

MAGNATEX® MLS Series



Operation & Maintenance Manual



**Mechanical Seal
PFA Lined
ANSI Process Pumps**

MLS IOM R2

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TABLE OF CONTENTS

SECTION A

GENERAL INFORMATION

A.1 Preface	1
A.2 Specifications	2
A.3 Receiving and Inspecting the Pump	3

SECTION B

PUMP INSTALLATION

B.1 Foundation and Baseplate Alignment	4
B.2 Alignment	6

SECTION C

PREPARATION FOR STARTUP

C.1 Checking Rotation	7
C.2 Checking Impeller Clearance	7

SECTION D

PUMP STARTUP

D.1 Starting the Pump	8
D.2 Operating a Magnatex MLS Pump at Reduced Capacity	9

SECTION E

PUMP DISASSEMBLY

E.1 Recommended Spare Parts	10
E.2 Required Tools	11
E.3 Disassembly	11

SECTION

PUMP ASSEMBLY

F.1 Assembly	13
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SECTION G

PUMP DRAWINGS

G.1 Dimensional Drawing, Magnatex MLS Series Pump	22
G.2 Sectional Drawing, Magnatex MLS	23

SECTION H

PUMP PARTS

H.1 Parts List and Materials of Construction	24
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SECTION I

MAINTENANCE, OPERATIONS AND REBUILD CHECKLIST

I.1 Operations checks	25
I.2 Rebuild checks	26

SECTION A

GENERAL INFORMATION

A.1 PREFACE

Magnatex MLS Series ANSI Pump is a horizontal overhung, end suction and top discharge with an open impeller, which meets the requirements of ANSI B73.1, fabricated with the best materials and continuous inspection.

With correct installation, periodic inspection, correct usage and careful maintenance, this pump will yield a long satisfactory service life.



- ✓ Before performing pump maintenance always make sure power to the driver is locked out.
- ✓ Consult either the pump manufacturer or an authorized dealer before changing the pump operation conditions from those under which it was sold.
- ✓ Never operate the pump without its coupling guard installed.
- ✓ Do not use heat to remove impeller or to disassemble the pump, trapped liquid may cause an explosion.
- ✓ Do not operate the pump without proper safety devices installed.
- ✓ Always make sure both the discharge valve and the suction valve are open before operating the pump.
- ✓ Always prime the pump before starting.
- ✓ Piping should not be forced to make connection with the pump.
- ✓ When the system is pressurized, neither vent nor drain valves should be opened, nor should any plugs be removed.
- ✓ Never operate below minimum recommended flow.

A.2 SPECIFICATIONS

VOLUTE: The volute is top centerline with a fully confined gasket. The foot support is used for maximum resistance to misalignment and distortion from piping loads. The casing is PFA lined.

However it is important not to impart piping loads on to the pump.

IMPELLER: The impeller is fully open and threaded to the shaft. The threads are sealed by a Teflon O- ring.

Never rotate the pump counter clockwise as the impeller can unscrew and rub on the casing.

STUFFING BOX COVER: Machined for mechanical seal and made of ETFE.

FRAME ADAPTER: The ductile iron frame adapter has a machined rabbet fit to the seal chamber / stuffing box cover.

BEARING FRAME: Of rigid iron construction. No machining is required to convert from oil to grease or oil mist lubrication. Flood oil lubrication is standard. The oil level is viewed through a sight glass. The power end is sealed with an Inpro "VBX" labyrinth seal. Grease lubricated bearings are only available in sealed-for-life bearings.

SHAFT: Manufactured from 316SS with an adjustable bearing and a bolt type adjustment for confined bearing cartridge. There is also a replaceable PTFE shaft sleeve included.

BEARING SUPPORT: Is Constructed of ductile iron, it is rigid and has grooves and openings for oil lubrication, grease or oil mist.

OUTBOARD BEARING: Angularly locked and connected to the shaft and housing to deal with thrust loads.

INBOARD BEARING: Its rigid, simple design, adequate for high RPM, also requires little attention in service.

MECHANICAL SEAL: The mechanical seal is self-adjusting and positively driven by the impeller hub.

NAMEPLATE INFORMATION: Each pump has a nameplate that provides information about the pump, such as pump model, size impeller diameter, construction material, serial number, etc., (Fig 1). The nameplate is located on the bearing frame. When ordering spare parts you will need to identify pump model, size, serial number and the item number of required parts.

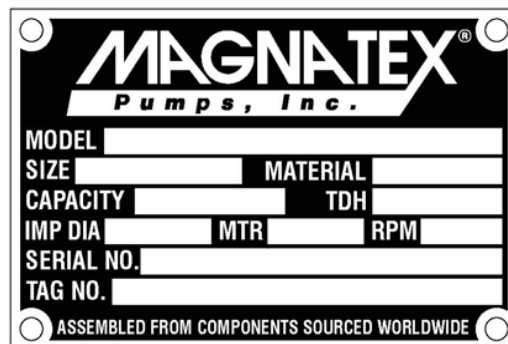
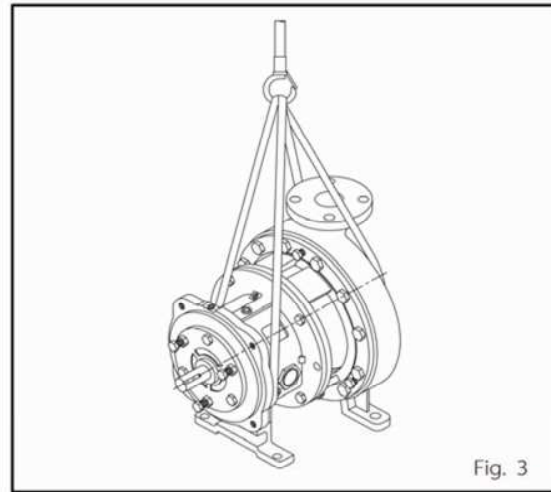
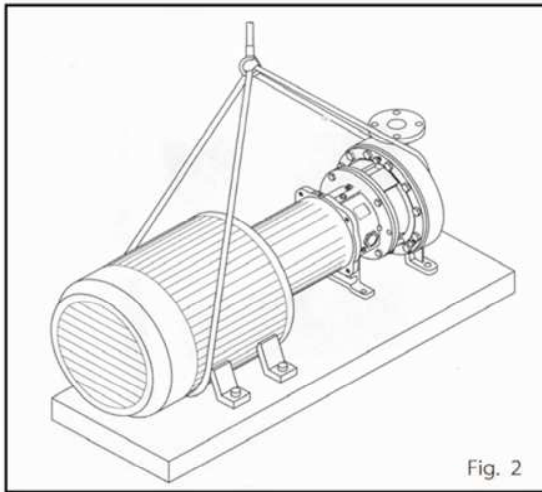


