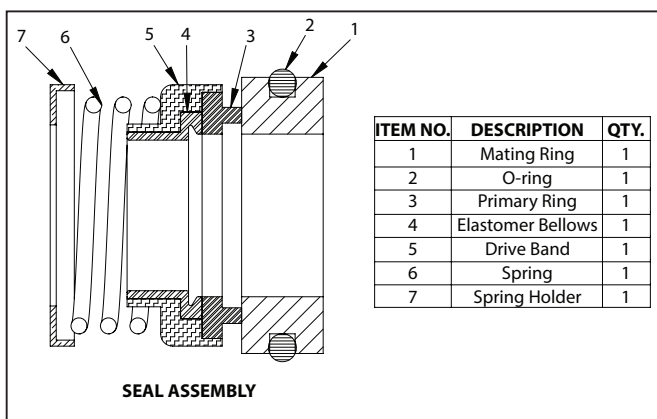
MP Pumps rebuild kits include a new drive sleeve to avoid the possibility of damaging the drive sleeve. See back of manual for list of seal kits and corresponding rebuild kits. Impellers are also available if wear or damage is present.

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.

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## **MAINTENANCE**

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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.

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## **REASSEMBLY**

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### **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 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 15 PUMPAK STAINLESS STEEL (184TC / 215 TC)

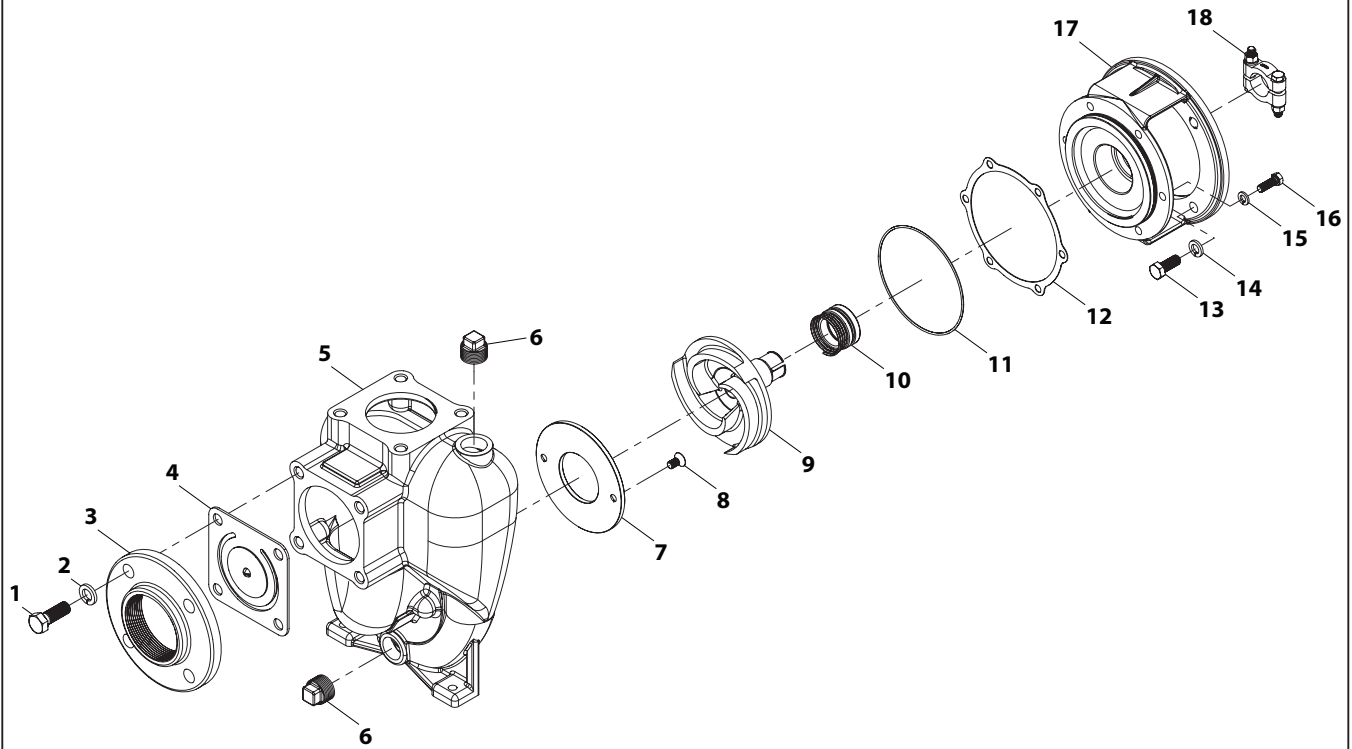


Figure 4

## PARTS LIST / FLOMAX 15 PUMPAK STAINLESS STEEL (184TC / 215 TC)

Item	Description (size)	Qty	Part No.	Mtl
1	Capscrew (5/8-11x1.75)	4	MP36606	304 SS
2	Lockwasher (5/8")	4	MP26853	304 SS
3	Suction Flange	1	MP38027	316 SS
4	Flapper Assembly	1	MP38077	SS / Viton
5	Housing	1	MP38011	316 SS
6	Pipe Plug (1" NPT)	2	MP34780	316 SS
7	Wear Plate	1	MP27979	316 SS
8	Screw (FHS 3/8" - 16" x 3/4")	2	MP37115	304 SS
9	Impeller	1	MP38078	316 SS
		1	MP29461	304 SS

Item	Description (size)	Qty	Part No.	Mtl
10	See Table for seal options			
11	O-Ring (AS-568-162)	1	MP29715	Viton
12	Gasket	1	MP22240	Lexide Ni-2085
13	Capscrew (1/2" - 13" x 1.25")	4	MP21246	304 SS
14	Lockwasher (1/2")	4	MP21254	304 SS
15	Capscrew (3/8" - 16" x 1.13")	6	MP21291	304 SS
16	Lockwasher (1/2")	6	MP21266	304 SS
17	Adapter	1	MP38061	316 SS
18	Clamp Assembly	1	MP23039	303 SS

### SEAL TYPE OPTIONS

Seal PN	Seal Type	Shaft Dia.	Mating Ring	Material		
				Primary Ring	Elastomer	Components
MP22362	21	1.5"	Ceramic	Carbon	Viton	316 SS and 18-8 SS

## PARTS LIST / FLOMAX 15 PEDESTAL STAINLESS STEEL

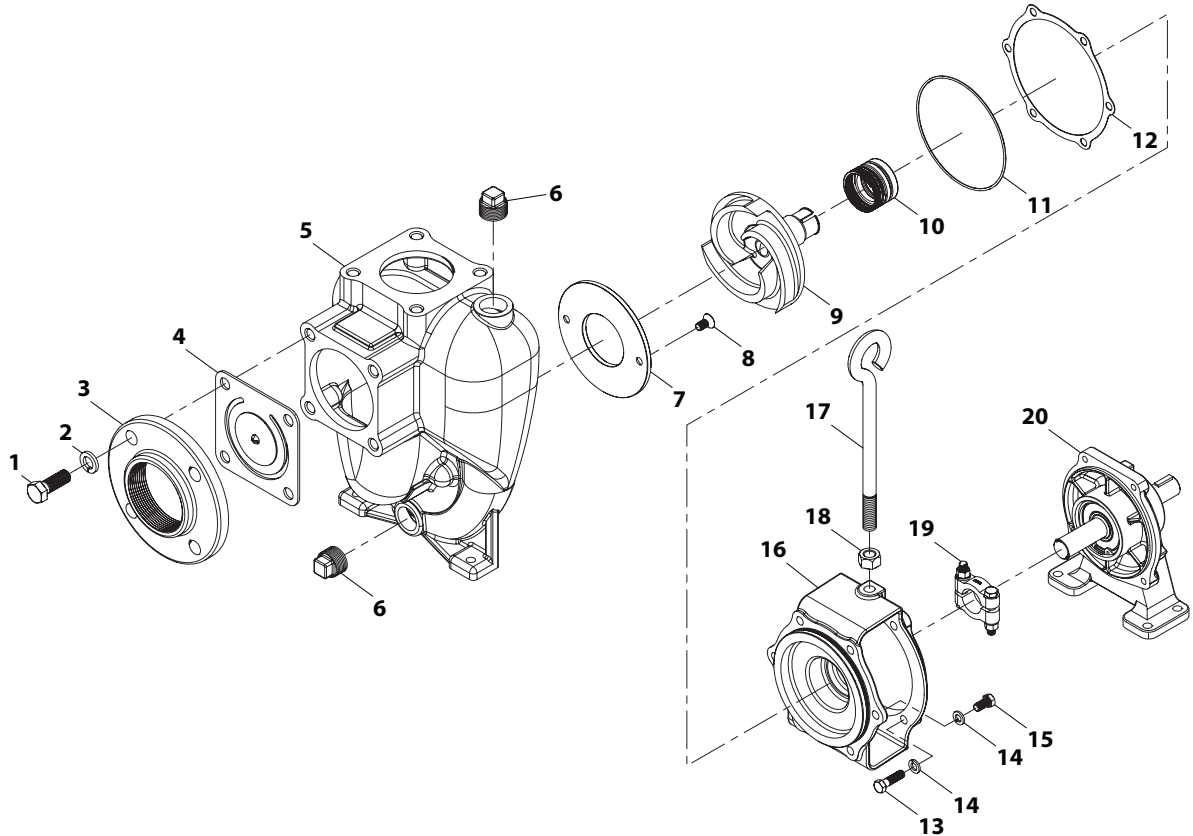


Figure 5

## PARTS LIST / FLOMAX 15 PEDESTAL STAINLESS STEEL

Item	Description (size)	Qty	Part No.	Mtl
1	Capscrew (5/8-11x1.75)	4	MP36606	304 SS
2	Lockwasher (5/8")	4	MP26853	304 SS
3	Suction Flange	1	MP38027	316 SS
4	Flapper Assembly	1	MP38077	SS / Viton
5	Housing	1	MP38011	316 SS
6	Pipe Plug (1" NPT)	2	MP34780	316 SS
7	Wear Plate	1	MP27979	316 SS
8	Screw (FHS 3/8" - 16" x 3/4")	2	MP37115	304 SS
9	Impeller	1	MP38070	316 SS
		1	MP29466	304 SS
		1	MP29641	304 SS

