

PENGUIN

Installation & Maintenance

Magnetic Drive Pump Series MTD

MODELS

MTD-5

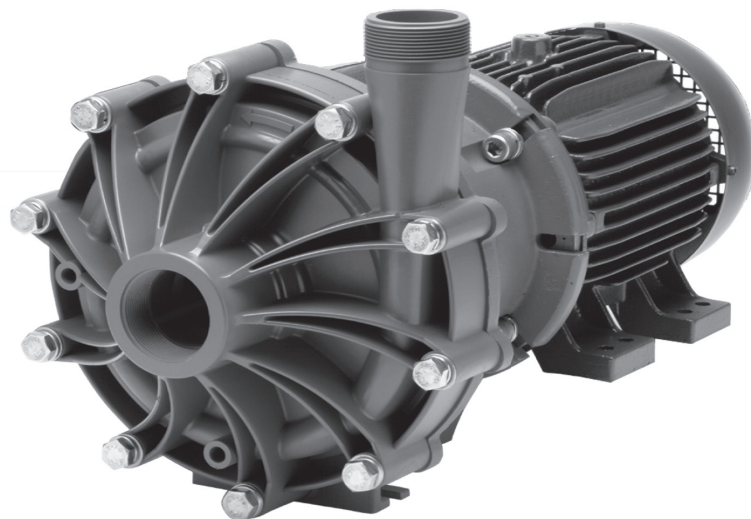
MTD-7-1/2

MTD-10

MATERIALS

B - Polypropylene

C - PVDF (Kynar)



INTRODUCTION

Penguin magnetic-driven pumps are designed to handle a large range of chemicals without difficulty. Constructed of polypropylene, kynar, Series MTD pumps have an upper working temperature of 190/220/250 degrees, respectively, and thus can handle highly corrosive or mild chemicals, acids or solvents. Series M pumps eliminate the conventional shaft seal found in most pumps. This means that there is no rotating seal to wear out and allow the liquid being pumped to leak out. The pumping action may eventually fail, however, the liquid can never leak out. Series MTD pumps are easy to install and operate, and are virtually maintenance free. All pumps have been tested for proper operation before leaving the factory. To obtain optimum service life, please follow all instructions.

RECOMMENDATIONS

Install the pump as close as possible to the liquid reservoir from which the liquid is being pumped. As more energy is necessary to prime the liquid than to discharge the fluid, make the suction as short as possible.

Always make sure there is enough liquid in the reservoir and the level is high enough considering the capacity of the pump unit. Inadequate liquid will cause vortex in the reservoir. A vortex occurs when air mixes from the surface into the fluid. This can disturb the flow and also prevents the pump from priming. Never run the pump for more than 5-10 minutes against a closed discharge valve. This will cause overheating of the fluid in the pump and will damage the polypropylene parts. Temperature in this case will increase up to 220 degrees. If the pump is being run against a closed discharge valve for a long duration of time, install a small bleed line back into the reservoir before the discharge valve of the pump. If the line is small, there is a minimum pressure loss. This prevents overheating by recirculating the fluid.

ELECTRICAL

Model MTD pumps are supplied as standard in a single phase, single voltage, 115V, 50/60c motor with 230V as an option. All other models supplied with a single phase are dual voltage, 115/230V motors. The factory wires all dual voltage motors for the lower voltage (115V) unless otherwise requested. When changing from 115V wiring to 230V wiring, follow the motor manufacturer's wiring instructions, which are found in the motor junction box or motor label. Be sure to wire the motor for clockwise rotation as viewed from the suction entrance of the pump. A power cord and plug are supplied for immediate plug-in operation on motors wired for the lower voltage. These motors have already been wired at the factory for proper rotation. A plug is not supplied on motors wired 230V. Motors supplied in three-phase are dual voltage, 230/460V, 50/60c which are not wired at the factory. Since direction of rotation cannot be determined without operating the pump, the motor rotation must be checked before operation. Attach leads to motor and bump start. Since these pumps must not run dry for more than 10 seconds, do not leave motor running. As viewed from the suction entrance of the pump, check for clockwise rotation. If counterclockwise rotation, change any two leads and check rotation again. Many options are available on the M Series motors including explosion-proof and special voltage motors. If any of these options are required, please check the motors carefully or consult factory.

PLUMBING

It is recommended to enlarge the suction line a minimum of one size larger than the suction entrance. Never reduce plumbing on the suction. Avoid 90 degree elbows and never use a 180 degree elbow. Make sure that every suction coupling/connection is airtight. Always use a valve on the discharge of the pump. In case of a flooded suction, in which the liquid level is higher than the center of the suction entrance, provide a T-connection with a small valve after the discharge valve to assist in letting the air out during flooding. In case of a non-flooded suction, in which the liquid level is lower than the center of the suction entrance, provide a foot valve on the end of the submerged suction line.

IMPORTANT INFORMATION - READ FIRST

Model Number and Serial Number

Record the model number and serial number below for future reference. This is important information when ordering replacement parts or when technical assistance is required. The numbers are found on a label located on the motor adapter.

