

# PENGUIN

Installation & Maintenance

## Magnetic Drive Pump Series MTD

### MODELS

MTD-1/3

MTD-1/2

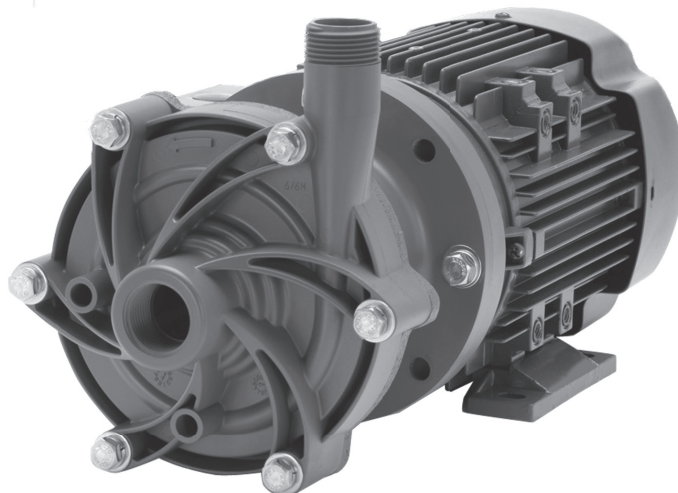
MTD-3/4

MTD-1

### 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-1/14 and M-1/8 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.

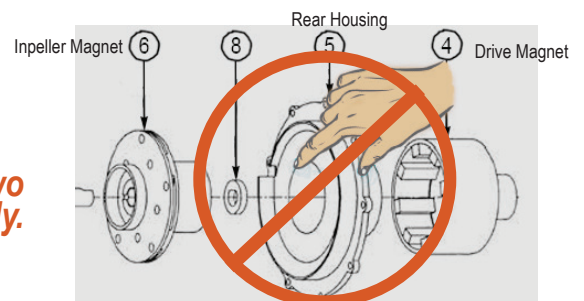
**WARNING:** When pumping flammable or combustible liquids with a MTD Series pump it is important to follow these guidelines:

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.**



# Installation & Operation Instructions MTD-1/3, MTD-1/2, MTD-3/4 & MTD-1

- ⚠ 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).

### MTD-1/2, MTD-3/4, MTD-1 Capabilities

**Maximum Working Pressure:** 80 psi (5.5 bar)

**Maximum Viscosity:** 150 cP

**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 infrequent particles. Maximum hardness is 80 HS. Maximum concentration is 10% by weight. If solids are being pumped, it is recommended that the pump have either ceramic or for best results, silicon carbide components. 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	1725 rpm	2900 rpm	1450 rpm
1/2 gpm	1/4 gpm	1.9 lpm	.95 lpm
(1.9 lpm)	(.95 lpm)	(1/2 gpm)	(1/4 gpm)

**Maximum Allowable Motor Power:** Do not exceed the maximum power rating for the pump coupling.

Standard coupling for the **MTD-1/2** is 6 pole. Maximum motor power is 1/2 horsepower (.37 kW).

Standard coupling for the **MTD-3/4 & MTD-1** is 8 pole. Maximum motor power is 1 horsepower (.75 kW).

**Maximum Noise Level:** 60 dBA (pump only)

### 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.

## Unpacking and Inspection

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

## Section I - Assembly

### Pumps with Motors

Proceed to Installation Section

### Pumps Without Motors

#### Tools Required:

Metric socket or wrench set, 9/16" socket or wrench and 3/16" Allen bit & torque wrench (NEMA motors only)

1. Remove the pump, drive magnet assembly and hardware package from the carton.

**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. Place motor on the fan end. See figure 1.

**NOTE:** For 56C/145TC frame motors go to step 4.

3. Install the motor adapter flange (item 14) on motor face using bolts, lock washers and flat washers (items 27, 28, 29). See figure 2.

**Note:** B5 flange motors require customer supplied hardware.

Torque bolts to the following:

- 63 frame (M5) = 30 in-lb (3.4 N-m)
- 71 frame (M6) = 90 in-lb (10.2 N-m)
- 80 frame (M6) = 90 in-lb (10.2 N-m)

**NOTE:** 63/71 B14 adapter flange is reversible. Install 63/71 B14 adapter so that proper motor flange size is facing motor.

