PENGUIN

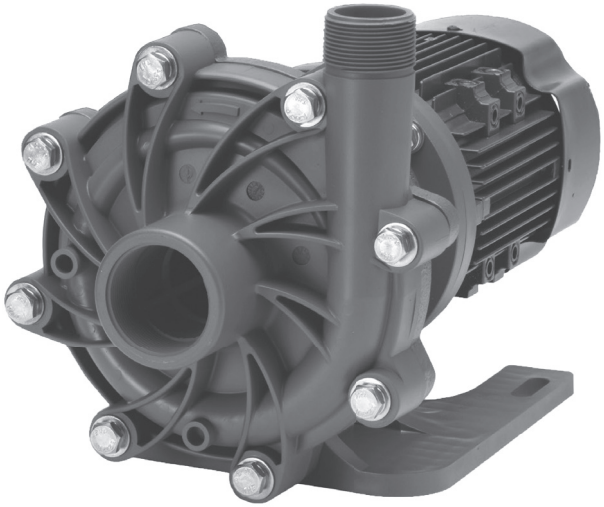
Installation & Maintenance

Magnetic Drive Pump

Series MTD

MODELS
MTD-2
MTD-3

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 avail-able 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 pros-thetic heart valves, internal wound clips (from surgery), metallic prosthetic devices or sickle cell anemia must not handle or be in the proxim-ity 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.

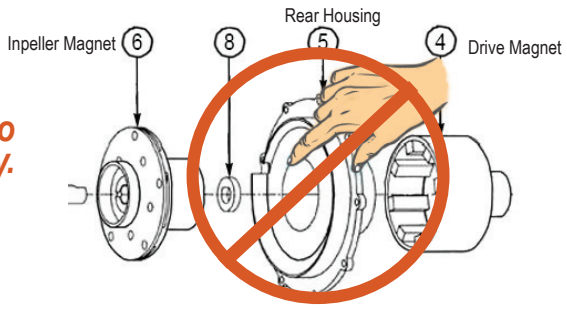
⚠ **WARNING:** When pumping flammable or combustible liquids with a MTD Series pump it is important to follow these guidelines:

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 220º F (104º 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).

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.
21°C (70°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 dis-charge 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-2, MTD-3 Capabilities

Maximum Working Pressure: 90 psi (6.2 bar)(models with o-ring)

Maximum Viscosity: 150 cP

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

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

Maximum Noise Level: 78 dBA (pump only)

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.

Model	3450 rpm	1725 rpm	2900 rpm	1450 rpm
MTD-2	4 gpm (.9 m^3/hr)	2 gpm (.5 m^3/hr)	.76 m^3/hr (3.4 gpm)	.38 m^3/hr (1.7 gpm)
MTD-3	5 gpm (1.1 m^3/hr)	2.5 gpm (.6 m^3/hr)	.95 m^3/hr (4.2 gpm)	.48 m^3/hr (2 gpm)

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

Standard coupling for the **MTD-2** is 6 pole. Maximum motor power is 2 horsepower (1.5 kW).
Standard coupling for the **MTD-3** is 8 pole. Maximum motor power is 3 horsepower (2.2 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.

MTD-2 & MTD-3 ASSEMBLY, INSTALLATION & 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

Pumps with Motors

Proceed to "Installation" Section.

Pumps Without Motors

NOTE: 184TC and 100/112 frame motors must have feet.

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

The NEMA 182-184TC and IEC 80, 90, 100/112 B14 flange models will require a 1/4" drive ratched and 9/16" socket to install (items 22, 23, 24) motor adapter bolt, lock washer, and flat washer between the foot.

1. Remove the pump, drive magnet assembly and hardware package from the carton. Do not remove the shipping plug until after the pump has been installed on the motor.

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. For 56C/145TC and B5 frame motors go to step 4. See figure 1.
3. For 184 NEMA and IEC motors only - install the motor adapter flange (item 10) on the motor face using bolts, lock washers and flat washers (items 21, 22, 23). See figure 2.