Model Number _____

Serial Number _____

Chemical Reaction Disclaimer

The user must exercise primary responsibility in selecting the product's materials of construction, which are compatible with the fluid(s) that come(s) in contact with the product. The user may consult Finish Thompson, Inc. (manufacturer) and a manufacturer's representative/distributor agent to seek a recommendation of the product's material of construction that offers the optimum available chemical compatibility. However neither manufacturer nor agent shall be liable for product damage or failure, injuries, or any other damage or loss arising out of a reaction, interaction or any chemical effect that occurs between the materials of the product's construction and fluids that come into contact with the product's components.

Safety Precautions

WARNING: READ THIS MANUAL COMPLETELY BEFORE INSTALLING AND OPERATING THIS UNIT. FAILURE TO FOLLOW THESE PRECAUTIONS CAN RESULT IN SERIOUS INJURY OR DEATH.

WARNING: Magnetic field hazard: This pump contains powerful magnets. Exposed magnets (pump not connected to motor) produce powerful magnetic fields. Individuals with cardiac pacemakers, implanted defibrillators, other electronic medical devices, metallic prosthetic heart valves, internal wound clips (from surgery), metallic prosthetic devices or sickle cell anemia must not handle or be in the proximity of the magnets contained inside the pump. Consult a health care provider for specific recommendations before working with this pump.

WARNING: Magnetic force hazard. This pump should only be disassembled and assembled using the recommended procedures. The magnetic attraction is powerful enough to rapidly pull the motor end and the wet end together. Do not place fingers between the mating surfaces of the motor and wet ends to avoid injuries. Keep the drive magnet and impeller assembly away from metal chips or particles, items with magnetic stripes like credit cards and magnetic computer media such as floppy discs and hard drives.

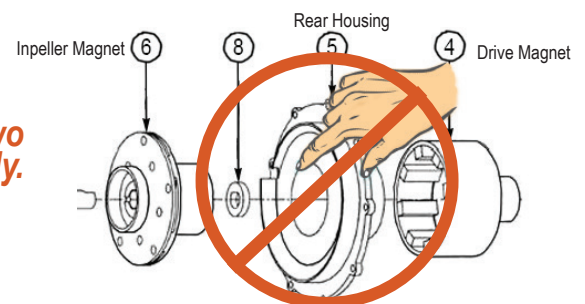
WARNING: When pumping flammable or combustible liquids with a MTD Series pump it is important to follow these guidelines:

1. You must use a PVDF pump. PVDF has conductive carbon fibers added which allow it to be grounded when installed in a properly grounded piping system or when a properly installed grounding strap is attached to a housing bolt. If PVDF is not compatible with the liquid being pumped, you should consider an ETFE lined UC Series magnetic drive pump.
2. You must select the non-sparking (Ns) bronze bump ring option. The non-sparking ring is pressed into the clamp ring or motor adapter and prevents sparking should the motor bearings fail and the outer mag drive assembly runs out of round.
3. You must select an explosion-proof FTI motor or provide your own explosion-proof motor.

When pumping non-flammable or non-combustible liquids in a hazardous area using a DB Series pump, it is important to take these guidelines:

1. You must select the non-sparking (Ns) bronze bump ring option. The non-sparking ring is pressed into the clamp ring or motor adapter and prevents sparking should the motor bearings fail and the outer mag drive assembly runs out of round.
2. You must select an explosion-proof FTI motor or provide your own explosion-proof motor.

CAUTION: DO NOT put fingers or hands between these two magnetic mating surfaces during assembly or disassembly.



- ⚠ WARNING:** Hot surfaces. This pump is capable of handling liquids with temperatures as high as 220° F (104° C). This may cause the outer areas of the pump to become hot as well and could cause burns.
- ⚠ WARNING:** Rotating Parts. This pump has components that rotate while in operation. Follow local safety standards for locking out the motor from the power supply during maintenance or service.
- ⚠ WARNING:** Chemical Hazard. This pump is used for transferring many types of potentially dangerous chemicals. Always wear protective clothing, eye protection and follow standard safety procedures when handling corrosive or personally harmful materials. Proper procedures should be followed for draining and decontaminating the pump before disassembly and inspection of the pump. There may be small quantities of chemicals present during inspection.
- ⚠ WARNING:** The pump and associated components are heavy. Failure to properly support the pump during lifting and movement could result in serious injury or damage to the pump and components.
- ⚠ WARNING:** Never run pump at less than minimum flow or with the discharge valve closed. This could lead to pump failure.