**NOTE:** Apply anti-seize compound on the threads of the bolts.

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

**NOTE:** Make sure the motor shaft is clean and free of burrs. The outer drive is precision machined and has a bore tolerance of  $\pm 0.0005/-0$  inch.

5. Slide the outer drive magnet assembly (item 13) onto the motor shaft until the motor shaft contacts the snap ring in the bore of the drive. See figures 4 & 5.



Figure 4

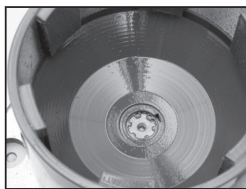


Figure 5



Figure 1

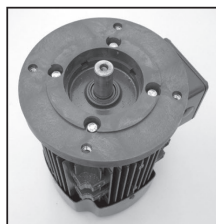


Figure 2



Figure 3

6. Secure the drive on the motor shaft.

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

**Metric Motors:** Secure the drive to the motor shaft using bolt, lock washer and flat washer (items 21, 22, 23). Thread the bolt into the end of the motor shaft (while holding the outer drive to prevent it from turning). See figure 6.

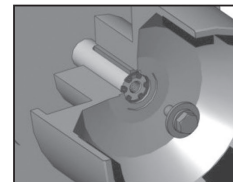


Figure 6

Tighten the bolt to the following:

- 63 frame (M4) = 15 in-lb (1.7 N-m)
- 71 frame (M5) = 30 in-lb (3.4 N-m)
- 80 frame (M6) = 90 in-lb (10.2 N-m)
- 90 frame (M8) = 130 in-lb (14.7 N-m)

**NEMA Motors:** Install set screws (item 13B) 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 7.

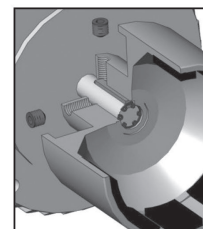


Figure 7

7. Install the pump end on the motor/drive magnet assembly. With the motor/outer drive magnet assembly in a horizontal position, securely clamp to the workbench.

**Note:** If the pump has the optional o-ring sealing option (available on 56C and 145 frame pumps only), install the o-ring (item 12) in the groove in the motor adapter (motor end).

Carefully slide the pump onto the drive magnet assembly. The last couple of inches (5 cm) before the pump reaches the motor will have STRONG magnetic attraction between the pump and outer drive magnet assembly. See figure 8.

8. Secure the pump to the motor with (4) 3/8" bolts, lock washers and flat washers (items 24, 25, 26). Tighten to 60 in-lb (6.8 N-m). See figure 9.

**Note:** 63/71 frame require 3/8-16 hex jam nuts. Place nut in and secure pump to motor.

**Note:** Apply anti-seize compound on the threads of the bolts.

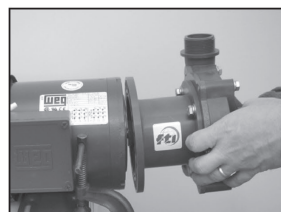


Figure 8



Figure 9

9. Rotate the motor fan to ensure that there is no binding in the pump.

10. Proceed to Installation Section.



## Section II – Installation

### Mounting

Motor feet should be securely fastened to a solid foundation.

**Note:** Shims are required for the motor feet on ALL 63, 71 and 80 frame motors and 90 frame B5 motors.

#### Instructions for horizontal discharge installation:

The pump ships from the factory with the discharge in a vertical orientation. These instructions allow a horizontal discharge.

1. Remove (4) clamp ring bolts, lock washers and flat washers (items 20, 19, 18). Rotate clamp ring clockwise 90° from the motor end.
2. Reinstall (4) clamp ring bolts, lock washers and flat washers. Tighten to 60 in-lb (6.8 N-m).

**Note:** If the pump has the optional o-ring sealing option (available on 56C and 145 frame pumps only), make sure o-ring is properly seated in the groove after the clamp has been rotated.

**Note:** When the pump discharge is in a horizontal configuration, the motor must be shimmed to raise the front of the pump to avoid interference.

