

MAGNATEX® 3596 Series



Operation & Maintenance Manual



**Mechanical Seal B73.1
ANSI Process Pumps**

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SECTION A

GENERAL INFORMATION

A.1 PREFACE

Magnatex 3596 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.

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 an ETFE 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 or conventional packing.

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

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 a bronze labyrinth seal.

SHAFT: Manufactured from 4140 steel with an adjustable bearing and a bolt type roll pin on the shaft end. The 316SS shaft (also available) does not require a sleeve.

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.

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.

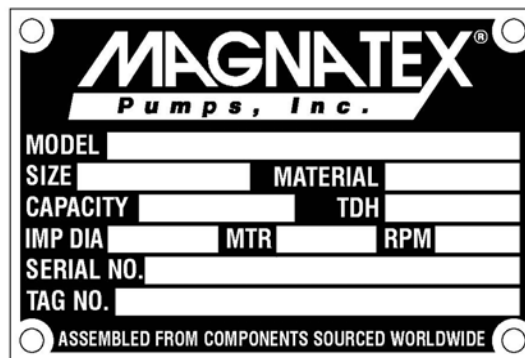


Fig 1

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).

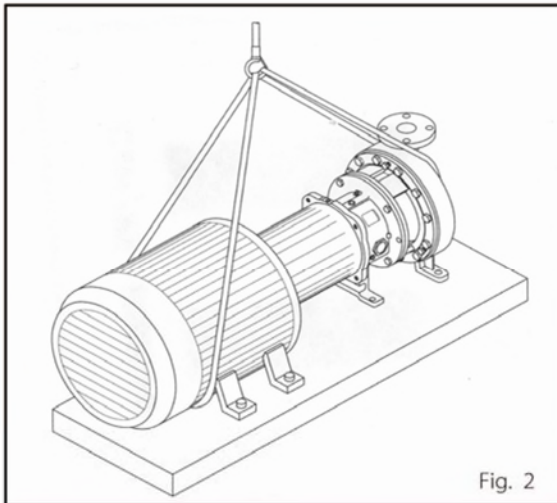


Fig. 2

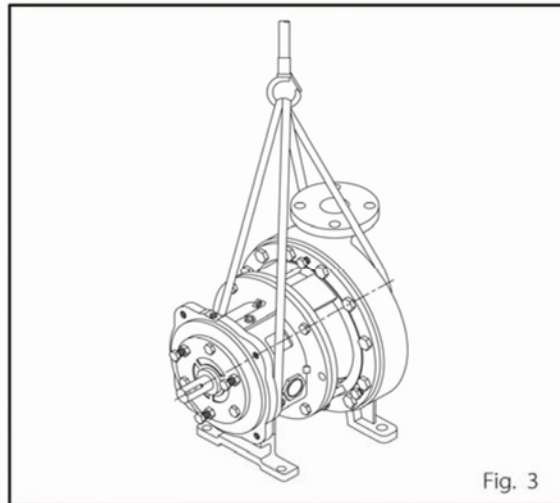


Fig. 3

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 than (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

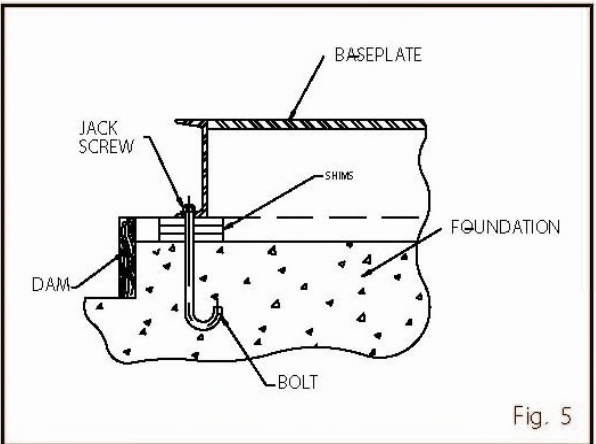
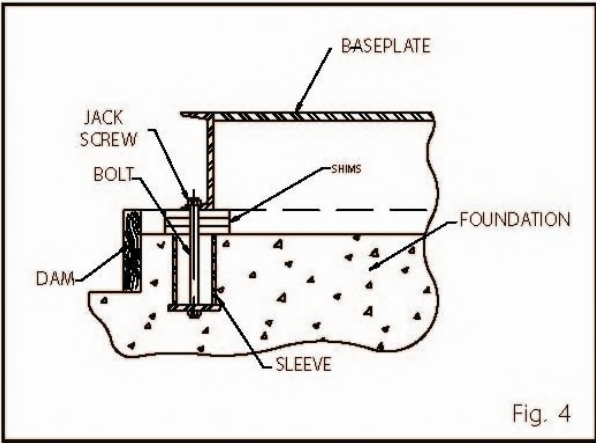
PUMP INSTALLATION

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.

