OPERATOR'S MANUAL HOT OIL PUMP

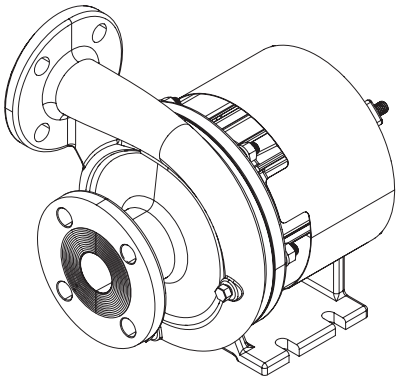
INCLUDING: OPERATION, INSTALLATION AND MAINTENANCE

RELEASED: 4-1-22
(REV: A)

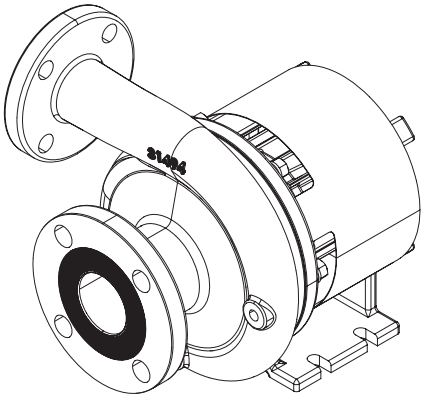
HTO® 80	HTO® 120	HTO® 180	HTO® 300
(1-1/2" x 1-1/4")	(2" x 1-1/2")	(3" x 1-1/2")	(3" x 2-1/2")

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

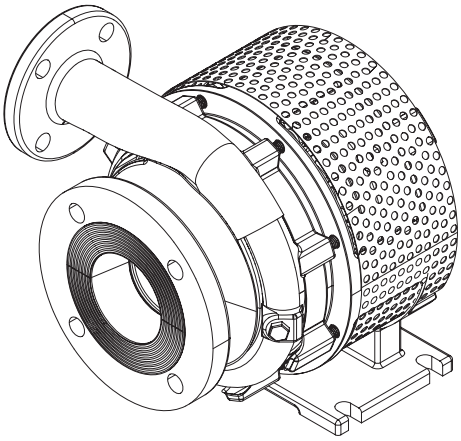
It is the responsibility of the employer to place this information in the hands of the operator. Keep for future reference.



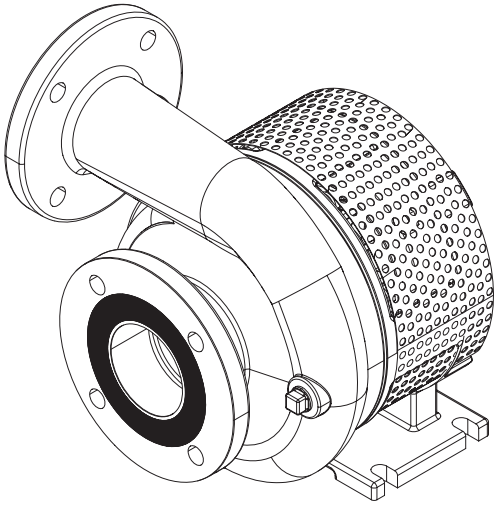
80 Series



120 Series



180 Series



300 Series

Figure 1

INGERSOLL RAND COMPANY INC
34800 BENNETT DR, FRASER, MI 48026
1-800-563-8006 • support@mppumps.com
www.gardnerdenver.com/en-us/mppumps

GENERAL DESCRIPTION

HTO 80, 120, 180 and 300 Series:

High Temperature Oil – Centrifugal Pump Series

MP Pumps' HTO line of centrifugal pumps are made for pumping hot oil up to 650° F. This is a unique patented design which features high temperature and low thermal conductivity materials to keep the mechanical seal cool and reduce the amount of process heat lost.

The pumps are air cooled and close coupled to standard NEMA C face motors.

SPECIFICATIONS

	HTO 80	HTO 120	HTO 180	HTO 300
Suction and Discharge	1-1/2" x 1-1/4" ANSI 150 or NPT	2" x 1-1/2" ANSI 150 or NPT	3" x 1-1/2" ANSI 150	3" x 2-1/2" ANSI 150
Application	Industrial, OEM			
Materials of construction	Ductile iron			
Flow	Up to 85 gpm (321.8 lpm)	Up to 195 gpm (738.2 lpm)	Up to 320 gpm (1211.3 lpm)	Up to 500 gpm (1892.7 lpm)
Head Feet	Up to 130 ft (39.6 m)	Up to 135 ft (41.1 m)	Up to 160 ft (48.8 m)	Up to 190 ft (57.9 m)
Impeller	5.9" (149.9 mm) Cast Iron, Enclosed	5.96" (151.3 mm) Cast Iron, Enclosed	6.45" (163.8 mm) Cast Iron, Enclosed	7.0" (177.8 mm) Cast Iron, Enclosed
Motor	Up to 3 HP (2.23 kw)	Up to 5 HP (3.72 kw)	Up to 10 HP (7.45 kw)	Up to 20 HP (14.91 kw)
Drive Options	Close coupled 56C, 145TC Pedestal, PumPAK® (with out motor)	Close coupled 145TC, 184C Pedestal, PumPAK® (with out motor)	Close coupled 184TC, 215TC Pedestal PumPAK® (with out motor)	
Seal	Carbon / Silicon carbide / Viton		Carbon / Silicon carbide / Viton, Optional severe duty seal available	
Drive Sleeve	303 Stainless steel			
Temperature	650° F (343.3° C) max			
Features	Close coupled for a compact and lightweight design, Air cooled by integral fan / clamp Hollow carbon graphite isolator bushing, Hollow sleeve design Reduces the amount of process heat lost, No need for a water jacket or seal flush			

OPERATING AND SAFETY PRECAUTIONS

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


EXCESSIVE AIR PRESSURE
STATIC SPARK


HAZARDOUS MATERIALS
HAZARDOUS PRESSURE

⚠ 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.

STORAGE PRECAUTIONS

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

INSTALLATION

1. The pump must be installed in a horizontal shaft position.
2. The housing may be rotated to a horizontal or vertical discharge to fit the particular piping installation.
3. Rigid and supported piping must be used that will not strain the pump housing when temperature changes are made during the use of the pump.
4. The piping system must be free of foreign material and moisture before start-up.
5. Pipe thread sealing compound must be used on the NPT flanges that is compatible with the fluid being pumped and is rated for the temperature requirements.
6. The installation should permit adequate circulation of air to provide proper cooling of the motor and pump seal housing.
7. Do not install in a sealed enclosure or insulate the pump adapter and motor. The motor and/or pump seal may fail from excessive heat.
8. A good installation will have an enclosure that provides adequate air flow of ambient air to the motor of the pump.

START-UP:

1. Follow all requirements and recommendations from the heat transfer fluid manufacturer for fill, start-up and use.
2. Check for leaks before insulating the piping system.
3. Check for proper shaft rotation by jogging the power and observing the fan clamp. Rotation arrows are provided on pump housing.
4. The seal cavity inside the pump will internally vent during fill and start-up.
5. A small amount of oil may leak from the seal cavity at the shaft; this is normal for a new installation and will stop after approximately one hour.
6. Do not allow the pump to run dry, or continue to operate the pump when it is noisy, vibrating, or leaks are observed. These noticeable signs give a warning that something is wrong with the equipment and must be investigated to avoid possible damage or injury from burns caused by hot oil.

MOTOR MOUNTING

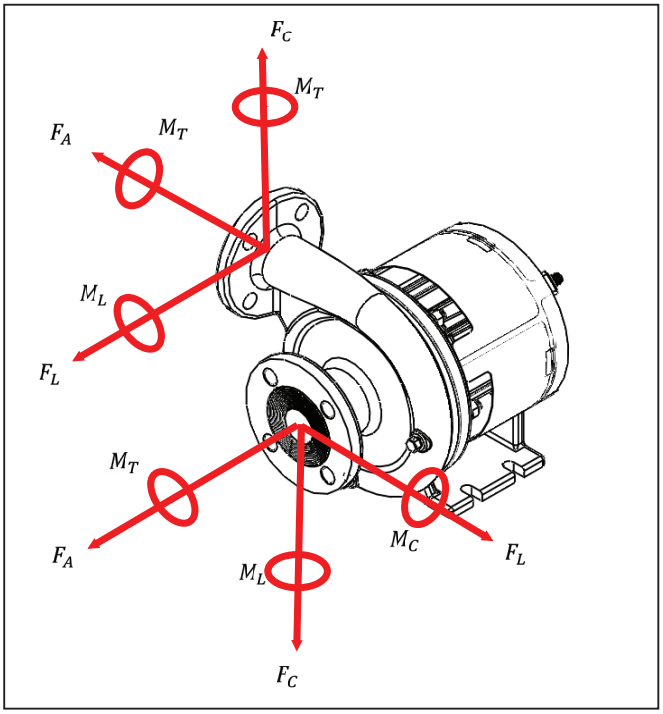
Check rotation of the driver to be sure it coincides with the required rotation of the pump. When viewed from the driver end the rotation of the pump is CLOCKWISE.
A PumPAK shaft sleeve is machined to precisely fit the shaft of your driver. No provision is made for drive key and none is required.
Loosen 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, rotate the driver slowly by hand to make certain that there is no rubbing.

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
5/8-18	85-95	N/A

INSTALLATION FOR HOT OIL 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)	HOT OIL PUMP					
	Force lbs (N)			Moment ft*lbs (N*m)		
	FL	FC	FA	MC	MT	ML
1.25"	337 (1500)	337 (1500)	253 (1125)	69 (93.75)	104 (141)	69 (122)
1.5"	405 (1800)	405 (1800)	303 (1350)	100 (135)	149 (203)	100 (176)
2"	540 (2400)	540 (2400)	405 (1800)	177 (240)	266 (360)	177 (312)
2.5"	674 (3000)	674 (3000)	506 (2250)	277 (375)	415 (563)	277 (488)
3"	809 (3600)	809 (3600)	607 (2700)	398 (540)	597 (810)	398 (702)