Installation/Operation Precautions

- ⚠ CAUTION:** This pump should never be operated without liquid in the casing. It is recommended that run dry protection be used. Optional electronic power monitors are available to help protect against run dry. If the pump has a PTFE or ceramic bushing, IT CANNOT BE RUN DRY WITHOUT CAUSING DAMAGE TO THE PUMP. However, the pump can operate without liquid in the casing if the pump has a carbon bushing. The exact length of time the pump can operate dry with a carbon bushing varies with operating conditions and the environment.
- ⚠ CAUTION:** Never start or operate with a closed suction valve. Never operate with a closed discharge valve.
- ⚠ CAUTION:** Always provide adequate NPSHa (net positive suction head available). It is recommended to provide at least 2 feet (61 cm) above the NPSHr (net positive suction head required).
- ⚠ CAUTION:** If pump is used on variable speed drive, do not exceed the frequency for which the pump was designed (for example, if the pump is 50 Hz model, do not exceed 50 Hz).

⚠ Protection Control

A power monitor, flow switch, pressure switch or similar device must be used to protect against dry running, closed discharge valve or decoupling. Any of these conditions could lead to a rise in surface temperature of the pump.

⚠ Construction Materials

Pump must be manufactured from PVDF with a PVDF motor adapter and bronze bump ring and have the designation “-A” in the pump part number. The PVDF contains conductive carbon which allows it to be grounded when installed in a properly grounded piping system or when a properly installed grounding strap is attached to a housing bolt. The bronze bump ring is pressed into the clamp ring or motor adapter and prevents sparking should the motor bearings fail and the outer drive magnet runs out of round.

⚠ Grounding

Static sparking can cause an explosion. When operating in a hazardous area or pumping a hazardous fluid the entire pump system must be grounded to prevent static discharge. Before operating the pump, ensure the electrical continuity throughout the pumping system and earth ground is 1 Ohm or less. If greater than 1 Ohm, re-check all grounding connections.

⚠ Elastomer Selection

Proper o-ring material must be chosen for the fluid being pumped. Improper material selection could lead to swelling and be a possible source of leaks. This is the responsibility of the end user.

⚠ Leaks

The pump must be checked for leaks on a regular basis. If leaks are noticed, the pump must be repaired or replaced immediately.

Temperature Classification

The surface temperature of the DB Series pumps depends upon the temperature of the fluid that is being pumped. The following chart lists different fluid temperatures and the corresponding pump surface temperature.

Fluid Temperature	Max. Surface Temperature	Temperature Class	Max. Allowable Surface Temp.
29°C (85°F)	55°C (131°F)	T6	85°C
77°C (170°F)	76°C (168°F)	T5	100°C
104°C (220°F)	84°C (183°F)	T4	135°C

Cleaning

The pump must be cleaned on a regular basis to avoid dust build up greater than 5 mm.

Motor Rotation Test

Pump must be full of liquid with no trapped air in the suction and discharge lines before the rotation of the motor is checked. Do not operate pump until it is full of liquid.

Start Up

The pump must be filled from a flooded suction tank (gravity) or primed with liquid from an outside source. Open the inlet (suction) and discharge valves completely and allow the pump to fill with liquid. Close the discharge valve. Turn the pump on and slowly open the discharge valve. Adjust the flow rate and pressure by regulating the discharge valve. Do not attempt to adjust the flow with the suction valve.

Maintenance

The recommended maintenance schedule depends upon the nature of the fluid being pumped and the specific application. If the pump is used on a clean fluid, it is recommended that the pump be removed from service and examined after six months of operation or after 2,000 hours of operation. If the pump is used on fluids with solids, high temperatures or other items that could cause accelerated wear, then this initial examination should be sooner.

After the initial examination of the internal components and wear items are measured, a specific maintenance schedule can be determined. For best results, it is recommended that the pump be removed from service annually for examination.

MTD-5, MTD-7-1/2, MTD-10 Capabilities

Maximum Working Pressure: 90 psi (6.2 bar)

Maximum Temperature: Polypropylene: 180° F (82° C); PVDF: 220° F (104° C)

NOTE: Maximum temperature is application dependent. Consult a chemical resistance guide or the chemical manufacturer for chemical compatibility and temperature limits.

Solids: Maximum particle size is 100 microns for slurries and 1/64" (.4 mm) for occasional solids.
Maximum hardness is 80 HS. Maximum concentration is 10% by weight.

NOTE: If solids are being pumped, it is recommended that the pump have silicon carbide components for best results.
Pumping solids may lead to increased wear.

Minimum Allowable Flow Rate: Do not allow the flow rate to drop below the minimum flow rate listed in the chart below.

3450 rpm (60 Hz)	1725 rpm (60 Hz)	2900 rpm (50 Hz)	1450 rpm (50 Hz)
10 gpm (2.3m ³ /hr)	5 gpm (1.1 m ³ /hr)	10 gpm (2.3 m ³ /hr)	5 gpm (1.1 m ³ /hr)

Maximum Noise Level: 80 dBA (pump only)

Maximum Allowable Motor Power:

Do not exceed 7.5 kW (10 horsepower) for 50 Hz, 2900 rpm applications. For 60 Hz, 3450 rpm applications, the pump is capable of starting a 15 horsepower motor but is limited to a maximum of 13 horsepower (9.7 kW) while running. Use the information in the chart below to determine the maximum specific gravity capabilities by impeller trim for non-overloading applications. The use of a power monitor is strongly recommended for 60 Hz applications above 10 horsepower (7.5 kW).