Item	Description (size)	Qty	Part No.	Mtl
10	See Table for seal options			
11	O-Ring (AS-568-162)	1	MP29715	Viton
12	Gasket	1	MP22240	Lexide Ni-2085
13	Capscrew (1/2" - 13" x 1.25")	4	MP21259	304 SS
14	Lockwasher (3/8" x 1/8")	10	MP21266	304 SS
15	Capscrew (3/8" - 16" x 1.13")	6	MP25663	304 SS
16	Adapter	1	MP38038	316 SS
17	Lift Eye	1	MP22460	Steel
18	Hexnut	1	MP22461	Steel
19	Clamp Assembly	1	MP23039	303 SS
20	Pedestal Assembly	1	MP26163	Cast Iron

### SEAL TYPE OPTIONS

Seal PN	Seal Type	Shaft Dia.	Mating Ring	Material		
				Primary Ring	Elastomer	Components
MP22362	21	1.5"	Ceramic	Carbon	Viton	316 SS and 18-8 SS

## PARTS LIST / FLOMAX 15 PEDESTAL ENGINE MOUNT STAINLESS STEEL

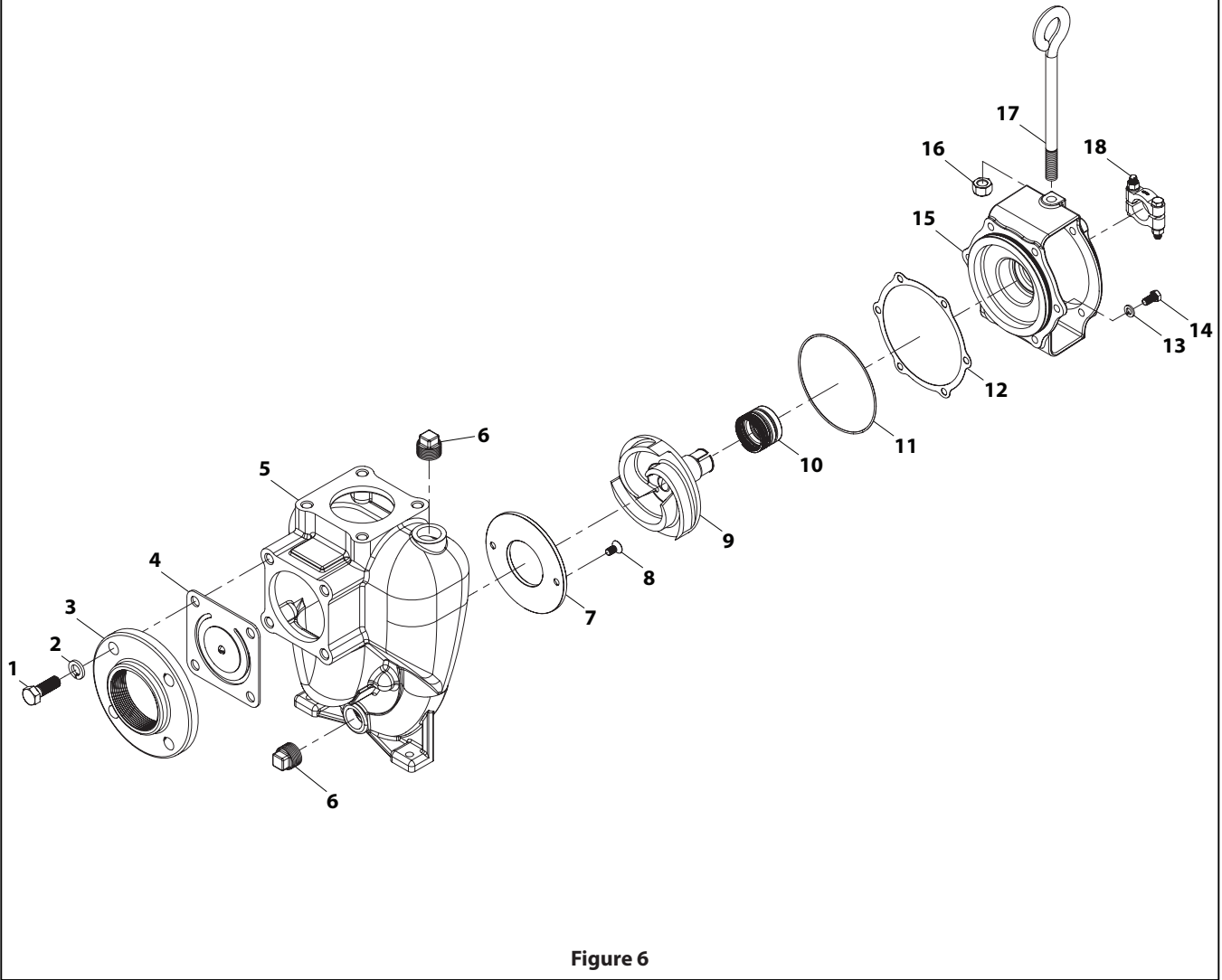


Figure 6

## PARTS LIST / FLOMAX 15 PEDESTAL ENGINE MOUNT STAINLESS STEEL

1	Capscrew (5/8-11x1.75)	4	MP36606	304 SS
2	Lockwasher (5/8")	4	MP26853	304 SS
3	Suction Flange	1	MP38027	316 SS
4	Flapper Assembly	1	MP38077	SS / Viton
5	Housing	1	MP38011	316 SS
6	Pipe Plug (1" NPT)	2	MP34780	316 SS
7	Wear Plate	1	MP27979	316 SS
8	Screw (FHS 3/8" - 16" x 3/4")	2	MP37115	304 SS
9	Impeller	1	MP38070	316 SS
		1	MP29466	304 SS

10	See Table for seal options			
11	O-Ring (AS-568-162)	1	MP29715	Viton
12	Gasket	1	MP22240	Lexide Ni-2085
13	Lockwasher (3/8" x 1/8")	6	MP21266	304 SS
14	Capscrew (3/8" - 16" x 7/8")	6	MP21251	304 SS
15	Adapter	1	MP38038	316 SS
16	Hexnut	1	MP22461	Steel
17	Lift Eye	1	MP22460	Steel
18	Clamp Assembly	1	MP23039	303 SS

### SEAL TYPE OPTIONS

Seal PN	Seal Type	Shaft Dia.	Mating Ring	Material		
				Primary Ring	Elastomer	Components
MP22362	21	1.5"	Ceramic	Carbon	Viton	316 SS and 18-8 SS