### Piping

**⚠ Caution:** The NPSH available must be greater than the NPSH required. Filters, strainers and any other fittings in the suction line will lower the NPSH available and should be calculated into the application.

- 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.
- Keep bends and valves at least ten pipe diameters away from the suction and discharge.
- The suction line should be at least as large as the suction inlet port or one pipe size larger so that it does not affect the NPSHa. Do not reduce the suction line size.
- The suction line should not have any high spots. This can create air pockets. The suction piping should be level or slope slightly upward to the pump.
- A check valve and control valve (if used) should be installed on the discharge line. The control valve is used for regulating flow. An isolation valves on the suction and discharge are used to make the pump accessible for maintenance. The check valve helps prevent the pump against damage from water hammer. This is particularly important when the static discharge head is high.
- If flexible hose is preferred, use a reinforced hose rated for the proper temperature, pressure and chemical resistance to the fluid being pumped.
- The suction valve must be completely open to avoid restricting the suction flow.
- It is advisable to install a flush system in the piping to allow the pump to be flushed before the pump is removed from service.

**Note:** The pump is provided with a provision for a customer

installed ¼" drain in the impeller housing. See the Drain Installation Section for details.

- For units in a suction lift system, install appropriate piping in the discharge to allow priming of the pump (DB models are not self-priming).
- When installing pumps with flanges, we recommend the 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

1. This pump must be filled from a flooded suction tank (gravity) or primed with liquid from an outside source. DB Series pumps are 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.

- 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.
- Use of a power monitor is strongly recommended for pumps with ceramic, PTFE or silicon carbide bushings. The power monitor will stop the pump and help prevent damage if the pump should run dry.

### Shutdown

Use the following procedure to shutdown the pump.

- Slowly close the discharge valve.
- Turn off the motor.
- Close the suction valve.

### Flush Systems

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

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

### Optional Drain Installation

- Remove the impeller housing (item 1) from the pump assembly.
- Clamp the impeller housing to a drill press table.
- 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.

- Using a 1/4" NPT tap, tap the hole in the molded boss to the appropriate depth.
- 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.

## Section V - 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.

- Securely clamp the motor to the bench. Remove the (4) bolts, lock washers and flat washers (items 24, 25, 26) securing the pump to the motor.

- Firmly grab the pump and pull straight back to disengage the motor and the pump. See figure 10.

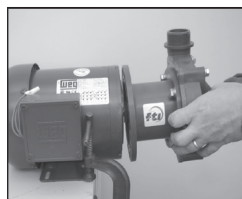


Figure 10

- Place pump on bench with housing facing up. Remove (6) 8 mm housing bolts, lock washers and flat washers (items 15, 16, 17). See figure 11.

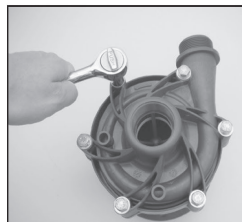


Figure 11

- Pull housing (item 1) straight up to remove. 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.

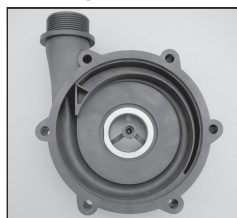


Figure 12



Figure 13

- Remove impeller/inner drive assembly (items 4A, 4, 5, 5A). Inspect impeller and drive for signs of wear or damage. Look for signs of rubbing, damage and wear to the impeller and inner drive. See figure 13. Check the impeller thrust ring and bushing for wear. See figure 14.

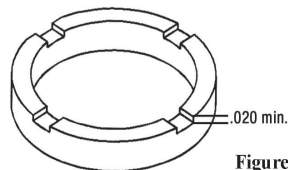


Figure 14



7. Remove the impeller shaft (item 6) from the barrier and check for signs of cracking, chipping, scoring or wear. See figure 15.
8. Remove the barrier (item 7) from the motor adapter (item 11) (make sure the shaft has been removed). If necessary, gently tap on the back side 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.
9. Remove the o-ring (item 3) from the barrier and inspect for chemical attack, swelling, brittleness, cuts, etc.
10. Visually inspect the outer drive (item 13) for rubbing, damage, corrosion or loose magnets.