Maximum Specific Gravity for Non-Overloading Applications

3450 rpm (60 Hz)	
Closed Impeller Diameter	Maximum Specific Gravity
7.25" (184.2 mm)	1.0
7" (177.8 mm)	1.1
6.5" (165.1 mm)	1.5
6" (152.4 mm)	1.8
5.5" (139.7 mm)	1.8
5" (127.0 mm)	1.8
4.5" (114.0 mm)	1.8

2900 rpm (50 Hz)	
Closed Impeller Diameter	Maximum Specific Gravity
184.2 mm (7.25")	1.35
177.8 mm (7")	1.6
165.1 mm (6.5")	1.5
152.4 mm (6")	1.8
139.7 mm (5.5")	1.8
127.0 mm (5")	1.8

3450 rpm (60 Hz)	
Open Impeller Diameter	Maximum Specific Gravity
6" (152.4 mm)	1.5
5.5" (139.7 mm)	1.8
5" (127.0 mm)	1.8
4.5" (114.0 mm)	1.8

2900 rpm (50 Hz)	
Open Impeller Diameter	Maximum Specific Gravity
181.0 mm (7.13")	1.35
177.8 mm (7")	1.5
165.1 mm (6.5")	1.75
152.4 mm (6")	1.8
139.7 mm (5.5")	1.8

Assembly, Installation and Operation

Unpacking and Inspection

Unpack the pump and examine for any signs of shipping damage. If damage is detected, save the packaging and notify the carrier immediately.

Section I - Assembly

Tools Required:

3/8" Allen wrench or ballpoint hex socket, 3/16" Allen bit & torque wrench, 19 mm hex socket, metric socket set (for pumps with IEC outer drives)

Pumps with Motors

Proceed to "Installation" Section

Pumps Without Motors

NOTE: All motors must have motor feet

1. Remove the pump, drive magnet assembly and hardware package from the carton. For 184TC motors proceed to step 3.

CAUTION: Keep away from metallic particles, tools and electronics. Drive magnets MUST be free of metal chips.

WARNING: Keep the drive magnet away from the open end of the motor adapter and barrier. Strong magnetic attraction could allow the drive hub to enter the motor adapter resulting in injury or damage.

2. For 213/215 NEMA motors only

Install the o-ring (item 10A) in the groove in the motor adapter. Use small amount of petroleum jelly (or silicone grease on EPDM o-rings) to help hold the o-ring in place. Install the larger female rabbet portion of the motor adapter flange (item 10) on the motor face. Align the holes in the adapter with the holes in the motor face. See figure 1.

For 90, 100/112, & 132 with B5 flange motors

Install flange (item 10) on motor with the side with pockets (depressions) towards the motor face. Align (4) holes in the adapter with the holes in the motor face. Install (4) bolts, lock washers and flat washers through the motor adapter into the motor face. **Note:** B5 flange motors require customer supplied hardware.

For 90 and 132 with B14 flange & 145TC motors

Install flange (item 10) on motor with pockets (depressions) side towards the motor face. Align (4) holes in the adapter with the holes in the motor face. Install (4) bolts, lock washers and flat washers (items 20, 21, 22) through the motor adapter into the motor face. See figure 1.

For 100/112 with B14 flange motors

Install flange (item 10) on motor with pockets (depressions) towards the pump motor adapter (item 8). Align (4) holes in the adapter with the holes in the motor face. Install (4) bolts, lock washers and flat washers (items 20, 21, 22) through the motor adapter into the motor face.

Flange hole thread size:

90 B5 = M10 x 1.5

100/112 B5 = M12 x 1.75

132 B5 = M12 x 1.75

Torque bolts to the following:

90/100/112 B14 frame (M8) = 130 in-lb (14.7 N-m)

132 B14 (M10) frame (M10) = 240 in-lb (27.1 N-m)

90 frame B5 (M10) = 240 in-lb (27.1 N-m)

100/112/132 B5 (M12) = 480 in-lb (54.3 N-m)



Figure 1

3. Coat the motor shaft with anti-seize compound. Insert key supplied with motor into keyway on motor shaft.

NOTE: Make sure the motor shaft is clean and free of burrs. The outer drive is precision machined and has a bore tolerance of +.0005/-0 inch.

4. Slide the outer drive magnet assembly (item 9) onto the motor shaft until the motor shaft contacts the snap ring in the bore of the drive. Figures 2 and 3.

WARNING: Be careful, magnets will try to attract tools.



Figure 2



Figure 3

- ⚠ Metric Motors:** Secure the drive to the motor shaft using

bolt, lock washer and flat washer (items 17, 18, 19). Thread the bolt into the end of the motor shaft (while holding the outer drive to prevent it from turning). See figure 4.

Tighten the bolt to the following:

- 90 frame (M8) = 130 in-lb (14.7 N-m)
- 100/112 frame (M10) = 240 in-lb (27.1 N-m)
- 132 frame (M12) = 480 in-lb (54.3 N-m)

NEMA Motors: Install set screws (item 98) into threaded holes on the side of the outer drive magnet assembly. Using a 3/16" Allen bit & torque wrench, tighten to 228 in-lbs (25.8 N-m). See figure 5.