## PARTS LIST / FLOMAX 15 HYDRAULIC STAINLESS STEEL (0.73)

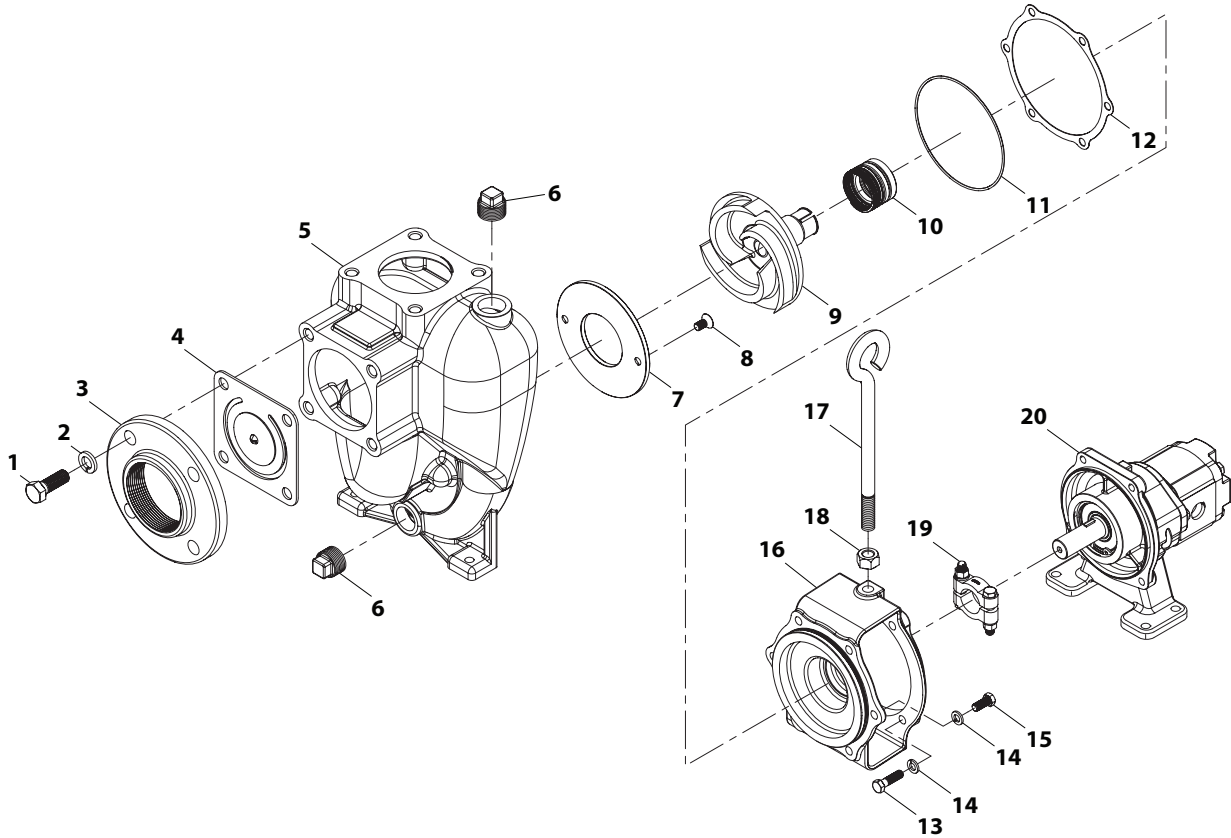


Figure 7

## PARTS LIST / FLOMAX 15 HYDRAULIC STAINLESS STEEL (0.73)

Item	Description (size)	Qty	Part No.	Mtl
1	Cap screw (5/8-11x1.75)	4	MP36606	304 SS
2	Lockwasher (5/8")	4	MP26853	304 SS
3	Suction Flange	1	MP38027	316 SS
4	Flapper Assembly	1	MP38077	SS / Viton
5	Housing	1	MP38011	316 SS
6	Pipe Plug (1" NPT)	2	MP34780	316 SS
7	Wear Plate	1	MP27979	316 SS
8	Screw (FHS 3/8" - 16" x 3/4")	2	MP37115	304 SS
9	Impeller	1	MP38070	316 SS
		1	MP36895	316 SS
10	See Table for seal options			

Item	Description (size)	Qty	Part No.	Mtl
11	O-Ring (AS-568-162)	1	MP29715	Viton
12	Gasket	1	MP22240	Lexide Ni-2085
13	Cap screw (3/8"-16")	4	MP21259	304 SS
14	Lockwasher (3/8" x 1/8")	10	MP21266	304 SS
15	Cap screw (3/8" - 16" x 7/8")	6	MP21251	304 SS
16	Adapter	1	MP38038	316 SS
17	Lift Eye	1	MP22460	Steel
18	Hexnut	1	MP22461	304 SS
19	Clamp Assembly	1	MP23039	303 SS
20	Pedestal Assembly	1	MP28551	Cast Iron

### SEAL TYPE OPTIONS

Seal PN	Seal Type	Shaft Dia.	Mating Ring	Material		
				Primary Ring	Elastomer	Components
MP22362	21	1.5"	Ceramic	Carbon	Viton	316 SS and 18-8 SS

## PARTS LIST / FLOMAX 15 PUMPAK BRONZE (184TC / 215 TC)

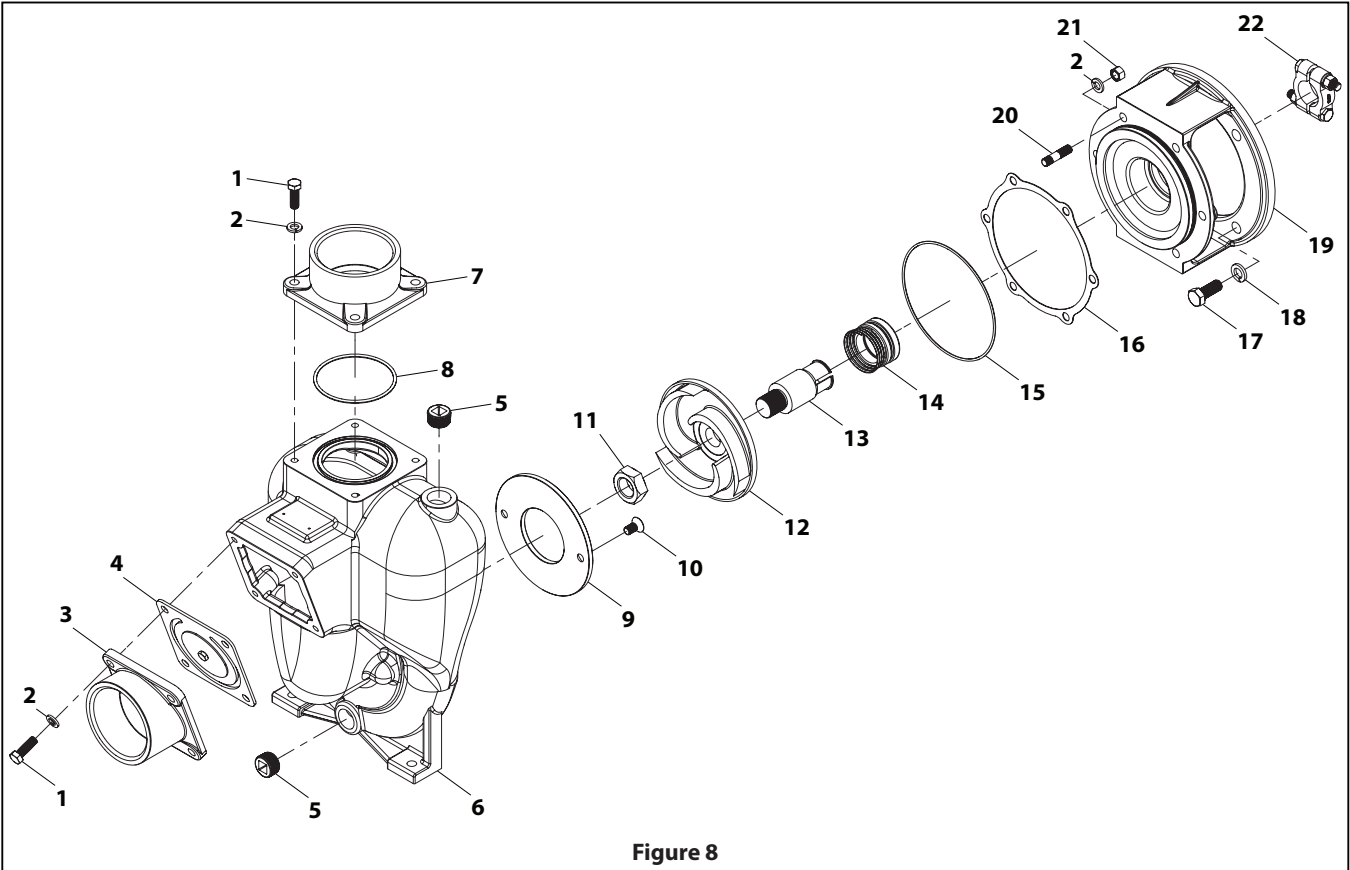


Figure 8

## PARTS LIST / FLOMAX 15 PUMPAK BRONZE (184TC / 215 TC)

Item	Description (size)	Qty	Part No.	Mtl
1	Capscrew (3/8"-16" x 1.13")	8	MP21291	304 SS
2	Lockwasher (3/8" x 1/8")	14	MP21266	304 SS
3	Suction Flange	1	MP22467	Federalloy I-836
4	Flapper Assembly	1	MP23040	Buna / Steel
5	Pipe Plug (3/4 NPT")	2	MP34332	Lead Free Brass
6	Housing	1	MP22350	Federalloy I-836
7	Discharge Flange	1	MP22470	Federalloy I-836
8	O-Ring	1	MP37138	Viton
9	Wear Plate	1	MP22243	Brass
10	Screw (FHS 3/8"-16" x 3/4")	2	MP37115	304 SS
11	Hex Jam Nut	1	MP22417	304 SS

