

OPERATOR'S MANUAL

FLOMAX 30

INCLUDING: OPERATION, INSTALLATION AND MAINTENANCE

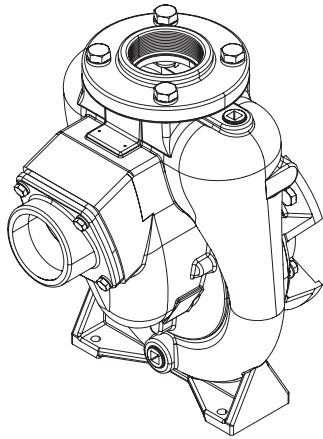
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FLOMAX® 30 (Cast Iron 3" X 3")

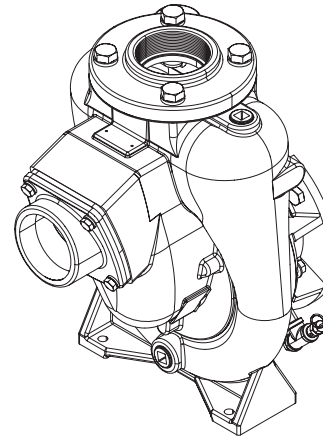


**READ THIS MANUAL CAREFULLY BEFORE INSTALLING,
OPERATING OR SERVICING THIS EQUIPMENT.**

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

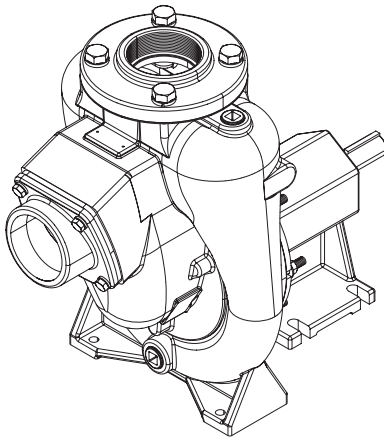


Standard Seal

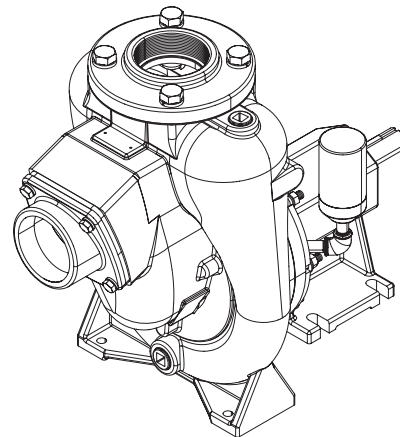


With Double Seal

PumPAK Models

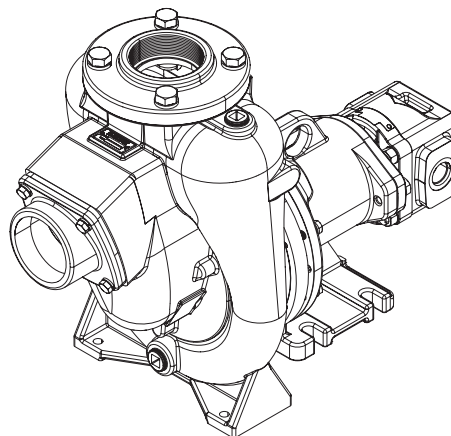


Standard Seal



With Double Seal

Pedestal Models



Hydraulic Models

Figure 1

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GENERAL DESCRIPTION

FLOMAX 30:**3" x 3" Self Priming Pump Centrifugal Pump**

Flomax® 30 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	3" x 3" NPT
Application	Agricultural, Industrial, Marine, OEM
Materials of construction	Cast iron
Flow	
PumPAK.....	Up to 480 gpm (1817 lpm)
Head Feet	
PumPAK.....	Up to 190 ft (57.9 m)
Suction lift	Up to a 25 ft (7.6 m)
Impeller	7.0" (177.8 mm) semi-open
Motor	Up to 30 HP (22.37 kw)
IEC Mounts	Up to 30 HP (22.37 kw)
Maximum Solid Size	0.6" (15.2 mm) diameter
Drive Options	Close coupled 184TC, 215TC, 256TC and 286TSC Pedestal PumPAK® (without motor)
Seal	Standard carbon / Ceramic / Viton Special seal material combinations available (Consult factory)
Drive Sleeve	316 stainless steel
Options	Hydraulic motors with flow control, 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):

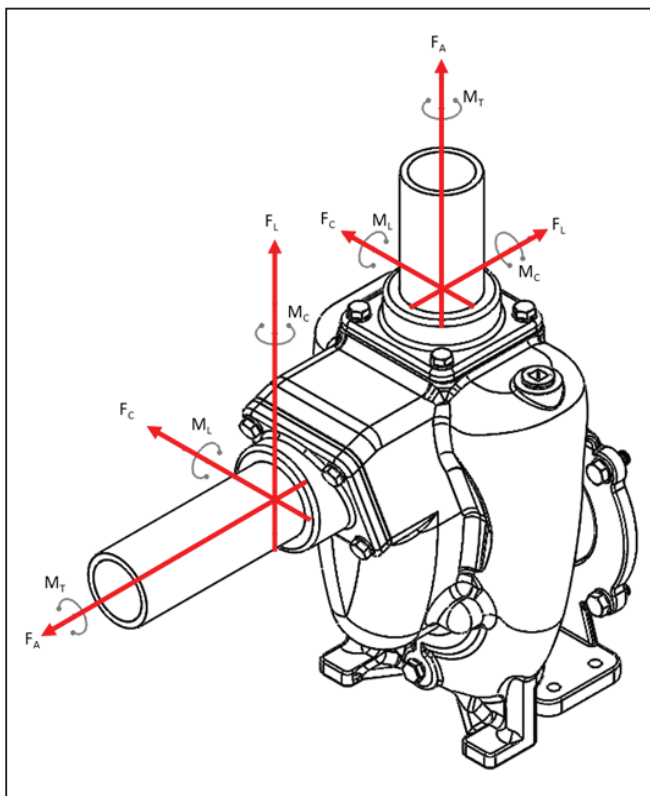
Check the shaft to insure that it rotates freely. Shafts should be aligned in accordance with the instructions of the coupling manufacturer. Final alignment must be performed after the pump has been completely installed and the pump and driver are at operating temperature. Proper shaft alignment is the 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)	FLOMAX 30 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

