

PENGUIN

Installation & Maintenance

Magnetic Drive Pump Series MTD

MODELS

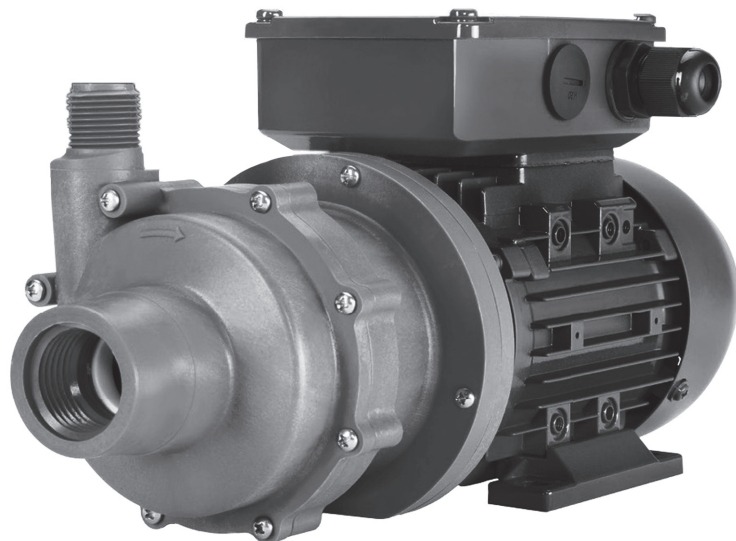
MTD-1/8

MTD-1/4

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 M 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 M 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.

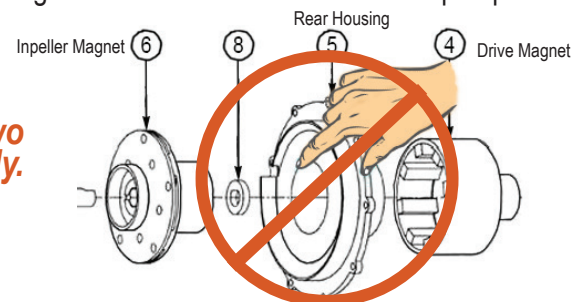
However neither manufacturer nor agent shall be liable for product damage or failure, injuries, or any other damage or loss arising out of a reaction, interaction or any chemical effect that occurs between the materials of the product's construction and fluids that come into contact with the product's 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:** 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.

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



Installation & Operation Instructions

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-1/8, MTD-1/4 Capabilities

Maximum Working Pressure: 60 psi (4.1 bar)

Maximum Viscosity: 50 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. 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	2900 rpm
.25 gpm	.95 lpm
(.95 lpm)	(.25 gpm)

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

Standard coupling for the **MTD-1/8, MTD-1/4** is 6 pole. Maximum motor power is 1/4 horsepower (.18 kW).

~~Standard coupling for the DB5.5 is 8 pole. Maximum motor power is 1/2 horsepower (.37 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.

Section I - Assembly

Pumps with Motors

Proceed to Installation Section

Pumps Without Motors

Tools Required: Metric socket set, 7 mm socket (63 frame), 8 mm socket (71 frame), 2.5 mm (56 frame), 3 mm and 4 mm Allen wrenches, and Phillips-head screwdriver.

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.



Figure 1

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

NOTE: The DB3, 4 & 5 pumps mount to either IEC 56, 63, 71 B14 frame motors depending on which motor adapter is ordered. The motor adapter flange (item 6) can be used for either frame depending on which side is used. See stamped identification on the flange. See figure 2. DB5.5 pumps mount to IEC 63 and 71 frame motors.

3. Install the motor adapter flange (item 6) on the motor face using motor adapter flange bolts (item 12).

NOTE: Apply anti-seize compound on the threads of the bolts. Hand tighten bolts being careful not to over tighten. See figure 3.



Figure 2

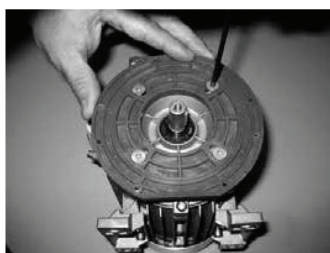


Figure 3

4. Make sure the motor shaft is clean and free of burrs. Coat the motor shaft with anti-seize compound. If not installed insert key supplied with motor into keyway on motor shaft.