Figure 1

Figure 2

Torque bolts to the following:

80 frame (M6) = 90 in-lb (10.2 N-m)
90/100/112 frame (M8) = 130 in-lb (14.4 N-m)
184 NEMA (1/2") = 300 in-lb (33.9 N-m)

Note: Apply anti-seize compound on 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.

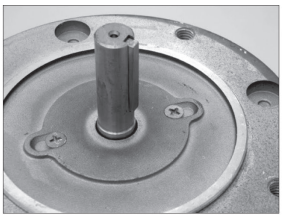


Figure 3

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

5. 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 4 and 5.

Figure 4

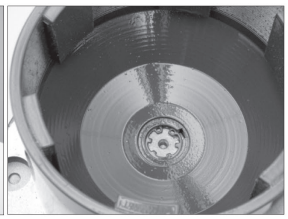


Figure 5

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 18, 19, 20). Thread the bolt into the end of the motor shaft (while holding the outer drive to prevent it from turning). See figure 6.

Tighten the bolt to the following:

80 frame (M6)	=	90 in-lb (10.2 N-m)
90 frame (M8)	=	130 in-lb (14.7 N-m)
100/112 frame (M10)	=	240 in-lb (27.1 N-m)

NEMA Motors: Install set screws (item 9A) 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.

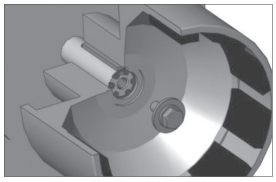


Figure 6 - IEC Drive

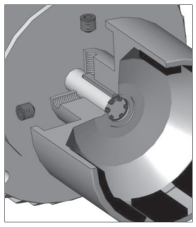


Figure 7 - NEMA Drive

7. For NEMA 56C and 145TC frame motors:

   Install o-ring (item 8E) in the groove on the back of the motor adapter (item 8D). Use petroleum jelly to hold the o-ring in place during installation. Note: 184TC and metric adapters do not use this o-ring. Install the pump end on the motor/drive magnet assembly. With the motor facing upright, align the pump feet so that the motor feet and pump feet are on the same side.

   Tip the pump end at an angle (discharge is approximately 45º) so that it is just touching the edge of the outer drive magnet assembly. See figure 8.

   Carefully lower the pump onto the drive magnet assembly by tipping discharge forward to 90º and dropping straight down. The last 3-4 inches (8-10 cm) before the pump reaches the motor will have STRONG magnetic attraction between the pump and outer drive magnet assembly.

Figure 8

8. Secure the pump to the motor with (4) 3/8" bolts, lock washers and flat washers (items 15,16,17). See figures 9 and 10.

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

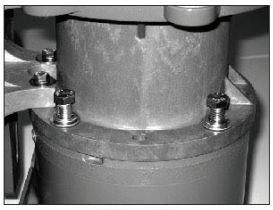


Figure 9

Figure 10

NOTE: B5 flange motors will require customer supplied hardware. B5 pumps with 100/112 frame do not include a pump foot.

9. Rotate the motor fan to ensure there is no binding in the pump.
10. 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 shims may be used as additional support for the motor feet (though not required).

Piping

CAUTION: The NPSH available to the pump 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. Also, 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 against the fluid being pumped.
- The suction valve must be completely open to avoid restricting the suction flow.
- FTI advises installing a flush system in the piping to allow the pump to be flushed before it 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 (DB11/15 models are not self-priming).
- 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

1. This pump must be filled from a flooded suction tank (gravity) or primed with liquid from an outside source. The DB11/15 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.
5. 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. ATEX certified pumps MUST use a power monitor.

Shutdown

Use the following procedure to shutdown the pump.

1. Slowly close the discharge valve.
2. Turn off the motor.
3. 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 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. De-burr the hole on the inside 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 overtighten.

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.

1. 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.

2. For pumps with motors 2 horsepower (1.5 kW) or smaller, securely clamp the pump feet to the bench. Remove the (4) bolts, lock washers and flat washers (items 15,16,17) securing the pump to the motor. See figure 9.