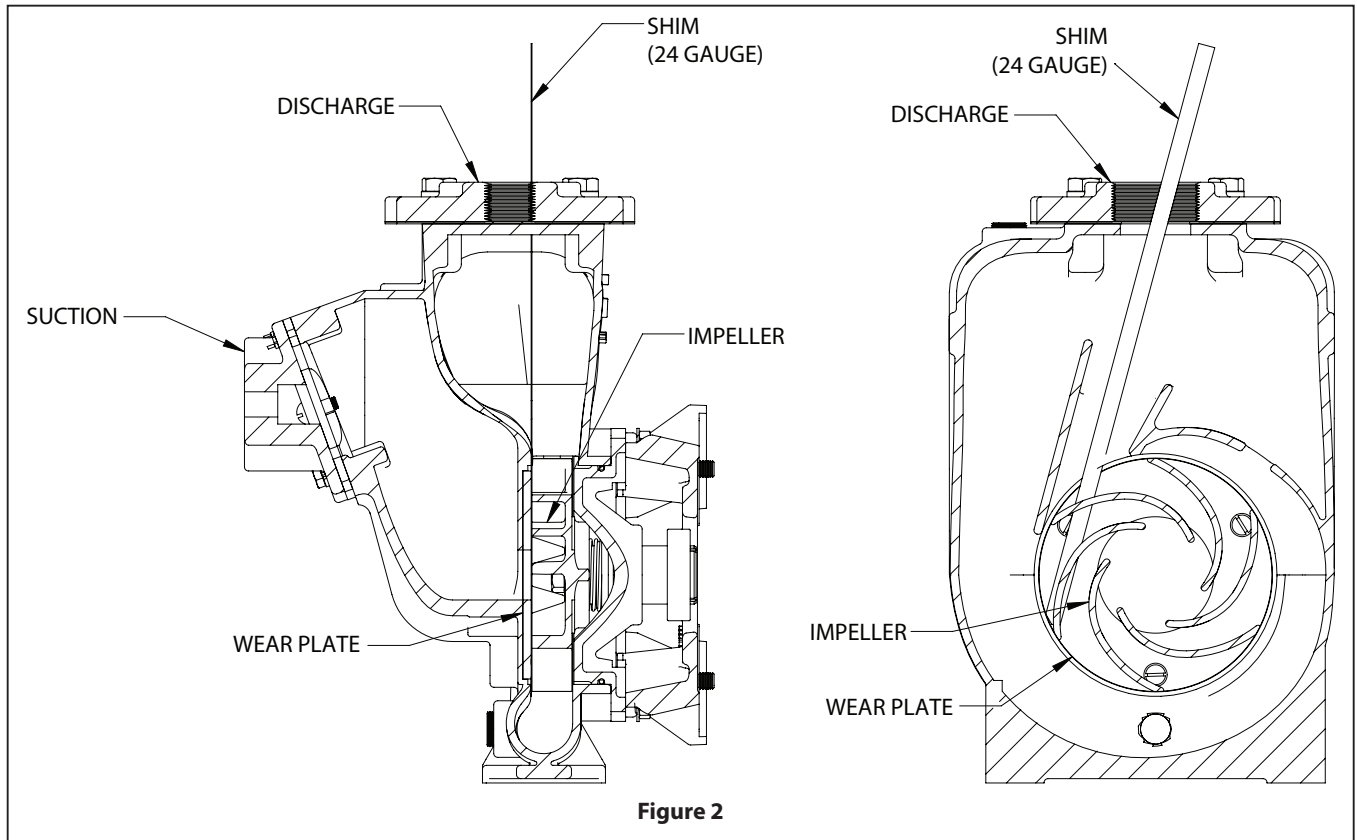
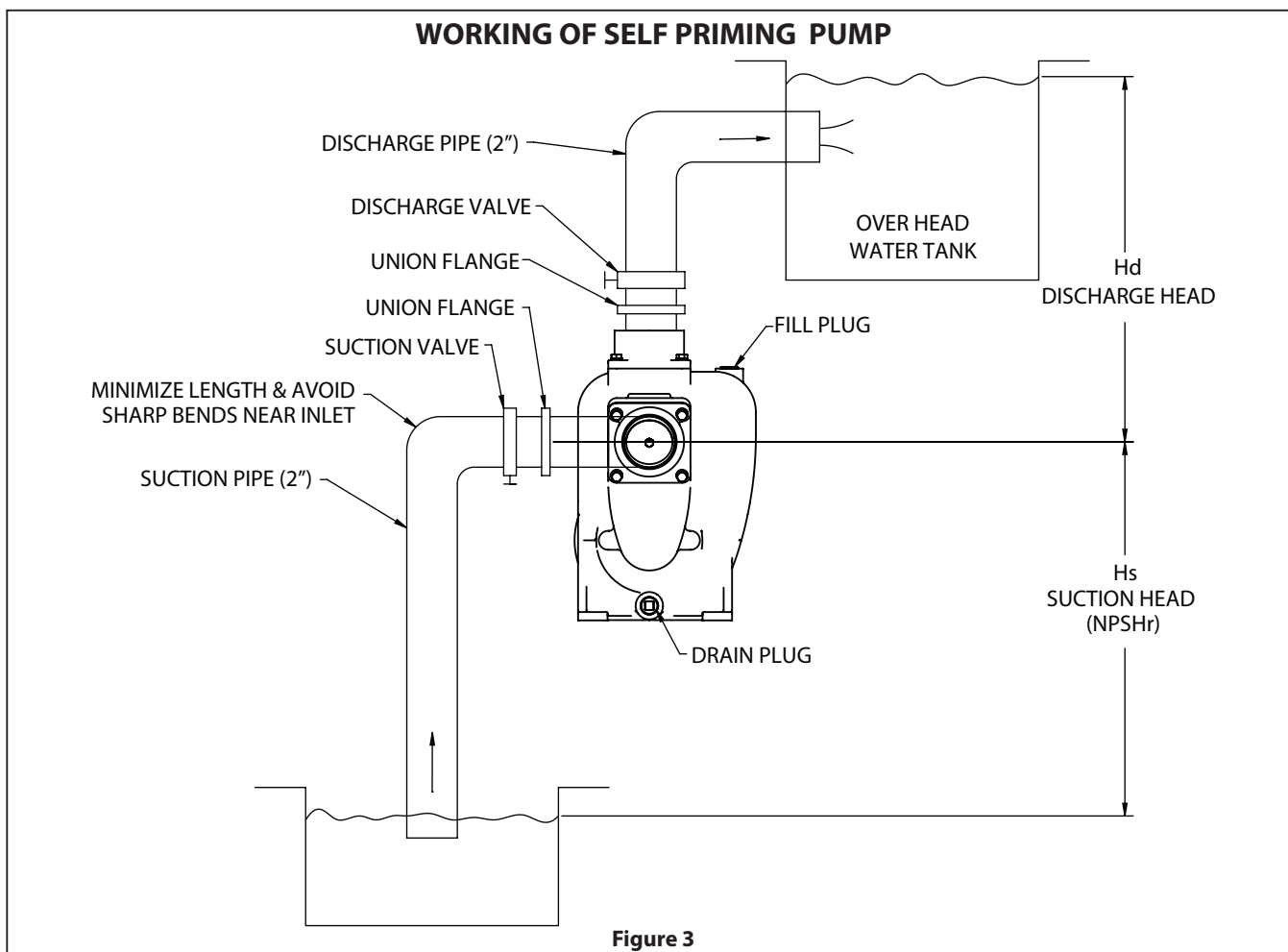


Figure 2



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 bellow and cage.

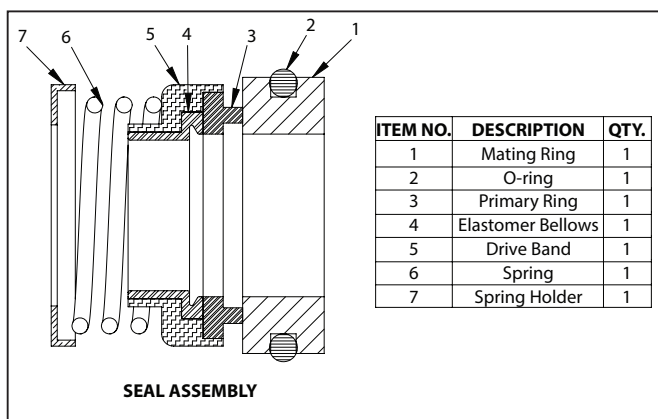
MP Pumps rebuild kits include a new drive sleeve to avoid the possibility of damaging the drive sleeve. See back of manual for list of seal kits and corresponding rebuild kits. Impellers are also available if wear or damage is present.

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.

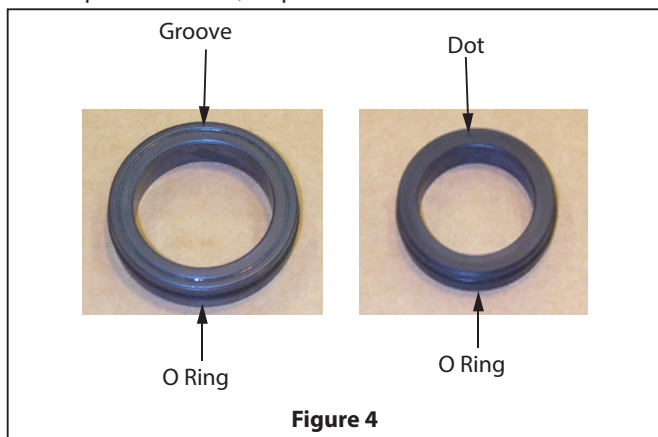


Figure 4

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.

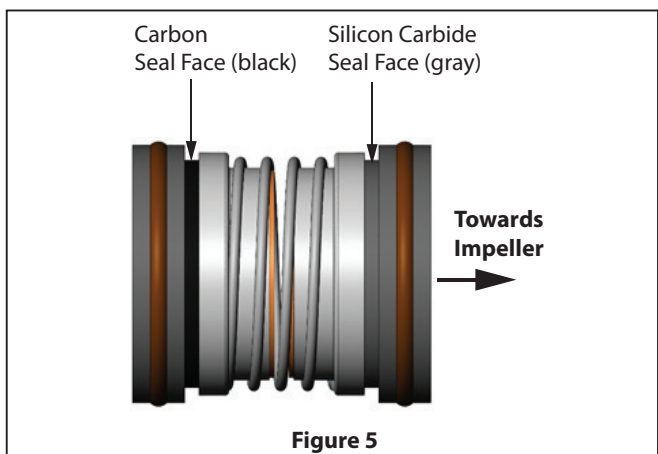


Figure 5

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.