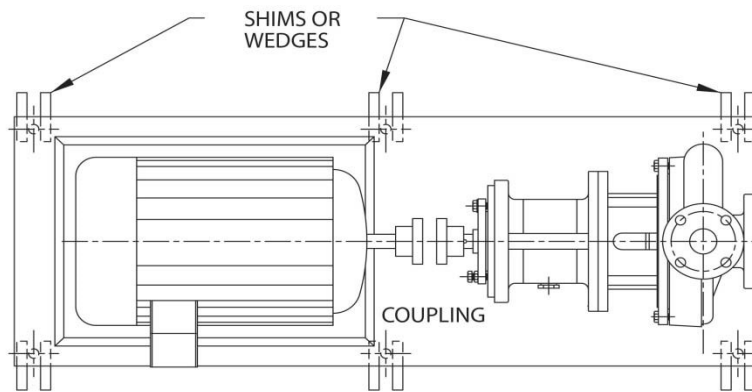


Fig. 6

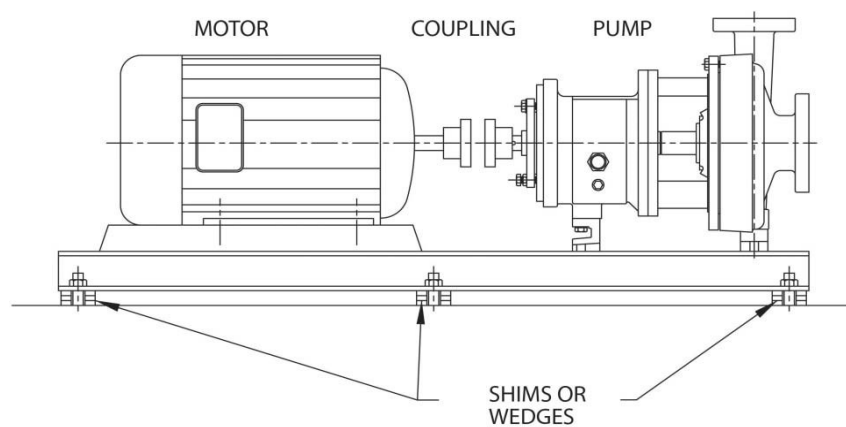


Fig. 7

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.

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.

Minimum values for different temperatures appear in the following table. The impeller clearance adjustments are necessary to prevent the impeller from contacting the casing due to differential expansion at higher operating temperatures. See section I.2 for impeller clearance setting.

IMPELLER CLEARANCES FOR SERVICE TEMPERATURES			
SERVICE TEMPERATURE °F (°C)	MAGNATEX 3596 S inches (mm.)	MAGNATEX 3596 M & L inches (mm.)	MAGNATEX 3596 XL inches (mm.)
To 200 °F (93°C)	0.005" (0.13 mm)	0.008" (0.20 mm)	0.010" (0.26 mm)
250 °F (93°C -121°C)	0.007" (0.18 mm)	0.010" (0.26 mm)	0.010" (0.26 mm)
300 °F (121°C -149°C)	0.009" (0.23 mm)	0.010" (0.26 mm)	0.019" (0.48 mm)
350 °F (149°C -177°C)	0.011" (0.28 mm)	0.010" (0.26 mm)	0.021" (0.53 mm)

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 170°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
Mobil – DTE Premium R&O Oil ISO68

MAGNATEX 3596 SERIES OIL SUMP CAPACITY		
Model	oz.	ml.
3575S	16	475
3575M	42	1250
3575L	48	1425
3575XL	96	2850

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 3596 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.