Item	Description (size)	Qty	Part No.	Mtl
12	Impeller	1	MP22398	Federalloy I-836
		1	MP22498	Federalloy I-836
13	Drive Sleeve	1	MP22435	303 SS
14	See Table for seal options			
15	O-Ring (AS-568-162)	1	MP29715	Viton
16	Gasket	1	MP22240	Lexide Ni-2085
17	Capscrew (1/2"-13" x 1.25")	4	MP21246	304 SS
18	Lockwasher (1/2")	4	MP21254	304 SS
19	Adaptor	1	MP22432	Federalloy I-836
20	Stud (3/8"-16" x 1.63")	6	MP21261	304 SS
21	Hex nut (3/8" - 16")	6	MP21266	304 SS
22	Clamp Assembly	1	MP23039	303 SS

### SEAL TYPE OPTIONS

Seal PN	Seal Type	Shaft Dia.	Mating Ring	Material		
				Primary Ring	Elastomer	Components
MP22362	21	1.5"	Ceramic	Carbon	Viton	316 SS and 18-8 SS

## PARTS LIST / FLOMAX 15 PEDESTAL BRONZE

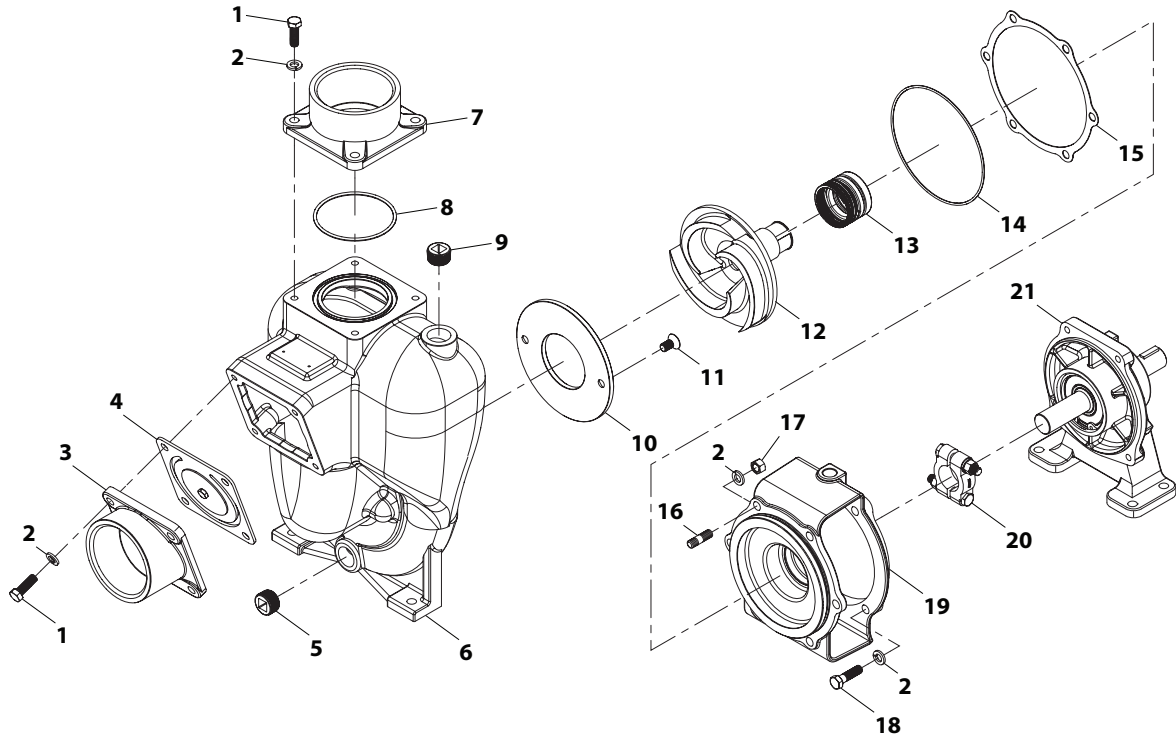


Figure 9

## PARTS LIST / FLOMAX 15 PEDESTAL BRONZE

Item	Description (size)	Qty	Part No.	Mtl
1	Capscrew (3/8"-16" x 1.13")	8	MP21291	304 SS
2	Lockwasher (3/8" x 1/8")	18	MP21266	304 SS
3	Suction Flange	1	MP22467	Federalloy I-836
4	Flapper Assembly	1	MP23040	Buna / Steel
5	Pipe Plug (3/4 NPT")	1	MP34332	Lead Free Brass
6	Housing	1	MP22350	Federalloy I-836
7	Discharge Flange	1	MP22470	Federalloy I-836
8	O-Ring	1	MP37138	Viton
9	Pipe Plug	1	MP35650	316 SS
10	Wear Plate	1	MP22243	Brass
11	Screw (FHS 3/8"-16" x 3/4")	2	MP37115	304 SS

Item	Description (size)	Qty	Part No.	Mtl
12	Impeller (5.75")	1	MP23037	Federalloy I-836
13	See Table for seal options			
14	O-Ring (A5-568-162)	1	MP29715	Viton
15	Gasket	1	MP22240	Lexide Ni-2085
16	Stud (3/8"-16" x 1.32")	6	MP21260	304 SS
17	Hexnut (3/8" - 16")	6	MP21268	304 SS
18	Capscrew (3/8"-16")	4	MP21259	304 SS
19	Adaptor	1	MP22347	Federalloy I-836
20	Clamp Assembly	1	MP23039	303 SS
21	Pedestal Assembly	1	MP26163	Cast Iron

### SEAL TYPE OPTIONS

Seal PN	Seal Type	Shaft Dia.	Mating Ring	Material		
				Primary Ring	Elastomer	Components
MP22362	21	1.5"	Ceramic	Carbon	Viton	316 SS and 18-8 SS