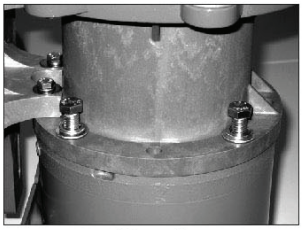


Figure 9

Firmly grab the motor and pull straight back to disengage the motor and pump. See figure 11.For pumps with motors 3 HP (2.2 kW) or larger, place the pump and motor on the floor. Remove the (4) bolts, lock washers and flat washers (items 15,16,17) securing the pump to the motor. See figure 9. Make sure the motor is on the fan end with the pump facing up. Pull straight up to remove the pump from the motor. See figure 12.

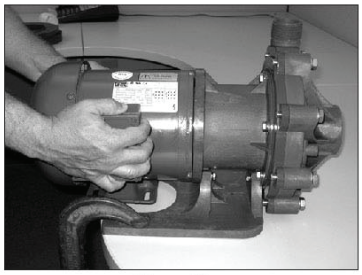


Figure 11

Figure 12

3. Place pump on bench with housing facing up. Remove (8) 10 mm housing bolts, lock washers and flat washers (items 12, 13, 14). See figure 13.

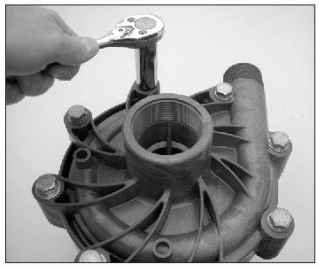


Figure 13

4. Pull housing (item 1) straight up to remove. Inspect housing for signs of wear or damage. Look for signs of rubbing, cracking on thrust ring, or damage to front shaft support. See figure 14.

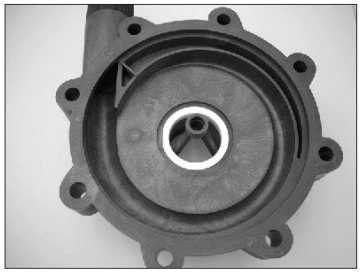


Figure 14

5. 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 or damage and wear to the impeller and inner drive. See figure 15.

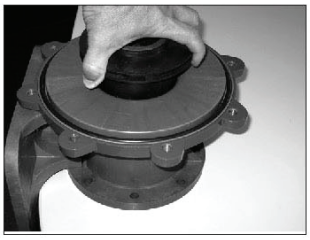


Figure 15

Check the impeller thrust ring and bushing for wear. See figure 16.

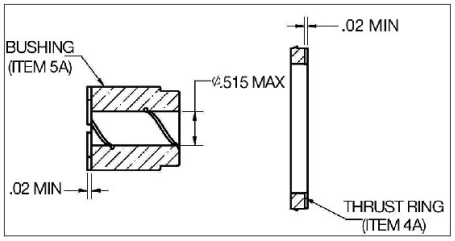


Figure 16

6. Remove the impeller shaft (item 6) from the barrier and check for signs of cracking, chipping, scoring or wear. See figure 17.

Figure 17

7. Remove the barrier (item 7) from the motor adapter (item 8). Make sure the spindle has been removed. Pry the barrier out with your hand. Inspect the inside and outside of the barrier for signs of rubbing. See figure 18.

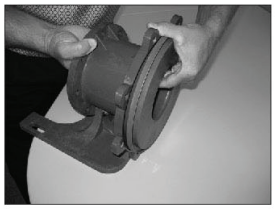


Figure 18

8. Remove the o-ring (item 2) from the barrier and inspect for chemical attack, swelling, brittleness, cuts, etc.
9. Visually inspect the outer drive (item 9) for rubbing, damage, corrosion or loose magnets.

Outer Drive Replacement

1. Remove the setscrews (item 9A) from the side of the drive (NEMA motors) or the bolt, lock washer and flat washer (items 18, 19, 20) 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 19.