MINIMUM RECOMMENDED FLOW FOR MAGNATEX 3596 SERIES PUMPS													
GPM (M ³ hr) MAXIMUM IMPELLER DIAMETER, WATER AT 60°F													
SIZES	MODEL	60HZ 3500 RPM		50HZ 2900 RPM		60HZ 1750 RPM		50HZ 1450 RPM		60HZ 1180 RPM		60HZ 880 RPM	
		1 x 1-1/2 - 6	MAGNATEX 3596S	16	3.6	13.3	1.1	6	1.4	5	1.1		
1-1/2 x 3 - 6	29	6.6		9	2.1	15	1.1	2	0.5				
2 x 3 - 6	62	14.1		52	11.8	16	3.6	13.3	3.0				
1 x 1-1/2 - 8	32	7.3		13	2.9	8	1.1	2	0.5				
1-1/2 x 3 - 8	MAGNATEX 3596 M & L	40	9.1	33	7.5	10	2.3	8.3	1.9				
3 x 4 - 7		113	25.7	94	21.3	36	8.2	30	6.8				
2 x 3 - 8		56	12.7	46	10.5	14	3.2	12	2.7				
3 x 4 - 8G		137	31.1	114	25.8	64	14.5	53	12.0				
1 x 2 - 10		40	9.1	22	4.9	8	1.8	6.6	1.5				
1-1/2 x 3 - 10		75	17.1	62	14.1	16	3.6	13	3.0				
2 x 3 - 10		125	28.4	104	23.6	30	6.8	25	5.6				
3 x 4 - 10		200	45.4	166	37.7	46	10.5	38	8.7				
3 x 4 - 10H		N/A		N/A		180	40.9	149	33.9	80	18.2		
4 x 6 - 10H		N/A		N/A		472	107.3	391	88.9	188	42.7		
1-1/2 x 3 - 13		180	40.9	150	33.9	45	10.2	38	8.5	26	5.9		
2 x 3 - 13		312	70.9	259	58.8	60	13.6	50	11.4	40	9.2		
3 x 4 - 13		400	90.9	332	75.3	288	65.5	239	54.2	150	15.2		
4 x 6 - 13		N/A		N/A		456	103.6	378	85.9	222	50.5		
6 x 8 - 13	N/A		N/A		792	180.0	656	149.1	390	88.6			
8 x 10 - 13	N/A		N/A		1360	309.1	1127	256.1	660	150.0			
6 x 8 - 15	N/A		N/A		1095	248.9	907	206.2	580	131.8			
8 x 10 - 15	N/A		N/A		N/A		N/A		1550	352.3	920	209.1	
8 x 10 - 15G	N/A		N/A		2200	500.0	1823	414.3	1180	268.2	894	203.2	
8 x 10 - 16H	N/A		N/A		2850	647.7	2361	536.7	1600	363.6	900	204.5	
8 x 10 - 17	N/A		N/A		2150	488.6	1781	404.9	1120	254.5	840	190.9	

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
- Shaft
- Outboard bearing
- Inboard bearing
- Inboard labyrinth seal
- Outboard labyrinth seal
- Bearing lock washer
- Volute gasket
- O- Ring bearing housing
- Gasket – frame to adapter
- Stuffing box packing
- O- Ring impeller

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
- Brass drift punch
- Lifting sling
- Induction bearing heater
- Torque wrench
- Heavy work gloves
- Cleaning agents
- 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 opposite 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

PUMP ASSEMBLY

All pumps parts should be inspected before reassembly. Check that all parts are clean before assembly.

F.1 ASSEMBLY OF BEARING FRAME

Step 1 –Install all threaded plugs in bearing frame (sight oiler plug, for oil mist connection plug, oil fill plug, oil drain plug, relief plug and oil cooler inlet and outlet plugs.

Step 2 –Install bearing frame foot and bolts, hand tighten.

F.2 ASSEMBLY OF ROTATING ELEMENT

Step 1 –For the models 3596S and 3596M: Install outboard bearing on shaft. Coat internal surfaces of bearings with lubricant that will be used in the pumps operations.

The inboard bearing is installed with the shield away from impeller.

For model 3596L: Install the two angular contact outboard bearings as a set on shaft. For proper installation please check SKF catalog. The bearings must be installed “back to back”. Coat the internal surfaces of bearings with oil that will be used in pump operation.

Step 2 –Place lock washer on shaft and tang of lock washer in keyway of shaft.