Figure 4



Figure 5

5. Install the pump end on the motor/drive magnet assembly.

NOTE: If the pump has the optional o-ring sealing option (available on 184 and 215 frame pumps only), install the o-ring (item 8B) in the groove in the motor adapter (motor end). Use small amount of petroleum jelly (or silicone grease on EPDM o-rings) to help hold the o-ring in place.

Place the motor/drive on a flat surface with the drive and motor face hanging over the bench surface. Secure the motor to the bench.

Firmly grab the pump and slide over the outer drive magnet until the motor adapter is seated in the rabbet of the motor (184TC) or the motor adapter flange. The last 4-5" (10-12 cm) will have strong magnetic attraction between the pump and outer drive magnet. See figures 6 and 7.

NOTE: The clearance between the motor adapter and drive magnet is tight (about .010"/.254 mm).

6. Secure the pump to the motor using (4) 1/2" socket head



Figure 6



Figure 7

cap screws, lock washers and flat washers (items 14, 15, 16). Use 3/8" Allen wrench or 3/8" hex socket on universal joint. See figures 8 and 9.



Figure 8



Figure 9

7. Rotate the motor fan to ensure that there is no binding in the pump.
8. Proceed to Installation Section

Section II - Installation

Mounting – Pump foot should be securely fastened to a solid foundation. If the pump was received with plastic shipping shims, these may be used as additional support for the motor feet.

CAUTION: The NPSH available to the pump must be greater than the NPSH required. NPSH available should be two feet (.6 meters) greater than NPSH required.

- Install the pump as close to the suction source as possible.
- Support the piping independently near the pump to eliminate any strain on the pump casing. In addition, the piping should be aligned to avoid placing stress on the pump casing.
- The suction side of the pump should be as straight and short as possible to minimize pipe friction.
- The suction line should not have any high spots. This can create air pockets that can reduce pump performance. The suction piping should be level or slope slightly upward to the pump.
- If flexible hose is preferred over pipe, use a reinforced hose rated for the proper temperature, pressure and is chemically resistant against the fluid being pumped.
- The suction valve must be completely open to avoid restricting the suction flow.
- When installing pumps with flanges, we recommend use of low seating stress gaskets such as Gore-Tex or Gylon (expanded PTFE).

Motor/Electrical

Only qualified personnel trained in the safe installation and operation of this equipment should install the motor. Install the motor according to National Electric Code, NEMA MG-2, IEC standards requirements and/or applicable local electrical codes. The voltage and frequency variations of the power supply should never exceed the limits established in the applicable standard. Prior to connecting to the power line, check nameplate voltage, rotation connection and ensure proper grounding. Sufficient ventilation area should be provided to insure proper operation and cooling of the motor. The motor must be installed with a suitable overload protection circuit. For three phase motors it is recommended to install a phase failure protection device. Download the motor manual from the specific motor manufacturers' website for additional information concerning motor installation, safety and maintenance instructions.

Wire the motor for clockwise rotation when facing the fan end of the motor.

CAUTION: Do not operate the pump to check rotation until the pump is full of liquid or damage may occur even if the motor is "bumped" to check motor rotation direction.

Check all electrical connections with the wiring diagram on the motor. Make sure the voltage, frequency, phase and amp draw

comply with the supply circuit.

If utilized, verify that power monitors or variable frequency drives have been properly installed according to the manufacturer's instructions. To verify correct rotation of the motor:

1. Install the pump into the system.
2. Fully open the suction and discharge valves.
3. Allow fluid to flow into the pump. Do not allow the pump to run dry (ceramic, PTFE and silicon carbide bushings can't be run dry without damage to pump components).
4. Jog the motor (allow it to run for 1-2 seconds) and observe the rotation of the motor fan. Refer to the directional arrow molded into the pump casing if necessary.

NOTE: A pump running backwards will pump but at a greatly reduced flow and pressure.

Section III - Start-up and Operation

Start-up and Operation

1. This pump must be filled from a flooded suction tank (gravity) or primed with liquid from an outside source. The DB22 is not self-priming.
2. Open the inlet (suction) and discharge valves completely and allow the pump to fill with liquid.
3. Close the discharge valve.
4. Turn the pump on. Slowly open the discharge valve. Adjust the flow rate and pressure by regulating the discharge valve. Do not attempt to adjust the flow with the suction valve.

Shutdown

1. Use the following procedure to shutdown the pump.
2. Slowly close the discharge valve.
3. Turn off the motor.
4. Close the suction valve.

Flush Systems

CAUTION: Some fluids react with water; use compatible flushing fluid.

1. Turn off the pump.
2. Completely close the suction and discharge valves.
3. Connect flushing fluid supply to flush inlet valve.
4. Connect flushing fluid drain to flush drain valve.
5. Open flushing inlet and outlet valves. Flush system until the pump is clean.