PRESSURE - TEMPERATURE LIMITS

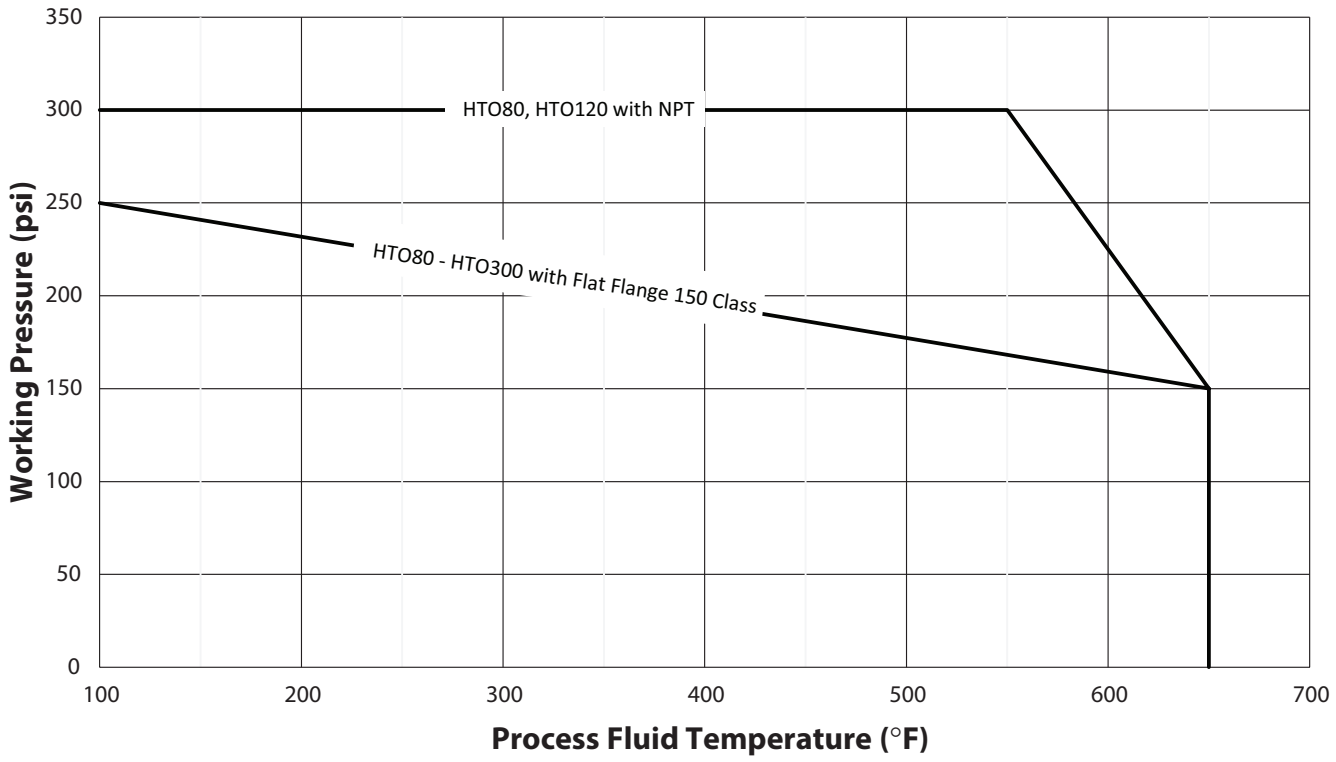


Figure 2

SEAL COOLING PERFORMANCE

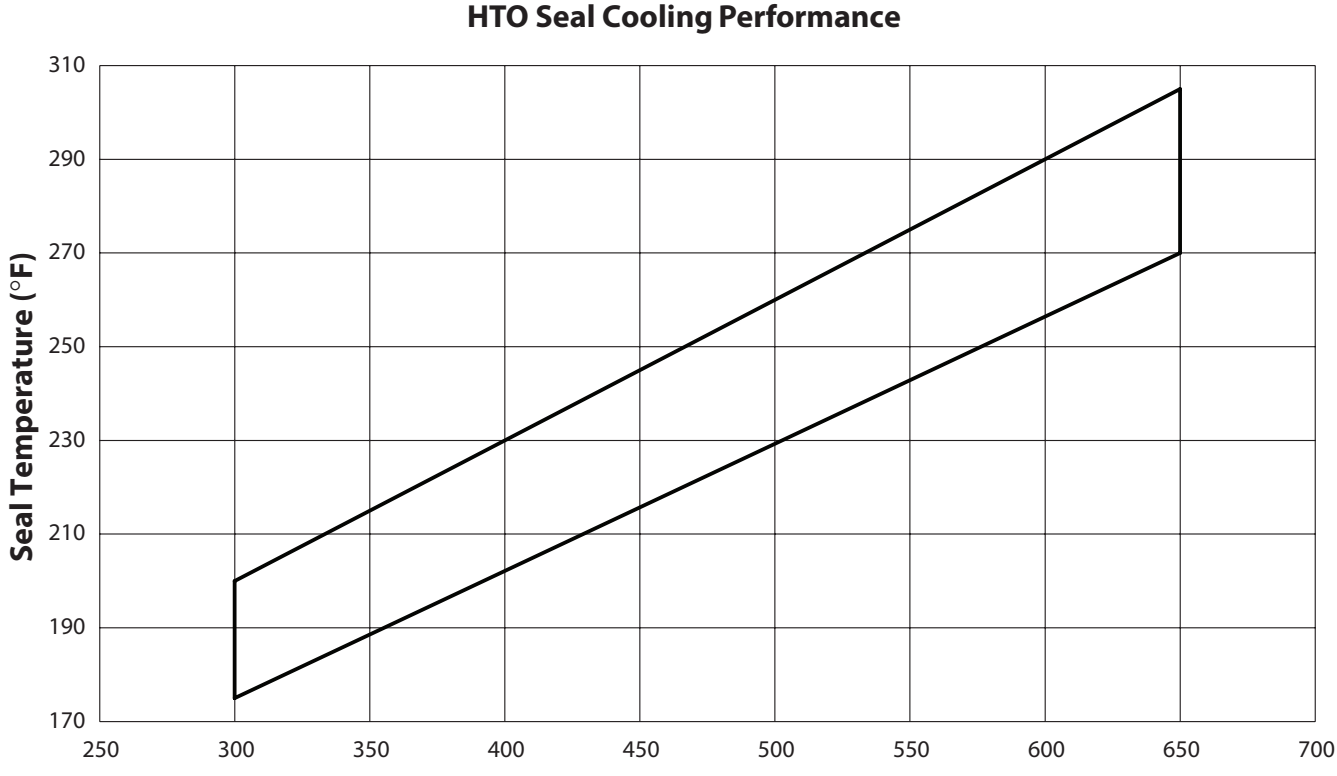


Figure 3

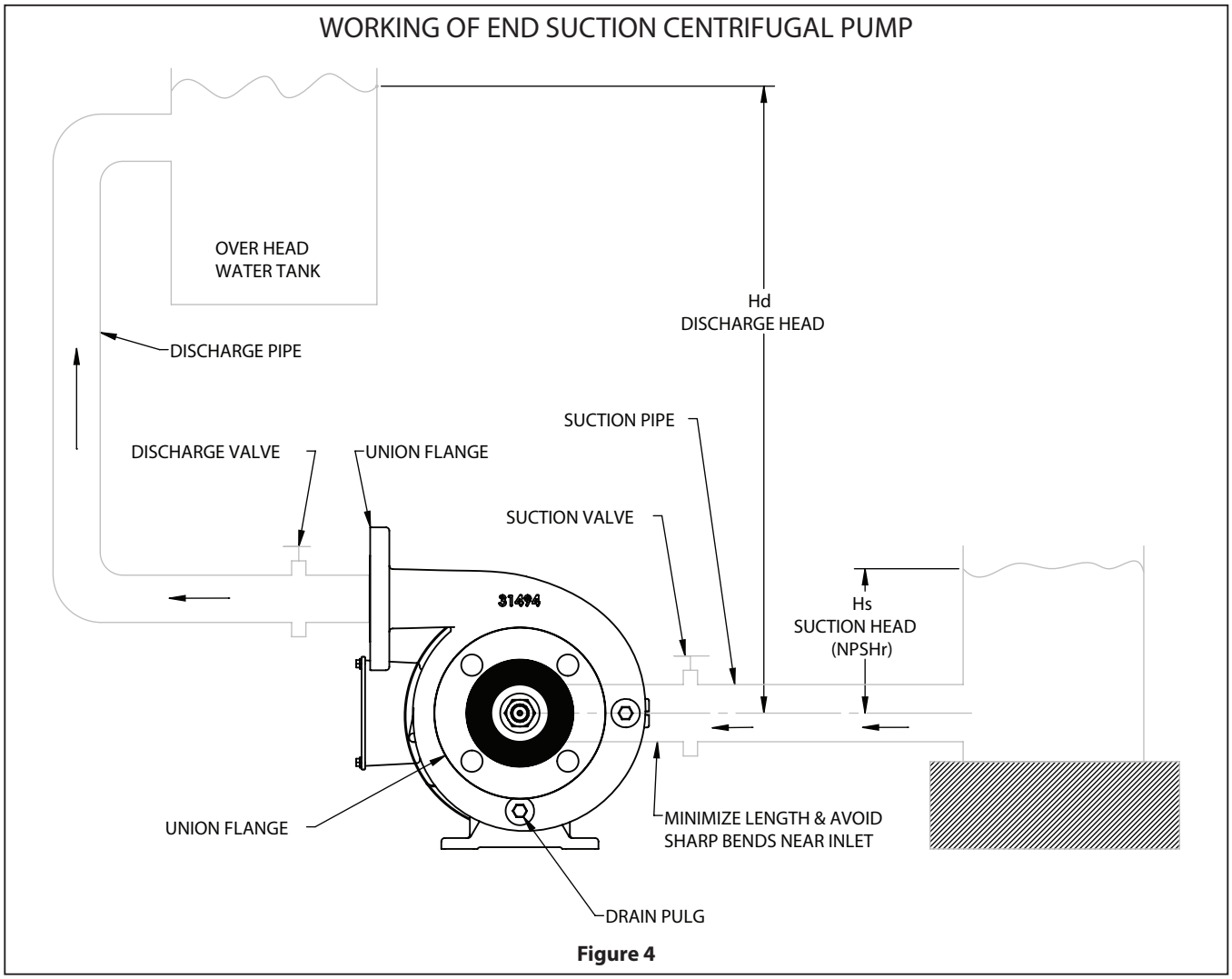


Figure 4

OPERATING INSTRUCTIONS

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.

The PumPAK 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.**

WORKING OF CENTRIFUGAL 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.

OPERATION AND MAINTENANCE

Thermal oil vapors leaking from a system can be highly flammable.

Any system leak should be repaired immediately.

Do not insulate the pump or system piping with porous flammable insulation. Fluid may wick, decompose and spontaneously ignite. Ideal mechanical seal life is 20,000 hours. Reduced seal life may be experienced from extreme conditions.

At disassembly, check the impeller and other wear items for unusual wear. Replace if necessary.

When servicing the pump, care should be taken that the pump has cooled to a sufficient temperature to permit disassembly. The product should be drained from the pump housing and disposed in accordance with the fluid manufacturer's recommendations. Operating personnel should be warned to exercise care and utilize eye and skin protection when servicing the pump.

WEAR AND INSPECTION POINTS

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

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.

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 adapter.
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.

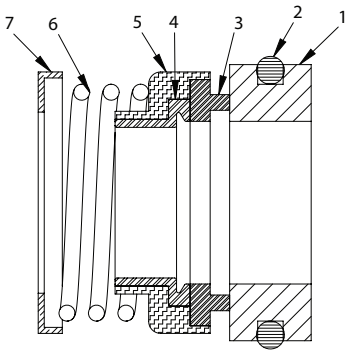
REMOVE IMPELLER

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.



SEAL ASSEMBLY

ITEM NO.	DESCRIPTION	QTY.
1	Mating Ring	1
2	O-ring	1
3	Primary Ring	1
4	Elastomer Bellows	1
5	Drive Band	1
6	Spring	1
7	Spring Holder	1

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.

MAINTENANCE

The HTO pump is of simple construction with only one moving part. The impeller on the HTO 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. HTO pumps are available with a selflubricated shaft seal. The self-lubricated seal is lubricated by the liquid in the pump. Operating the pump dry will seriously damage the seal.
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 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

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 nuts and lockwashers. Loosen and remove adapter.

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

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 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 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.