Figure 15

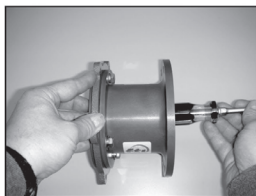


Figure 16

## Outer Drive Replacement

1. Remove the setscrews (item 13B) from the side of the drive (NEMA motors) or the bolt, lock washer and flat washer (items 21, 22, 23) 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. See figure 17.



Figure 17

3. To reinstall the drive or a new drive follow the instructions from Section I - Assembly, Pumps without Motors, steps 5 & 6.

## Thrust Ring Replacement

1. Thrust ring (item 4A) is held in-place with a snap fit with a 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 18 and 19.
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.

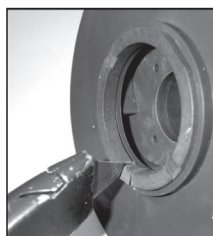


Figure 18

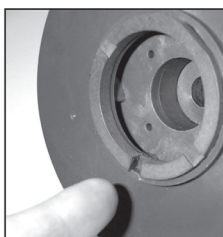


Figure 19

## Bushing Replacement

To remove the bushing, place the impeller/inner drive assembly in an arbor press. Insert a 7/16" diameter plastic or wood shaft through the eye of the impeller and press the bushing out.

To replace the bushing (item 5A), place the top of the impeller on an arbor press with the thrust ring face down. Insert the front of the bushing into the center of the impeller/inner drive magnet assembly. Press into place until the bushing reaches the shoulder molded into the inner drive. See figures 20, 21, 22.

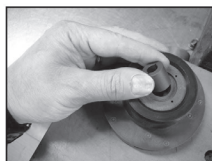


Figure 20



Figure 21

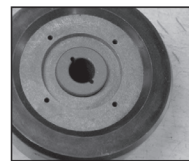


Figure 22

## Impeller Replacement

To remove the impeller from the inner drive magnet, gently pry off by hand or lightly tap on the back of the impeller.

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. See figure 23.

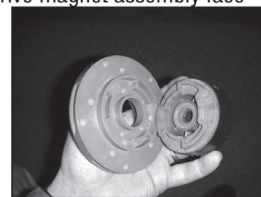


Figure 23

## Section VI - Reassembly

1. Place motor adapter (item 11) so the large flange is on the bench. Rotate the adapter so the four holes in the smaller flange are in the horizontal position. Install o-ring (item 10) in the groove. See figure 24.

2. Install clamp ring.

For vertical discharge – Install the clamp ring (item 9) in the motor adapter so the housing bolt holes (6 holes in clamp ring) are in 3:00 and 9:00 position. See figure 25.

For horizontal discharge - Install the clamp ring (item 9) in the motor adapter so two housing bolt holes (6 holes in clamp ring) are in 12:00 and 6:00 position. See figure 26.

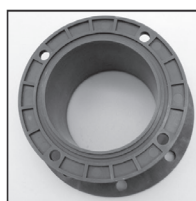


Figure 24

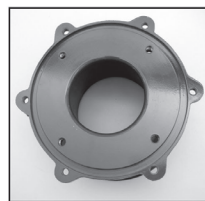


Figure 25

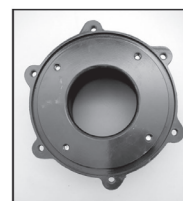


Figure 26

3. Install (4) bolts, lock washers and flat washers (items 20, 19, 18). Tighten evenly using a star pattern. Tighten to 60 in-lb (6.8 N-m). See figure 27.

4. Install barrier (item 7) into motor adapter and clamp ring assembly. Lubricate the o-ring with a chemically compatible lubricant, and install it in the groove in the clamp ring before installing the barrier. See figure 27A. Push barrier into place. See figure 27B.



Figure 27



Figure 27A

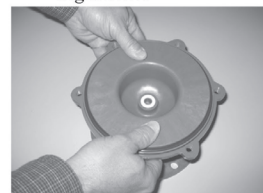


Figure 27B

5. Install o-ring (item 3) in groove in the barrier.

6. Install impeller shaft (item 6) into barrier by aligning the flats on the shaft with the flats in the barrier. Make sure it is completely seated. See figure 28.