NOTE: The outer drive is precision machined and has a bore tolerance of $+0.001/-0$ inch. It may be necessary to tap the drive on with a soft mallet.

5. Slide the outer drive magnet assembly (item 5) onto the motor shaft until the motor shaft contacts the snap ring in the bore of the drive. Turn the drive by hand to make sure it rotates freely. See figures 4 & 5.



Figure 4

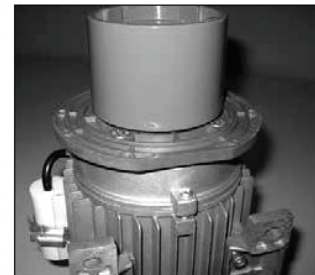


Figure 5

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

6. Secure the drive on the motor shaft using bolt, lock washer and flat washer (items 9, 10, 11). Coat the bolt threads with anti-seize compound. 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 using the 2.5 mm allen wrench (56 frame), 7mm socket (63 frame) or 8 mm socket (71 frame) to the following torque rating:

- 56 frame (M3) = 8 in.-lbs (.9 N-m)
- 63 frame (M4) = 15 in.-lbs (1.7 N-m)
- 71 frame (M5) = 30 in.-lbs (3.4 N-m)

7. Tighten two set screws (item 5B) to a torque of 75 in.-lbs. (8.5 N-m) using a 1/8" Allen wrench. See figure 6.

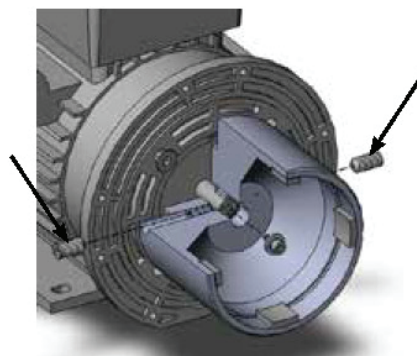


Figure 6

8. Install the pump end on the motor/drive magnet assembly. Carefully slide the pump onto the drive magnet assembly. See figure 7.
9. Secure the pump to the motor adapter flange (item 6) with (4) motor adapter screws (item 8). Hand tighten screws being careful not to over tighten. See figure 8.



Figure 7

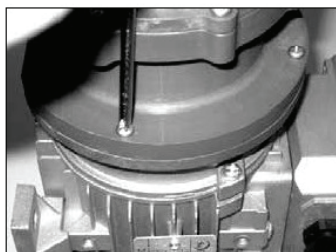


Figure 8

10. Rotate the motor fan or turn the impeller to ensure that there is no binding in the pump.
11. Proceed to Installation Section.

Section II – Installation

Mounting

Motor feet should be securely fastened to a solid foundation.

Instructions for horizontal discharge installation:

Note: The pump ships from the factory so the discharge will be in a vertical orientation. These instructions allow a horizontal discharge.

1. Place the pump & motor in an upright position on the fan end of the motor. Remove (8) housing screws (item 7). Pull the housing away from the motor adapter / barrier (item 4) and remove the o-ring (item 2). Reinstall the housing in the 3:00 position looking from the pump side. Note: O-ring will be lubricated from the factory and should not require additional lubrication. See figure 9.
2. Reinstall the o-ring onto the housing (item 1). If o-ring will not stay in place it may be necessary to roll the o-ring under when installing it on the housing. See figure 10.



Figure 9



Figure 10

3. Align the holes in the housing with the motor adapter / barrier. Push the housing with o-ring in place straight down to seat the o-ring. Hold the housing in place and reinstall the (8) housing screws (items 7, 7A) in a star like pattern using

the Phillips-head screwdriver. Hand tighten screws being careful not to over tighten. See figures 11 & 12.



Figure 11



Figure 12

NOTE: Install two long screws (item 7A) inserting one on either side of the discharge nozzle. See figure 12.

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 both the suction and discharge is used to make the pump accessible for maintenance. The check valve helps protect 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 is chemically resistant against 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.

Motor/Electrical/Maintenance/Disassembly

Motor/Electrical

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 counterclockwise 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.

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

If motor is supplied by Finish Thompson please use the wiring diagram provided under the conduit box cover on the motor.