PARTS LIST / HTO 80

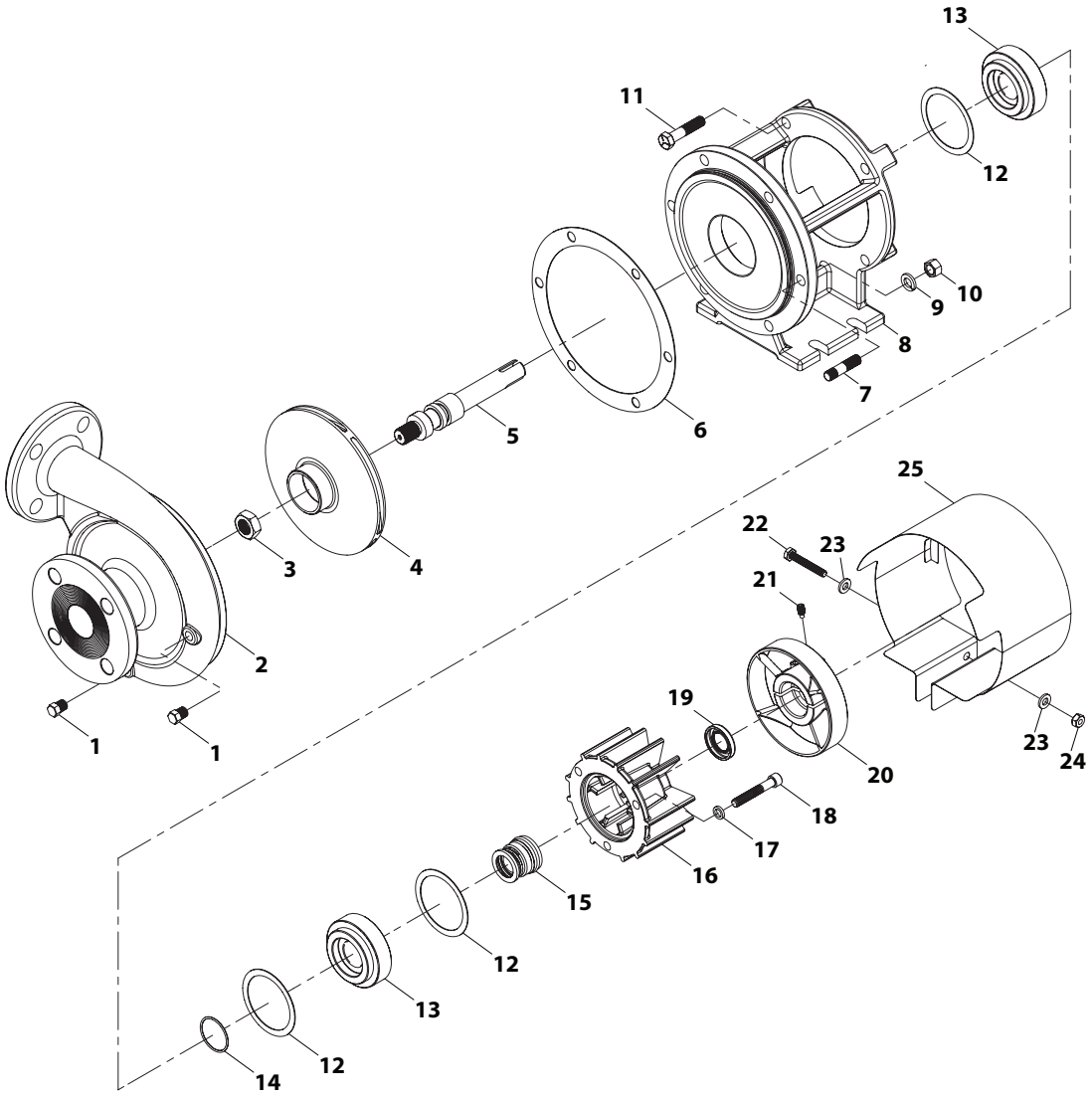


Figure 7

PARTS LIST / HTO 80

Item	Description (size)	Qty	Part No.	Mtl
1	Pipe Plug (1/8" NPT)	2	MP21585	Zinc Plated Steel
2	Housing	1	MP25666	Ductile Iron
	Housing	1	MP31871	Ductile Iron
3	Hex Jam Nut	1	MP22655	304 SS
4	Impeller	1	MP25910	Cast Iron
	Impeller	1	MP29565	Cast Iron
	Impeller	1	MP31894	Cast Iron
	Impeller	1	MP29430	Cast Iron
5	Drive Sleeve	1	MP29166	303 SS
	Drive Sleeve	1	MP29781	303 SS
6	Gasket (0.032" X 6")	1	MP31518	Grafoil
7	Stud(SS: 3/8 - 16 x 1.63)	6	MP21261	304 SS
8	Adaptor	1	MP29160	Ductile Iron
9	Lockwasher (3/8" x 1/8")	6	MP21266	304 SS
10	Hexnut (3/8"- 6")	6	MP21268	304 SS
11	Capscrew (3/8" - 16" x 1.75")	4	MP41259	Steel
12	Gasket	3	MP29165	Grafoil

Item	Description (size)	Qty	Part No.	Mtl
13	Isolator	2	MP29158	ST. Marys Grade 251
14	O-Ring (1.301" ID x 0.070")	1	MP29230	Viton
15	See Table for seal options			
16	Housing Seal	1	MP29162	Ductile Iron
	Housing Seal	1	MP29772	Ductile Iron
17	Washer Flat (0.50" x 0.327" x 0.093")	3	MP29765	Steel
18	Capscrew (5/16" - 18" x 2.0")	3	MP29178	Steel
19	Lipseal	1	MP29167	Viton
	Lipseal	1	MP29774	Viton
20	Clamp Fan	1	MP29164	Ductile Iron
	Clamp Fan	1	MP29775	Ductile Iron
21	Set Screw (1/4"-28" x 1/2")	1	MP33417	Steel
22	Capscrew (1/4" - 20" x 1.75")	1	MP33810	Zinc Plated Steel
23	Washer	2	MP27261	Steel
24	Hexnut (1/4" - 20")	1	MP21241	304 SS
25	Shield	1	MP33273	Zinc Plated Steel

SEAL TYPE OPTIONS

Seal PN	Seal Type	Shaft Dia.	Mating Ring	Material		
				Primary Ring	Elastomer	Components
MP29168	2	0.75	Silicon Carbide	Carbon	Viton	316 SS
MP29773	2	1	Silicon Carbide	Carbon	Viton	316 SS
MP33603	2	1.25	Silicon Carbide	Carbon	Viton	316 SS

PARTS LIST / HTO 120

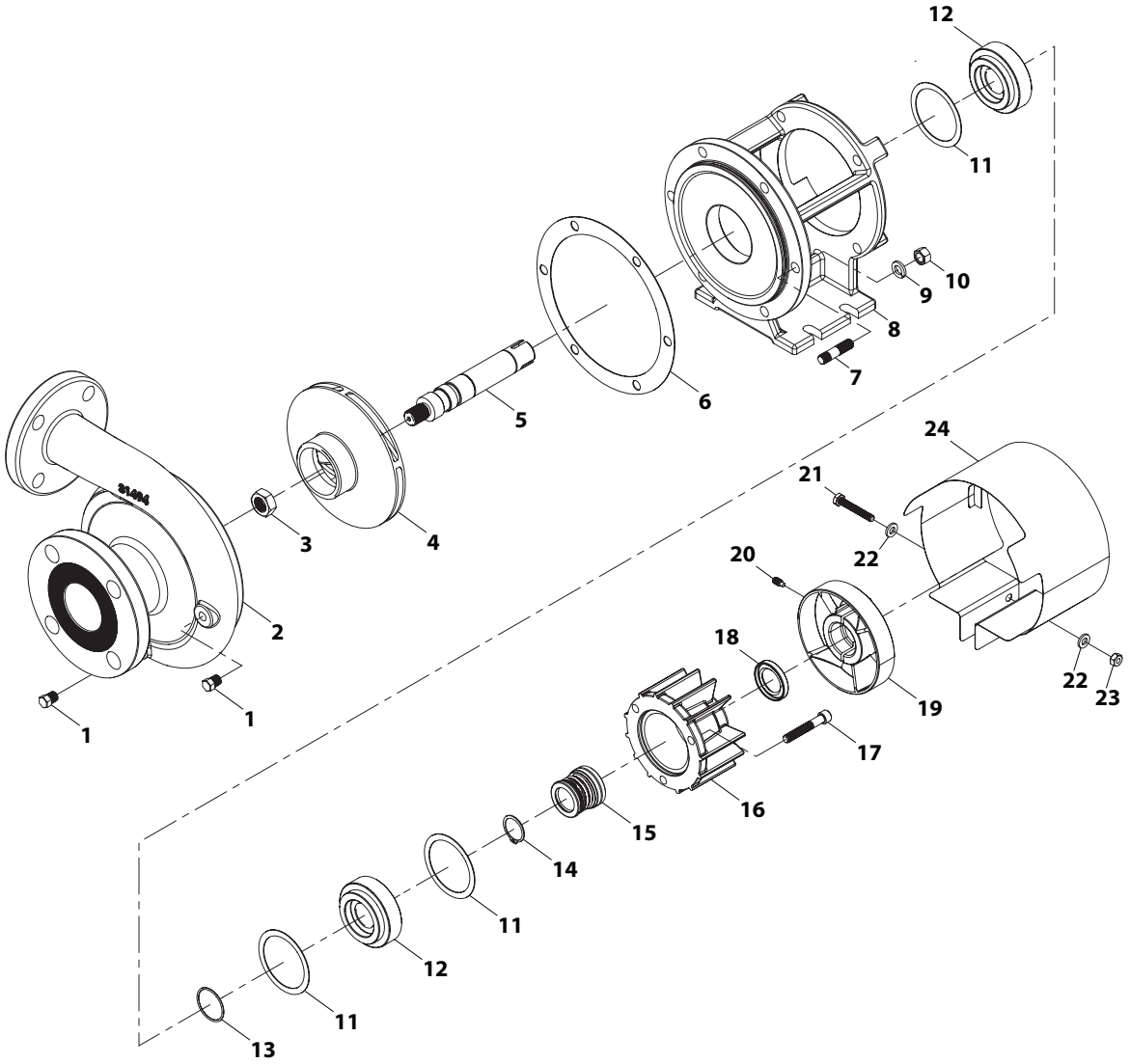


Figure 8

PARTS LIST / HTO 120

Item	Description (size)	Qty	Part No.	Mtl
1	Pipe Plug (1/8" NPT)	2	MP21585	Zinc Plated Steel
2	Housing	1	MP26587	Ductile Iron
	Housing	1	MP31492	Ductile Iron
3	Hex Jam Nut	1	MP22655	304 SS
4	Impeller	1	MP29770	Cast Iron
	Impeller	1	MP30740	Cast Iron
	Impeller	1	MP30223	Cast Iron
	Impeller	1	MP29894	Cast Iron
5	Drive Sleeve	1	MP29781	303 SS
6	Gasket (0.032" X 6")	1	MP31518	Garlock
7	Stud(SS: 3/8 - 16 x 1.63)	6	MP21261	304 SS
8	Adaptor	1	MP29160	Ductile Iron
9	Lockwasher (3/8" x 1/8")	6	MP21266	304 SS
10	Hexnut (3/8"- 6")	6	MP21268	304 SS
11	Gasket	3	MP29165	Garlock

Item	Description (size)	Qty	Part No.	Mtl
12	Isolator	2	MP29158	ST. Marys Grade 251
13	O-Ring (1.301" ID x 0.070")	1	MP29230	Viton
14	Snap Ring	1	MP29782	Steel
15	See Table for seal options			
16	Housing Seal	1	MP29772	Ductile Iron
17	Capscrew (5/16" - 18" x 2.0")	3	MP29178	Steel
18	Lipseal	1	MP29774	Viton
19	Clamp Fan	1	MP29775	Ductile Iron
20	Set Screw (1/4"-28" x 1/2")	1	MP33417	Steel
21	Capscrew (1/4" - 20" x 1.75")	1	MP33810	Zinc Plated Steel
22	Washer	2	MP27261	Steel
23	Hexnut (1/4" - 20")	1	MP21241	304 SS
24	Shield	1	MP33273	Zinc Plated Steel