Optional Drain Installation

1. Remove the impeller housing (item 1) from the pump

assembly.

2. Clamp the impeller housing to a drill press table.
3. Using a 7/16" drill and the molded boss as a guide, drill completely through the molded boss into the interior of the impeller housing.

CAUTION: Do not tap too deep or the impeller housing may be damaged.

4. Using a 1/4" NPT tap, tap the hole in the molded boss to the appropriate depth.
5. Install the drain plug or valve, being careful not to over-tighten.

Section IV - Maintenance

Recommended maintenance schedule

The recommended maintenance schedule depends upon the nature of the fluid being pumped and the specific application. If the pump is used on a clean fluid, it is recommended that the pump be removed from service and examined after six months of operation or after 2,000 hours of operation. If the pump is used on fluids with solids, high temperatures or other items that could cause accelerated wear, then this initial examination should be sooner.

After the initial examination of the internal components and wear items are measured, a specific maintenance schedule can be determined. For best results, it is recommended that the pump be removed from service annually for examination.

Disassembly

WARNING: Rotating Parts. This pump has components that rotate while in operation. Follow local safety standards for locking out the motor from the power supply during maintenance or service.

WARNING: Chemical Hazard. This pump is used for transferring many types of potentially dangerous chemicals. Always wear protective clothing, eye protection and follow standard safety procedures when handling corrosive or personally harmful materials. Proper procedures should be followed for draining and decontaminating the pump before disassembly and inspection of the pump. There may be small quantities of chemicals present during inspection.

WARNING: Magnetic force hazard. This pump should only be disassembled and assembled using the recommended procedures. The magnetic attraction is powerful enough to rapidly pull the motor end and the wet end together. Do not place fingers between the mating surfaces of the motor and wet ends to avoid injuries. Keep the drive magnet and impeller assembly away from metal chips or particles.

Stop the pump, lock out the motor starter, close all the valves

that are connected to the pump, and drain/decontaminate the pump.

⚠ WARNING: The pump must be thoroughly flushed of any hazardous materials and all internal pressure relieved prior to opening the pump. Allow the pump to reach ambient temperatures prior to performing maintenance.

1. Secure the pump/motor to the bench with the adapter foot hanging over the edge. Remove (4) 1/2" socket head cap screws, lock washers and flat washers (Items 14, 15, 16) securing the pump to the motor. Use 3/8" Allen wrench or 3/8" hex socket on universal joint.

2. Firmly grab the motor adapter and pull straight out to dis-engage the motor and pump. See figure 10.



Figure 10

NOTE: If the pump has the optional o-ring sealing option (available on 184 and 215 frame pumps only), make sure o-ring (item 8B) does not fall out of the motor adapter (motor end).

3. Place pump on bench with housing (item 1) facing up. Using a 19 mm socket, remove (10) M12 hex head cap screws, lock washers and flat washers (Items 11, 12, 13). See figure 11.
4. Pull housing straight up to remove. Impeller shaft (item 5) may be lodged in the front shaft support. Inspect housing for signs of wear or damage. Look for signs of rubbing, cracked thrust ring or damage to front shaft support. See figure 12.
5. Remove impeller/inner drive assembly (items 3A, 3, 4, 4A).



Figure 11

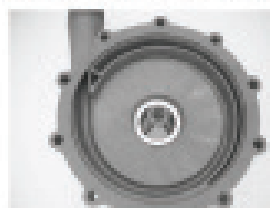


Figure 12

See figure 13. Inspect impeller and drive for signs of wear or damage. Look for signs of rubbing, damage and wear to the impeller and inner drive. Check the impeller thrust ring and bushing for wear. See figure 14.

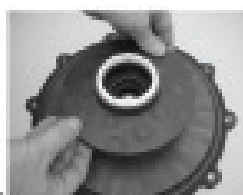


Figure 13

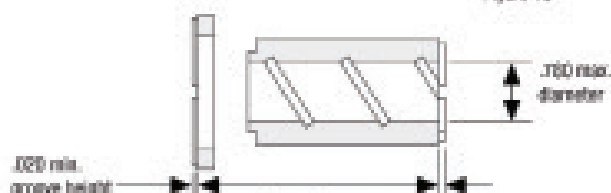


Figure 14

6. Remove the impeller shaft (item 5) from the barrier and check for signs of cracking, chipping, scoring or wear. See figure 15.

7. Remove the barrier (item 7) from the motor adapter (item 8) (make sure the spindle has been removed). If necessary, gently tap on the backside of the barrier with a soft rod (wood, plastic, etc). Inspect the inside and outside of the barrier for signs of rubbing. See figure 16.
8. Remove the o-ring (item 6) from the barrier and inspect for chemical attack, swelling, brittleness, cuts, etc.



Figure 15



Figure 16

9. Visually inspect the outer drive (item 9) for rubbing, damage, corrosion or loose magnets.

NOTE: Inspect the o-ring (item 8A), for chemical attack, swelling, brittleness, cuts, etc. Both NEMA and IEC pumps have o-ring item 8A. If the pump has the optional o-ring sealing option (available on 184 and 215 frame pumps only), inspect o-ring item 8B (and item 10A if 215 frame).