Figure 19

3. To reinstall the drive or a new drive follow the instructions from Section I - Assembly, Pumps without Motors, steps 4-6.

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 20-21.

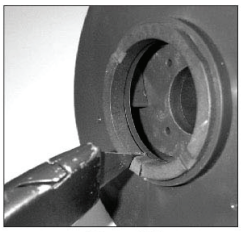


Figure 20

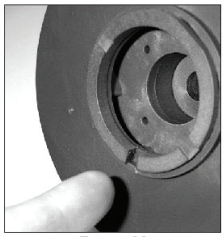


Figure 21

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.

Bushing Replacement

1. To remove the bushing, place the impeller/inner drive assembly in an arbor press. Insert a 3/4" diameter plastic or wood shaft through the eye of the impeller and press the bushing out.
2. 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 (figure 22) into the center of the impeller/inner drive magnet assembly, aligning the flat on the bushing with the flat in the bore of the inner drive magnet. Using a soft arbor, press into place until the bushing reaches the shoulder molded into the inner drive (figures 23 and 24).

Figure 22

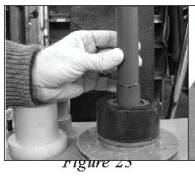


Figure 23

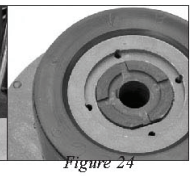


Figure 24

Impeller Replacement

Caution: Do not damage the outer surface of the inner drive magnet during impeller replacement.

Using the two slots provided, insert a flat blade screw driver into them and pry the impeller (items 4, 4A) up from the body of the inner drive magnet (items 5, 5A). Once a gap has been established, work around the perimeter to evenly increase the gap until the impeller can be removed. See figure 25.

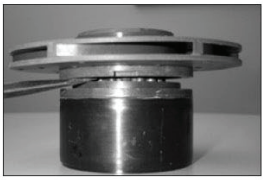


Figure 25

To install a new impeller, place the inner drive magnet assembly face up (splines facing up) on an arbor press. Align the spines in the impeller with the ones in the bore on the inner drive magnet. Place a piece of wood over the top of the impeller thrust ring. Using an arbor press, push down on the impeller until it is completely seated in the inner drive.

Section VI - Clamp Ring Replacement & Reassembly

1. Inspect the clamp ring. If clamp ring requires replacement, it is recommended to remove the plastic foot (Item 11) first. Note: 100/112 frame B5 adapters do not use the foot. See figures 26 & 27. Remove the 4-M6 bolts (items 24 & 24A).

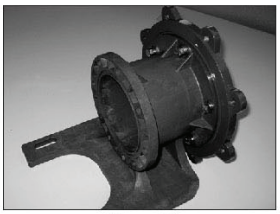


Figure 26

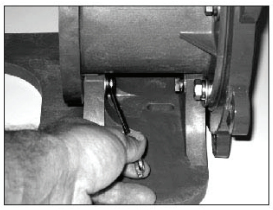


Figure 27

2. Remove the (5) M8 bolts, lock washers & flat washers (items 29, 28 & 27) from the clamp ring (item 8B). See figure 28. Remove the clamp ring from the motor adapter. There is a snug fit between the clamp ring & motor adapter due to the vapor protection o-ring (item 8C). Carefully pull the two parts apart. See figure 29.

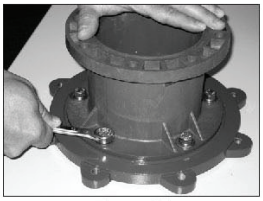


Figure 28

Figure 29

3. Inspect the motor adapter o-ring (item 8C). If damaged, replace. If reusable, lubricate it with a chemically compatible lubricant. See figure 30.

Figure 30

4. Install the new clamp ring. Place the clamp ring on a flat surface. See figure 31. Align the bolt holes (5 motor adapter and 2 foot bolt holes) on the clamp ring with the bolt holes on the motor adapter. Push the motor adapter straight down onto the clamp ring to seat the o-ring. See figure 32. Install (5) M8 bolts, lock washers and flat washers (items 29, 28 and 27), and tighten in a star pattern to 130 in-lb (14.7 N-m). See figure 33.