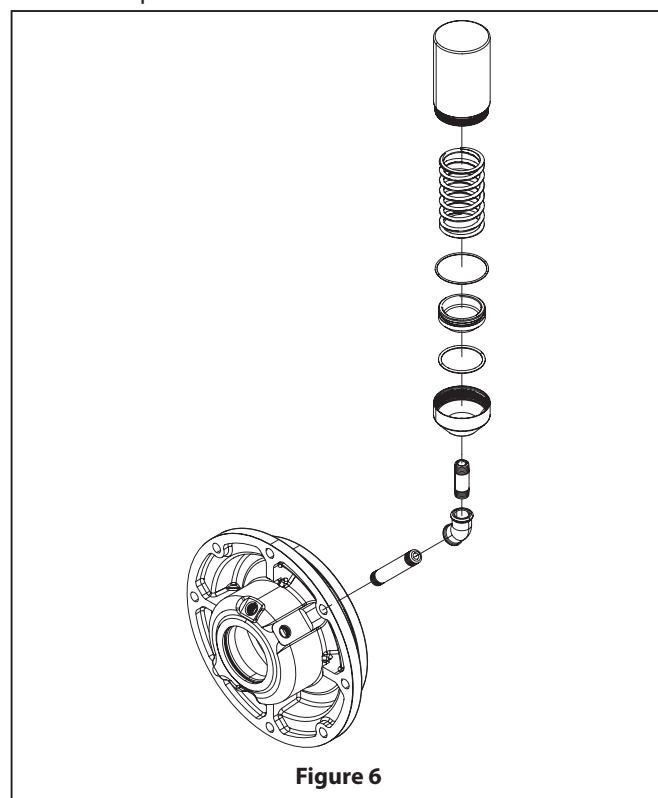


Figure 6

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 30 PUMPAK (184TC / 215TC / 256TC / 286TSC)

Item	Description (size)	Qty	Part No.	Mtl
1	Capscrew (3/8"-16" x 1.25")	4	MP21274	304 SS
2	Lockwasher (3/8" x 1/8")			
	(184TC, 256TC)	8	MP21266	304 SS
	(215TC, 286TSC)	4	MP21266	304 SS
3	Check Valve Body	1	MP40537	Cast Iron
4	Flapper Assembly	1	MP42147	Buna
5	Pipe Plug	2	MP41481	316 SS
6	Volute	1	MP31822	Cast Iron
7	Capscrew (5/8"-11" x 1.75")	4	MP36606	304 SS
8	Lockwasher (3/8")	4	MP26853	304 SS
9	Flange	1	MP32033	Cast Iron
10	Gasket	1	MP32034	Buna
11	Wear Plate	1	MP31830	Steel
12	Screw (FHS 5/16"-18")	3	MP28742	304 SS
13	Hex Jam Nut	1	MP 29194	316 SS
14	Impeller (7.0)	1	MP31819	Ductile Iron
	Impeller (6.75)	1	MP33177	Cast Iron
	Impeller (7.0)	1	MP34329	Federalloy I-836
	Impeller (6.35)	1	MP33178	Cast Iron
	Impeller (5.75)	1	MP39856	Ductile Iron
	Impeller (6.75)	1	MP34330	Federalloy I-836
15	Drive Sleeve			
	(184TC)	1	MP31094	316 SS
	(215TC)	1	MP31311	316 SS
	(256TC, 286TSC)	1	MP31833	316 SS

Item	Description (size)	Qty	Part No.	Mtl
16	Spacer (only for 184TC, 215TC)	1	MP31838	316 SS
17	See Table for seal options			
18	O-Ring	1	MP32020	Viton
19	Seal Housing			
	(184TC, 215TC)	1	MP31824	Cast Iron
	(256TC, 286TSC)	1	MP31825	Cast Iron
20	Flat Washer			
	(184TC)	4	MP28053	304 SS
	(215TC, 286TSC)	8	MP28053	304 SS
21	Capscrew (3/8"-16" x 7/8")	4	MP21251	304 SS
22	Motor Adaptor			
	(184TC, 215TC)	1	MP31091	Cast Iron
	(256TC)	1	MP31892	Cast Iron
	(286TSC)	1	MP33688	Cast Iron
23	Capscrew (1/2"-13" x 3/4") (184TC, 215TC and 286TSC)	4	MP31235	304 SS
	Capscrew (1/2"-13" x 1.0") (256TC)	4	MP33480	304 SS
24	Stud (3/8"-16" x 1.63")	4	MP21261	304 SS
25	Hex nut (3/8" - 16")	4	MP21268	304 SS
26	Clamp Assembly			
	(184TC)	1	MP31099	Steel
	(215TC)	1	MP31312	Steel
	(256TC, 286TC)	1	MP33036	Steel

SEAL TYPE OPTIONS

Seal PN	Seal Type	Shaft Dia.	Mating Ring	Material		
				Primary Ring	Elastomer	Components
MP26685	21	1.75"	Ceramic	Carbon	Viton	316 SS
MP31374	21	1.5"	Ceramic	Carbon	Viton	316 SS
MP35651	2	1.5"	Silicon Carbide	Carbon	Viton	316 SS

PARTS LIST / FLOMAX 30 PUMPAK (184TC / 215TC) (DOUBLE SEAL)

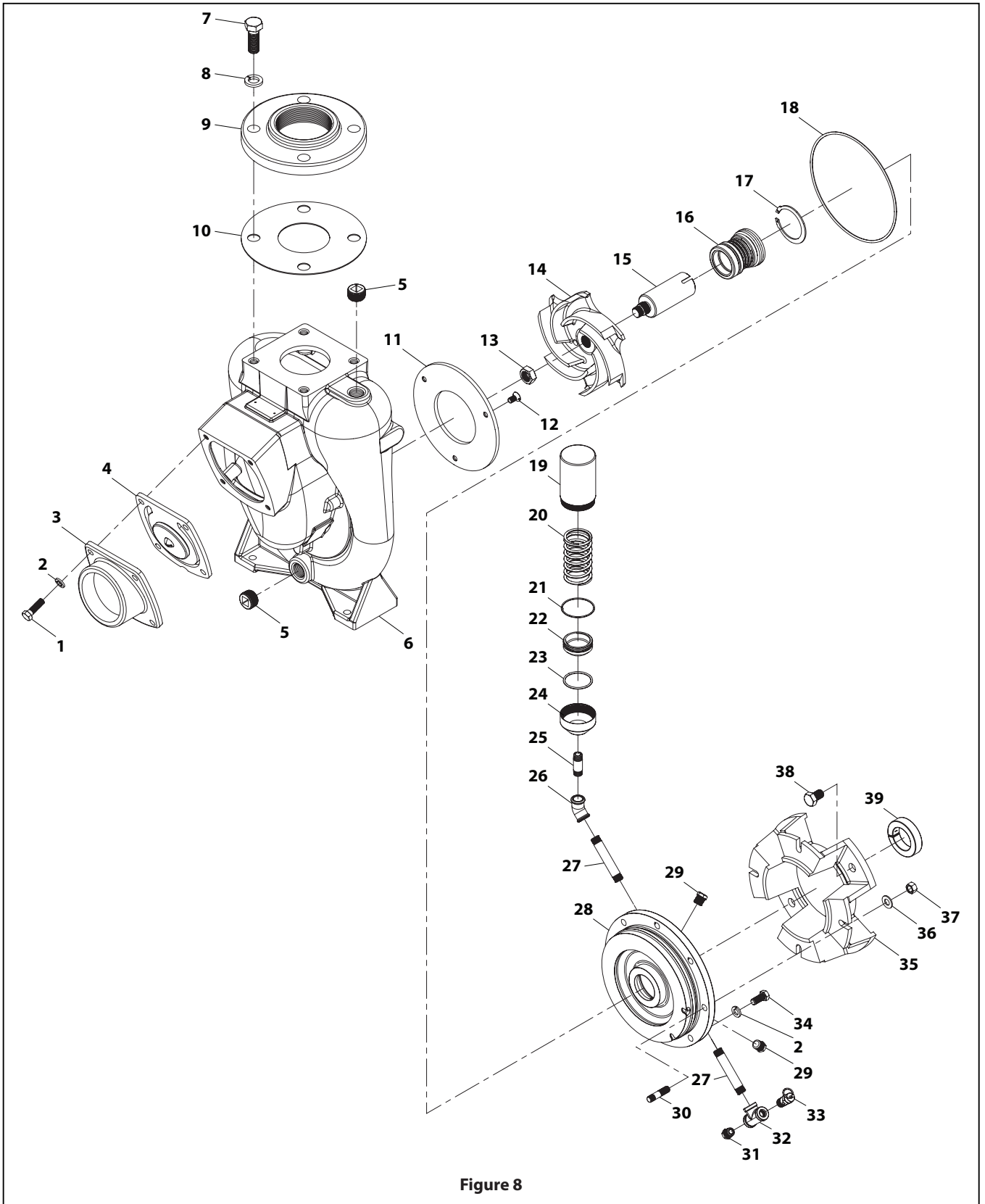


Figure 8

PARTS LIST / FLOMAX 30 PUMPAK (184TC / 215TC) (DOUBLE SEAL)

Item	Description (size)	Qty	Part No.	Mtl
1	Capscrew (3/8"-16" x 1.25")	4	MP21274	304 SS
2	Lockwasher (3/8" x 1/8")	8	MP21266	304 SS
3	Check Valve Body	1	MP40537	Cast Iron
4	Flapper Assembly	1	MP42147	Buna
5	Pipe Plug	2	MP41481	316 SS
6	Volute	1	MP31822	Cast Iron
7	Capscrew (5/8"-11" x 1.75")	4	MP36606	304 SS
8	Lockwasher (3/8")	4	MP26853	304 SS
9	Flange	1	MP32033	Cast Iron
10	Gasket	1	MP32034	Buna
11	Wear Plate	1	MP31830	304 SS
12	Screw (FHS 5/16"-18"x5/8")	3	MP28742	304 SS
13	Hex Jam Nut	1	MP 29194	316 SS
14	Impeller (6.35)	1	MP33163	Cast Iron
	Impeller (6.00)	1	MP33615	Cast Iron
	Impeller (6.75)	1	MP33162	Cast Iron
15	Drive Sleeve			
	(184TC)	1	MP31094	316 SS
	(215TC)	1	MP31311	316 SS
16	See Table for seal options			
17	Snap Ring	1	MP29335	Carbon Spring Steel
18	O Ring (AS568-262)	1	MP32020	Viton