SEAL TYPE OPTIONS

Seal PN	Seal Type	Shaft Dia.	Mating Ring	Material		
				Primary Ring	Elastomer	Components
MP29773	2	1	Silicon Carbide	Carbon	Viton	316 SS
MP35074	2	1	Ni-Resist	Carbon	Viton	316 SS
MP35435	2	1	Silicon Carbide	Carbon	Epdm	316 SS

PARTS LIST / HTO 180

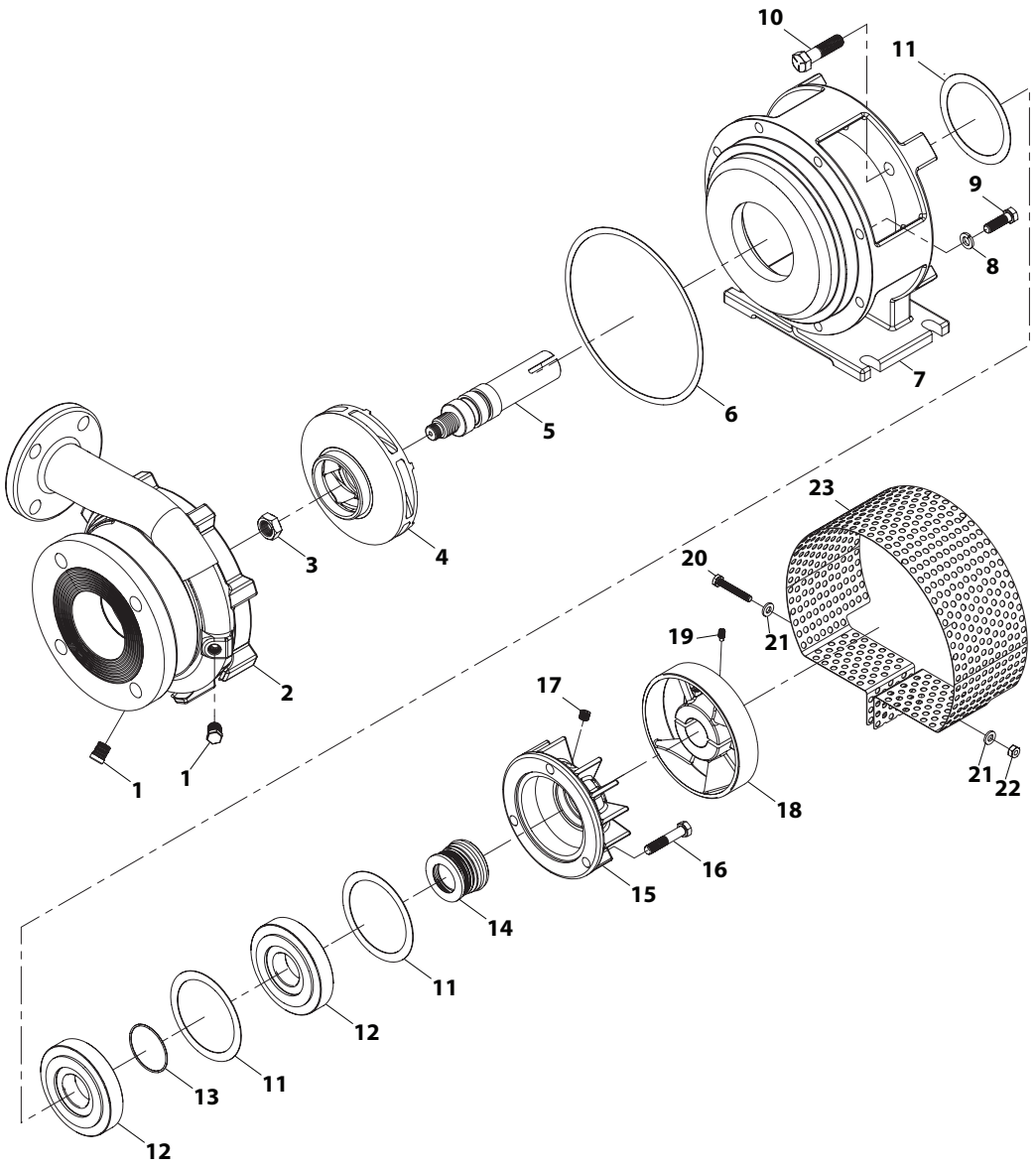


Figure 9

PARTS LIST / HTO 180

Item	Description (size)	Qty	Part No.	Mtl
1	Pipe Plug (1/8" NPT)	2	MP41475	Steel
2	Housing	1	MP33503	Ductile Iron
3	Hex Jam Nut	1	MP25168	Steel
4	Impeller	1	MP33505	Ductile Iron
	Impeller	1	MP34460	Ductile Iron
	Impeller	1	MP34459	Ductile Iron
	Impeller	1	MP37128	Ductile Iron
	Impeller	1	MP36063	Ductile Iron
5	Drive Sleeve	1	MP29822	303 SS
	Drive Sleeve	1	MP33510	303 SS
6	Gasket	1	MP31519	Garlock
7	Adaptor	1	MP33506	Ductile Iron
8	Lockwasher (3/8" x 1/8")	8	MP30626	Steel
9	Capscrew (3/8" - 16" x 1.25")	8	MP41257	Steel
10	Capscrew (1/2" - 13" x 2")	4	MP41279	Steel
11	Gasket	3	MP29825	Garlock

Item	Description (size)	Qty	Part No.	Mtl
12	Isolator	2	MP30842	ST. Marys Grade 251
13	O-Ring	1	MP30841	Viton
14	See Table for seal options			
15	Housing Seal	1	MP29830	Ductile Iron
16	Capscrew (3/8" -16" x 2")	3	MP21277	304 SS
17	Pipe Plug (1/8" NPT)	1	MP30824	Steel
18	Clamp Fan	1	MP29833	Ductile Iron
	Clamp Fan	1	MP33509	Ductile Iron / Steel
19	Set Screw (1/4"-28" x 1/2")	1	MP33417	Steel
20	Capscrew (1/4" - 20" x 1.75")	1	MP33810	Zinc Plated Steel
21	Washer	2	MP27261	Steel
22	Hexnut (1/4" - 20")	1	MP21241	304 SS
23	Shield	1	MP33274	Zinc Plated Steel

SEAL TYPE OPTIONS

Seal PN	Seal Type	Shaft Dia.	Mating Ring	Material		
				Primary Ring	Elastomer	Components
MP34933	2	1.5	Silicon Carbide	Carbon	Viton	316 SS
MP33507	2	1.25	Silicon Carbide	Carbon	Viton	316 SS
MP35000	2	1.5	Ni-Resist	Carbon	Viton	316 SS
MP31347	2	1.5	Silicon Carbide	Tungsten Carbide	Viton	316 SS

PARTS LIST / HTO 300

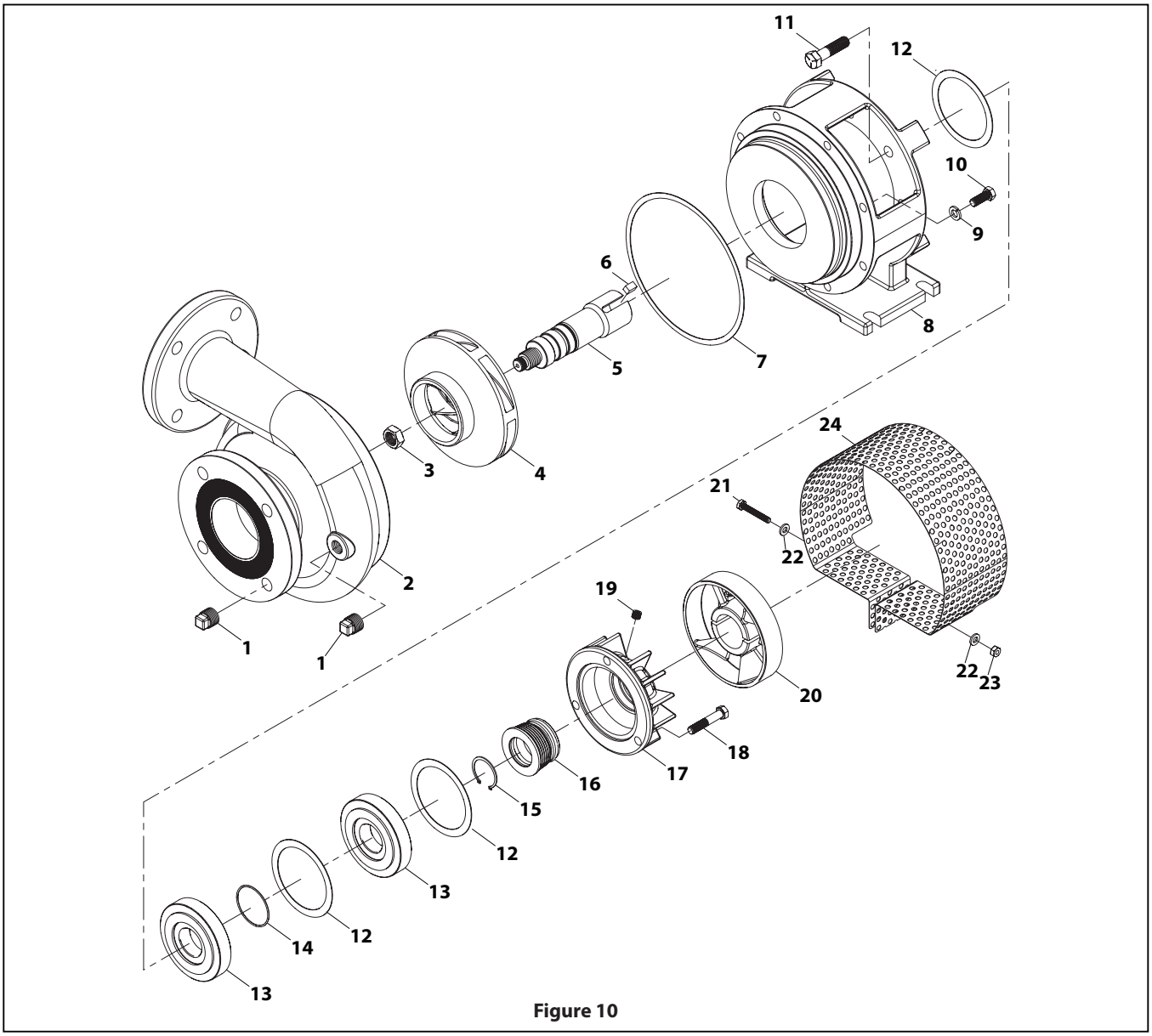


Figure 10

PARTS LIST / HTO 300

Item	Description (size)	Qty	Part No.	Mtl
1	Pipe Plug (1/2" NPT)	2	MP41479	Cast Iron
2	Housing	1	MP26733	Ductile Iron
3	Hex Jam Nut	1	MP25168	Steel
4	Impeller	1	MP29823	Cast Iron
	Impeller	1	MP31206	Cast Iron
	Impeller	1	MP31404	Cast Iron
	Impeller	1	MP30837	Cast Iron
	Impeller	1	MP33487	Cast Iron
	Impeller	1	MP33032	Cast Iron
	Impeller	1	MP34946	Cast Iron
5	Drive Sleeve	1	MP29822	303 SS
	Drive Sleeve	1	MP33510	303 SS
6	Square Key	1	MP29831	Steel
7	Gasket	1	MP31519	Garlock
8	Adaptor	1	MP29828	Ductile Iron
9	Lockwasher (3/8" x 1/8")	8	MP30626	Steel
10	Capscrew (3/8" -16" x 1")	8	MP41256	Steel