Step 3 –Thread locknut onto shaft. Tighten locknut until tight. Bend washer tang aligning with slot of lock washer into the slot of locknut.

Step 4 –For models 3596S and 3596M: Place bearing retaining ring so that the flat side will be against the outboard bearing. This bearing retaining ring is beveled; the flat face should be towards outboard bearing to prevent movement of the bearing when installed in the bearing housing.

For the model 3596L: Place bearing clamp ring over shaft (Note orientation).

Step 5 –Install inboard bearing on shaft. Before installing, coat internal surfaces of the bearings with the oil to be used in pump operation.

Step 6 –Install a new O-ring in bearing housing.

Step 7 –Coat outside of outboard bearing and inside of bearing housing with oil.

Step 8 –Install the shaft/bearing assembly in the bearing housing.

Step 9 –For model 3596S and 3596M: Secure the retaining ring in groove. Check that the groove in the bearing frame is not blocked by the retaining ring and the bearing is secure in the bearing housing.

Step 10 –Check that the shaft turns freely.

Step 11 –Before installing the outboard labyrinth seal, cover the edges of the keyway on the shaft with thin tape in order to protect outboard labyrinth seal O-ring during installation.

Step 12 –Install outboard labyrinth seal in bearing housing with the groove for oil drainage oriented downwards. Shaft must rotate freely.

Step 13 –Lubricate the outer track of the bearing housing, the inboard bearing and inner track of the bearing frame with the oil to be used during the pump operation.

Step 14 –Install shaft assembly into frame. Check that the shaft turns freely.

Step 15 –Position the bearing housing in the bearing frame. Align the word “top” with the upper portion of the bearing frame. Tighten the clamp bolts and adjusting screws and locknuts by hand.

Step 16 –Once the rotating element is installed in the bearing frame, place a dial indicator on the end of the shaft. Move shaft forward and backward to check axial movement.

MAGNATEX 3596 SERIES SHAFT END PLAY in. (mm)					
		3596S	3596M	3596L	3596XL
Double row	min	0.0011(.028)	0.0013(.033)	N/A	0.0014(.036)
	max	0.0019(.047)	0.0021(.054)		0.0023(.058)
Duplex	min	0.0007(.012)	0.0009(.022)	0.0010(.026)	0.0010(.026)
	max	0.0010(.026)	0.0012(.030)	0.0015(.038)	0.0015(.038)

Step 17 – Check shaft run out. Install the shaft sleeve, if used, and then hand tighten impeller. Rotate shaft 360 degrees. Disassemble and determine cause if the total indicator reading is greater than 0.002 in.

Step 18 – Check frame face run out. Rotate shaft so indicator rides along the fit for 360 °.

If the total indicator reading is more than 0.001 in (0.025 mm) disassemble and troubleshoot.

F.3 INSTALL FRAME ADAPTER, SEAL CHAMBER, IMPELLER, AND CASING (FOR DYNAMIC SEAL INSTALLATION SKIP TO SECTION F.4)

Step 1 – Install the gasket on the frame.

Step 2 – Install the frame adapter onto frame assembly aligning bolt holes and dowel locations with the frame.

Step 3 – Install dowel pins and bolts.

Step 4 – Check adapter to determine if the total indicator reading is within tolerance.

Step 5 – Install inboard labyrinth oil seal into adapter/bearing frame with the oil drain ports oriented downward in the 6 o’clock position.

Step 6 – Lubricate the O-Ring on the mechanical seal and place cartridge mechanical seal on the shaft/shaft sleeve. Refer to the seal manufacturer’s installation instructions to complete seal installation.

Step 7 – Install the seal chamber aligning the studs with the mechanical seal gland. Fasten the seal chamber to the frame adapter with stud/nut (370H).

- Step 8** – Place a new impeller gasket onto the impeller hub O-ring groove and thread the impeller onto the shaft and tighten the impeller:
- Slide shaft wrench over the shaft and key.
 - Looking from the impeller end of the shaft, rotate the impeller counter clockwise, raising the wrench off the work surface.
 - Now turn it quickly back the opposite way, banging the wrench handle on the workbench or a solid block to tighten impeller securely.
- Step 9** – Place casing gasket on seal chamber register and install casing making sure the gasket is properly positioned and not pinched. Tighten casing bolts to specified torque in torque table.