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. PTFE or ceramic 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 housing.

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.

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 PTFE 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.

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.

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 in other conditions 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

Disassembly/Reassembly

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. To avoid injuries, do not place fingers between the mating surfaces of the motor and wet end. 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. Place the pump & motor vertically on the motor fan end on a work bench. Remove the (4) screws (item 8) securing the pump to the motor adapter / barrier (item 4). See figure 13.



Figure 13

3. Firmly grab the pump and pull straight up to disengage the motor and pump. See figure 14.



Figure 14

4. Place pump on bench with housing facing up. Remove (8) housing screws (item 7). See figure 15.



Figure 15

5. Pull housing (item 1) straight up to remove. Inspect housing for signs of wear or damage. Look for signs of rubbing or cracked thrust ring. See figure 16.
6. Remove impeller assembly (item 3). See figure 17. Inspect impeller and drive for signs of wear or damage. Look for signs of rubbing, damage and wear. Check the impeller thrust ring and bushing for wear.



Figure 16



Figure 17

NOTE: Replace the thrust washer and bushing if wear exceeds dimensions in figure 18.

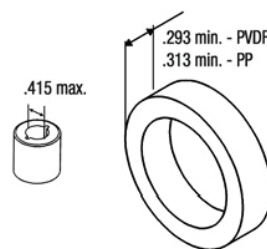


Figure 18

7. Remove the o-ring (item 2) and look for chemical attack, swelling, brittleness, cuts, etc. See figure 19.
8. Inspect the motor adapter / barrier (item 4). Inspect the inside and outside for signs of rubbing or damage. See figure 20.



Figure 19



Figure 20

9. Visually inspect the outer drive (item 5) for rubbing, damage, corrosion or loose magnets. See figure 21.



Figure 21

Outer Drive Replacement

1. Remove the bolt, lock washer and flat washer (items 9, 10 & 11) from the center of the drive. Hold the drive with your hand to prevent it from turning. See figure 22.

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

2. Remove the drive magnet from the motor shaft by gently pushing down on 2 pry bars or large flat head screwdrivers from the bottom of the drive. See figure 23.



Figure 22



Figure 23

3. To reinstall the original 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 3A) is held in-place with a press fit. Using fingers, pliers or flat head screwdriver pry ring up and out of the holder. See figure 24.
2. To reinstall simply press the thrust ring into the impeller by hand. See figure 25.

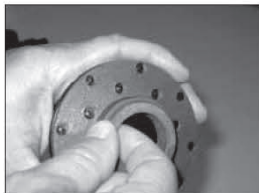


Figure 24



Figure 25

Bushing Replacement

To remove the bushing, place the impeller assembly in an arbor press. Insert a 1/2" (12.7mm) diameter plastic or wood dowel through the eye of the impeller and press the bushing out. See figure 26.

To replace the bushing (item 3B), 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 assembly & press into place using a 3/4" (19 mm) diameter plastic or wood dowel until the bushing reaches the shoulder molded into the inner drive. See figures 27, 28, 29 & 30.



Figure 26

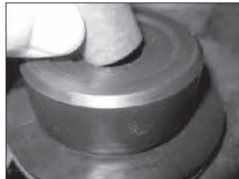


Figure 27



Figure 28



Figure 29



Figure 30

Section VI - Reassembly

1. Place impeller assembly (item 3) into the motor adapter / barrier (item 4). See figure 31.
2. Install o-ring (item 2) onto housing (item 1). Lubricate the o-ring with P80 or a compatible lubricant. If o-ring will not stay in place it may be necessary to roll the o-ring under when installing it on the housing. See figure 32.



Figure 31

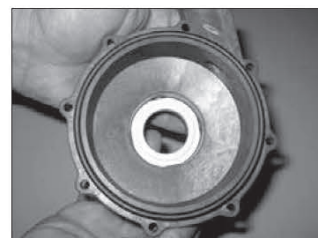


Figure 32

3. With the discharge port oriented in either a vertical (12:00) or horizontal (3:00) position, align the holes of the housing with the motor adapter / barrier. The flat side of the motor adapter / barrier aligns with the motor feet or bottom of the pump. See figures 33 & 34. See note on page 4, step 3 of Mounting.