Item	Description (size)	Qty	Part No.	Mtl
11	Capscrew (1/2" -13" x 2")	4	MP41279	Steel
12	Gasket	3	MP29825	Garlock
13	Isolator	2	MP30842	ST. Marys Grade 251
14	O-Ring	1	MP30841	Viton
15	Snap Ring	1	MP29826	PH 15-7 Mo SS
16	See Table for seal options			
17	Housing Seal	1	MP29830	Ductile Iron
18	Capscrew (3/8" -16" x 2")	3	MP21277	304 SS
19	Pipe Plug (1/8" NPT)	1	MP30824	Steel
20	Clamp Fan	1	MP29833	Ductile Iron
	Clamp Fan	1	MP33509	Ductile Iron / Steel
21	Capscrew (1/4" - 20" x 1.75")	1	MP33810	Zinc Plated Steel
22	Washer	2	MP27261	Steel
23	Hexnut (1/4" - 20")	1	MP21241	304 SS
24	Shield	1	MP33274	Zinc Plated Steel

SEAL TYPE OPTIONS

Seal PN	Seal Type	Shaft Dia.	Mating Ring	Material		
				Primary Ring	Elastomer	Components
MP34933	2	1.5	Silicon Carbide	Carbon	Viton	316 SS
MP31347	2	1.5	Silicon Carbide	Tungsten Carbide	Viton	316 SS
MP35000	2	1.5	Ni-Resist	Carbon	Viton	316 SS
MP33507	2	1.25	Silicon Carbide	Carbon	Viton	316 SS

SERVICE KITS

PUMP MODEL	PUMP DESCRIPTION	SEAL KIT
MP37106	HTO80PMP D:3-3 56C 5.9 HD VENT	MP30762
MP37084	HTO80PMP D:PED 56C FA 4.25 HD	MP30762
MP51172	HTO80PMP D:1-3 56C 208/460 XP 4.25 VD	MP30762
MP29559	HTO80PMP D:3-3 56C XP 5.9 HD	MP30762
MP30082	HTO80PMP D:1.5-3 56C 208/460 4.8 HD	MP30762
MP30188	HTO80PMP D:3-3 56C 5.25 HD	MP30762
MP35507	HTO80PMP D:1/2-3 56C 1750 4.25 HD	MP30762
MP30245	HTO80PMP D:1-1 56C 4.25 HD	MP30762
MP38322	HTO80PMP D:3-3 56C WDM 5.9 HD	MP30762
MP30375	HTO80PMP C:3-3 56C 5.9 IPEG	MP30762
MP30396	HTO80PMP C:2-3 56C 50/60HZ 5.25 IPEG	MP30762
MP50168	HTO80PMP D:1/2-1 56C 1750 XP 5.9 HD	MP30762
MP30397	HTO80PMP C:1.5-3 56C 4.8 IPEG	MP30762
MP51006	HTO80PMP D:PED 56C FA 5.4 HD	MP30762
MP30398	HTO80PMP C:1-3 56C 4.25 IPEG	MP30762
MP29456	HTO80PMP D:2-3 56C 50/60HZ 5.9 HD	MP30762
MP30586	HTO80PMP D:3-3 56C 50/60HZ 5.9 HD	MP30762
MP35916	HTO80PMP C:2-3 56C 50HZ 2850 5.25 IPEG	MP30762
MP36413	HTO80PMP D:2-3 56C INV DTY 5.25 HD	MP30762
MP31024	HTO80PMP C:1-3 56C 50HZ 4.25 IPEG	MP30762
MP38637	HTO80PMP D:3-3 56C 4.75 VD	MP30762
MP31144	HTO80PMP D:3-3 56C 5.9 VD	MP30762
MP31210	HTO80PMP D:2-3 56C 50/60HZ 5.25 VD	MP30762
MP50017	HTO80PMP D:1-3 56C 208/460 XP 4.25 HD	MP30762
MP50527	HTO80PMP D:PED 56C FA 5.25 FF VD	MP30762
MP29431	HTO80PMP D:2-3 56C 50/60HZ 5.25 HD	MP30762
MP31346	HTO80PMP D:1-3 56C 208/460 4.25 VD	MP30762
MP31389	HTO80PMP C:1-3 56C 575V 4.25 IPEG	MP30762
MP51206	HTO80PMP D:3-3 56C 5.9 HD CHROMALOX	MP30762
MP31412	HTO80PMP D:1/2-3 56C 1750 5.9 HD	MP30762
MP35500	HTO80PMP D:1-3 56C 1750 XP 5.9 HD	MP30762
MP31488	HTO80PMP D:1.5-3 56C 208/460 4.25 HD	MP30762
MP31694	HTO80PMP D:3-3 56C 575V 5.9 VD	MP30762
MP35870	HTO80PMP D:3-3 56C 50/60HZ CE 5.9 VD	MP30762
MP32021	HTO80PMP D:1/2-3 56C 1750 ODP 5.9 B-HD	MP30762
MP35975	HTO80PMP D:2-3 56C WDM 5.25 VD	MP30762
MP33077	HTO80PMP D:3-3 56C 5.9 HD VERT MT BOX	MP30762
MP36675	HTO80PMP D:1-1 56C 4.25 VD	MP30762
MP29630	HTO80PMP D:3/4-3 56C 1750 5.9 HD	MP30762
MP29672	HTO80PMP D:PED 56C FA 5.9 HD	MP30762
MP29566	HTO80PMP D:1-3 56C 208/460 4.25 HD	MP30762
MP29711	HTO80PMP D:1/2-3 56C 1750 ODP 5.9 HD	MP30762
MP33283	HTO80PMP C:3-3 56C 50HZ 2850 5.9 IPEG	MP30762
MP33298	HTO80PMP D:1.5-1 56C RR 4.75 HD	MP30762
MP33711	HTO80PMP D:1-3 56C 1750 5.9 HD	MP30762
MP29411	HTO80PMP D:3-3 56C 5.9 HD	MP30762
MP33808	HTO80PMP D:3-3 56C 200/400 5.9 HD	MP30762
MP38504	HTO80PMP D:2-3 56C 1750 5.9 HD	MP30762
MP34042	HTO80PMP D:1.5-3 56C 208/460 4.75 VD	MP30762
MP34044	HTO80PMP D:PED 56C FA 4.75 VD	MP30762
MP38750	HTO80PMP D:1.5-3 56C 208/460 5.25 VD	MP30762
MP39474	HTO80PMP D:1-3 56C 1750 4.25 VD	MP30762
MP39625	HTO80PMP C:2-3 56C 575V 60HZ 5.25 IPEG	MP30762

SERVICE KITS

PUMP MODEL	PUMP DESCRIPTION	SEAL KIT
MP34474	HTO80PMP D:3-1 56C 208/230 60HZ 5.75 HD	MP30762
MP50045	HTO80PMP D:3-3 56C 575V 5.75 HD	MP30762
MP34655	HTO80PMP D:1.5-3 56C 208/460 5.25 HD	MP30762
MP50554	HTO80PMP D:1/2-3 56C 1750 XP 5.9 HD	MP30762
MP34799	HTO80PMP D:3-3 56C 5.75 HD	MP30762
MP50921	HTO80PMP D:2-3 56C 50/60HZ 5.4 HD	MP30762
MP34869	HTO80PMP D:3-3 56C 415V 50HZ 2850 5.9 HD	MP30762
MP50976	HTO80PMP D:3-3 56C 575V 5.9 HD	MP30762
MP34970	HTO80PMP D:3-3 56C 5.75 VD	MP30762
MP51055	HTO80PMP D:3-3 56C 575V 5.75 FF HD	MP30762
MP35018	HTO80PMP D:1-3 208/460 WSDN 4.25 HD	MP30762
MP29632	HTO80PMP D:1-3 56C ODP 4.5 HD	MP30762
MP35667	HTO80PPK D:CCMTR 5/8 FA 56C 5.9 HD-BTM	MP30762
MP31046	HTO80PMP D:3-3 56C 5.25 VD	MP30762
MP29156	HTO80PPK D:CCMTR 5/8 FA 56C 5.9 HD	MP30762
MP39485	HTO80PMP D:3-3 56C 380V 50HZ 5.9 VD	MP30762
MP50537	HTO80PMP D:3-3 56C 575V 5.25 FF VD	MP30762
MP31893	HTO80PPK D:CCMTR 5/8 FA 56C 4.75 HD	MP30762
MP34810	HTO80PMP D:3-3 56C 5.25 FF VD	MP30762
MP29415	HTO80PPK D:CCMTR 5/8 FA 56C 5.0 HD	MP30762
MP35073	HTO80PMP D:1.5-3 56C 208/460 4.25 FF VD	MP30762
MP34181	HTO80PMP D:1-3 56C 208/460 4.25 FF VD	MP30762
MP34493	HTO80PMP D:2-3 56C 575V 5.25 FF HD	MP30762
MP33023	HTO80PPK D:CCMTR 5/8 FA 56C 4.75 VD	MP30762
MP50402	HTO80PMP D:3-3 56C 575V 5.9 FF HD	MP30762
MP34772	HTO80PMP D:3-3 56C 4.25 FF VD	MP30762
MP35286	HTO80PMP D:3-3 56C 5.25 FF HD	MP30762
MP51149	HTO80PMP D:2-1 56C 5.25 FF VD	MP30762
MP33063	HTO80PMP D:3-3 56C 380V 50HZ 5.9 FF HD	MP30762
MP33896	HTO80PMP D:1/2-3 56C 1750 5.9 FF VD	MP30762
MP30738	HTO80PPK D:CCMTR 5/8 FA 56C 5.25 VD	MP30762
MP34085	HTO80PMP D:1-1 56C 4.25 FF VD	MP30762
MP33104	HTO80PMP D:3-3 56C 50/60HZ 5.9 FF HD	MP30762
MP35485	HTO80PMP D:1.5-3 56C 4.75 FF VD	MP30762
MP39800	HTO80PMP D:PED 56C FA 5.9 VD FF	MP30762
MP34648	HTO80PMP D:1-3 56C 208/460 4.25 FF HD	MP30762
MP33173	HTO80PMP D:2-3 56C 50/60HZ 5.25 FF VD	MP30762
MP33239	HTO80PMP D:1.5-3 56C 208/460 4.75 FF HD	MP30762
MP35519	HTO80PMP D:3-3 56C 575V CE 5.9 FF HD	MP30762
MP33279	HTO80PPK D:CCMTR 5/8 FA 56C 4.5 VD	MP30762
MP35702	HTO80PMP D:2-3 56C 50HZ 2850 5.25 FF VD	MP30762
MP30739	HTO80PPK D:CCMTR 5/8 FA 56C 5.9 VD	MP30762
MP33288	HTO80PPK D:CCMTR 5/8 FA 56C 5.4 VD	MP30762
MP33289	HTO80PPK D:CCMTR 5/8 FA 56C 4.0 VD	MP30762
MP30224	HTO80PPK D:CCMTR 5/8 FA 56C 4.5 HD	MP30762
MP30632	HTO80PPK D:CCMTR 5/8 FA 56C 5.25 HD	MP30762
MP38521	HTO80PMP D:3-3 56C XP 5.9 FF HD	MP30762
MP33525	HTO80PMP D:1.5-3 56C 208/460 4.75 FF VD	MP30762
MP33580	HTO80PMP D:3-3 56C 5.9 FF VD	MP30762
MP39330	HTO80PMP D:3-3 56C XP 5.75 FF HD	MP30762
MP39440	HTO80PMP D:1-1 56C 4.25 FF HD	MP30762
MP34498	HTO80PMP D:2-3 56C 50/60HZ 5.25 FF HD	MP30762
MP39821	HTO80PPK D:CCMTR 5/8 FA 56C 4.25 VD	MP30762