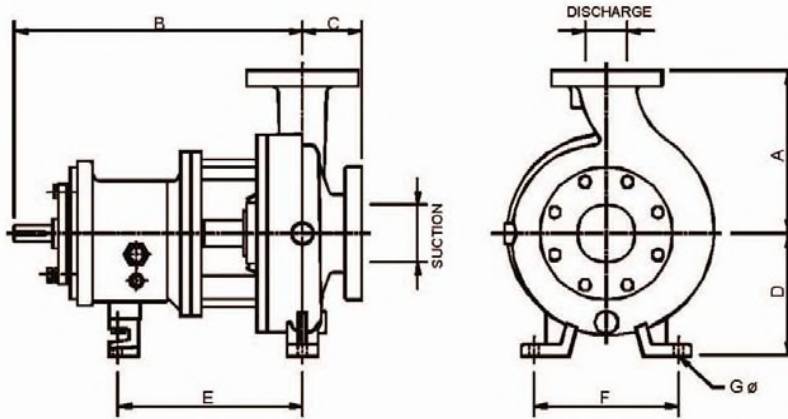
F.4 DYNAMIC SEAL ASSEMBLY

- Step 1** – Install the gasket on the frame.
- Step 2** – Install the frame adapter onto frame assembly aligning bolt holes and dowel locations with the frame.
- Step 3** – Install dowel pins and bolts.
- Step 4** – Check adapter to determine if the total indicator reading is within tolerance.
- Step 5** – Install inboard labyrinth oil seal into adapter/bearing frame with the oil drain ports oriented downward to the 6 o'clock position.
- Step 6** – Place the stuffing box cover in place and fasten the seal chamber to the frame adapter with stud/nut (370H).
- Step 7** – Install the repeller with integral sleeve onto the shaft and place the stuffing box cover plate to enclose the repeller
- Step 8** – Place a new impeller gasket onto the impeller hub O-ring groove and thread the impeller onto the shaft and tighten the impeller:
- Slide shaft wrench over the shaft and key.
 - Looking from the impeller end of the shaft, rotate the impeller counter clockwise, raising the wrench off the work surface.
 - Now turn it quickly back the opposite way, banging the wrench handle on the workbench or a solid block to tighten impeller securely.
- Step 9** – Place casing gasket on stuffing box register and install casing making sure the gasket is properly positioned and not pinched. Tighten casing bolts to specified torque in torque table.
- Step 10** – Install braided graphite packing in accordance with the 3596 Dry Running Packing Instructions supplement.