Outer Drive Replacement

1. Remove the setscrews (item 9B) from the side of the drive (NEMA motors) or the bolt, lock washer and flat washer (items 17, 18, 19) from the center of the drive (metric motors).

⚠ WARNING: Be careful, tools will want to be attracted to the magnets.

2. Remove the drive magnet from the motor shaft by gently prying up from the bottom of the drive.
3. To reinstall the drive or a new drive follow the instructions from "Section I – Assembly, Pumps without Motors, Steps 3 & 4".

Thrust Ring Replacement

1. Thrust ring (item 3A) is held in-place with a snap fit ridge. Using a razor knife or side cutters, cut a notch out of the thrust ring. Pull ring up and out of the holder. See figures 17 and 18.
2. To reinstall, align the two flats on the thrust ring with the flats in the bore of the impeller. Using a piece of wood press into place using an arbor press until the thrust ring is completely seated in the impeller.

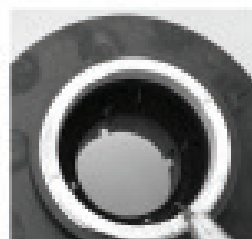


Figure 17

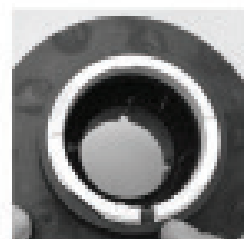


Figure 18

Bushing Replacement

1. To remove the bushing, place the impeller/inner drive assembly (items 3A, 3, 4, 4A) with the impeller facing up in an arbor press. If necessary support the bottom of the assembly with blocks to allow the bushing to fall out. Insert a 1" (25.4mm) diameter plastic or wooden shaft through the impeller and press bushing out. See figure 19.
2. To replace bushing, place the assembly on a flat surface with the impeller thrust ring face down. With the slotted face of the bushing facing the rear of the inner drive, align the flat in the bushing with the flat in the inner drive magnet. See figure 20. Gently push until bushing bottoms out.



Figure 19



Figure 20

Impeller Replacement

1. To remove the impeller from the inner drive magnet, gently pry off by hand or lightly tap on the back of the impeller.
2. To install a new impeller, place the inner drive magnet assembly face up. Line up the patterns on the impeller with the ones on the inner drive magnet so they match and press into place by hand. An arbor press can also be used to press the impeller on the inner drive. Place a piece of wood over the top of the impeller thrust ring and push down on the impeller until it is completely seated in the inner drive.

Reassembly

1. Lubricate the o-ring (item 8A) with a chemically compatible lubricant and install in the groove in the motor adapter.
2. Install the barrier (item 7) into the motor adapter (item 8). Press firmly to ensure that the barrier is completely seated.
3. Install o-ring (item 6) in groove in barrier.
4. Install impeller shaft (item 5) into barrier by aligning flats on the shaft with the ones in the barrier. Make sure it is completely seated. See figure 21.



Figure 21

5. Carefully install the impeller/inner drive assembly (items 3A, 3, 4, 4A) by sliding it over the impeller shaft in the barrier. It is normal for the impeller/inner drive to pop up a slight amount due to magnetic forces. See figures 22 and 23.

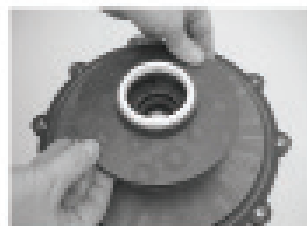


Figure 22

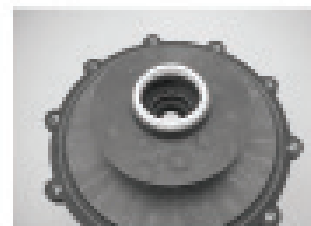


Figure 23

6. Install the impeller housing (item 1). Make sure the discharge is in the correct orientation in relation to the motor adapter pump foot. Align the shaft in the barrier with the front shaft support in the impeller housing. Press down to push the impeller/inner drive magnet assembly into position. Holding the impeller housing with one hand, install and finger-tighten two bolts lock washers and flat washers (items 11, 12, 13) in opposite locations. See figure 24.
7. Install the remaining bolts, lock washers and flat washers finger tight.
8. Using a 19 mm socket, tighten all the bolts evenly using a star pattern. Tighten to 240 in-lb (27.1 N-m).
9. Reinstall the pump on the motor/drive magnet following instructions from "Section I – Assembly, Pumps without Motors, Steps 5 & 8".