Fig 1

A.3 RECEIVING AND INSPECTING THE PUMP

Please inspect the pump as soon as it is received and check that everything is in order. File any claims with the transportation company. **This is a weighty pump**; lifting equipment must be able to adequately support the entire assembly (Fig 2, 3).

 **DANGER** 



STORAGE REQUIREMENTS

Proper storage of your MAGNATEX pump will insure that it is ready for service when needed.

GENERAL RULE: Pumps with corrosive fluid application; the process side of the pump should be drained and flushed with water and blown dry using low pressure air flow. After pump is dry a suitable rust preventative should be applied to the interior of the process side of the pump, whenever idle for periods in excess of (1) month or less for humid environments.

For oil lubricated pumps the used oil should be drained and the reservoir filled with fresh oil to the normal operating level. Pumps with sealed grease-lubricated bearings do not require any special attention.

SHORT TERM STORAGE: No special steps are required if the pump is stored indoors in a temperature controlled environment, for less that (6) months. Follow general rule, and rotate the pump shaft several times every 3 months.

LONG TERM STORAGE: In excess of (6) months, all machined surfaces and bearing must be treated with a rust preservative. Rotation of the shaft will be required every 3 months. Refer to coupling and driver manufacturer to comply with their recommended long term storage procedures. Unit must be stored in a covered and dry location. For specific recommendations regarding your storage conditions contact MAGNATEX Pumps.

SECTION B

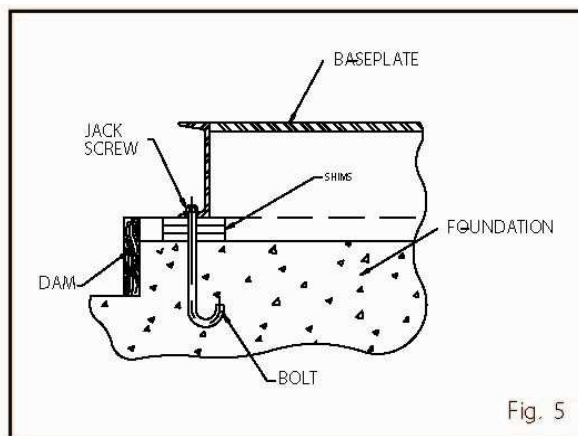
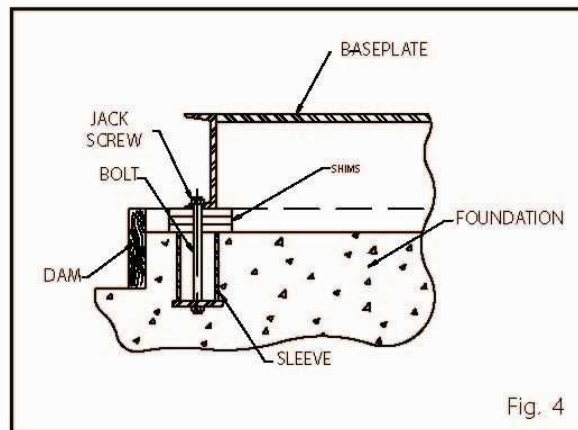
PUMP INSTALLATION

A pump should be located near the supply of liquid and have adequate space for operation, maintenance and inspection.

B.1 FOUNDATION AND BASEPLATE ALIGNMENT

FOUNDATION

Baseplate mounted pumps are normally grouted on a concrete foundation, which has been poured on a solid footing; foundation bolts commonly used are J – type and sleeve – type. Both designs permit movement for final bolt adjustment.



LEVEL BASEPLATE

- A. Place one set of wedges or shims on each side of every foundation bolt. The wedges should extend between $\frac{3}{4}$ " and $1\frac{1}{2}$ " above foundation to allow for adequate grouting.
- B. Remove liquid and / or debris from anchor bolt holes/sleeve before grouting. If the sleeve type bolts are being used, fill the sleeves with packing or rags to prevent grout from entering.
- C. Lower Baseplate on to foundation bolts.
- D. Level Baseplate to within $\frac{1}{8}$ " over length of the Baseplate and to within $\frac{1}{16}$ " over the width of the base by adjusting the wedges.
- E. Hand tighten the bolts.