SERVICE KITS

PUMP MODEL	PUMP DESCRIPTION	SEAL KIT
MP33755	HTO80PMP D:3-3 56C 4.75 FF VD	MP30762
MP30227	HTO80PPK D:CCMTR 5/8 FA 56C 4.25 HD	MP30762
MP50956	HTO80PMP D:3-3 56C 5.25 FF VD BALDOR	MP30762
MP32064	HTO80PMP D:3-3 56C 5.9 FF HD	MP30762
MP37889	HTO80PMP D:1.5-3 56C 380V 4.75 F-FLG VD	MP30762
MP51191	HTO80PMP D:2-3 56C 3450 460V 4.75 FF VD	MP30762
MP37955	HTO80PMP D:1.5-1 56C 4.75 F-FLG VD	MP30762
MP31872	HTO80PPK D:CCMTR 5/8 FA 56C 5.9 FF HD	MP30762
MP36773	HTO80PPK D:CCMTR 5/8 FA 56C 5.9 FF VD	MP30762
MP36213	HTO80PPK D:CCMTR 5/8 FA 56C 5.4 FF HD	MP30762
MP34564	HTO80PPK D:CCMTR 5/8 FA 56C 4.25 FF VD	MP30762
MP33110	HTO80PPK D:CCMTR 5/8 FA 56C 5.25 FF VD	MP30762
MP33827	HTO80PPK D:CCMTR 5/8 FA 56C 5.0 FF VD	MP30762
MP35769	HTO80PMP D:2-3 145TC 1750 XP 5.9 VENT HD	MP30763
MP35736	HTO80PMP D:3-3 145TC 4.25 HD TAP SL HSG	MP30763
MP50942	HTO80PMP D:HS PED .37DISP 5.9 HD	MP30763
MP37177	HTO80PMP D:2-3 145TC XP 5.25 T-2 CSC VD	MP30763
MP37274	HTO120PMP D:5-3 184C 5.96 HTW CB-12:00VD	MP30763
MP38002	HTO80PMP D:1.5-3 145TC 5.9 50Hz HD	MP30763
MP39775	HTO120PMP D:5-3 184C IP54 5.96 VD	MP30763
MP29892	HTO120PMP D:5-3 184C 5.5 HD	MP30763
MP38606	HTO120PMP D:1-3 143TC 1725 5.96 HD	MP30763
MP30170	HTO120PMP D:5-3 184C 5.96 HD	MP30763
MP30222	HTO120PMP D:3-3 145TC 5.0 HD	MP30763
MP39372	HTO120PMP D:5-3 184C 50HZ 5.96 VD	MP30763
MP35495	HTO120PMP D:3-3 145TC TEFC 5.96IMP VD	MP30763
MP30580	HTO120PMP D:PED FA 5.96 HD	MP30763
MP30754	HTO120PMP D:3-3 145TC 5.25 HD	MP30763
MP30884	HTO120PMP D:5-3 184C 5.96 VD	MP30763
MP30977	HTO120PMP D:5-3 184C 5.5 VD	MP30763
MP38417	HTO120PMP D:3-3 145TC 50HZ 5.96IMP HD	MP30763
MP39483	HTO120PMP D:5-3 575V 184C 5.96HD	MP30763
MP31221	HTO120PMP D:PED FA 5.96 VD	MP30763
MP31289	HTO120PMP D:2-3 145TC 4.5 HD	MP30763
MP31500	HTO120PMP D:3-3 145TC 5.0 VD	MP30763
MP37156	HTO120PMP D:3-3 145TC WDM 5.0 VD	MP30763
MP38175	HTO120PMP D:5-3 184C 575 SEVDTY5.96FF VD	MP30763
MP33771	HTO120PMP D:2-3 145TC 4.5 VD	MP30763
MP38392	HTO120PMP D:2-3 145TC 50HZ 4.5 HDBOT	MP30763
MP38616	HTO120PMP D:3-3 145TC 5.5 VD	MP30763
MP34046	HTO120PMP D:PED FA 5.5 VD	MP30763
MP39923	HTO120PMP D:3-3 184C 380V 50HZ 5.75 HD	MP30763
MP34522	HTO120PMP D:3-3 145TC 5.5 HD	MP30763
MP34583	HTO120PMP D:1-3 143TC 1725 5.96 VD	MP30763
MP50187	HTO120PMP D:5-3 184C XP 5.96 HD	MP30763
MP34089	HTO120PPK D:CCMTR 7/8 145TC 4.5 HD	MP30763
MP39403	HTO120PMP D:5-3 184C 5.96 HTW FF VD	MP30763
MP50492	HTO120PPK D:CCMTR 7/8 145TC 4.5 VD	MP30763
MP39250	HTO120PMP D:5-3 184C 575V 5.96 FF VD	MP30763
MP32065	HTO120PMP D:5-3 184C 5.96 FF HD	MP30763
MP31717	HTO120PMP D:5-3 184C5.96FFVD	MP30763
MP34990	HTO120PMP D:2-3 145TC XP 4.5 FF HD	MP30763
MP33017	HTO120PMP D:3-3 145TC 5.0 FF VD	MP30763

SERVICE KITS

PUMP MODEL	PUMP DESCRIPTION	SEAL KIT
MP35049	HTO120PMP D:3-3 145TC 5.0 FF HD	MP30763
MP35100	HTO120PMP D:3-3 145TC XP 4.5 FF VD	MP30763
MP35284	HTO120PMP D:5-3 184C 50/60HZ 5.96 FF HD	MP30763
MP38530	HTO120PMP D:3-3 145TC XP 5.0 FF VD	MP30763
MP39097	HTO120PMP D:5-3 184C 5.75 FF HD	MP30763
MP35441	HTO120PMP D:3-3 145TC XP 5.0 FF B-HD	MP30763
MP34424	HTO120PMP D:5-3 184C 575V 5.96 FF HD	MP30763
MP33114	HTO120PMP D:2-1 145TC 4.5 FF VD	MP30763
MP34712	HTO120PMP D:5-3 184C 5.5 FF VD	MP30763
MP50710	HTO120PMP D:5-3 184C 5.25 FF HD	MP30763
MP32036	HTO120PMP D:5-3 184C 5.75 FF VD	MP30763
MP51028	HTO120PPK D:CCMTR 7/8 145TC 5.0 B-HD	MP30763
MP38019	HTO120PMP D:5-3 184C 575V 5.96F-FLGHD MB	MP30763
MP33972	HTO120PMP D:5-3 184C 5.5 FF HD	MP30763
MP30741	HTO120PPK D:CCMTR 7/8 145TC 5.5 VD	MP30763
MP33370	HTO120PMP D:5-3 184C 5.96 FF VD	MP30763
MP38615	HTO120PMP D:3-3 145TC 5.96 FF VD	MP30763
MP35910	HTO120PMP D:5-3 184C 50/60HZ 5.96 HD NPT	MP30763
MP39118	HTO120PMP D:3-3 145TC 50HZ 5.96 FF HD	MP30763
MP36373	HTO120PMP D:3-3 145TC 5.5 FF HD	MP30763
MP36497	HTO120PMP D:5-3 184C 50/60HZ CE 5.96 VD	MP30763
MP30742	HTO120PPK D:CCMTR 7/8 145TC 5.96 VD	MP30763
MP50081	HTO80PMP D:3-3 145TC380V 50HZ 5.75 FF HD	MP30763
MP37017	HTO120PMP D:5-3 184C 50/60HZ 5.96 VD NPT	MP30763
MP30673	HTO120PPK D:CCMTR 7/8 145TC 5.5 HD	MP30763
MP50533	HTO120PMP D:5-3 184C 5.96 CB-12:00 FF VD	MP30763
MP50582	HTO120PPK D:CCMTR 7/8 145TC 5.0 VD	MP30763
MP29809	HTO120PPK D:CCMTR 7/8 145TC 5.96 HD	MP30763
MP50720	HTO120PMP D:3-3 145TC XP 5.0 FF HD	MP30763
MP37164	HTO120PMP D:3-3 145TC XP 5.5 FF HD	MP30763
MP37220	HTO120PMP D:3-3 145TC 575V 4.5 FF HD	MP30763
MP33831	HTO120PMP D:2-3 145TC 4.5 FF VD	MP30763
MP51112	HTO120PMP D:5-3 184C 5.25 FF VD	MP30763
MP36279	HTO80PPK D:CCMTR 7/8 145TC 5.9 CSC VD	MP30763
MP50744	HTO80PPK D:CCMTR 7/8 145TC 5.9 CSC FF VD	MP30763
MP35857	HTO120PPK D:CCMTR 7/8 145TC 5.96 FF HD	MP30763
MP31791	HTO120PPK D:CCMTR 7/8 145TC 5.96 FF VD	MP30763
MP36686	HTO120PPK D:CCMTR 7/8 145TC 5.0 FF HD	MP30763
MP35945	HTO120PPK D:CCMTR 7/8 145TC 4.5 FF HD	MP30763
MP31493	HTO120PPK D:CCMTR 7/8 145TC 4.5 FF VD	MP30763
MP37941	HTO300PMP D:10-3 215TC6.62 160GPM STC VD	MP34856
MP34152	HTO300PMP D:15-3 215TC 6.38 STC HD 550F	MP34856
MP34239	HTO300PMP D:7.5-3 213TC 5.5 STC VD 550F	MP34856
MP33786	HTO300PMP D:10-3 215TC 5.7 STC HD 550F	MP34856
MP39059	HTO300PMP D:15-3 215TC 6.5 HD STC	MP34856
MP33709	HTO300PMP D:15-3 215TC 6.62 STC VD 550F	MP34856
MP39423	HTO300PPK D:CCMTR 215TC 5.7 STC HD 550F	MP34856
MP34458	HTO180PMP D:10-3 215TC 6.5 STC 550F VD	MP34856
MP34227	HTO300PPK D:CCMTR 215TC 7.0 STC VD 550F	MP34856
MP33708	HTO300PPK D:CCMTR 215TC 6.0 STC VD 550F	MP34856
MP51070	HTO300PPK D:CCMTR 1.375 215TC 6.4 STC HD	MP34856
MP39979	HTO180PPK D:CCMTR 1.375 215TC 6.5 STC VD	MP34856
MP34573	HTO180PMP D:7.5-3 213TC 575V 5.8 STC VD	MP34856