SECTION G

PUMP DRAWINGS

G.1 DIMENSIONAL DRAWING MAGNATEX 3596 SERIES PUMPS

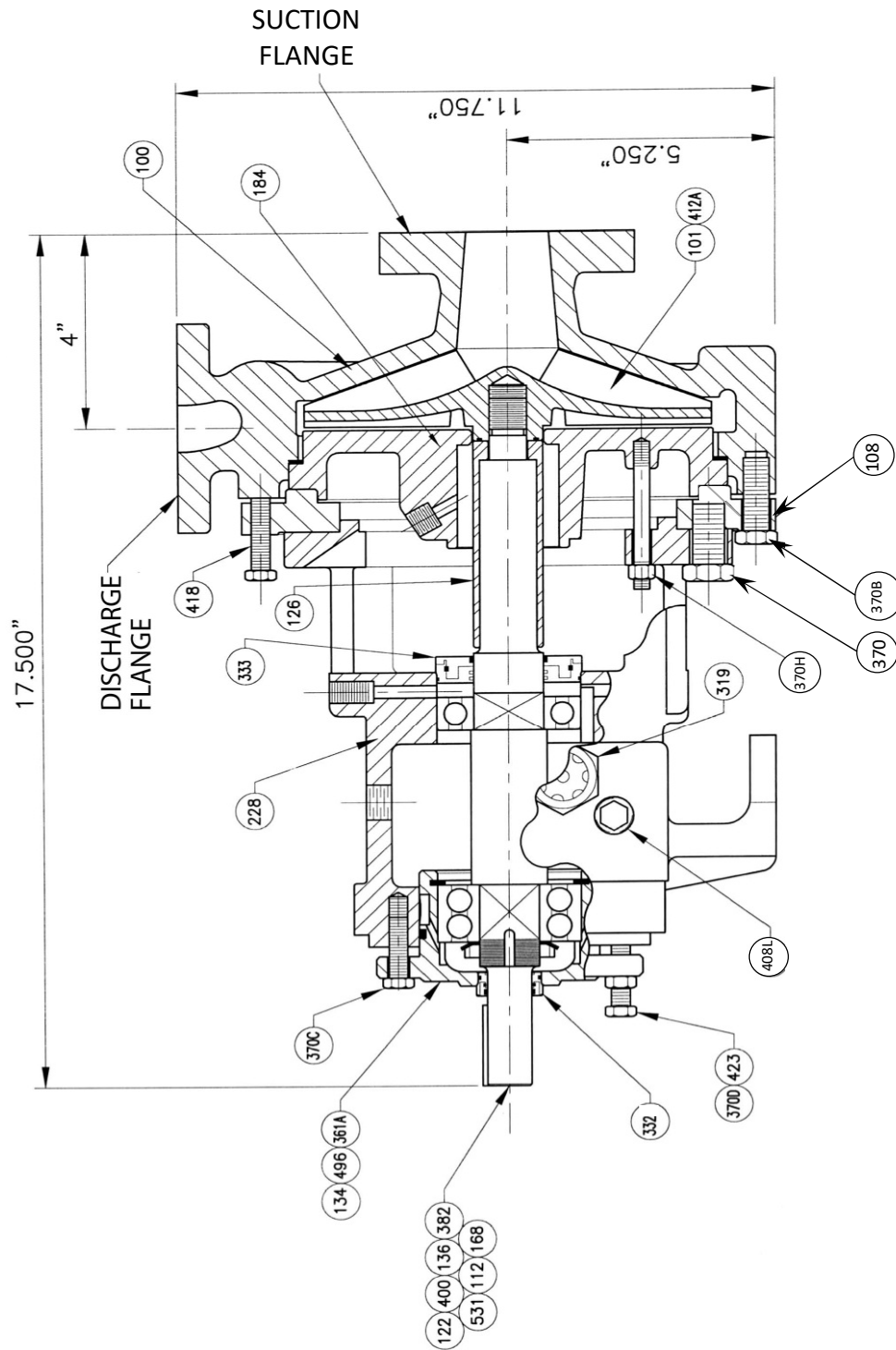


GENERAL DIMENSION

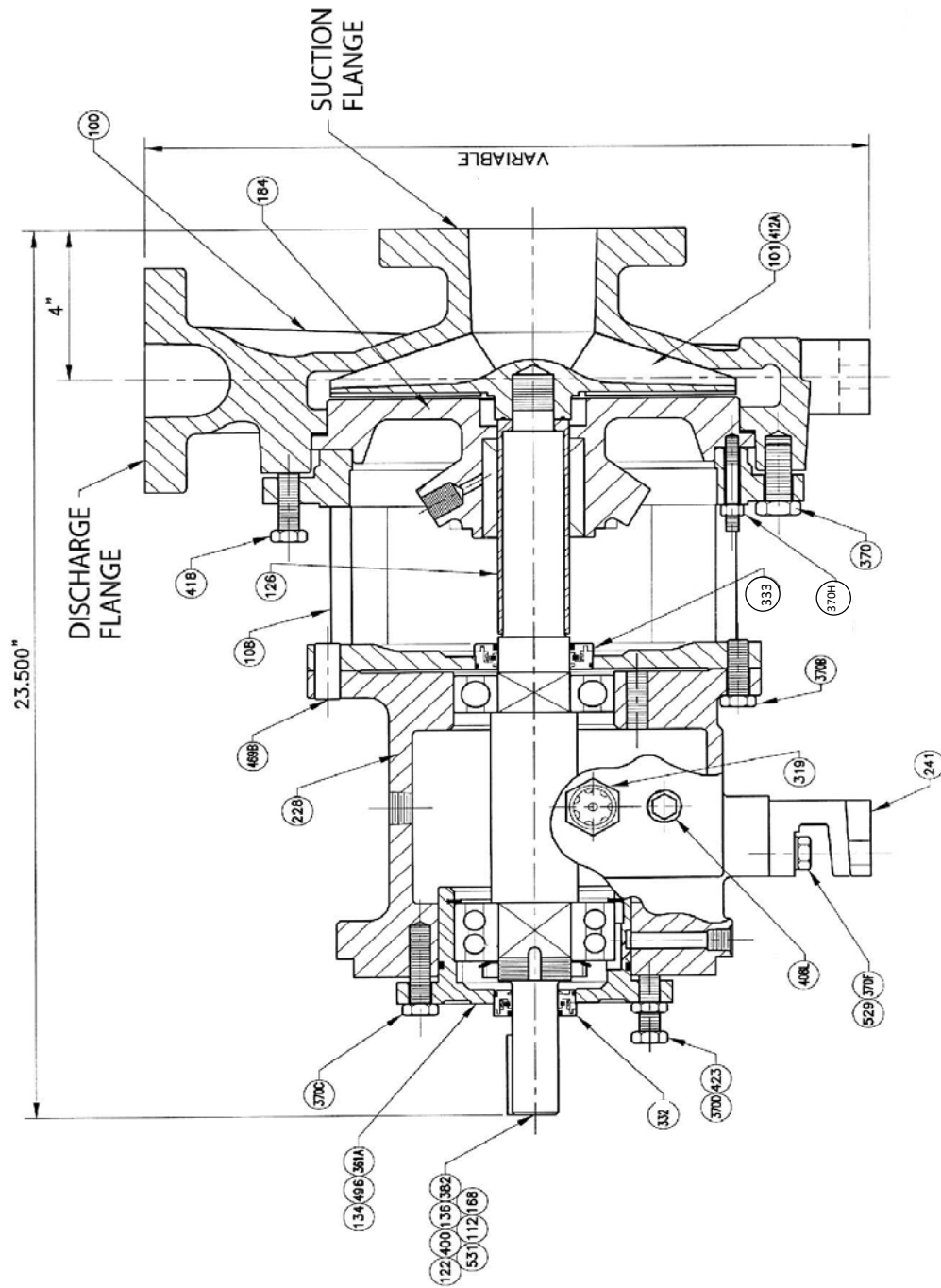
FRAME	SIZE	ANSI DESIGNATION	DISCHARGE SIZE	SUCTION SIZE	A	B	C	D	E	F	BORE	WEIGHT	
					DIMENSIONS IN INCHES (CENTIMETERS)								
MAGNATEX 3596S	1 x 1.5-6	AA	1	1.5	6.5 (16.5)	13.5 (34.3)		5.25 (13.3)	7.25 (18.5)	6 (15.2)	.625 (1.58)	84 (38)	
	1.5 x 3-6	AB	1.5	3								42 (92)	
	2 x 3-6	AC	2	3								43 (95)	
	1 x 1.5-8	AA	1	1.5								45 (100)	
	1.5 x 3-8	AB8	1.5	3								49 (108)	
MAGNATEX 3596M & 3596L	3 x 4-7	---	3	4	11 (28.0)	19.5 (49.5)	4 (10.2)	8.25 (21.0)	12.5 (31.8)	9.75 (24.7)	.625 (1.58)	100 (220)	
	2 x 3-8	A60	2	3	9.5 (24.2)							200 (91)	
	3 x 4-8	A70	3	4	11 (28.0)							200 (100)	
	3 x 4-8G	A70	3	4								220 (91)	