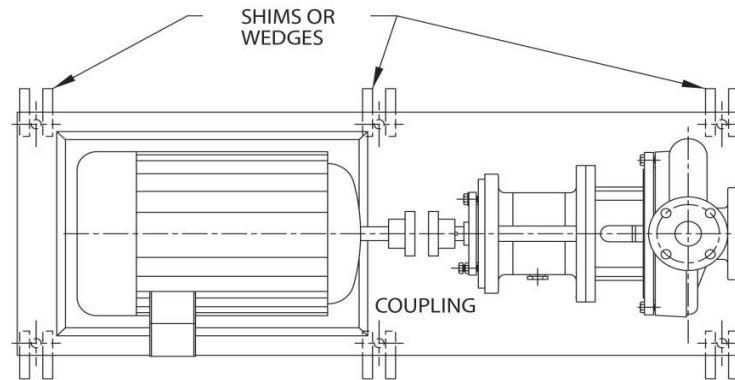


Fig. 6

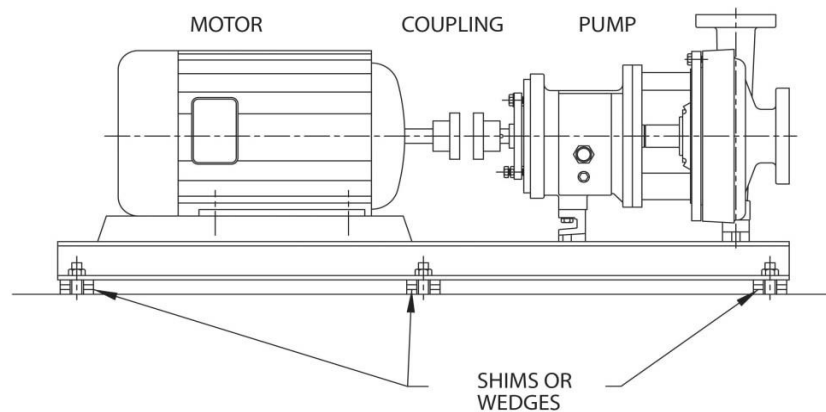


Fig. 7

B.2 ALIGNMENT

INITIAL ALIGNMENT CHECKS: (Done prior to operation)

- ✓ Check before grouting the Baseplate to be sure correct alignment is possible.
- ✓ Check after Baseplate is grouted to see if grouting process has altered alignment.
- ✓ After pipes are connected, check to see if strained connections have altered alignment. If so, eliminate piping strain to achieve optimal alignment.

FINAL ALIGNMENT:

- ✓ Alignment should be checked after first run when both pump and driver are at operating temperature.
- ✓ Alignment should be checked periodically in accordance with plant operating procedures.
- ✓ Good alignment should be checked periodically in accordance with plant operating procedures.
- ✓ Good alignment is achieved when the dial indicator readings are 0.002 in or less.

SECTION C

PREPARATION FOR START-UP



*Make sure driver power is locked out.
Failure to lock out driver power may result in serious physical injury.*

C.1 ROTATION CHECK



*Serious damage may result if pump is run in the wrong rotation.
Do not perform initial rotation check with coupling halves connected.*

1. Make sure spacer element is removed from the coupling hubs and that the hubs are securely fastened to shafts.
2. Connect driver power and JOG driver just long enough to determine direction of rotation. Rotation must correspond to arrow on bearing housing.
3. Open disconnect for driver power source.
4. Re-connect coupling halves with spacer coupling element and re-install coupling guard.

C.2 CHECK IMPELLER CLEARANCE

Before starting the pump the impeller clearance must be checked. The pump efficiency is maintained when the proper impeller clearance is set. Impeller front clearance is factory set to predetermined limits.

SECTION D PUMP

START-UP D.1



CAUTION

*Pump has been shipped without oil in the bearing housing
in compliance with US DOT regulations.*

*Add oil to the bearing housing (oil lubricated pumps only!) prior to operation.
Serious damage may result if pump is run without adequate lubrication.*

LUBRICATION

Bearing lubrication is very important for the best service life of the pump. Regular oil changes and lubrication analysis is part of the best maintenance practices for optimum reliability. As operating conditions vary frequency of re-lubrication can be modified based upon operating records for the specific pump service.

Recommended lubricants:

OIL: ISO VG68 High Quality turbine oil. Maintain oil temperature between 122°F (50°C) and 180°F (82°C) for normal operation. Contact Magnatex Pumps Inc. with any questions.

Suitable oil brands:

Shell – Tellus Oil 68 Royal Purple – SYNFILM VG68 Synth.
Chevron – GTS Oil 68 Exxon – Terrestic EP 68

MAGNATEX MLS SERIES OIL SUMP CAPACITY		
Model	oz.	ml.
MLS	16	475

DO NOT OVERFILL! FILL RESERVOIR ONLY UNTIL OIL LEVEL IS IN THE MIDDLE OF BEARING FRAME SIGHT GAUGE

GREASE: Only sealed bearing are offered as an option. These bearings cannot be re-lubricated

STARTING PUMP

1. Add oil to pump bearing housing via breather port (breather must be removed) until level shows in the sight glass at the middle of the gauge window. Allow the level to settle out before adding additional oil. Do not overfill!
2. Ensure that suction valve and any recirculation or cooling lines have been opened.
3. Completely close or partially open discharge valve as determined by system conditions. Never open discharge valve more than 25% on startup.
4. Start driver. Observe pressure gauges. Stop driver if discharge pressure is not attained quickly. Allow about 10 seconds for the system liquid levels to settle and attempt to re-start. If pump still does not come up to pressure, vent all high point vents, re-prime pump and attempt to restart.
5. Open discharge valve slowly until the desired flow is obtained. If normal levels of vibration, bearing temperature and noise are exceeded, shut the pump down and resolve the problems.
6. To prevent damage resulting from cavitation or recirculation always operate the pump at or near the rated conditions.