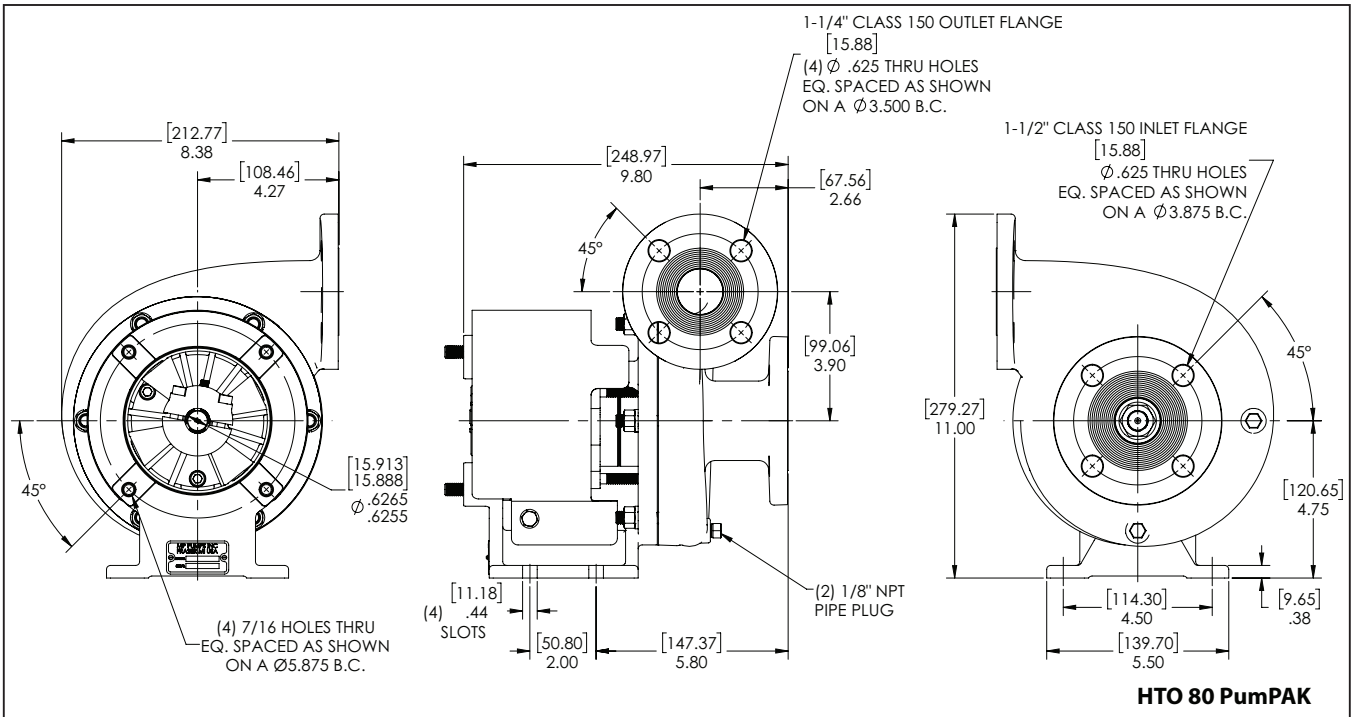
SERVICE KITS

PUMP MODEL	PUMP DESCRIPTION	SEAL KIT
MP34808	HTO180PMP D:7.5-3 184TC ODP 5.125 550 VD	MP34857
MP34457	HTO180PMP D:7.5-3 184TC 5.8 VD	MP34857
MP35568	HTO180PMP D:3-3 182TC 1750 XP 6.5 VD	MP34857
MP38324	HTO180PMP D:7.5-3 184TC 5.18 HD	MP34857
MP35838	HTO180PMP D:7.5-3 184TC 6.5 HD	MP34857
MP38018	HTO180PMP D:5-3 184TC TEFC 5.18CDI 575VD	MP34857
MP33534	HTO180PMP D:7.5-3 184TC 5.8 HD	MP34857
MP34897	HTO180PMP D:5-3 184TC 5.18 HD	MP34857
MP50394	HTO180PMP D:1.5-3 184TC 1750 TEFC 6.5 VD	MP34857
MP35090	HTO180PMP D:7.5-3 184TC 6.5 VD	MP34857
MP37127	HTO180PMP D:7.5-3 184TC ODP 5.645 550 VD	MP34857
MP39886	HTO180PMP D:7.5-3 184TC 5.375 VD	MP34857
MP39973	HTO180PMP D:7.5-3 184TC 5.5 HD	MP34857
MP35846	HTO180PMP D:3-3 184TC 50HZ CE 5.18	MP34857
MP37070	HTO180PMP D:7.5-3 184TC 5.8 HD MB	MP34857
MP37950	HTO300PMP D:3-3 182TC1750 TEFC 7.0CDI VD	MP34857
MP50195	HTO180PMP D:7.5-3 184TC 5.5 VD	MP34857
MP36632	HTO180PMP D:7.5-3 184TC XP 5.8 550F VD	MP34857
MP50336	HTO180PMP D:7.5-3 184TC 5.9 VD	MP34857
MP39629	HTO180PMP D:5-3 184TC 50HZ CE 5.8 HD	MP34857
MP50334	HTO180PPK D:CCMTR 1.125 184TC 5.18 VD	MP34857
MP51117	HTO300PPK D:CCMTR 1.125 184TC 7.0 HD	MP34857
MP35164	HTO180PPK D:CCMTR 1.125 184TC 6.5 HD	MP34857
MP37143	HTO180PPK D:CCMTR 1.125 184TC 5.8 HD	MP34857
MP39522	HTO300PPK D:CCMTR 1.125 184TC 5.5 HD	MP34857
MP35990	HTO180PPK D:CCMTR 1.125 184TC 5.18 HD	MP34857
MP38162	HTO300PPK D:CCMTR 1.125 184TC 6.62 HD	MP34857
MP38263	HTO300PMP D:PED 7.0 HD	MP35224
MP50724	HTO300PMP D:15-3 215TC 6.5 VD	MP35224
MP39919	HTO300PMP D:15-3 400V 50HZ 215TC 7.0 HD	MP35224
MP39444	HTO300PMP D:15-3 215TC 6.38 VD	MP35224
MP38073	HTO300PMP D:7.5-3 215TC 5.0 VD	MP35224
MP35225	HTO300PMP D:10-3 215TC 5.7 HD	MP35224
MP38084	HTO300PMP D:15-3 215TC 6.62 HD 380V 60HZ	MP35224
MP37963	HTO300PMP D:10-3 215TC 575V 5.7CDI HD	MP35224
MP38290	HTO300PMP D:10-3 215TC XP 5.5 HD	MP35224
MP39816	HTO300PMP D:10-3 215TC 6.62 HD 380V 60HZ	MP35224
MP35232	HTO300PMP D:10-3 215TC 6.38 VD	MP35224
MP38401	HTO300PMP D:15-3 215TC 6.38 HD	MP35224
MP35226	HTO300PMP D:10-3 215TC 6.38 HD	MP35224
MP38003	HTO300PMP D:10-3 215TC XP 5.7CDI VD	MP35224
MP35240	HTO300PMP D:20-3 215TC 7.0 VD	MP35224
MP35243	HTO300PMP D:10-3 215TC 6.0 VD	MP35224
MP37020	HTO300PMP D:15-3 215TC 6.62 HD W/FNC	MP35224
MP38701	HTO300PMP D:10-3 215TC 5.7 HD	MP35224
MP35222	HTO300PMP D:10-3 215TC 5.7 VD-DWN	MP35224
MP39049	HTO300PMP D:15-3 215TC 6.5 HD	MP35224
MP37218	HTO300PMP D:10-3 215TC XP 5.7 HD	MP35224
MP35227	HTO300PMP D:10-3 215TC 6.0 HD	MP35224
MP39091	HTO300PMP D:20-3 215TC 7.0 HD	MP35224
MP50958	HTO300PMP D:15-3 215TC XP 6.63 VD	MP35224
MP35229	HTO300PMP D:7.5-3 215TC 5.5 VD	MP35224
MP35263	HTO300PMP D:15-3 215TC 6.62 HD	MP35224

SERVICE KITS

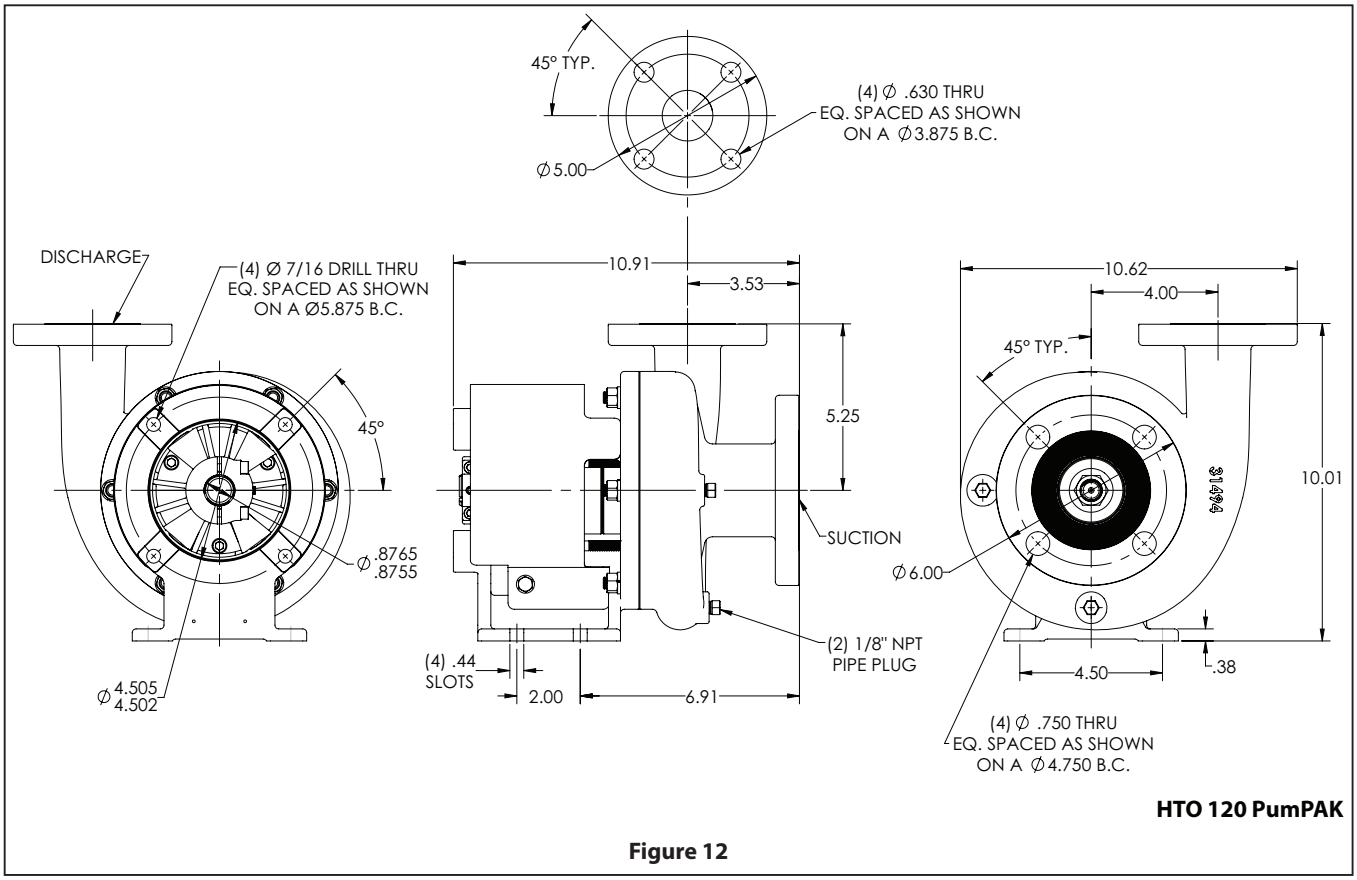
PUMP MODEL	PUMP DESCRIPTION	SEAL KIT
MP36669	HTO300PMP D:15-3 215TC ODP 6.62 HD	MP35224
MP35230	HTO300PMP D:15-3 215TC 7.0 HD	MP35224
MP35223	HTO300PPK D:CCMTR 1.375 215TC 7.0 HD	MP35224
MP37246	HTO180PMP D:7.5-3 215TC 50HZ MD 6.5 HD	MP35224
MP38270	HTO300PPK D:CCMTR 1.375 215TC 5.5 HD	MP35224
MP50882	HTO180PMP D:7.5-3 215TC 400V 50HZ 6.5 HD	MP35224
MP39341	HTO180PMP D:10-3 215TC 575V 6.0 CSC HD	MP35224
MP50575	HTO180PMP D:10-3 215TC 5.8 CSC VD	MP35224
MP39109	HTO180PMP D:7.5-3 215TC 50HZ 6.5 VD	MP35224
MP39784	HTO300PPK D:CCMTR 1.375 215TC 5.7 VD	MP35224
MP36252	HTO180PMP D:10-3 215TC 6.0 CSC HD	MP35224
MP35761	HTO300PPK D:CCMTR1.375 215TC 6.62 FNC VD	MP35224
MP38223	HTO180PMP D:7.5-3 215TC 50HZ 6.5 HD	MP35224
MP35973	HTO300PPK D:CCMTR 1.375 215TC 6.38 HD	MP35224
MP39922	HTO180PMP D:7.5-3 215TC 400V 50HZ 5.8 HD	MP35224
MP38325	HTO180PMP D:10-3 215TC 6.5 CSC VD	MP35224
MP35837	HTO180PMP D:10-3 215TC 6.5 CSC HD	MP35224
MP38249	HTO180PMP D:10-3 215TC 6.0 CSC VD	MP35224
MP38353	HTO300PPK D:CCMTR 1.375 215TC 5.7 HD	MP35224
MP50277	HTO300PPK D:CCMTR 1.375 215TC 6.38 VD	MP35224
MP39719	HTO180PMP D:10-3 215TC 5.8 CSC HD	MP35224
MP38103	HTO300PPK D:CCMTR 1.375 215TC 6.62 HD	MP35224
MP38391	HTO180PPK D:CCMTR 1.375 215TC 6.5 HD	MP35224
MP50141	HTO180PPK D:CCMTR 1.375 215TC 5.8 HD	MP35224
MP39872	HTO180PPK D:CCMTR 1.375 215TC 5.645 VD	MP35224
MP39303	HTO180PPK D:CCMTR 1.375 215TC 6.5 VD	MP35224
MP50182	HTO180PPK D:CCMTR 1.375 215TC 6.0 HD	MP35224
MP35231	HTO300PPK D:CCMTR 1.375 215TC 7.0 NO HSG	MP35224
MP35399	HTO80PMP D:2-3 145TC 5.25 T-2 F48 FF VD	MP35288
MP36332	HTO80PMP D:3-3 145TC 5.9 F48 JC FF VD	MP35288
MP37064	HTO80PMP D:3-3 184C 50HZ 5.25 F48 FF VD	MP35288
MP51175	HTO120PMP D:5-3 184C 5.96 F48 FF VD	MP35288
MP50906	HTO120PMP D:2-3 145TC 4.5 NRS VD	MP35310
MP36292	HTO120PMP D:5-3 184C 5.5 NRS VD	MP35310
MP34151	HTO120PMP D:5-3 184C 5.5 NRS HD	MP35310
MP35433	HTO120PMP D:3-3 145TC 5.0 NRS HD	MP35310
MP33832	HTO120PMP D:5-3 184C 5.96 NRS VD	MP35310
MP38631	HTO120PMP D:5-3 184C 5.96 NRS HD	MP35310
MP35926	HTO120PMP D:5-3 184C 5.5 NRS FF VD	MP35310
MP34708	HTO120PMP D:5-3 184C 5.75 NRS VD	MP35310
MP33792	HTO120PMP D:5-3 184C 5.96 NRS FF VD	MP35310
MP50909	HTO120PMP D:5-3 184C 5.75 NRS HD	MP35310
MP37273	HTO120PMP D:PED FA 5.96 F-FLG NRS VD	MP35310
MP37888	HTO120PMP D:3-3 184C 50HZ 5.96 FF NRS VD	MP35310
MP34935	HTO120PPK D:CCMTR 7/8 145TC 5.96 NRS HD	MP35310
MP38035	HTO120PMP D:3-3 145TC 5.0 NRS FF VD	MP35310
MP36377	HTO120PPK D:CCMTR 7/8 5.96 NRS FF VD	MP35310
MP37118	HTO80PMP D:1-3 56C 4.25 T-2 NRS HD	MP34292
MP37977	HTO80PMP D:1/2-3 56C 1750 TEFC NRS HD	MP34292
MP38021	HTO80PMP D:3-3 56C 5.9 NRS VD	MP34292
MP33700	HTO80PMP D:3-3 56C 5.9 T-2 NRS FF VD	MP34292
MP33843	HTO80PPK D:CCMTR 5/8 56C 5.9 NRS NHSG	MP34292
MP34763	HTO80PPK D:CCMTR 5/8 56C 5.9 NRS FF VD	MP34292