Item	Description (size)	Qty	Part No.	Mtl
19	Reservoir	1	MP38361	AL T-3 2011
20	Spring	1	MP38358	Music Wire
21	O-Ring (AS-586-032)	1	MP38363	Viton
22	Piston	1	MP38360	AL T-3 2011
23	O-Ring (AS-586-129)	1	MP38362	Viton
24	End Cap	1	MP39299	AL
25	Pipe Nipple (1/4" NPT X 1.5)	1	MP28635	304 SS
26	Elbow	1	MP41668	304 SS
27	Nipple	1	MP41652	304 SS
28	Seal Housing	1	MP31827	Cast Iron
29	Pipe Plug (1/4" NPT)	2	MP33639	304 SS
30	Stud (3/8"-16" x 1.63")	4	MP21261	304 SS
31	Grease Fitting (1/4" NPT)	1	MP31735	Zinc Plated Steel
32	Tee (1/4" NPT)	1	MP31734	Steel
33	Relief Valve (1/4" NPT)	1	MP31733	Brass
34	Capscrew (3/8"-16" x 7/8")	4	MP21251	304 SS
35	Motor Adaptor	1	MP31091	Cast Iron
36	Flat Washer	4	MP28053	304 SS
37	Hex nut (3/8" - 16")	4	MP21268	304 SS
38	Capscrew (1/2"-13" x 3/4")	4	MP31235	304 SS
39	Clamp Assembly			
	(184TC)	1	MP31099	Steel
	(215TC)	1	MP31312	Steel

SEAL TYPE OPTIONS

Seal PN	Seal Type	Shaft Dia.	Mating Ring	Material		
				Primary Ring	Elastomer	Components
MP30660	21	1.5	Tungsten/Ceramic	Carbon/Silicon	Viton	316 SS

PARTS LIST / FLOMAX 30 PEDESTAL

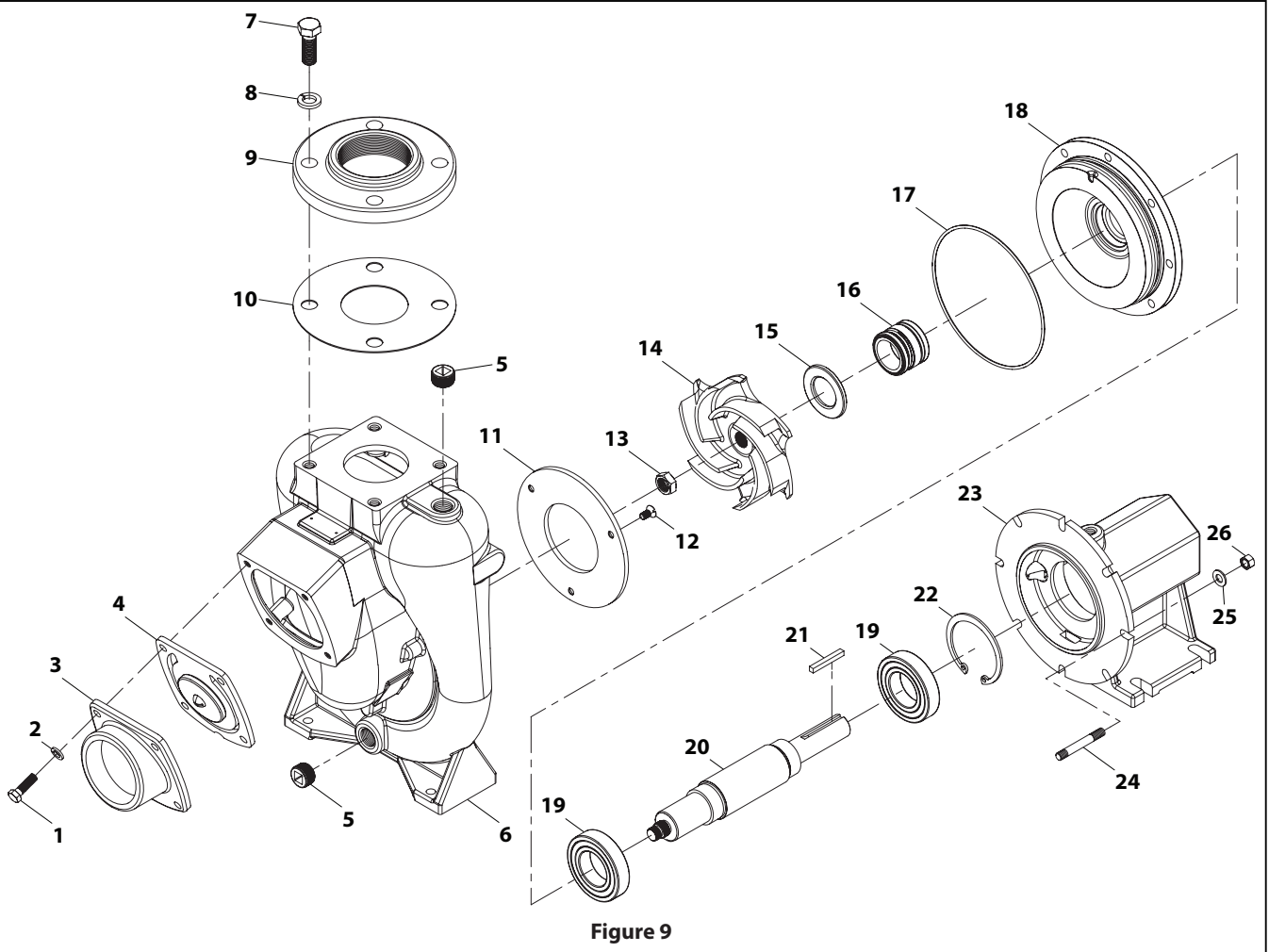


Figure 9

PARTS LIST / FLOMAX 30 PEDESTAL

Item	Description (size)	Qty	Part No.	Mtl
1	Cap screw (3/8"-16" x 1.25")	4	MP21274	304 SS
2	Lockwasher (3/8" x 1/8")	4	MP21266	304 SS
3	Check Valve Body	1	MP40537	Cast Iron
4	Flapper Assembly	1	MP42147	Nitrile / Cast Iron
5	Pipe Plug	2	MP41481	316 SS
6	Volute	1	MP31822	Cast Iron
7	Cap screw (5/8"-11" x 1.75")	4	MP36606	304 SS
8	Lockwasher (3/8")	4	MP26853	304 SS
9	Flange	1	MP32033	Cast Iron
10	Gasket	1	MP32034	Buna
11	Wear Plate	1	MP31830	Steel
12	Screw (FHS 5/16"-18")	3	MP28742	304 SS
13	Hex Jam Nut	1	MP 29194	316SS

Item	Description (size)	Qty	Part No.	Mtl
14	Impeller	1	MP31819	Ductile Iron
15	Spacer	1	MP31838	316 SS
16	Seal Assembly	1	MP31374	CCS Viton
17	O-Ring	1	MP32020	Viton
18	Seal Housing	1	MP31824	Cast Iron
19	Ball Bearing	2	MP31804	Steel
20	Shaft	1	MP31839	316 SS
21	Square Key	1	MP33232	Steel
22	Snap Ring	1	MP31803	Carbon Spring Steel
23	Bearing Housing	1	MP31906	Cast Iron
24	Stud (3/8"-16" x 1.63")	8	MP21261	304 SS
26	Flat Washer	8	MP28053	304 SS
26	Hex nut (3/8" - 16")	8	MP21268	304 SS

SEAL TYPE OPTIONS

Seal PN	Seal Type	Shaft Dia.	Mating Ring	Material		
				Primary Ring	Elastomer	Components
MP31374	21	1.5	Ceramic	Carbon	Viton	316 SS

PARTS LIST / FLOMAX 30 PEDESTAL (DOUBLE SEAL)