7. If the specific gravity is greater than originally assumed or the rated flow rate is exceeded the driver could overload. The following table shows minimum recommended flows.
8. Always change capacity by regulating the valve in the discharge line. Never throttle flow from the suction side, which can cause cavitation and serious damage to the pump.

D.2 OPERATING MAGNATEX MLS PUMP AT REDUCED CAPACITY



Do not operate pump below minimum rated flows or with suction and/or discharge valve closed. These conditions could cause an explosive hazard due to vaporization of pumped liquid and can rapidly lead to pump failure and physical injury.

1. Minimum recommended flow for Magnatex MLS series pump, size 1x1-1/2 – 6, is 7 GPM (1.59 M³/hr) at max impeller for water at 60°F. For lighter liquids divide the minimum flow by the fluids specific gravity.

SECTION E

PUMP DISASSEMBLY



- ✓ Power to the driver should be locked out to prevent accidental startup.
- ✓ Pump operator should be familiar with all safety precautions.
- ✓ Protective equipment should always be worn in case pump is handling fluids that are hazardous and/or toxic.
- ✓ Proper lifting methods should be employed when handling pump components.
- ✓ Heavy work gloves should be worn when handling impellers as they have sharp edges.
- ✓ Suction and discharge valves should remain open during operation.
- ✓ All replacement parts should be available (see below).

E.1 RECOMMENDED SPARE PARTS

- Impeller
- Shaft sleeve
- Mechanical seal assembly
- Shaft
- Inboard bearing
- Outboard bearing
- Outboard bearing lock washer
- Outboard bearing lock nut
- Volute gasket
- O- Ring rear plate
- O- Ring bearing housing
- Gasket – frame to adapter
- Stuffing box packing
- O- Ring impeller shaft sleeve side

E.2 REQUIRED TOOLS

- Wrenches 7/16", 1/2", 9/16", 3/4", 7/8", and 15/16"
- Screwdriver
- Pliers
- Rubber mallet
- Allen wrenches
- Snap-ring pliers
- Micrometer
- Dial indicator
- Bearing puller/Arbor Press
- Brass drift punch
- Lifting sling
- Induction bearing heater with demagnetizing feature
- Torque wrench
- Heavy work gloves
- Cleaning agents and lint free cloths/wipes
- Feeler gauges

E.3 DISASSEMBLY

Step 1 - Drain all liquid from pump and flush if necessary. Disconnect all auxiliary piping and tubing.

Step 2 - Remove coupling guard and disconnect coupling.

Step 3 - If oil-lubricated; drain oil from bearing frame by removing bearing frame drain plug.

(Oil should be saved for analysis to assist preventative maintenance.)

Replace plug after oil is drained.

Step 4 - Remove casing bolts and frame foot bolts.

Step 5 - Carefully remove back pull-out assembly (requires assistance).

Step 6 - Remove jack screws.

Step 7 - Remove volute gasket and discard. (Replace with new gasket during re-assembly.)

Step 8 - Frame adapter should be secured to workbench.

Step 9 - Remove coupling hub.

Step 10 - Removal of impeller:



Wear heavy work gloves to prevent injury from sharp edges!

- ❖ Impeller rotates freely:
 - Slide shaft wrench over the shaft and key.
 - Looking from the impeller end of the shaft, rotate the impeller clockwise, raising the wrench off the work surface.
 - Now turn it quickly back the other way, banging the wrench handle on the workbench or a solid block until impeller comes loose.
- ❖ Impeller does not rotate:
 - Use strap wrench to apply torque in counter clockwise direction while shaft wrench handle rests against the work surface. A wooden block and mallet may be used to provide impact to loosen the impeller.

Step 11 - Remove volute gasket and discard. (Replace with new gasket during re-assembly.)

Step 12 - Remove seal chamber/stuffing box cover.

Step 13 - Remove seal gland/packing stuffing box

Step 14 - Remove the shaft sleeve.

Step 15 - Remove packing and lantern ring from the stuffing box cover (only pumps with packing).

Step 16 - Remove the frame adapter by removing the dowel pins and bolts.

Step 17 - Discard gaskets (replace with new ones during reassembly).

Step 18 - Remove inboard labyrinth oil seal

Step 19 - Disassemble power end

- Remove clamp screws, and begin to tighten jack screws to start the housing out of the bearing frame.
- Slide shaft assembly out of bearing frame.
- Remove the jack screw with nuts.
- Remove bearing housing O-Ring and bearing retaining snap ring.
- Remove bearing housing from shaft.
- From the bearing housing, remove the outboard labyrinth seal and O-Rings.
- From the shaft, remove the bearing locknut and washer, inboard bearing, and outboard bearing.

Step 20 - Remove all plugs from bearing frame, unbolt the feet, and remove.

SECTION F

Step 1 - Mounting the Mechanical Seal

- (1) Avoid damaging the seal faces. Do not touch the seal faces or place heavy objects on them.
- (2) Pay special attention not to let dust or solids of any kind onto the seal faces, gaskets and the mounting section of the mechanical seal faces.
- (3) If foreign matter is found on the mechanical seal or o-rings (turning and fixed rings), wipe them off with a soft cloth or wash them with clean acetone.
If foreign matter is found on gaskets, wipe them off with a soft cloth or soft lint-free wipe.
- (4) Handle gaskets and packing with care not to damage or deform them; and store them in a clean environment.
- (5) When installing O-rings, apply silicon oil on the O-rings and their mating sections.
Application of silicon oil makes it easier to insert the O-rings and prevents damages.



Always use silicon oil since other lubricants may contain solvents which can damage plastic parts.