	1 x 2-10	A05	1	2	8.5 (21.6)							220 (100)	
	1.5 x 3-10	A50	1.5	3	9.5 (24.2)							230 (104)	
	2 x 3-10	A60	2	3								265 (120)	
	3 x 4-10	A70	3	4	11 (28.0)							305 (138)	
	3 x 4-10H	A40	3	4	12.5 (31.8)							305 (138)	
	4 x 6-10	A80	4	6	13.5 (34.3)								
	4 x 6-10H	A80	4	6								10 (25.4)	245 (111)
	1.5 x 3-13	A20	1.5	3	10.5 (26.7)								275 (125)
	2 x 3-13	A30	2	3	11.5 (29.2)								330 (150)
	3 x 4-13	A40	3	4	12.5 (31.8)								405 (184)
4 x 6-13	A80	4	6	13.5 (34.3)									
MAGNATEX 3596XL	6 x 8-13	A90	6	8	16 (40.6)	27.9 (70.8)	6 (15.2)	14.5 (36.8)	18.75 (47.6)	16 (40.6)	.875 (2.22)		560 (254)
	8 x 10-13	A100	8	10	18 (45.7)							670 (304)	
	6 x 8-15	A110	6	8								610 (277)	
	8 x 10-15	A120	8	10	19 (48.3)							740 (336)	
	8 x 10-15G	A129	8	10								322 (710)	

NOTE: For models not shown contact Magnatex Pumps Inc.