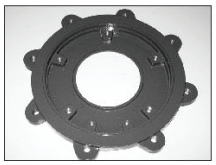


Figure 31

Figure 32

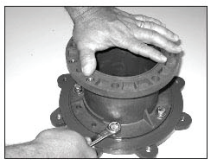


Figure 33

5. For 56C, 145TC and 80 frame B14, re-install the plastic foot (item 11) to the motor adapter (item 8D). Use the longer M6 bolts, lock washers and flat washers (items 24A, 25 and 26) for the front bolt holes towards the clamp ring. See figure 34. use the shorter M6 bolts, lock washers and flat washers (items 24, 25 and 26) for the rear bolt holes towards the motor face. Note: Nuts (item 30) are glued into the rear of the motor adapter to help with the installation of the rear bolts. Make sure the nuts are still in place. See figure 35. Tighten bolts to 5 ft-lbs. (6.7 N-m). For 184 frame, IEC 90, 100/112 frame B14 and 80/90 frame B5, leave the foot off until the motor adapter is installed on the motor. This will allow easer access to the bottom bolt hole in the motor adapter.

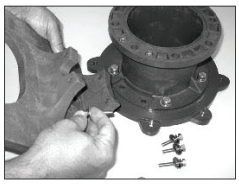


Figure 34

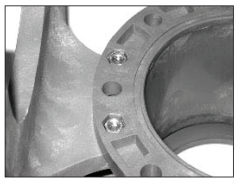


Figure 35

6. Position the motor adapter assembly on a flat surface. If the foot is installed, allow the feet to hang over the edge. See figure 36. Install the o-ring (item 8A) into the groove on the clamp ring. Lubricate the o-ring with a compatible lubricant. See figure 37. Install the barrier (item 7) into the clamp ring motor adapter assembly (items 8A, 8B, 8C, 8D, 27, 28, and 29). Push the barrier straight down until it seats in the clamp ring. See figure 38.

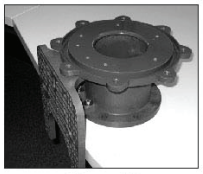


Figure 36

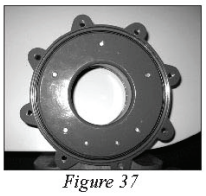


Figure 37

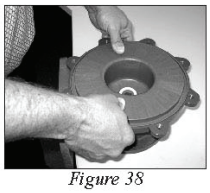


Figure 38

7. Install o-ring (item 2). See figure 39.
8. Install impeller shaft (item 6) into barrier by aligning the flats on the shaft with the ones in the barrier. Make sure it is completely seated. See figure 39.

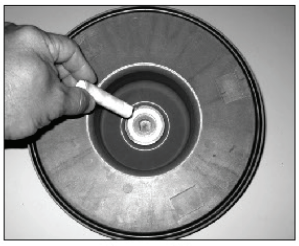


Figure 39

9. Carefully install the impeller/inner drive assembly (items 4, 4A, 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 40 and 41.

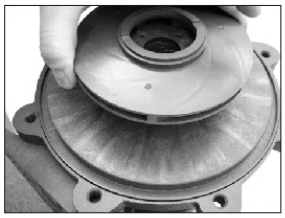


Figure 40

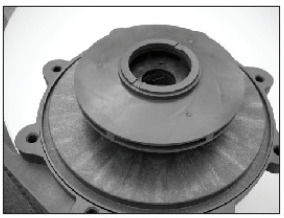


Figure 41

10. Install the impeller housing (item 1). Make sure the dis charge is in the correct orientation in relation to pump foot. Align the shaft in the barrier with the front shaft support in the impeller housing. Press down to push the impeller/in ner drive magnet assembly into position. Holding the impeller housing with one hand, install and finger-tighten two bolts, lock washers and flat washers (items 12, 13, 14) in opposite locations. See figure 42.