- (6) Tighten nuts and bolts evenly to avoid uneven fastening. Use the torque specified in an alternating sequence for tightening.
- (7) When mounting a mechanical seal, pay special attention not to damage vulnerable sliding faces and O-rings. Do not use impact of any kind on the shaft once the seal faces are engaged.

Step 2 - Cautions in Using the Mechanical Seal

- (1) If the mechanical seal has been disassembled or the fluid in the pump has been drained, vent the air inside the pump before restarting it.
- (2) Do not run the pump dry with a mechanical seal installed under any circumstance.
- (3) Before starting the pump, remove the coupling guard and make sure that the coupling can be turned easily by hand.

Step 3 - Cautions in Assembling the Mechanical Seal

Pay special attention not to damage the sliding faces of the mechanical seal during the work. To keep seal components clean work on a piece of clean cardboard or a soft clean cloth.

3.1. Assembling the stuffing box

- (1) Install the fixed ring gasket (208) on the stuffing box (230)



Fig. 1

(2) Install the stationary ring (202).



Fig. 2

(3) Install the stationary ring cover gasket (101-19).



Fig. 3

(4) Install the stationary ring cover (231).



Fig. 4

- (5) Install the stationary ring cover bolts (104-26) and tighten them with a torque wrench at 5.5 ft·lb (7.5 N·m) with an allowance of $\pm 5\%$.



Fig. 5



Do not over torque because you will damage the fluoropolymer threads.

- (6) Install the O-ring (102-17) to the rear plate (089).



Fig. 6

- (7) Insert the stuffing box into the rear plate. (Fig. 7)
Align both parts and then use a plastic mallet to tap the metallic section into the seal chamber. (Fig. 8)

After inserting it, make sure that there is no unevenness around the mating section of the stuffing box and the rear plate. (Fig. 9)



Fig. 7



Fig. 8



Fig. 9

3.2. Assembling the impeller

- (1) Install the spring retainer (213) onto the impeller (013) and insert the spring retainer bolts (223) with a Phillips screwdriver.

Note that the bolts should be tightened lightly, by hand, since excessive force will damage the threads.

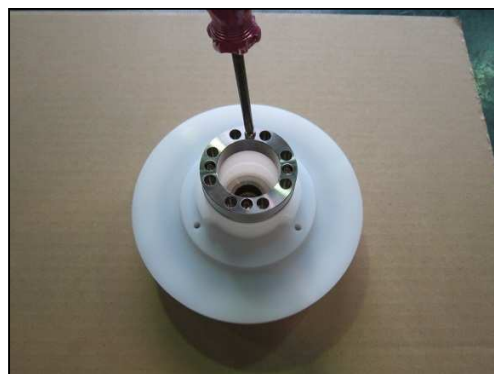


Fig. 10

- (2) Insert the O-ring (102-2B) on the impeller.



Fig. 11

- (3) Install the O-ring (102-2A) on the impeller.



Fig. 12

- (4) Insert the springs (210) into the spring retainer.



Fig. 13



Fig. 14

- (5) Apply silicon oil on the inside perimeter of the rotating ring (201) (Fig.15), and set it as shown in Fig. 16.
There will be resistance because of the springs as you push the assembly down onto the impeller hub as shown in Fig. 17. Wipe the sliding face of the seal with a soft cloth to remove any excess silicon oil.



Fig. 15



Fig. 16



Fig. 17

3.3. Pump assembly

- (1) First, adjust the gap between the bracket (028) and the bearing housing (068) to 0.15 inches or less using the bearing housing bolts (104-38).



Fig. 18

- (2) Set the rear ring (115) on the bracket (028) and fasten them with brackets bolts (104-17) securely. (42 ft-lbs/57 N·m \pm 5%)
Use plastic mallet to tap in the rear ring if necessary.
Note that the use of a bolt with a length of 1.375 inches or longer will damage the rear plate.



Fig. 19

- (3) Insert the stuffing box assembly prepared in 4.1. Extreme care should be taken not to let the fixed ring hit the main shaft.



Fig. 20

- (4) Slide the shaft sleeve (019) onto the main shaft (018).



Fig. 21

- (5) Install the impeller assembly prepared in 4.2.
Extreme care should be taken not to let the rotating ring come in contact with the main shaft.



Fig. 22



Fig. 23

At this stage, the gap between the impeller and the rear plate shall be adjusted.

Using the bearing housing nuts and bolts, adjust the gap between the two parts to 0.190 - 0.195 inches. (Fig. 24 and Fig. 25) Although the allowance of 0.165 to 0.215 inches is given, try to adjust the gap as close to the specified distance as possible since the gap will affect the pressure on the mechanical seal sliding faces and the pump performance. This will result in an approximate impeller to casing clearance of 0.008 - 0.010 inches.

Upon adjusting the gap, tighten the bearing housing nuts securely. (12 ft-lbs/16 N·m \pm 5%)



Fig. 24



Fig. 25

- (6) Install the casing gasket (101-01) on the casing (001) as shown in Fig. 26 and secure it on the bracket.



Fig. 26

- (7) Tighten the casing bolts (104-03) evenly to secure the casing.
Note the specified tightening torque of 30 ft·lb (41 N·m) with an allowance of $\pm 5\%$ in fastening the bolts.