## PARTS LIST / FLOMAX 15 HYDRAULIC BRONZE (0.73)

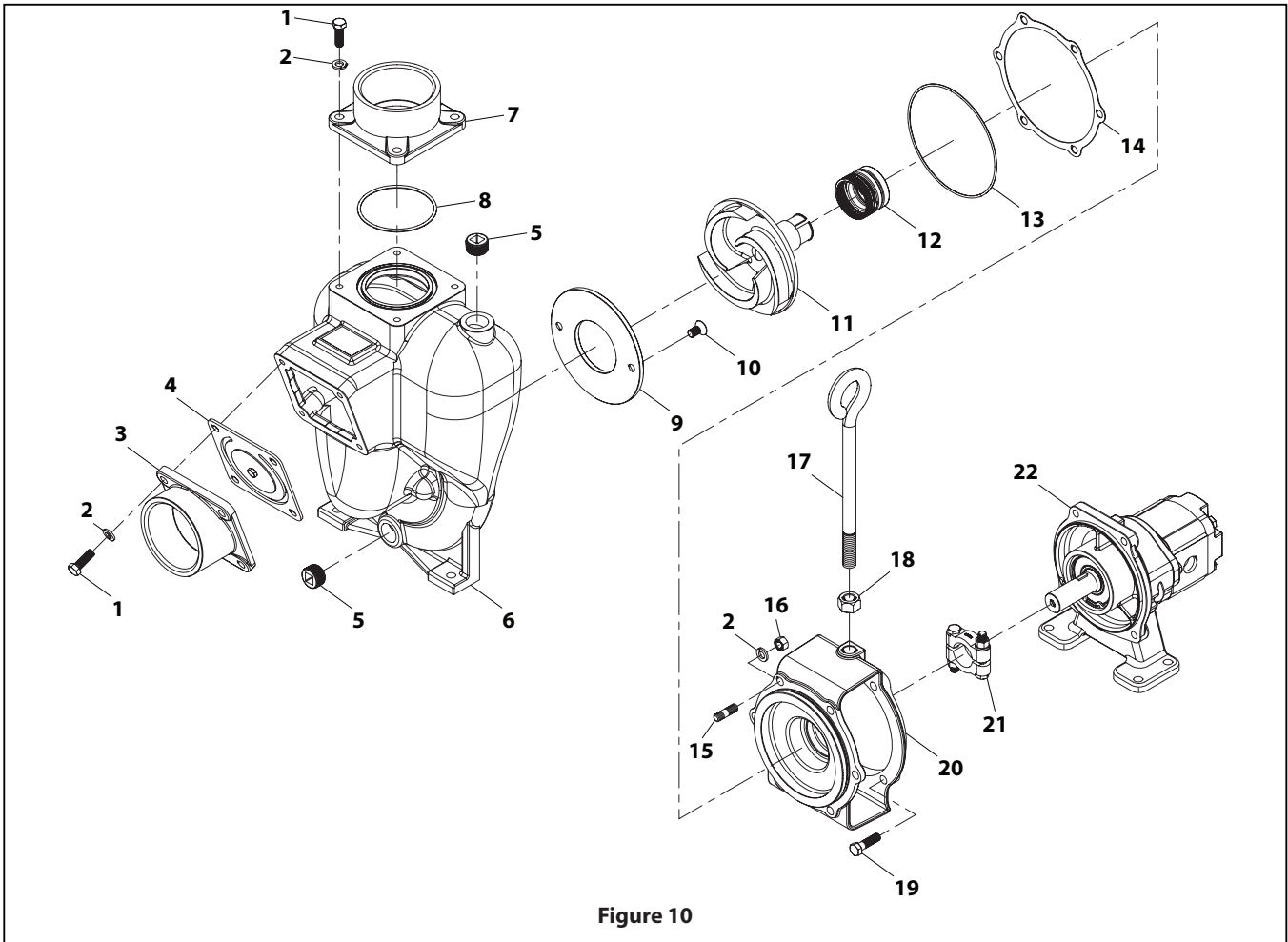


Figure 10

## PARTS LIST / FLOMAX 15 HYDRAULIC BRONZE (0.73)

1	Capscrew (3/8"-16" x 1.13")	8	MP21291	304 SS	12	See Table for seal options			
2	Lockwasher (3/8" x 1/8")	14	MP21266	304 SS	13	O-Ring (AS-568-162)	1	MP29715	Viton
3	Suction Flange	1	MP22467	Federalloy I-836	14	Gasket	1	MP22240	Lexide Ni-2085
4	Flapper Assembly	1	MP23040	Nitrile / Steel	15	Stud (3/8"-16" x 1.32")	6	MP21260	304 SS
5	Pipe Plug (3/4 NPT")	1	MP34332	Lead Free Brass	16	Hexnut (3/8" - 16")	6	MP21268	304 SS
6	Housing	1	MP22350	Federalloy I-836	17	Lift Eye	1	MP22460	Steel
7	Discharge Flange	1	MP22470	Federalloy I-836	18	Hexnut	1	MP22461	304 SS
8	O-Ring	1	MP37138	Viton	19	Capscrew (3/8"-16")	4	MP21259	304 SS
9	Wear Plate	1	MP22243	Brass	20	Adaptor	1	MP23493	Federalloy I-836
10	Screw (FHS 3/8"-16" x 3/4")	2	MP37115	304 SS	21	Clamp Assembly	1	MP23039	303 SS
11	Impeller (5.75")	1	MP30726	Federalloy I-836	22	Pedestal Assembly	1	MP28551	Cast Iron

### SEAL TYPE OPTIONS

Seal PN	Seal Type	Shaft Dia.	Mating Ring	Material		
				Primary Ring	Elastomer	Components
MP22362	21	1.5"	Ceramic	Carbon	Viton	316 SS and 18-8 SS



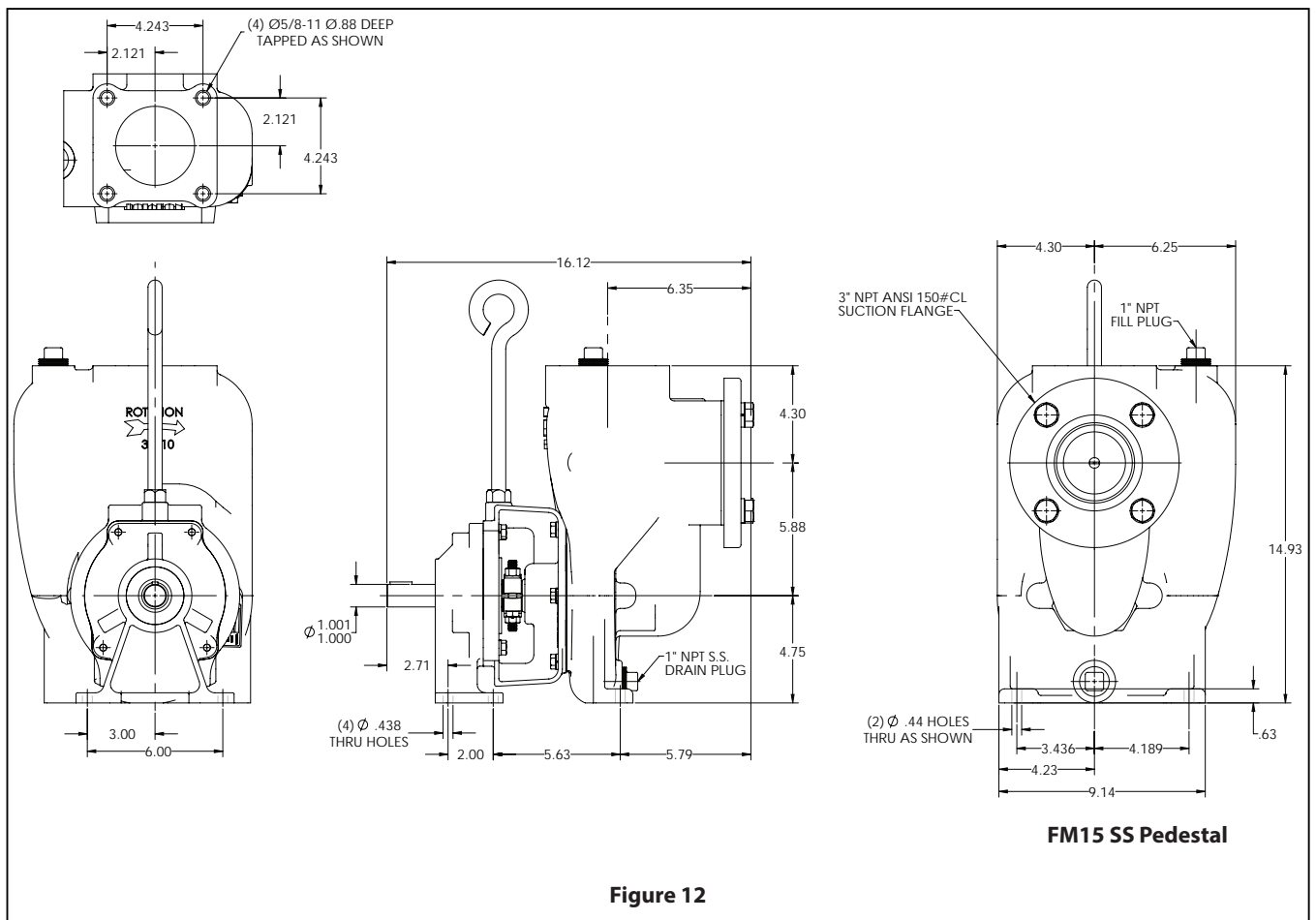
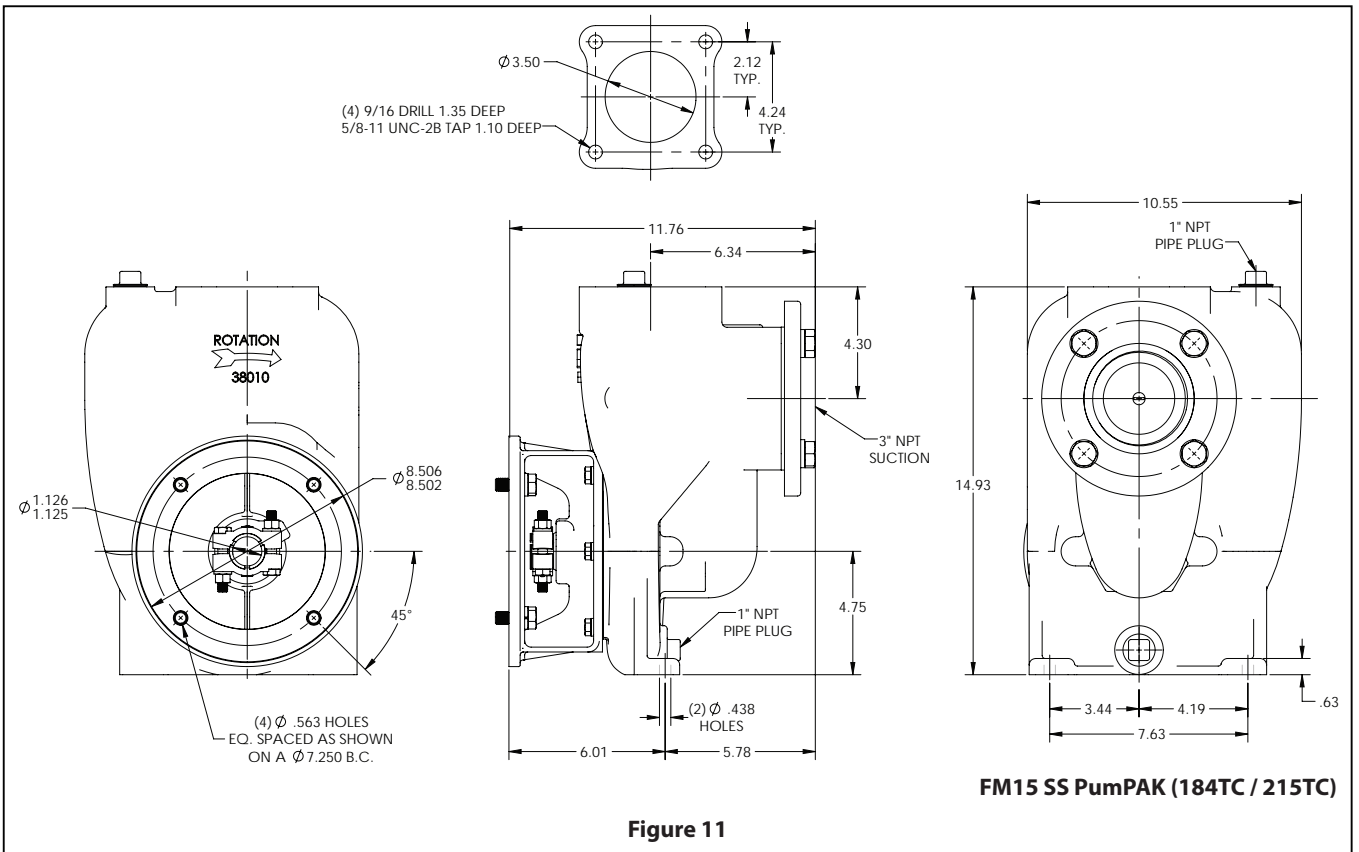
## SERVICE KITS