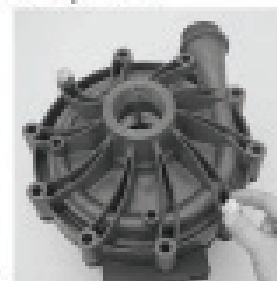


Figure 24

Spare Parts List

MTD-5, MTD-7-1/2, MTD-10

ITEM	QTY	DESCRIPTION	MTD-5, 5 HP, 182/184TC FRAME		MTD-7 1/2, 7 1/2 HP, 213/215TC FRAME		MTD-10, 10 HP, 213/215TC FRAME	
			PUMP MATERIAL		PUMP MATERIAL		PUMP MATERIAL	
			POLYPRO	PVDF	POLYPRO	PVDF	POLYPRO	PVDF
			P/N	P/N	P/N	P/N	P/N	P/N
1	1	Housing, NPT threadsm & ceramic ring	MTD-106403	MTD-106403-1	MTD-106403	MTD-106403-1	MTD-106403	MTD-106403-1
		Housing, NPT threads & SiC ring (optinal)	MTD-106471	MTD-106471-1	MTD-106471	MTD-106471-1	MTD-106471	MTD-106471-1
2	1	Impeller ass'y w/PTFE thrust ring	MTD-106472-6	MTD-106472-9	MTD-106472-6	MTD-106472-7	MTD-106472-20	MTD-106472-21
		Impeller ass'y w/SiC thrust ring	MTD-106473-8	MTD-106473-9	MTD-106473-6	MTD-106473-7	MTD-106473-20	MTD-106473-21
2A	1	Impeller thrust ring only, Fluorosint (standard)	MTD-J103899					
		Impeller thrust ring only, SiC (optional)	MTD-J104170					
3	1	Impeller drive ass'y w/carbon bushing (std),PolyPump	MTD-106476	MTD-106476-1	MTD-106476	MTD-106476-1	MTD-106476	MTD-106476-1
		Impeller drive ass'y w/PTFE bushing (opt),PolyPump	MTD-106476-2	MTD-106476-3	MTD-106476-2	MTD-106476-3	MTD-106476-2	MTD-106476-3
		Impeller drive ass'y w/SiC bushing (opt)	MTD-106476-4	MTD-106476-5	MTD-106476-4	MTD-106476-5	MTD-106476-4	MTD-106476-5
3A	1	Impeller bushing only, carbon (std)	MTD-J103917-1					
		Impeller bushijng only, filled PTFE (opt)	MTD-106757					
		Impeller bushing only, SiC (opt)	MTD-106757-1					
4	1	Impeller shaft, ceramic (std)	MTD-106450					
		Impeller shaft, SiC (opt)	MTD-106450-1					
5	1	Housing o'ring, FKM (Viton) (std)	MTD-106764					
		Housing o'ring, EPDM (opt)	MTD-106765					
6	1	Barrier	MTD-106400	MTD-106400-1	MTD-106400	MTD-106400-1	MTD-106400	MTD-106400-1
7	1	Motor adaptor (standard)	MTD-106414-1	MTD-106414-2	MTD-106414-1	MTD-106414-2	MTD-106414-1	MTD-106414-2
		Motor adaptor w/non-sparking ring (optional)	MTD-106794	MTD-106794-1	MTD-106794	MTD-106794-1	MTD-106794	MTD-106794-1
7A	1	Front motor adaptor o'ring, Buna-N (standard)	MTD-106844					
7B	1	Rear motor adaptor o'ring, Buna-N (standard)	MTD-106847					
8	1	Outer drive magnet ass'y w/retaining ring,182/184TC frame, includes set screws	MTD-106453					
		Outer drive magnet ass'y w/retaining ring,213/215TC frame, includes set screws	MTD-106453-1					
8A	1	Retaining ring only, 182/184TC frame	MTD-105710					
		Retaining ring only, 213/215TC frame	MTD-106454					
8B	1 Set	Set screw set, 2 screws/set, for NEMA motors	MTD-J101084					
9	1	Motor adaptor flange, for 213/215TC only,PolyPump,MTD-5-10	MTD-106775	MTD-106775-1	MTD-106775	MTD-106775-1	MTD-106775	MTD-106775-1
9A	1	Motor Adapter Flange O-Ring (NEMA 213/215 Frame Motors Only), Buna	MTD-108165					
10	10	Housing Bolt, Stainless Steel	MTD-106501					
11	10	Housing Lock Washer, Stainless Steel	MTD-106503					
12	10	Housing Flat Washer, Stainless Steel	MTD-106505					
13	4	Motor Adapter Bolt, 213/215TC, Stainless Steel	MTD-106511					
14	4	Motor Adapter Lock Washer, Stainless Steel	MTD-J101023					
15	4	Motor Adapter Flat Washer, Stainless Steel	MTD-106497					
16	1	Motor, TEFC, 230/460/3/60	MTD-J102550		MTD-J103127		MTD-J103101	
		Motor, TEFC, CHEM DUTY, 230/460/3/60,MTD-5	MTD-J102327		MTD-J102328		N/A	
		Motor, TEFC, WASHDOWN, 230/460/3/60,MTD-5	MTD-J103488		MTD-J103489		MTD-J103646	
		Motor, TEFC, EXPLOSION PROOF, 230/460/3/60,MTD-5	MTD-J102330		MTD-106945		MTD-J103647	
17	1	Wet End Assembly						