Fig. 27

- (8) Insert the drain gasket (101-05) onto the drain flange (102), and secure to the casing with the drain bolts. (104-52)



Fig. 28

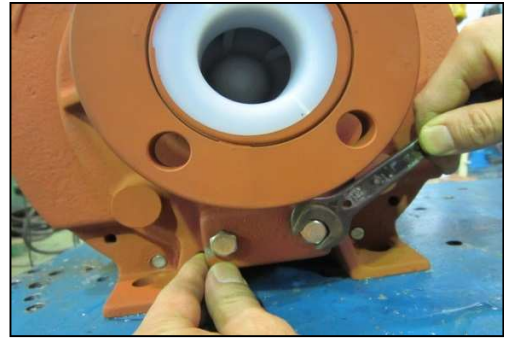
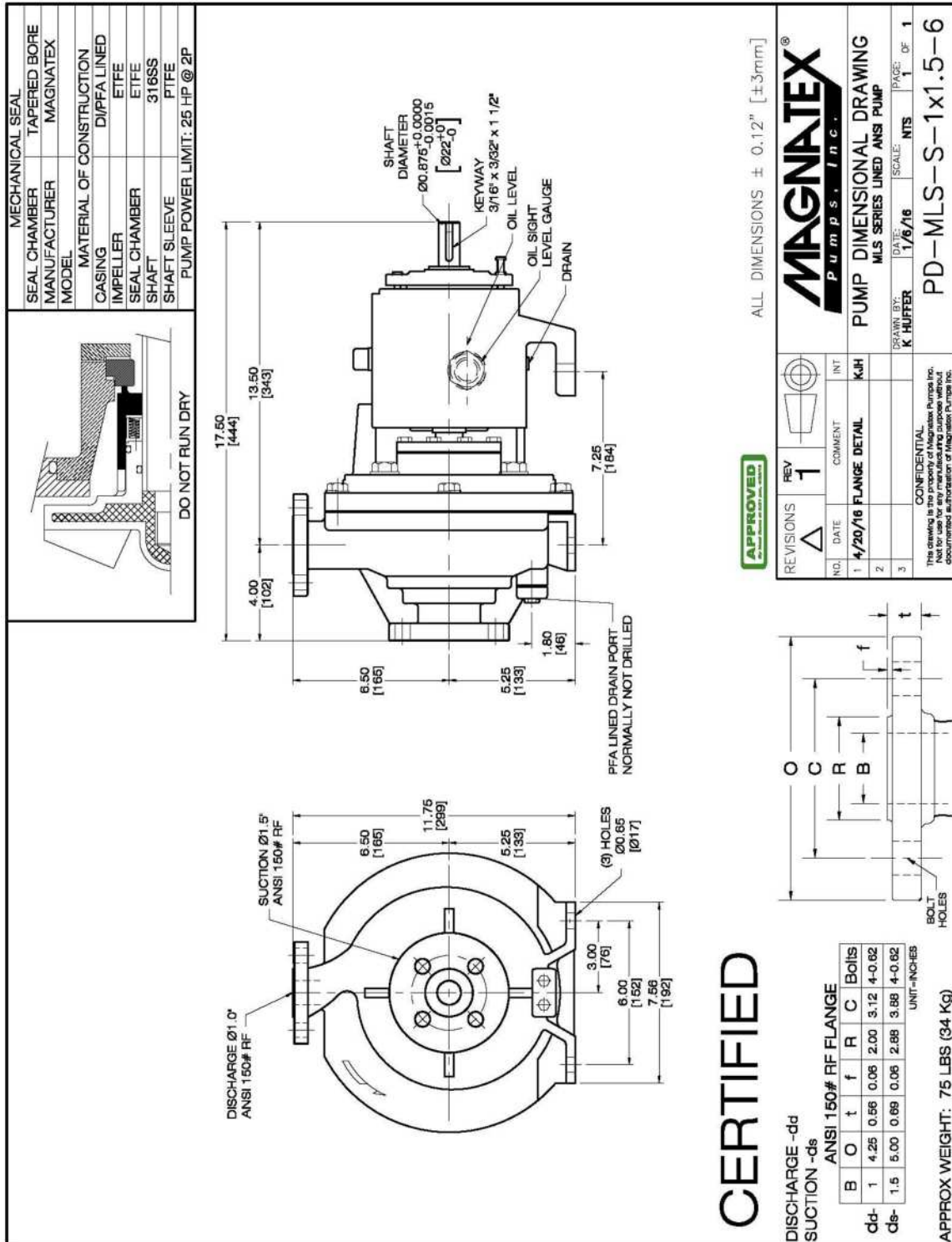