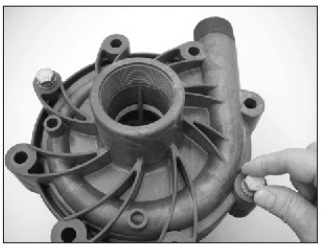


Figure 42

11. Install the remaining bolts, lock washers and flat washers finger tight.
12. Tighten all the bolts evenly using a star pattern. Tighten to 20 foot-lbs (27 N-m).
13. Reinstall the pump on the motor/drive magnet following instructions found in “Assembly, Pumps Without Motors,” steps 7-10.

MTD-2 & MTD-3 Spare Parts

			MTD-2		MTD-3	
			Pump Matrial		Pump Matrial	
Item	QTY	Description	Polypro	PVDF	Polypro	PVDF
1	1	Standard Housing with Ring, NPT threads & standard alumina ceramic ring	105688-1	105688-3		105739-3
		Standard Housing with Ring, BSP threads & standard alumina ceramic ring				105739-7
		Standard Housing with Ring, NPT threads & optional SiC ring	105903	105903-1	105904	105904-2
2	1	EPDM (optional)	105717			
		FKM (standard)	105716			
5	1	Impeller Drive Assembly, 6-pole w/ carbon bushing	105913	105913-3	105913	105913-3
		Impeller Drive Assembly, 8-pole w/ carbon bushing	105913-1	105913-4	105913-1	105913-4
		Impeller Drive Assembly, 10-pole w/ carbon bushing		105913-5		105913-5
		Impeller Drive Assembly, 6-pole w/ PTFE bushing	105913-6	105913-9	105913-6	105913-9
		Impeller Drive Assembly, 8-pole w/ PTFE bushing	105913-7	105913-10	105913-7	105913-10
		Impeller Drive Assembly, 6-pole w/ silicon carbide bushing	105913-18	105913-21	105913-18	105913-21
		Impeller Drive Assembly, 8-pole w/ silicon carbide bushing	105913-19	105913-22	105913-19	105913-22
6	1	Impeller Shaft, Alumina Ceramic (standard)	105811-1			
		Impeller Shaft, Silicon Carbide (optional)	105811-2			
7	1	Barrier	105689-1	105689-2	105689-1	105689-2
8	1	Motor Adapter Kits (includes items BA - BE plus hardware), Standard motor adapter - all frame sizes	107405	107406	107405	107406
8A	1	Barrier/Clamp 0-ring, Buna Barrier/Clamp 0-ring, FKM	107281 107279			
8B	1	Clamp Ring, Painted cast iron (Standard)	107228	107228-1	107228	107228-1
BC	1	Clamp Ring/Motor 0-ring, Buna	107282			
9	1	Drive Mannet Assembly with Snap Ring, 6-pole 56C frame (includes set screws)	105878			
		Drive Mannet Assembly with Snap Ring, 8-pole 56C frame (includes set screws)	105878-1			
9A	2	Set Screws for NEMA motor frames only	J101084			
9B	1	Snap Ring, 182/184TC frame Snap Ring, 80 frame Snap Ring, 90 frame	105710 105711 105712			
12	8	Housing Bolt, SS	105755			
13	8	Housing Lockwasher, SS	105757			
15	4	Motor Adapter Bolt, All frames except 100/112 B5	J103118			
22*	4	Motor Adapter Flange Lock Washer, 182/184TC frame	J101023			
24	2	Rear Foot Bolt	J103968			
24A	2	Front Foot Bolt	107289			
25	4	Foot Lock Washer	J100672			
26	4	Foot Flat Washer	J100113			
27	5	Clamp Ring Flat Washer	J101293			
28	5	Clamp Ring Lock Washer	J102282			
29	5	Clamp Ring Bolt	J103662			
30	2	Nut For rear foot bolt	107286			
		Wet End Assembly