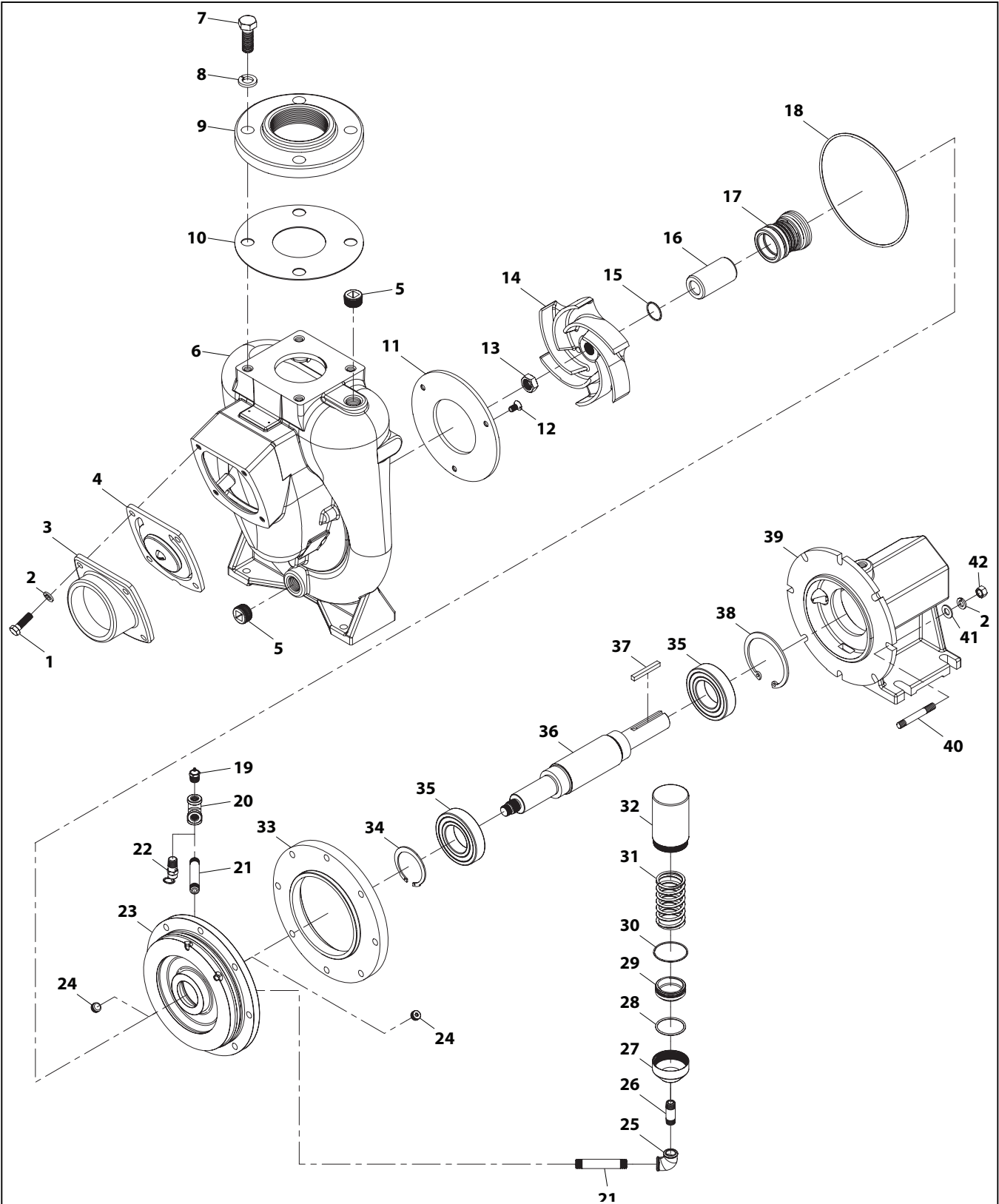


Figure 10

PARTS LIST / FLOMAX 30 PEDESTAL (DOUBLE SEAL)

Item	Description (size)	Qty	Part No.	Mtl	Item	Description (size)	Qty	Part No.	Mtl
1	Capscrew (3/8"-16" x 1.25")	4	MP21274	304 SS	21	Nipple	1	MP41652	304 SS
2	Lockwasher (3/8" x 1/8")	12	MP21266	304 SS	22	Relief Valve (1/4"NPT)	1	MP31733	Brass
3	Check Valve Body	1	MP40537	Cast Iron	23	Seal Housing	1	MP31827	Cast Iron
4	Flapper Assembly	1	MP42147	Buna	24	Pipe Plug (1/4"NPT)	2	MP33639	304 SS
5	Pipe Plug	2	MP41481	316 SS	25	Elbow	1	MP41672	304 SS
6	Volute	1	MP31822	Cast Iron	26	Pipe Nipple (1/4" NPT X 1.5)	1	MP28635	304 SS
7	Capscrew (5/8"-11" x 1.75")	4	MP36606	304 SS	27	End Cap	1	MP39299	AL
8	Lockwasher (3/8")	4	MP26853	304 SS	28	O-Ring (AS-586-129)	1	MP38362	Viton
9	Flange	1	MP32033	Cast Iron	29	Piston	1	MP38360	AL T-3 2011
10	Gasket	1	MP32034	Buna	30	O-Ring (AS-586-032)	1	MP38363	Viton
11	Wear Plate	1	MP31830	304 SS	31	Spring	1	MP38358	Music Wire
12	Screw (FHS 5/16"-18" x 5/8")	3	MP28742	304 SS	32	Reservoir	1	MP38361	AL T-3 2011
13	Hex Jam Nut	1	MP 29194	316 SS	33	Spacer	1	MP31836	Carbon Steel
14	Impeller (7.0)	1	MP31820	Ductile Iron	34	Snap Ring (2.38")	1	MP29335	Carbon Spring Steel
	Impeller (6.35)	1	MP33163	Cast Iron	35	Ball Bearing	2	MP31804	Steel
	Impeller (W/FNC)	1	MP34434	Ductile Iron	36	Shaft	2	MP31837	316 SS
	Impeller (6.35 W/FNC)	1	MP50569	Ductile Iron	37	Square Key	1	MP33232	Steel
	Impeller (6.75)	1	MP33162	Cast Iron	38	Snap Ring (3.734")	1	MP31803	Carbon Spring Steel
15	O Ring (1.05" x 1.19" x 0.07")	1	MP29334	Viton	39	Bearing Housing	1	MP31906	Cast Iron
16	Sleeve	1	MP31983	SS	40	Stud (3/8" -16" x 2.89")	8	MP31709	304 SS
17	See Table for seal options				41	Flat Washer	8	MP28053	304 SS
18	O Ring (AS568-262)	1	MP32020	Viton	42	Hex nut (3/8" - 16")	8	MP21268	304 SS
19	Grease Fitting (1/4" NPT)	1	MP31735	Zinc Plated Steel					
20	Tee (1/4" NPT)	1	MP31734	Steel					

SEAL TYPE OPTIONS

Seal PN	Seal Type	Shaft Dia.	Mating Ring	Material		
				Primary Ring	Elastomer	Components
MP30660	21	1.5	Tungsten/Ceramic	Carbon/Silicon	Viton	316 SS

PARTS LIST / FLOMAX 30 HYDRAULIC (1.59)