Fig. 29

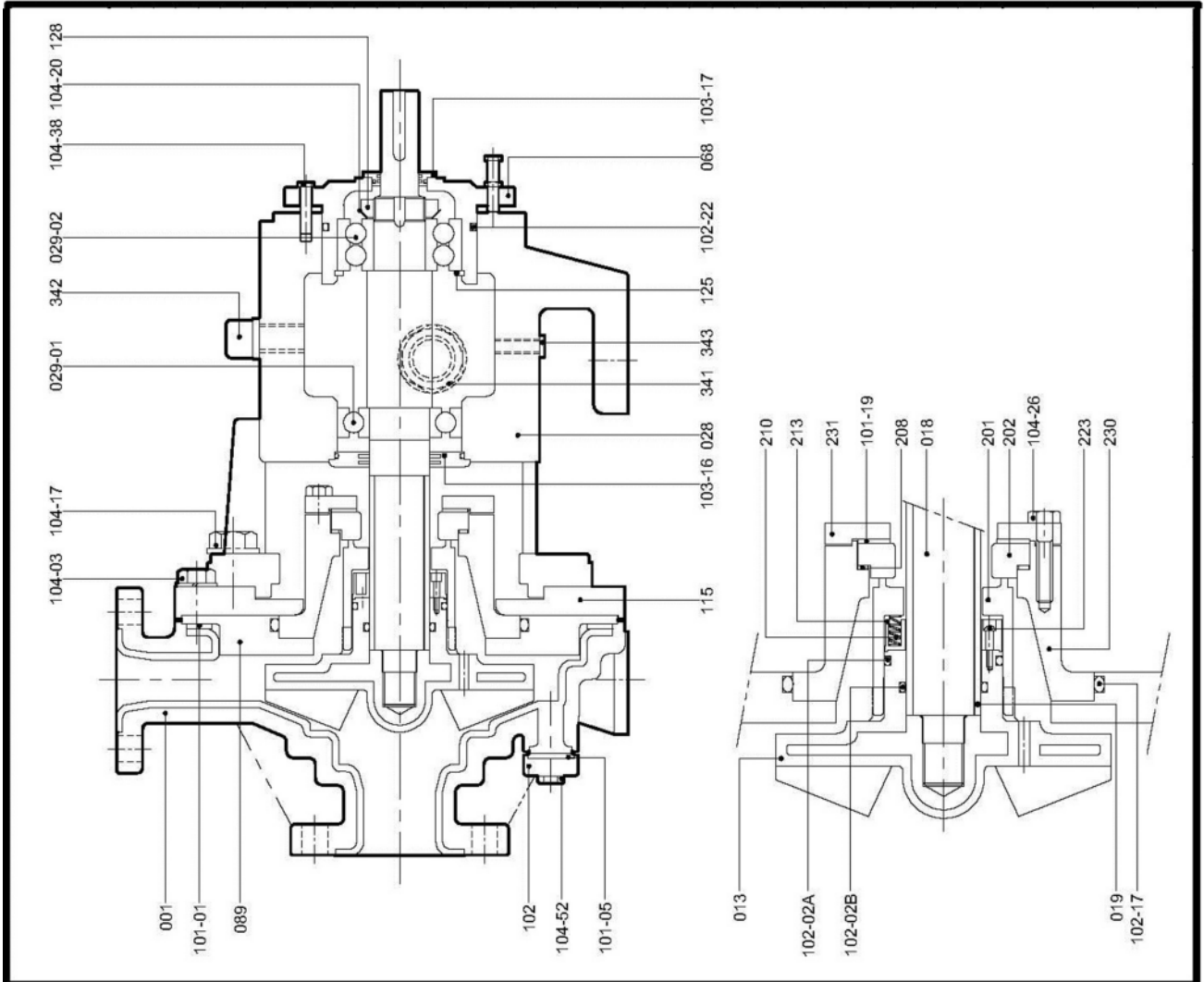
SECTION G

PUMP DRAWINGS

G.1 DIMENSIONAL DRAWING MAGNETEX MLS SERIES PUMPS



G.2 SECTIONAL DRAWING, MAGNATEX MLS



SECTION H

H.1 PARTS LIST AND MATERIALS OF CONSTRUCTION

PART NO.	QTY	PART NAME	MATERIALS	REMARKS
343	1	Oil Drain Plug	Steel	
342	1	Oil Fill Plug	Steel	
341	1	Oil Level Gauge	Steel	
231	1	Stationary Ring Cover	304SS	
230	1	Stuffing Box	ETFE	
223	4	Spring Retainer Bolt	316SS	
213	1	Spring Retainer	316SS	
210	8	Spring	Hastelloy C	
208	1	Stationary Ring Gasket	PTFE	
202	1	Stationary Ring	Al ₂ O ₃ /SiC	
201	1	Rotating Ring	C-PTFE	Carbon & SiC Optional
128	1	Lock Nut, Bearing	Steel	
125	1	Retaining Ring, Bearing	Carbon Steel	
115	1	Rear Ring	Gray Cast Iron	A48 Class No. 35
104-52	2	Drain Bolt	316SS	
104-38	6 & 3	Bearing Housing Bolt & Lock Nut	Steel	Jack Bolt uses Lock Nut
104-26	8	Stationary Ring Cover Bolt	316SS	
104-20	1	Lockwasher, Bearing	Steel	
104-17	4	Bracket Bolt	316SS	with Spring Washer
104-03	6	Casing Bolt	316SS	with Spring Washer
103-17	1	Labyrinth Seal (Motor Side)	Bronze	Integrated O-Ring, FKM
103-16	1	Labyrinth Seal (Pump Side)	Bronze	Integrated O-Ring, FKM
102-22	1	O-Ring (Bearing Housing)	NBR	
102-17	1	O-Ring (Rear Plate)	FPM/EPM	
102-02B	1	O-Ring (Impeller: Shaft Sleeve Side)	FPM/EPM	
102-2A	1	O-Ring (Impeller: Rotating Ring Side)	FPM/EPM	PTFE coating
102	1	Drain Flange	Cast Iron	A48 Class No. 35
101-19	1	Stationary Ring Cover Gasket	PTFE	
101-05	1	Drain Gasket	PTFE	(Jacketed Gasket)
101-01	1	Casing Gasket	PTFE	(Jacketed Gasket)
089	1	Rear Plate	PTFE	
068	1	Bearing Housing	Ductile Iron	
029-02	1	Bearing (Motor Side)	Steel	High-Carbon Chromium
029-01	1	Bearing (Pump Side)	Steel	High-Carbon Chromium
028	1	Bracket	Ductile Iron	
019	1	Shaft Sleeve	PTFE	
018	1	Shaft	316SS	
013	1	Impeller	ETFE	Integrated Insert: SCS13
001	1	Casing	Ductile Iron	Wetted Side: PFA

SECTION I

MAINTENANCE, OPERATIONS AND REBUILD CHECKLIST

I.1 - OPERATION CHECKS

LUBRICATION

Bearing lubrication is very important for the best service life of the pump. Regular oil changes and lubrication analysis is part of the best maintenance practices for optimum reliability. As operating conditions vary frequency of re-lubrication can be modified based upon operating records for the specific pump service.