PUMP MODEL	PUMP DESCRIPTION	SEAL KIT	IMPELLER KIT	BEARING KIT
MP39236	FM15PMP SS:PED/HYD 6.0 5BL EP FLP	MP51504	----	MP51490
MP38155	FM15PMP SS:PED/HYD 6.0 SSC	----	----	MP51490
MP38753	FM15PMP SS:C:HYD/PED 5.94DI DSC W/FNC.73	----	----	MP51490
MP50215	FM15PMP SS:PED/HYD 5.75	----	----	MP51490
MP37089	FM15PMP SS:PED/HYD 5.75 EP FLP GSK	MP51504	----	MP51490
MP37038	FM15PMP SS:PED/HYD 6.0 EP FLP	MP51504	----	MP51490
MP38119	FM15PMP SS:PED/HYD 6.0	----	----	MP51490
MP39369	FM15PMP SS:PED/HYD 6.0 5BL	----	----	MP51490
MP50221	FM15PMP SS:PED/HYD 5.94 DSC	----	----	MP51490
MP35123	FM15PMP SS:PED/HYD 6.0 NRS NO MTR 5BL	----	----	MP51490
MP35204	FM15PMP SS:PED/HYD 5BL NEO NRS 6.0 V-FLP	----	----	MP51490
MP39674	FM15PMP SS:PED 5.5 SSC	----	----	MP51490
MP35194	FM15PMP SS:PED 6.0 BUNA	----	----	MP51490
MP50025	FM15PMP SS:PED 5.56 5BL EPDM	MP51504	----	MP51490
MP50620	FM15PMP SS:PED 6.0 5BL W/O SUC FLG	----	----	MP51490
MP39557	FM15PMP SS:PED 6.0 EPDM	MP51504	----	MP51490
MP35789	FM15PMP SS:C:PED 5.94DI T-31 DSC W/FNC	----	----	MP51490
MP50458	FM15PMP SS:10-3 215T XP 5.8 5BL CSC EP	----	----	MP51490
MP39593	FM15PMP SS:PED 6.0 5BL NRS NEO	----	----	MP51490
MP36290	FM15PMP SS:PED 4.88 5BL VITON	----	----	MP51490
MP50015	FM15PMP SS:PED 5.0 DSC	----	----	MP51490
MP50048	FM15PMP SS:PED 5.8 DSC	----	----	MP51490
MP36747	FM15PMP SS:PED 4.88 SSC EP FLP 5BL	----	----	MP51490
MP50719	FM15PMP SS:PED 5.88 3BL	----	----	MP51490
MP39273	FM15PMP SS:10-3 215T 208/460 6.0 WBA	----	----	MP51490
MP39473	FM15PMP SS:PED 5.5 5BL	----	----	MP51490
MP39494	FM15PMP SS:PED 6.0 5BL SSC	----	----	MP51490
MP37208	FM15PMP SS:PED 5.5	----	----	MP51490
MP37965	FM15PMP SS:PED 6.0 5BL EP-FLP/GSK	MP51504	----	MP51490
MP38054	FM15PMP SS:PED 6.0 3BL EP SEAL/FLP/GSK	MP51504	----	MP51490
MP38056	FM15PMP SS:10-3 215T XP 5.56 5BL SSC	----	----	MP51490
MP39866	FM15PMP SS:PED 5.94 DSC	----	----	MP51490
MP38416	FM15PMP SS:5-3 184T 5.5 3BL BCF	----	----	MP51490
MP34793	FM15PMP SS:PED 6.0	----	----	MP51490
MP38433	FM15PMP SS:PED 6.0 5BL	----	----	MP51490
MP50805	FM15PMP SS:PED 6.0 + 38647 KIT	----	----	MP51490
MP38769	FM15PMP SS:PED 5.5 EPDM	MP51504	----	MP51490
MP39075	FM15PMP SS:PED 6.0 NRS NEO	----	----	MP51490
MP50955	FM15PMP SS:PED 5.88 3BL SSC	----	----	MP51490
MP39100	FM15PMP SS:5-3 184T 5.75 3BL BCF	----	----	MP51490
MP39101	FM15PMP SS:PED 5.75	----	----	MP51490
MP37033	FM15PMP SS:PED 6.0 SSC	----	----	MP51490
MP38384	FM15PMP SS:10-3 215C 6.0 EP SEAL FLP GSK	MP51504	----	----
MP39079	FM15PPK SS:PEM 6.0 EP-FLP/GSK NO SUC FLG	MP51504	----	----
MP37966	FM15PPK SS:PEM 6.0 3BL EP-FLP/GSK	MP51504	----	----
MP21383	FM15PPK B:C:CMTR 1.13 5.75	MP51485	----	----
MP36967	FM15PMP B:7.5-3 184TC WDM IEE45 5.75 WBA	MP51485	----	----
MP22837	FM15PMP B:7.5-3 184TC 5.75BI WBA	MP51485	----	----
MP37041	FM15PMP B:PED/CL 12V 6.0 DIS-EL	MP51485	----	MP51490
MP29342	FM15PMP B:PED/HYD 5.75	MP51485	----	MP51490
MP37042	FM15PMP B:PED/CL 24V 6.0 DIS-EL	MP51485	----	MP51490
MP21380	FM15PMP B:PED 6.0	MP51485	----	MP51490
MP24825	FM15PMP B:PED 5.75	MP51485	----	MP51490

## SERVICE KITS

PUMP MODEL	PUMP DESCRIPTION	SEAL KIT	IMPELLER KIT	BEARING KIT
MP36168	FM15PMP B:7.5-3 213T 208/460 6.0BI	MP51485	----	MP51490
MP27006	FM15PMP B:PED 5.5	MP51485	----	MP51490
MP51156	FM15PPK B:PEM 6.0 SI	MP51485	----	----
MP21371	FM15PPK B:PEM 6.0 BF	MP51485	----	----
MP24399	FM15PMP B:5-3 184TC 5.5 WBA	MP51485	----	----
MP24828	FM15PPK B:CCMTR 1.13 5.5CDI	MP51485	----	----
MP28324	FM15PMP B:7.5-3 184TC 6.0 WBA	MP51485	----	----
MP28423	FM15PMP B:7.5-3 184TC 6.0 SS PLUG WBA	MP51485	----	----
MP37999	FM15PMP B:10-3 215C 6.0SI 5BL SSWP WBA	MP51485	----	----
MP38774	FM15PMP B:7.5-1 184TC 5.88SI 5BL WBA	MP51485	----	----
MP29984	FM15PPK B:CCMTR 1.13 6.0	MP51485	----	----
MP39038	FM15PPK B:CCMTR 1.12 6.0SI 3BL SSWP	MP51485	----	----
MP33359	FM15PPK B:CCMTR 1.12 5.56SI 5BL	MP51485	----	----
MP39498	FM15PMP B:7.5-3 184TC 6.0SI SSWP WBA	MP51485	----	----
MP50684	FM15PMP B:5-3 184TC 50HZ 6.0	MP51485	----	----
MP51154	FM15PMP B:7.5-1 184TC 6.0 SI WBA	MP51485	----	----
MP35280	FM15PPK B:CCMTR 1.12 5.75SI 5BL RD	MP51485	----	----
MP51197	FM15PPK B:CCMTR 1.12 5.75CSI 3BL SSWP	MP51485	----	----