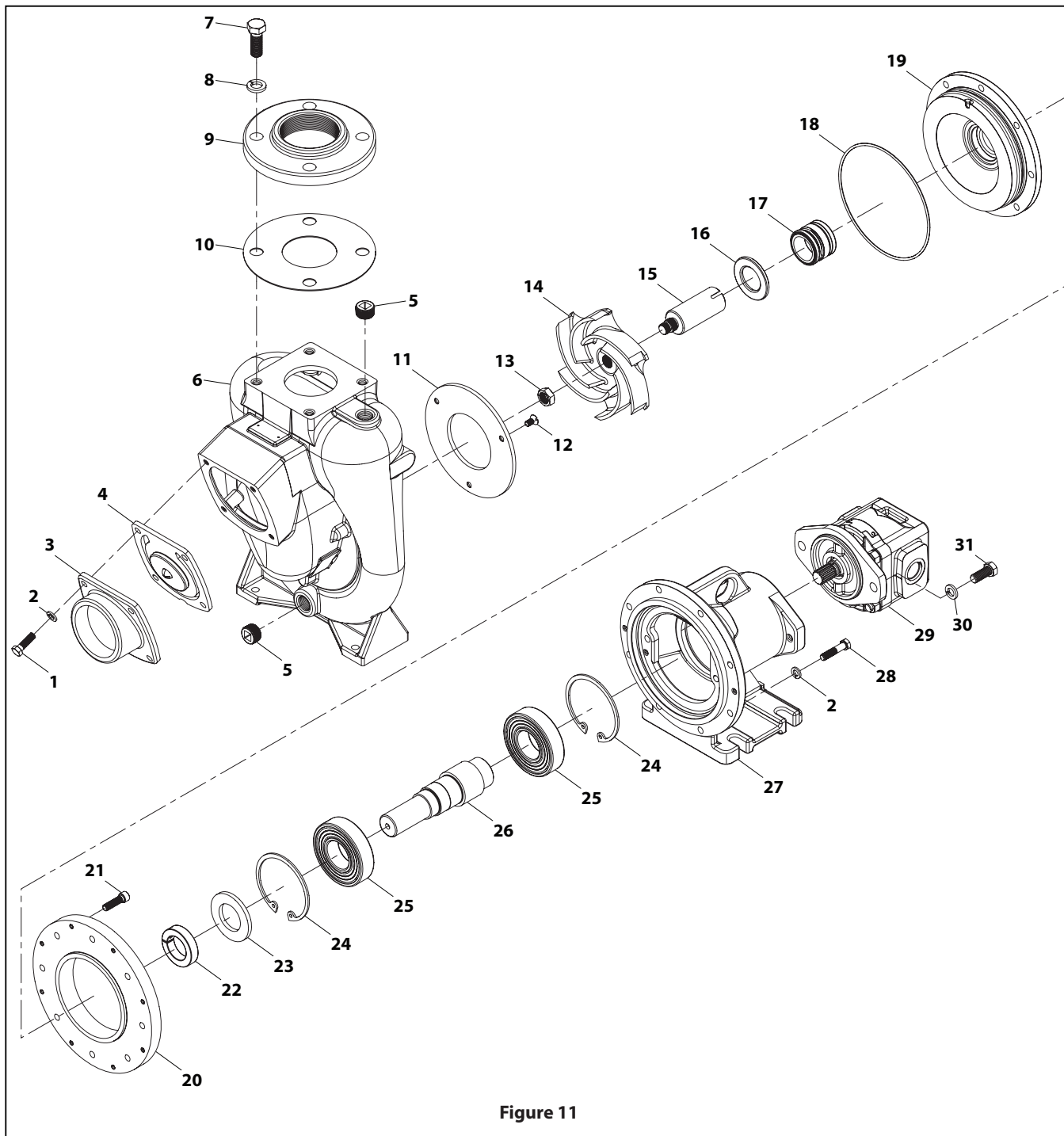


Figure 11

PARTS LIST / FLOMAX 30 HYDRAULIC (1.59)

Item	Description (size)	Qty	Part No.	Mtl	Item	Description (size)	Qty	Part No.	Mtl
1	Capscrew (3/8"-16" x 1.25")	4	MP21274	304 SS	17	See Table for seal options			
2	Lockwasher (3/8" x 1/8")	12	MP21266	304 SS	18	O-Ring	1	MP32020	Viton
3	Check Valve Body	1	MP40537	Cast Iron	19	Seal Housing	1	MP31824	Cast Iron
4	Flapper Assembly	1	MP34341	Viton	20	Adapter Plate	1	MP39088	Steel
5	Pipe Plug	2	MP41481	316 SS	21	Capscrew (3/8"-16")	8	MP39089	304 SS
6	Volute	1	MP31822	Ductile Iron	22	Clamp	1	MP 31312	Steel
7	Capscrew (5/8"-11" x 1.75")	4	MP36606	304 SS	23	Slinger	1	MP26680	Neoprene Rubber
8	Lockwasher (5/8")	4	MP26853	304 SS	24	Snap Ring	2	MP26998	Steel
9	Flange	1	MP32033	Cast Iron	25	Ball Bearing	2	MP26997	Steel
10	Gasket	1	MP34667	Viton	26	Shaft	1	MP33367	316 SS
11	Wear Plate	1	MP31830	Steel	27	Body	1	MP26994	Cast Iron
12	Screw (FHS 5/16"-18")	3	MP28742	316SS	28	Capscrew (3/8"-16" x 1.75")	8	MP41259	Steel
13	Hex Jam Nut	1	MP 29194	316SS	29	Hydraulic Motor	1	MP29993	Cast Iron
14	Impeller	1	MP33177	Cast Iron	30	Lockwasher (1/2")	2	MP21254	304 SS
15	Drive Sleeve	1	MP 31311	316 SS	31	Capscrew (1/2-13 x 1.25")	2	MP21246	304 SS
16	Spacer	1	MP31838	316SS					