Recommended lubricants:

OIL: ISO VG68 High Quality turbine oil. Maintain oil temperature between 122°F (50°C) and 180°F (82°C) for normal operation. For operation with pumped liquids above 350°F (177°C) use finned oil cooler. Contact Magnatex Pumps Inc. with any questions.

Suitable oil brands:

Shell – Tellus Oil 68 Royal Purple – SYNFILM VG68 Synth.
 Chevron – GTS Oil 68 Exxon – Terrestic EP 68

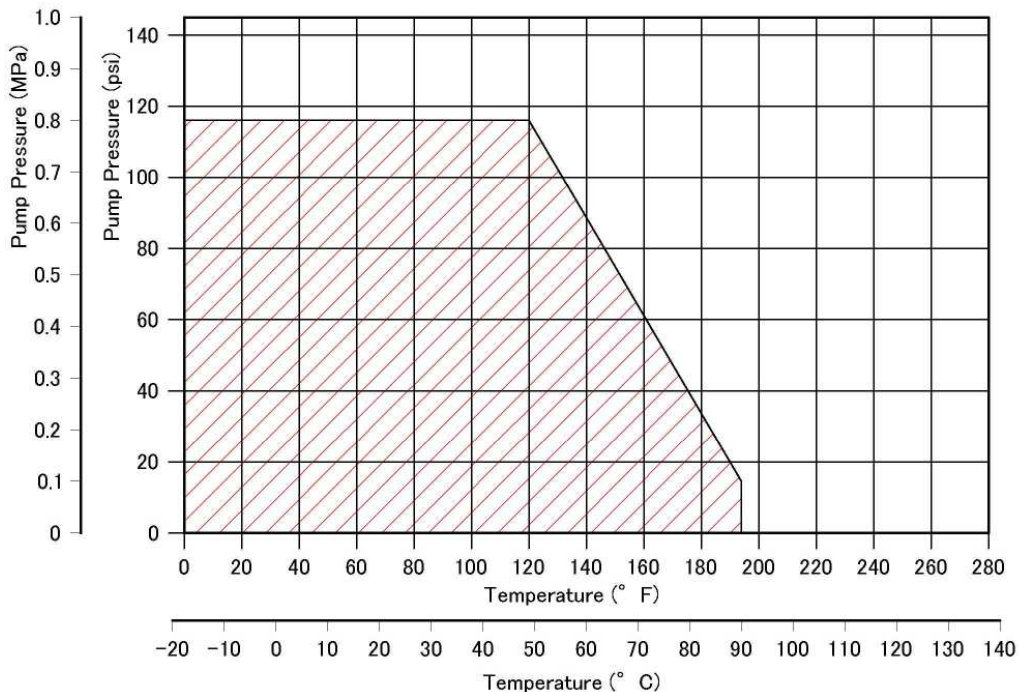
MAGNATEX MLS SERIES OIL SUMP CAPACITY		
Model	oz.	ml.
MLS	16	475

DO NOT OVERFILL! FILL RESERVOIR ONLY UNTIL OIL LEVEL IS IN THE MIDDLE OF BEARING FRAME SIGHT GAUGE

GREASE: Only sealed bearing are offered as an option. These bearings cannot be re-lubricated.

OPERATING TEMPERATURES

Allowable Pressure and Temperature of MLS Pumps



I.2 – REBUILD CHECKS

BEARING FIT AND TOLERANCES

MAGNATEX MLS SERIES BEARING FIT AND TOLERANCES				
MODEL	MLS in.(mm)		MODEL	MLS in.(mm)
SHAFT O.D.	1.3785 (35.013)		SHAFT O.D.	1.1815 (30.011)
INBOARD	1.3781 (35.002)		OUTBOARD	1.1812 (30.002)
	0.0010 (0.025) TIGHT			0.0008 (0.021) TIGHT
	0.0001 (0.002) TIGHT			0.0001 (0.002) TIGHT
BEARING I.D.	1.3780 (35.000)		BEARING I.D.	1.1811 (30.00)
INBOARD	1.3775 (34.988)		OUTBOARD	1.1807 (29.990)
FRAME I.D.	2.8346 (72.000)		HOUSING I.D.	2.8346 (72.000)
INBOARD	2.8353 (71.987)		OUTBOARD	2.8353 (72.019)
	0.0012 (0.032) LOOSE			0.0012 (0.032) LOOSE
	0.0000 (0.000) LOOSE			0.0000 (0.000) LOOSE
BEARING O.D.	2.8346 (72.000)		BEARING O.D.	2.8346 (72.000)
INBOARD	2.8341 (71.987)		OUTBOARD	2.8341 (71.987)

INDICATOR CHECKS

- ✓ Impeller Vane Runout – 0.005 in. T.I.R. Max.
- ✓ Shaft Straightness – 0.0005 in. T.I.R. Max.
- ✓ Shaft Runout, Sleeve Fit – Less Sleeve – 0.002 in. / With Sleeve – 0.001 in. T.I.R. Max.
- ✓ Stuffing Box Runout – 0.005 in. T.I.R. Max.

SHAFT END PLAY

MAGNATEX MLS SERIES SHAFT END PLAY in. (mm)		
		MLS
Double row	min	0.0011(.028)
	max	0.0019(.047)
Duplex	min	0.0007(.012)
	max	0.0010(.026)