## DIMENSIONAL DATA



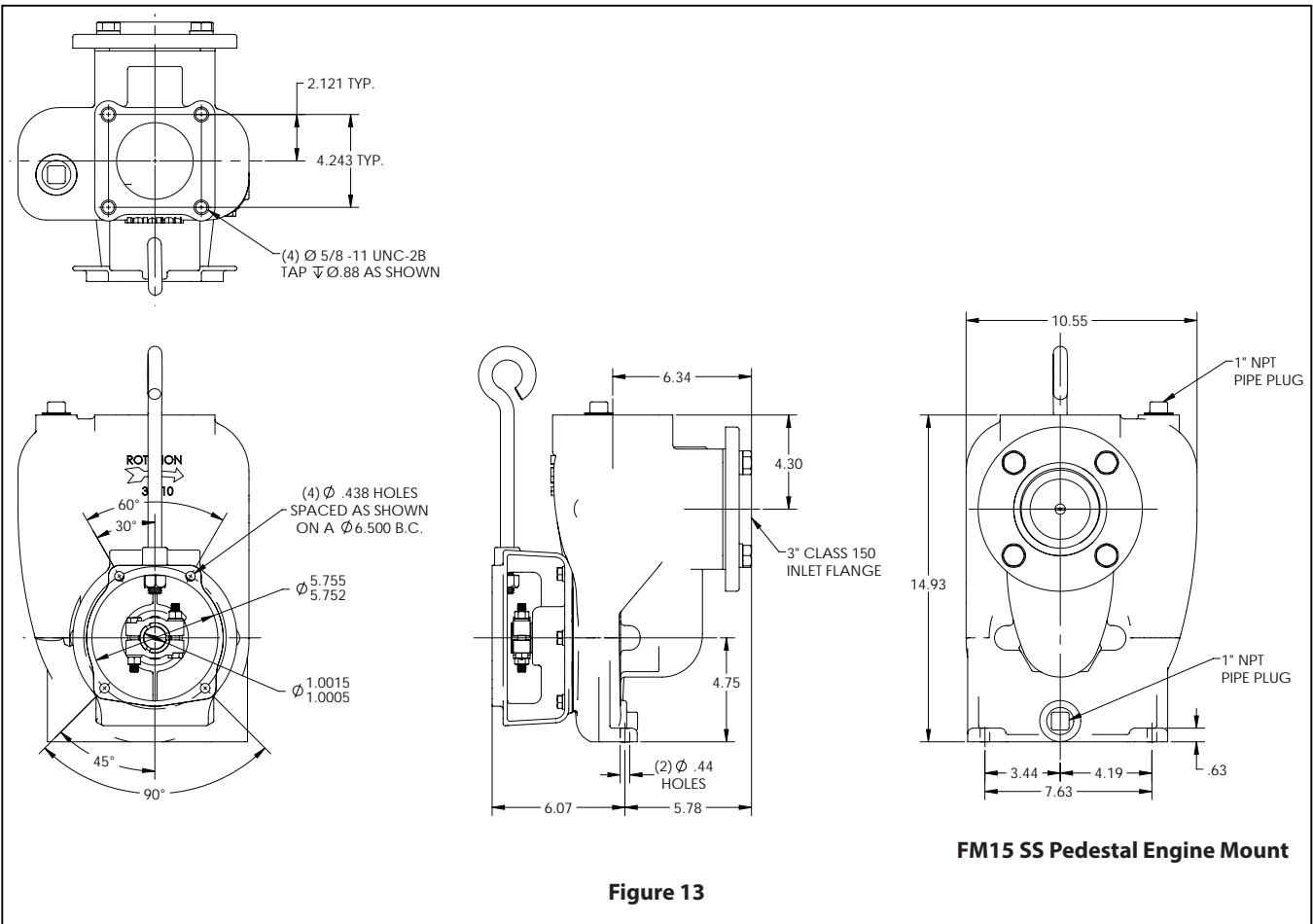


Figure 13

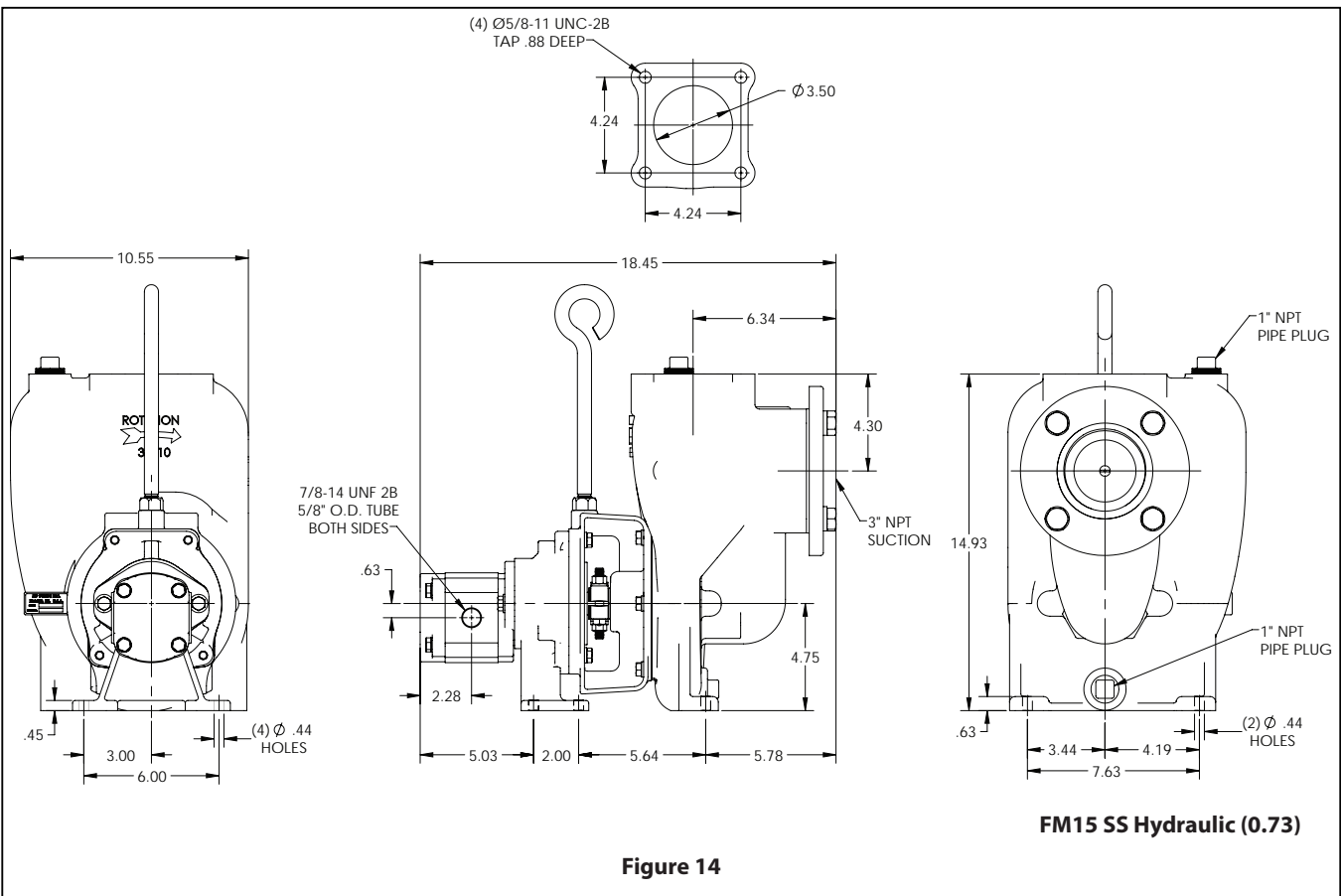
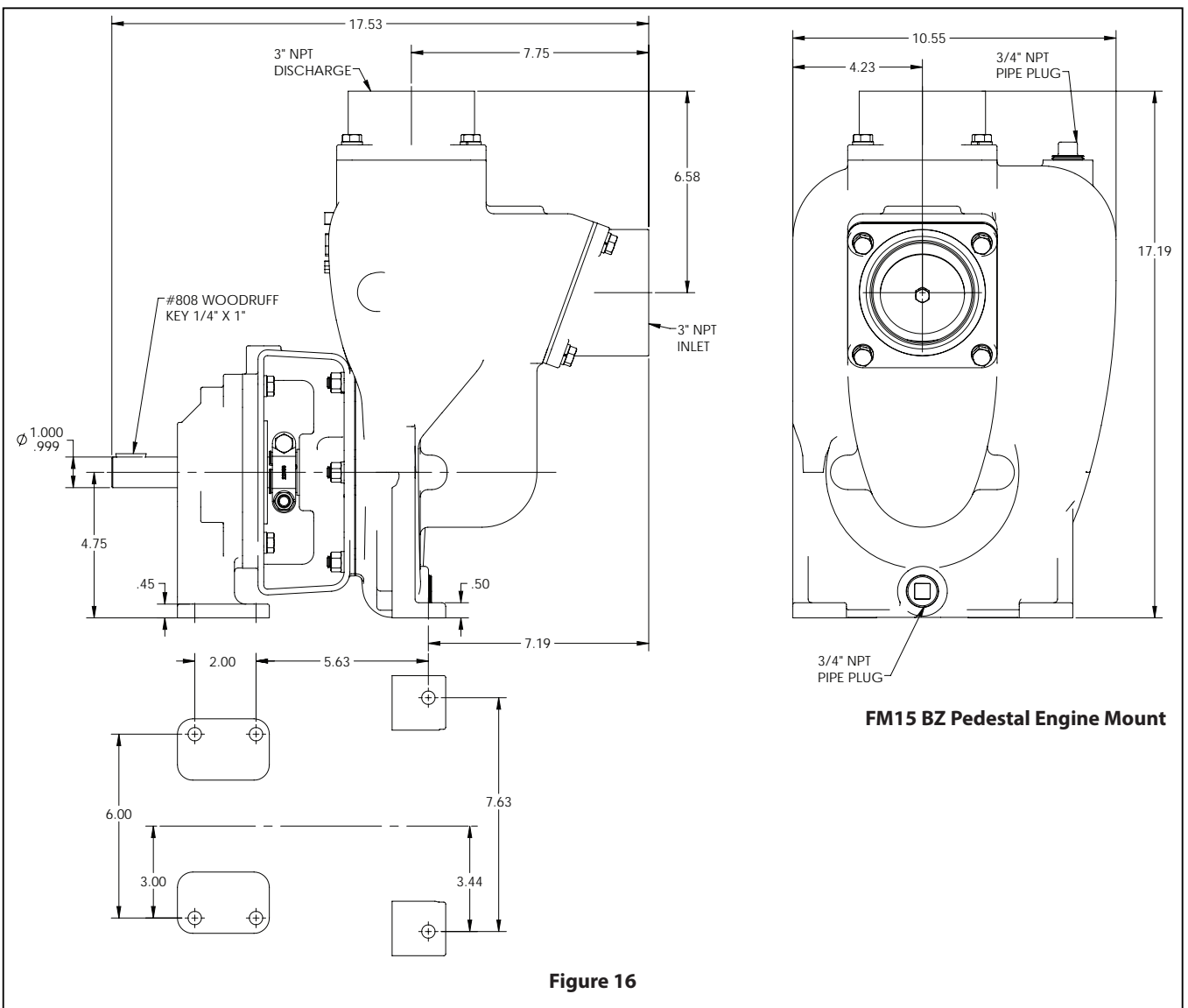
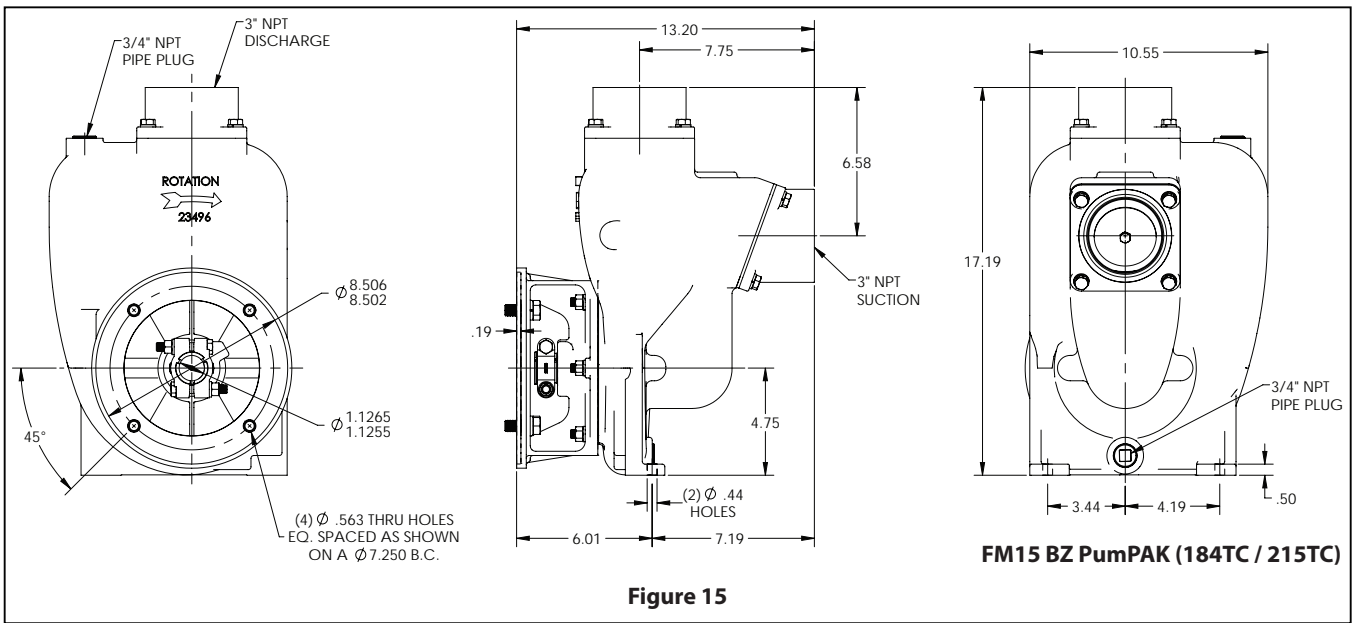
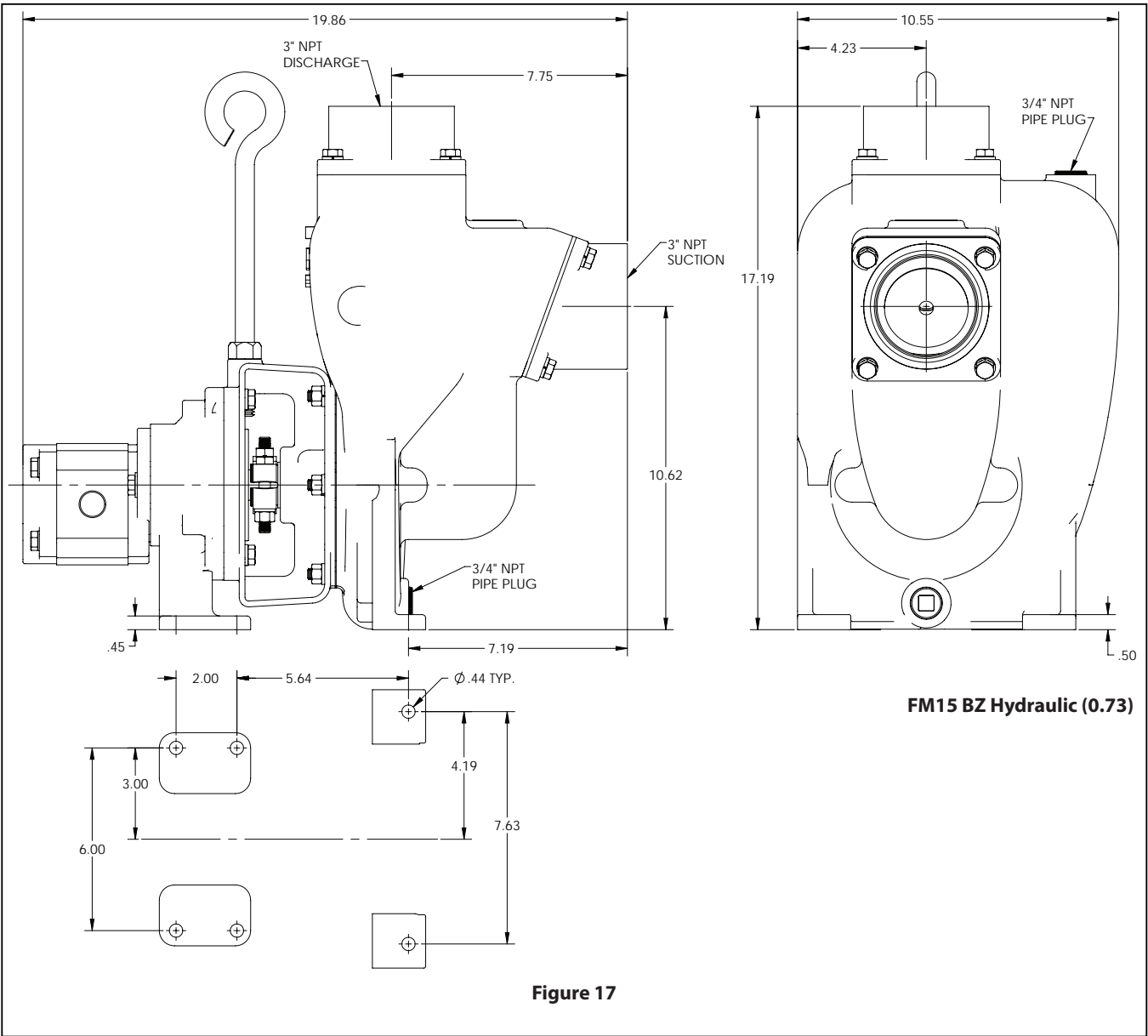


Figure 14





**Figure 17**

## TROUBLESHOOTING

PROBLEM	PROBABLE CAUSE	REMEDY
<b>No liquid delivered.</b>	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.
<b>Pump not producing rated flow or head.</b>	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.
<b>Pump starts then stops pumping.</b>	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.
<b>Bearings run hot.</b>	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'