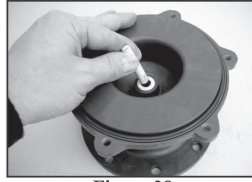


Figure 28

7. Carefully install the impeller/inner drive assembly (items 4A, 4, 5, 5A) 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 29 and 30.



Figure 29

8. Establish the bottom of the motor adapter/clamp ring assembly. See figures 25 and 26.

9. Install the impeller housing making sure that the discharge is in correct orientation (vertical or horizontal). Align the shaft in the barrier with the front shaft support in the impeller housing. Pressing down, 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 15, 16, 17) in opposite locations. See figure 31.

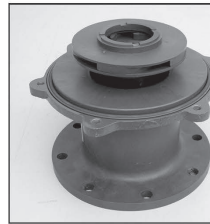


Figure 30

10. Install the remaining bolts, lock washers and flat washers finger tight.

11. Tighten all the bolts evenly using a star pattern. Tighten to 60 inch-lbs (6.8 N-m).

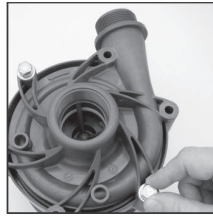


Figure 31

12. Reinstall the pump on the motor/drive magnet following instructions found in "Assembly, Pumps without motors," steps 7-10.

## Section VII - Troubleshooting

### General Notes:

- Do not pump liquids containing ferrous metal fines.
- If magnets decouple, stop pump immediately. Operating the pump with the magnets decoupled will eventually weaken the magnets.
- Do not use mismatched drive magnet assemblies (different number of magnets on inner and outer drive magnet assemblies).
- Contact our Technical Service Department at 1-800-888-3743 or by e-mail at [techservice@finishthompson.com](mailto:techservice@finishthompson.com) if you have any questions regarding product operation or repair.

### No or Insufficient Discharge

- Air leaks in suction piping
- Pump not primed
- System head higher than anticipated
- Closed valve
- Viscosity or specific gravity too high
- Motor too large for magnet coupling rating (magnets uncoupled)
- Suction lift too high or insufficient NPSH
- Clogged suction line or impeller vanes
- Motor rotation incorrect (correct rotation when viewed from the fan end is clockwise)

### Insufficient Pressure

- Air or gas in liquid
- Impeller diameter too small
- System head lower than anticipated
- Motors speed insufficient (too low) or motor rotation incorrect (correct rotation when viewed from the fan end is clockwise)

### Loss of Prime

- Leak in suction piping
- Foot valve or suction opening not submerged enough
- Foot valve too small or leaking
- Air or gas in liquid
- Foreign matter in impeller
- Leaking valve. Suction lift too high or insufficient NPSHa.

### Excessive Power Consumption

- Head lower than rating
- Excessive flow
- Specific gravity or viscosity too high.

### Vibration/Noise

- Loose magnet
- Drive magnet rubbing
- Pump cavitating from improper suction or feed
- Motor or piping not properly secured
- Foreign object in impeller