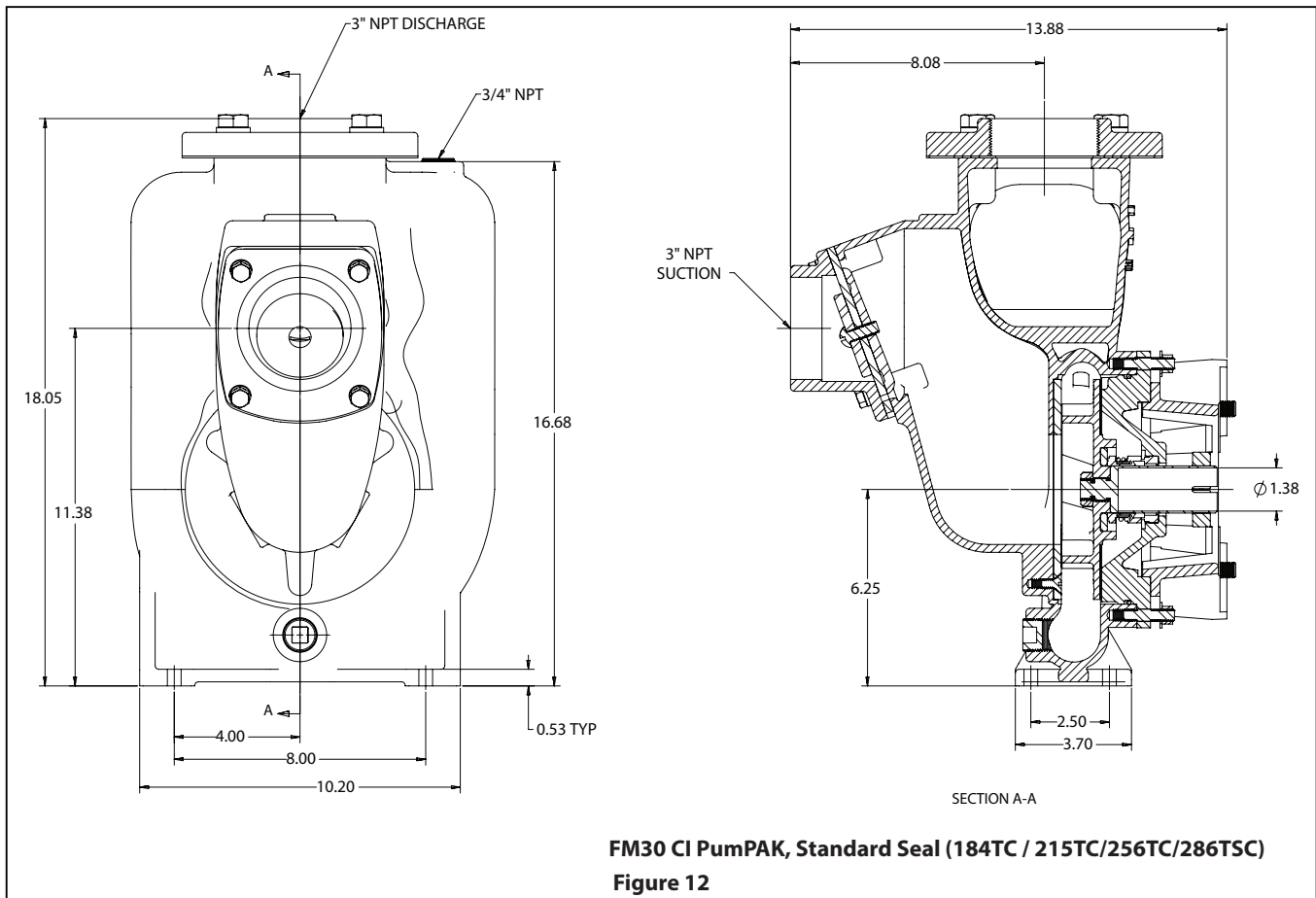
SEAL TYPE OPTIONS

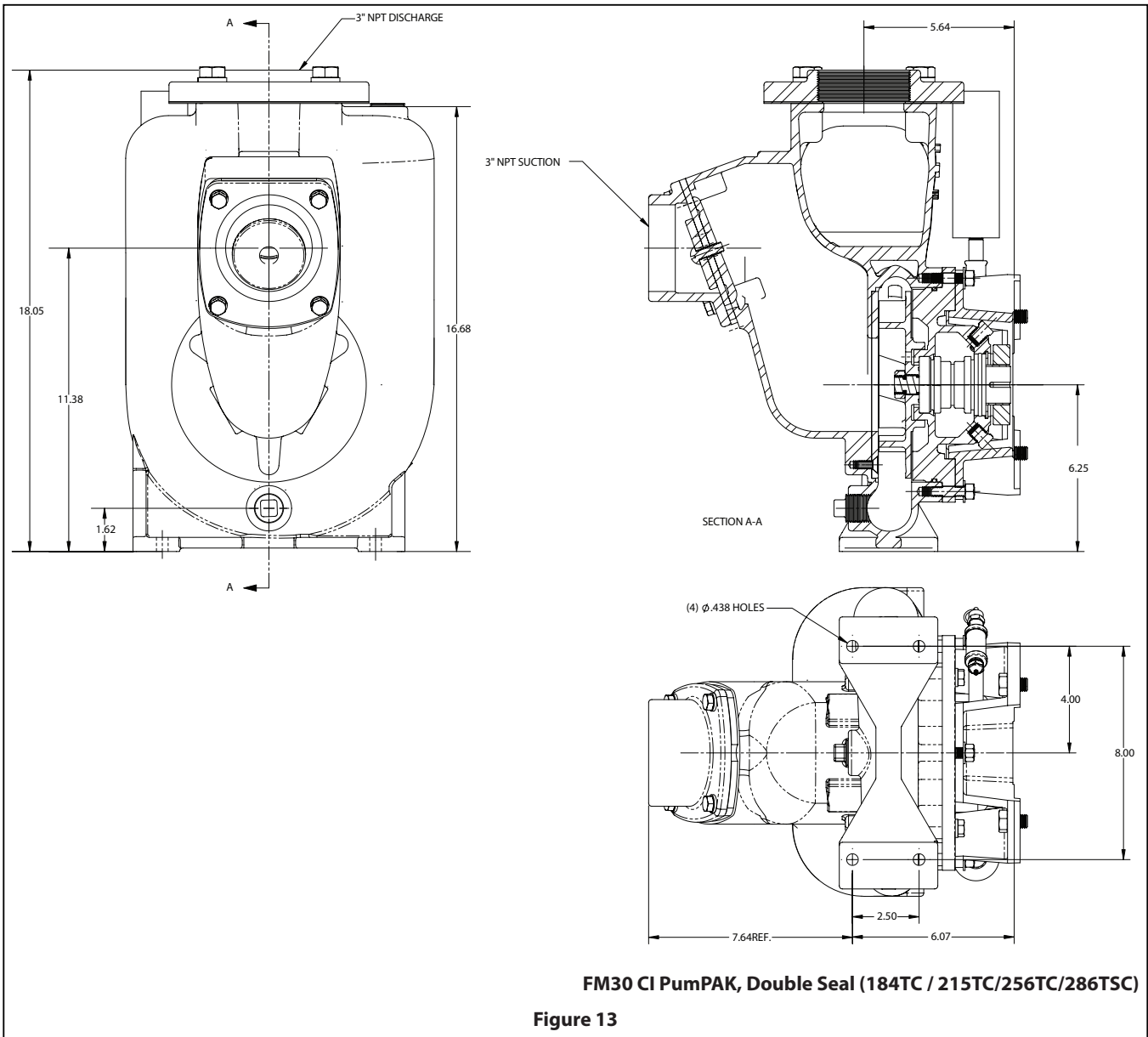
Seal PN	Seal Type	Shaft Dia.	Mating Ring	Material		
				Primary Ring	Elastomer	Components
MP31374	21	1.5	Ceramic	Carbon	Viton	316 SS

SERVICE KITS

PUMP MODEL	PUMP DESCRIPTION	SEAL KIT	IMPELLER KIT	BEARING KIT
MP33782	FM30PMP C:PED 6.35 T-21 DS	MP51507	----	MP51514
MP50568	FM30PMP C:20-3 256T 6.35 T-21 DS FNC BCF	MP51507	----	MP51514
MP34436	FM30PMP C:PED 7.0 T-21 DS W/FNC	MP51507	----	MP51514
MP33141	FM30PMP C:PED 7.0 T-21 DS	MP51507	----	MP51514
MP36802	FM30PMP C:30-3 286TS 7.0 T-21 DS	MP51507	----	MP51514
MP33613	FM30PMP C:PED 6.75 T-21 DS	MP51507	----	MP51514
MP50567	FM30PMP C:PED 6.35 DSC FNC	MP51507	----	MP51514
MP33172	FM30PMP C:B-18R ES 6.35 T-21 DS	MP51507	----	----
MP36787	FM30PMP C:30-3 286TS 7.0 T-2100 BCF	MP51508	----	MP51514
MP39445	FM30PMP C:PED 6.3BI T-2100	MP51508	----	MP51514
MP32035	FM30PMP C:PED 7.0 T-2100	MP51508	----	MP51514
MP50587	FM30PMP C:25-3 286TS TEFC 7.00 BCF 34587	MP51508	----	MP51514
MP36868	FM30PMP C:25-3 286TS TEFC 6.75 BCF 34587	MP51508	----	MP51514
MP50295	FM30PMP C:15-3 215T 6.0DI T-2100 BCF	MP51508	----	MP51514
MP36454	FM30PMP C:15-3 215TC 6.35BI T-2100	MP51508	----	----
MP33522	FM30PMP C:PED 6.3 T-2100	MP51508	----	MP51514
MP36795	FM30PMP C:20-3 256T 6.3DI T-2100 BCF	MP51508	----	MP51514
MP39143	FM30PMP C:B&S 18HP ES 6.35 T-2100	MP51508	----	----
MP34587	FM30PMP C:PED 6.75 T-2100	MP51508	----	MP51514
MP39446	FM30PMP C:20-3 256T 6.3BI T-2100 WBA	MP51508	----	MP51514
MP34641	FM30PMP C:3-3 182TC 1750 6.75 T-2100	MP51508	MP51510	----
MP34916	FM30PMP C:5-3 184TC 1750 ODP 6.75 T-2100	MP51508	MP51510	----
MP50294	FM30PMP C:PED 6.0 T-2100	MP51508	----	MP51514
MP50586	FM30PMP C:PED 7.00 T-2100	MP51508	----	MP51514
MP35381	FM30PMP C:15-3 215TC 6.35 T-2100	MP51508	----	----
MP51063	FM30PMP C:PED 6.75 SI T-2100	MP51508	----	MP51514
MP35387	FM30PMP C:25-3 284TSC 6.75 T-21	MP51509	----	----
MP38626	FM30PMP C:20-3 256TC XP 6.35DI T-21	MP51509	----	----
MP36549	FM30PMP C:20-3 256TC 50/60 XP 6.75 T-21	MP51509	----	----
MP34838	FM30PMP C:20-3 256TC 6.35DI T-21	MP51509	----	----
MP50331	FM30PMP C:30-3 286TSC 7.0 T-21	MP51509	----	----
MP34922	FM30PMP C:30-3 286TSC 6.875 T-21	MP51509	----	----
MP38489	FM30PMP C:PED 6.35 T-21 DS OIL LUBE	----	----	MP51514
MP38151	FM30PMP C:PED 7.0BI T-2100	----	----	MP51514
MP35255	FM30PMP C:PED 7.0BI T-2100 V-FLP	----	----	MP51514
MP38373	FM30PMP C:PED 6.75 SSC	----	----	MP51514
MP38374	FM30PMP C:5-3 184T XP 1750 6.75 SSC BCF	----	----	MP51514

DIMENSIONAL DATA





FM30 CI PumpAK, Double Seal (184TC / 215TC/256TC/286TSC)