DIMENSIONAL DATA



HTO 80 PumPAK

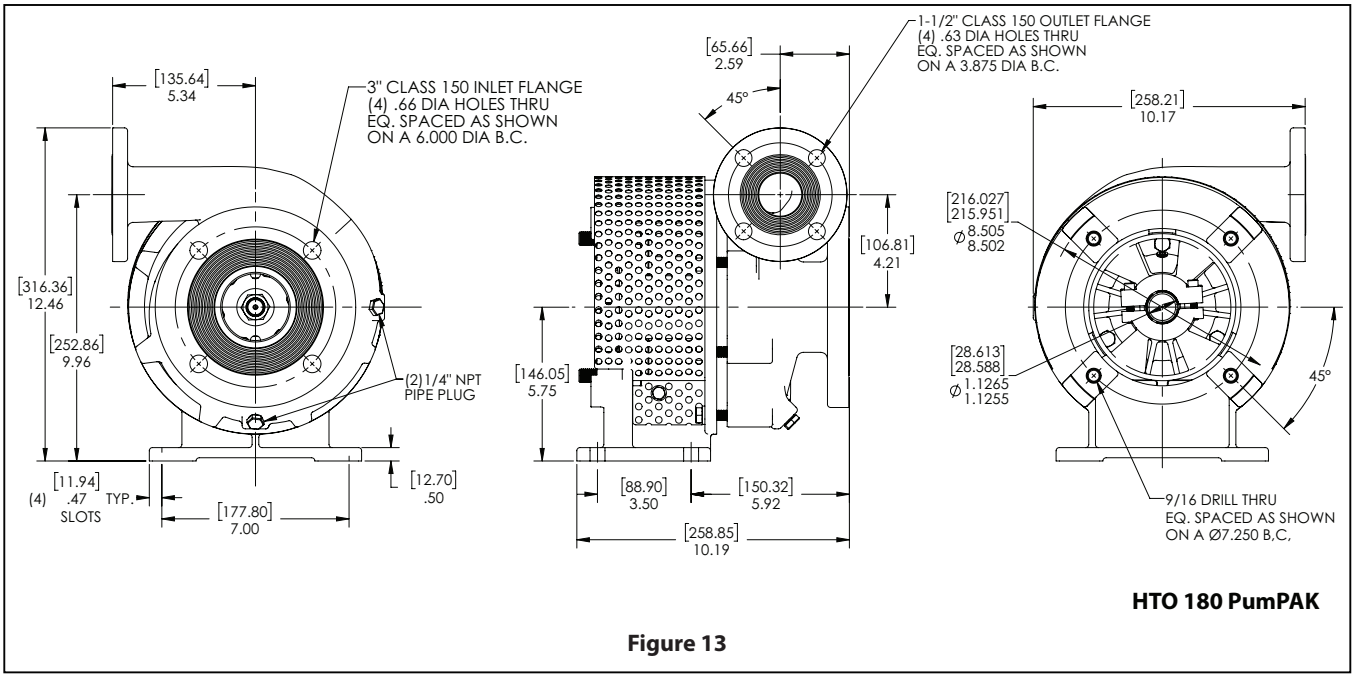
Figure 11



HTO 120 PumPAK

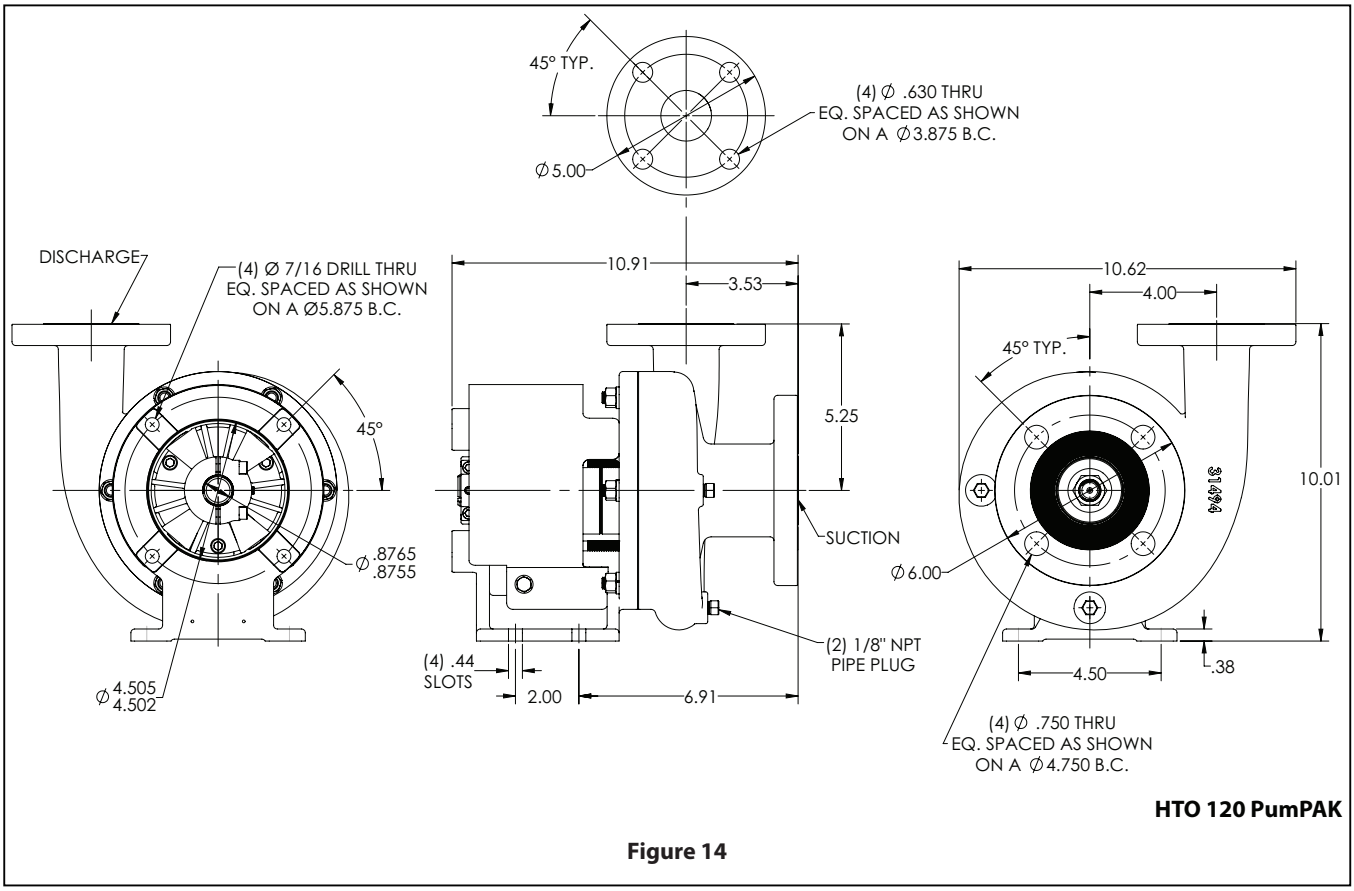
Figure 12

DIMENSIONAL DATA



HTO 180 PumPAK

Figure 13



HTO 120 PumPAK

Figure 14

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 baffler 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. Repalace 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'