# Spare Parts

## MTD-1/3, MTD-1/2, MTD-3/4 & MTD-1

			MTD-1/3 (DB3), 1/3 HP, 56 FRAME, 3.38" IMP		MTD-1/2 (DB6H), 1/2 HP, 56 FRAME, 3.88" IMP		MTD-3/4 (DB8), 3/4 HP, 56 FRAME, 4.18" IMP		MTD-1(DB10)	
			PUMP MATERIAL		PUMP MATERIAL		PUMP MATERIAL			
			POLYPRO	PVDF	POLYPRO	PVDF	POLYPRO	POLYPRO	PVDF	
ITEM NO	QTY	DESCRIPTION	P/N	P/N	P/N	P/N	P/N			
1	1	Housing, NPT threads, w/ceramic ring	MTD-106265	MTD-106265-1	MTD-106265	MTD-106265-1	MTD-106265			
		Housing, NPT threads, w/SiC ring	MTD-106346	MTD-106346-1	MTD-106346	MTD-106346-1	MTD-106346			
2	1	Housing o'ring, FKM (Viton) (standard)			MTD-106288					
		Housing o'ring, EPDM			MTD-106299					
3	1	Impeller ass'y w/PTFE thrust ring (standard)	MTD-106536-4	MTD-106536-5	MTD-106536	MTD-106536-1	MTD-106358			
		Impeller ass'y w/SiC thrust ring	MTD-106537-4	MTD-106537-5	MTD-106537	MTD-106537-1	MTD-106359			
3A	1	Impeller thrust ring only, filled PTFE (standard)			MTD-106257					
		Impeller thrust ring only, SiC			MTD-106257-1					
4	1	Impeller drive ass'y w/carbon bush, 6-pole (std)	MTD-106361	MTD-106361-3	MTD-106361	MTD-106361-3		MTD-106361-1		
		Impeller drive ass'y w/carbon bush, 8-pole (std)								
		Impeller drive ass'y w/PTFE bushing, 6-pole	MTD-106362	MTD-106362-3	MTD-106362	MTD-106362-3				
		Impeller drive ass'y w/PTFE bushing, 8-pole						MTD-106362-1		
		Impeller drive ass'y w/SiC bushing, 6-pole	MTD-106364	MTD-106364-3	MTD-106364	MTD-106364-3				
		Impeller drive ass'y w/SiC bushing, 8-pole						MTD-106364-1		
4A	1	Impeller bushing, carbon (standard)			MTD-J102367					
		Impeller bushing, filled PTFE			MTD-J102790					
		Impeller bushing, SiC			MTD-J103617-1					
5	1	Impeller shaft, ceramic (standard)			MTD-106293					
		Impeller shaft, SiC			MTD-106293-1					
6	1	Barrier w/SiC thrust washer	MTD-106235-4	MTD-106235-5	MTD-106235-4	MTD-106235-5	MTD-106235-4			
7	1	Barrier o'ring, Buna-N			MTD-106572					
8	1	Clamp ring (standard)	MTD-106246	MTD-106246-1	MTD-106246	MTD-106246-1	MTD-106246			
		Clamp ring, w/non-sparking ring	MTD-106521	MTD-106521-1	MTD-106521	MTD-106521-1	MTD-106521			
9	1	Clamp ring o'ring, Buna-N			MTD-106548					
10	1	Motor adaptor column	MTD-106248	MTD-106248-1	MTD-106248	MTD-106248-1	MTD-106248			
11	1	Motor adaptor column o'ring, Buna-N			MTD-106549					
12	1	Drive magnet ass'y w/retainer ring, 56 frame, 6-pole			MTD-106283					
		Drive magnet ass'y w/retainer ring, 56 frame, 8-pole					MTD-106283-1			
12A	1	Retaining ring only, 56 frame					MTD-105708			
12B	2	Set screws, SS					MTD-J101064			
13	6	6-housing bolts					MTD-J102789			
14	6	6-housing lock washers					MTD-J102282			
15	6	6-housing flat washers					MTD-105767			
16	4	Clamp ring flat washers					MTD-105767			
17	4	Clamp ring lock washer					MTD-J102282			
18	4	Clamp ring bolts					MTD-105770			
19	4	Motor adaptor bolts					MTD-J100114			
20	4	Motor adaptor lock washers					MTD-J100115			
21	4	Motor adaptor flat washers					MTD-J100128			
		Motor, TEFC, 115/230/1/60	MTD-J102998		MTD-J102575		MTD-J102504			
		Motor, TEFC, 115/230/1/60, wired 115v, 6 ft cord;	MTD-108326-3		MTD-108326		MTD-110607			
		W/NEMA plug (optional)								
		Motor, TEFC, 115/230/1/60-50	MTD-J102998-2		MTD-J102575-2		MTD-J102504-2			
22	1	Motor, TEFC, 230/460/3/60	MTD-J102999		MTD-J102575		MTD-J102578			
		Motor, TEFC, CHEM DUTY, 115/230/1/60					MTD-J103399			
		Motor, TEFC, CHEM DUTY, 230/460/3/60			MTD-J103398		MTD-J102675			
		Motor, TEFC, WASHDOWN, SS, 230/460/3/60					MTD-105810			
		Motor, EXPLOSION PROOF, 115/230/1/60	MTD-108192		MTD-J102668		MTD-J102669			
		Motor, EXPLOSION PROOF, 230/460/3/60	MTD-110766		MTD-J102665		MTD-J102666			
23	1	Wet End Assembly								