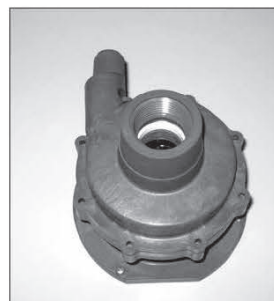


Figure 33
Vertical Discharge



Figure 34
Horizontal Discharge

NOTE: Install two long screws (item 7A) inserting one on either side of the discharge nozzle.

4. Push the housing with o-ring in place straight down to seat the o-ring. Hold the housing in place & reinstall the (8) housing screws (item 7) in a star like pattern using the phillips head screw driver. Hand tighten screws being careful not to over tighten. See figure 35.



Figure 35

5. To complete the reassembly go to Section I – Assembly, Pumps without Motors, Steps 4 - 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).
- Phone FTL's Technical Service Department, 1-800-888-3743, or e-mail, 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 counter clockwise)

Insufficient Pressure

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

Ordering Spare Parts

Spare parts can be ordered from your local distributor. Always refer to the pump model to avoid error.

Other FPI Products

See our full product range at www.filterpump.com.

MTD-1/8 & MTD-1/4 Spare Parts

MTD-1/8, MTD-1/4 SPARE PARTS LIST & PRICES			MTD-1/8, 1/8 HP, 56 B-14 FRAME		MTD-1/4, 1/4 HP, 63 B-14 FRAME	
ITEM			POLYPRO	PVDF	POLYPRO	PVDF
NO.	QTY.	DESCRIPTION	P/N	P/N	P/N	P/N
1	1	Impeller housing w/thrust ring & housing screws, NPT	MTD-A102865-1	MTD-A102865-3	MTD-A102865-1	MTD-A102865-3
2V	1	Housing o'ring, Viton	MTD-J03572			
2E	1	Housing o'ring, EPR	MTD-103571			
3A	1	Impeller ass'y w/thrust ring & carbon bushing, 6-pole magnets	MTD-110410-5	MTD-110410-6	MTD-110410-1	MTD-110410-2
3B	1	Impeller ass'y w/thrust ring & PTFE bushiing, 6-pole magnets	MTD-110410-11	MTD-110410-12	MTD-110410-7	MTD-110410-8
3C	1	Impeller thrust ring, PTFE	MTD-102141			
3D	1	Impeller bushing, carbon	MTD-J102387			
3E	1	Impeller bushing, PTFE	MTD-J102790			
4	1	Motor adaptor/barrier w ceramic shaft & silicon carbide thrust washer	MTD-106700	MTD-106700-1	MTD-106700	MTD-107700-1
5	1	Outer drive magnet ass'y w/retaining ring, 6-pole	MTD-110412-2	MTD-110412-2	MTD-110412-1	MTD-110412-1
5A	1	Retaining ring	MTD-107124	MTD-107124	MTD-106310	MTD-106310
5B	1 Set	Set screw set, 2 screws/set	MTD-1102466			
6	1	Motor adaptor flange	MTD-106701	MTD-106701-1	MTD-106701	MTD-106701-1
7	1 Set	Housing screw set, 6 screws/set	MTD-J101020			
7A	1 Set	Housing discharge screw set, 2 screws/set	MTD-107570			
8	1 Set	Motor adaptor barrier screw set, 4 screwa/set	MTD-J101020			
9	1	Drive bolt	MTD-107142		MTD-106314	
10	1	Drive lock washer	MTD-107141		MTD-106322	
11	1	Drive flat washer set	MTD-107125		MTD-106318	
12	1	Motor adaptor flange bolt	MTD-107140			
13-1	1	Motor,TEFC, 115/1/60	MTD-110481-4		MTD-110481-3	
13-1-CP	1	Motor, TEFC, 115/1/60, w/12 ft cord & NEMA plug	MTD-107597-4C		MTD-107597-3C	
13-2	1	Motor, TEFC, 230/1/60-50	MTD-110481-2		MTD-110481-1	
13-2-CP	1	Motor, TEFC, 230/1/60-50, w/12 ft cord & NEMA plug	MTD-107597-2C		MTD-107597-1C	
14	1	Wet end ass'y	MTD-18B-WE	MTD-18C-WE	MTD-14B-WE	MTD-14-WE