Figure 13

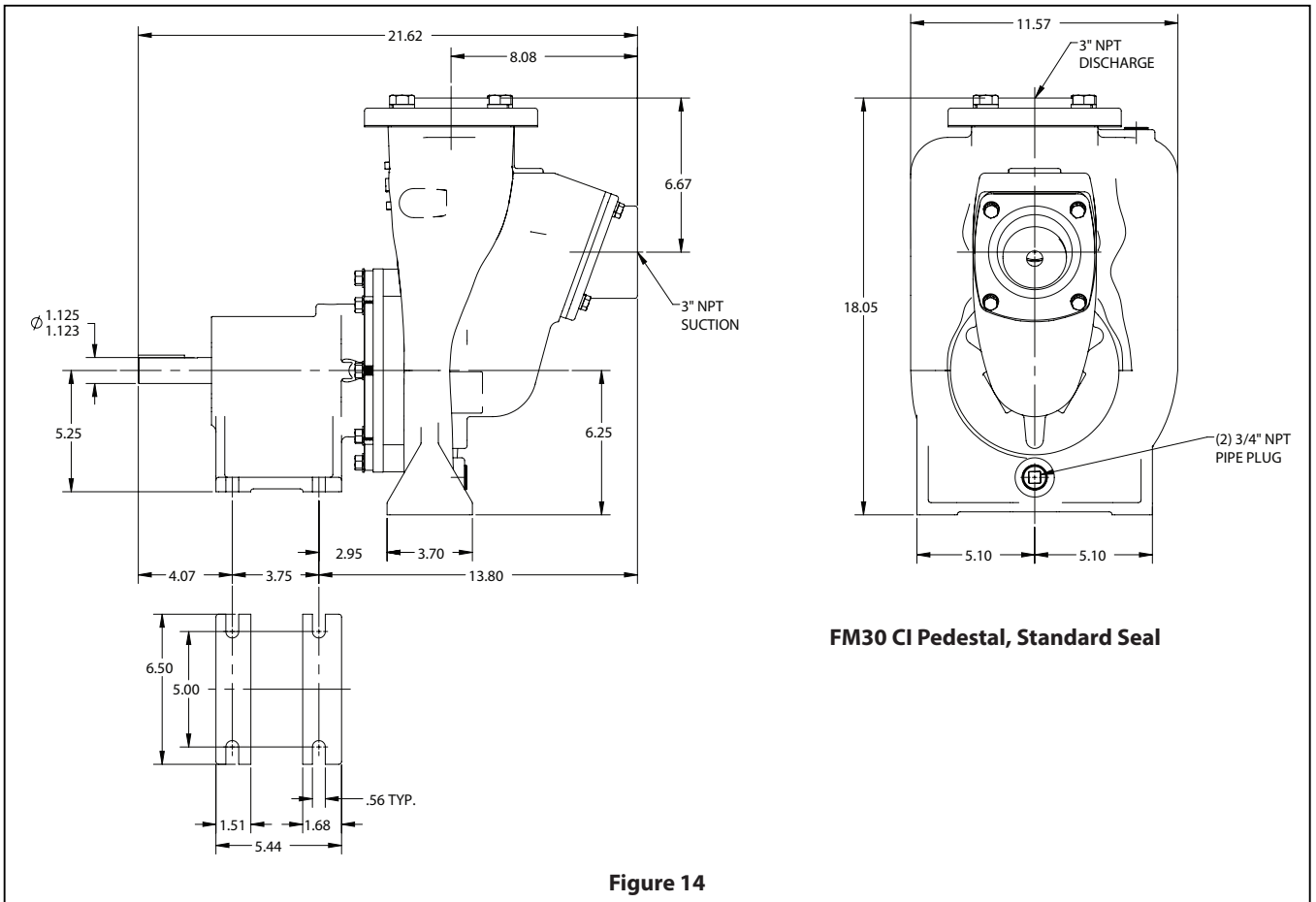


Figure 14

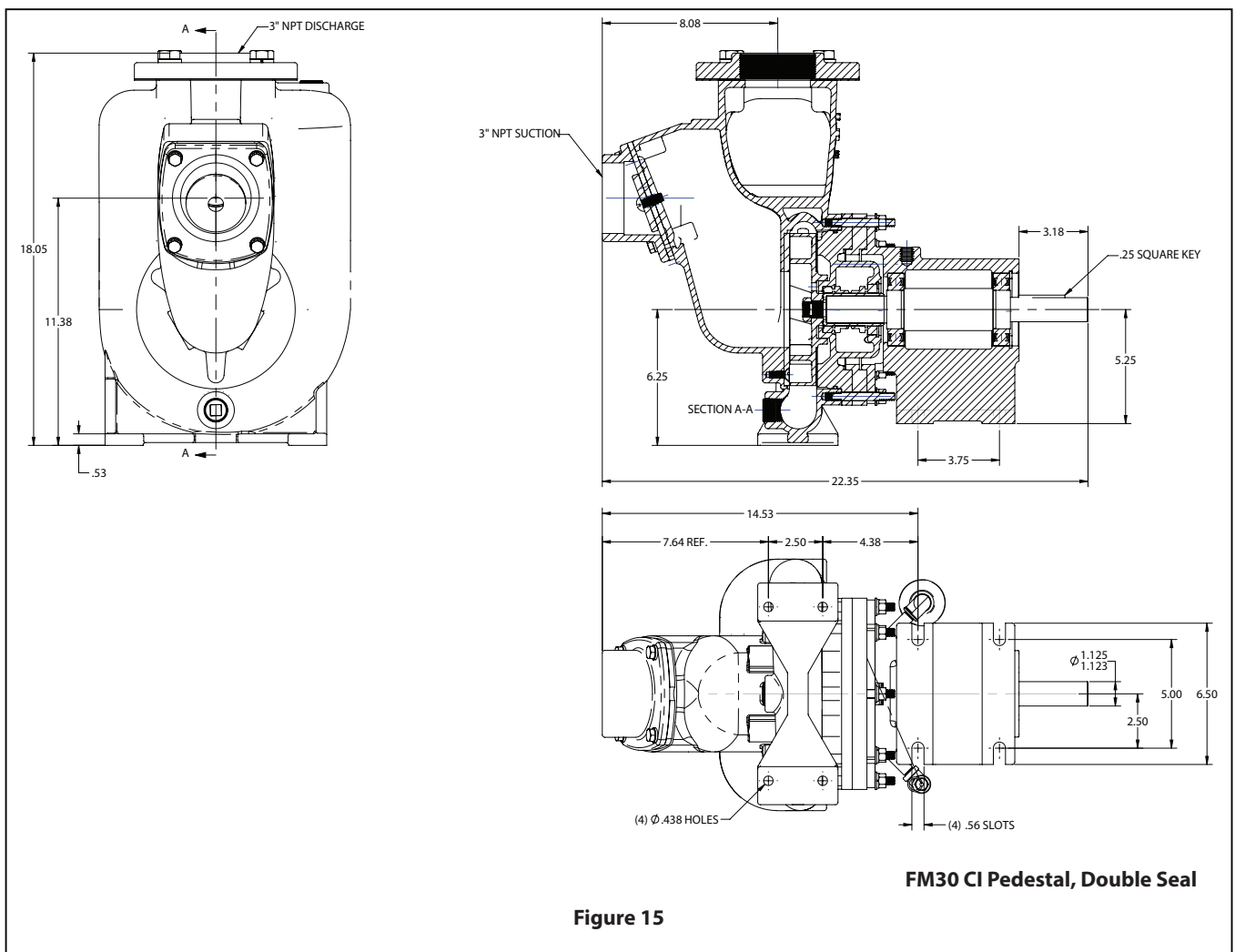
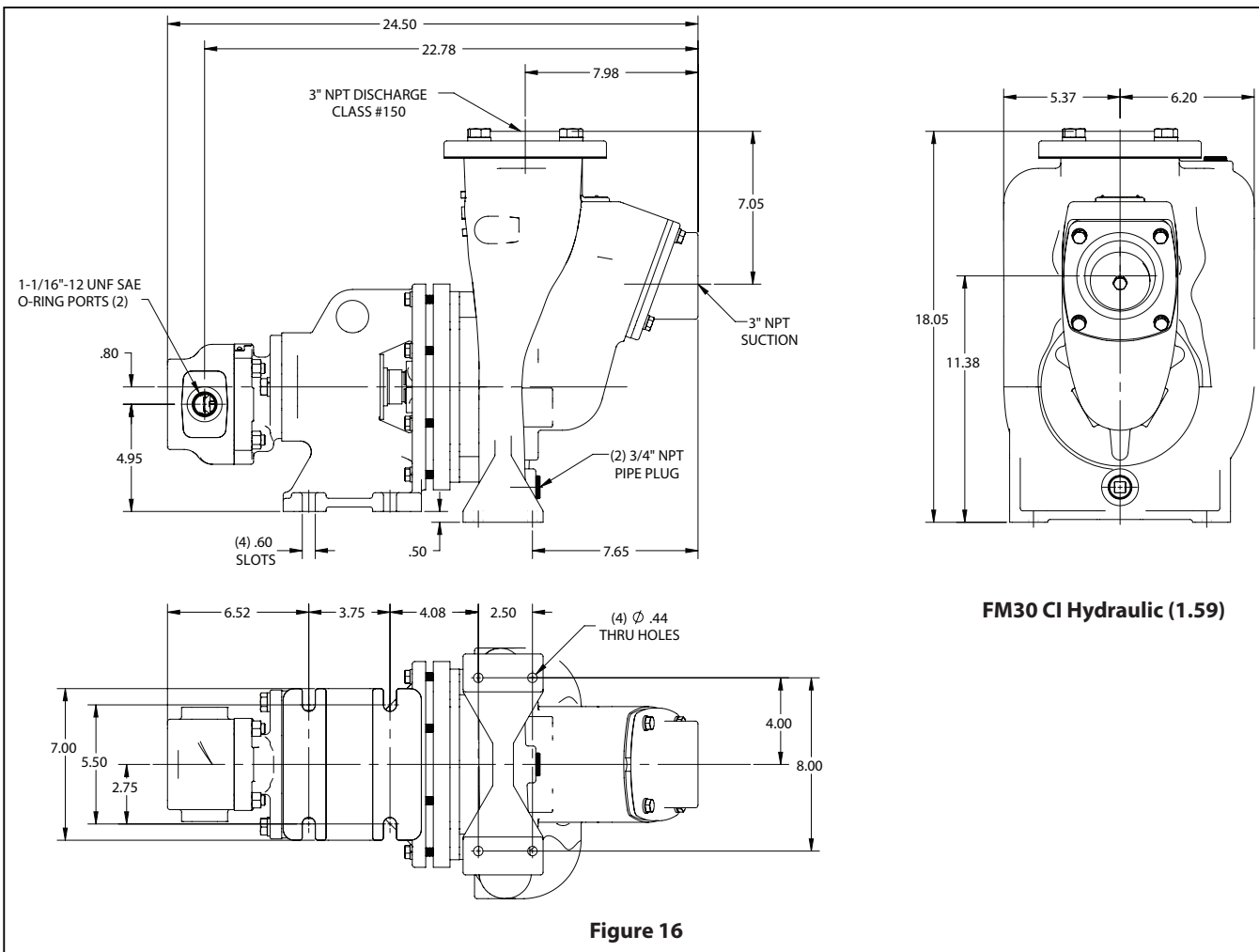


Figure 15



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'