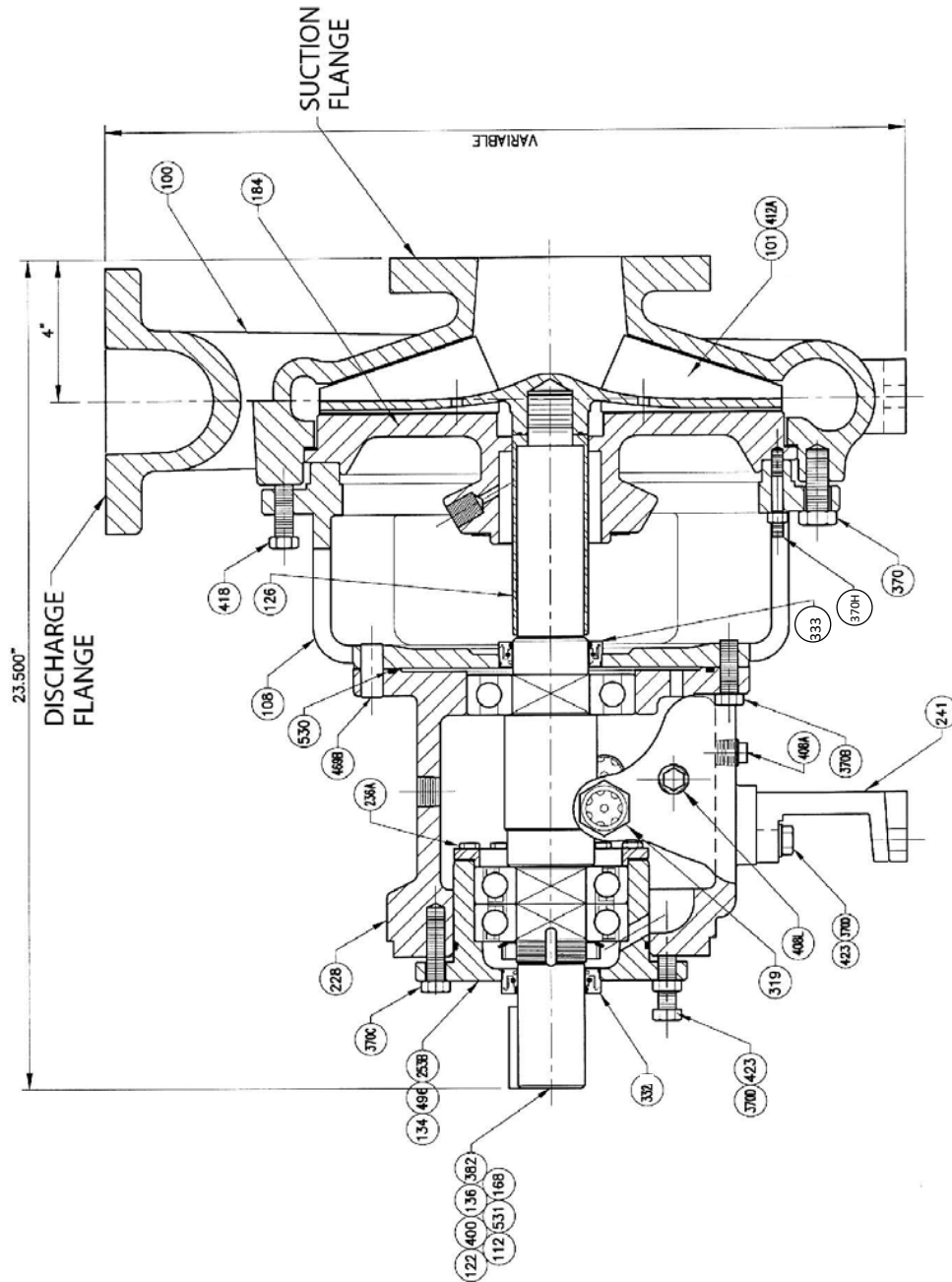
G.2 SECTIONAL DRAWING, MAGNATEX 3596S



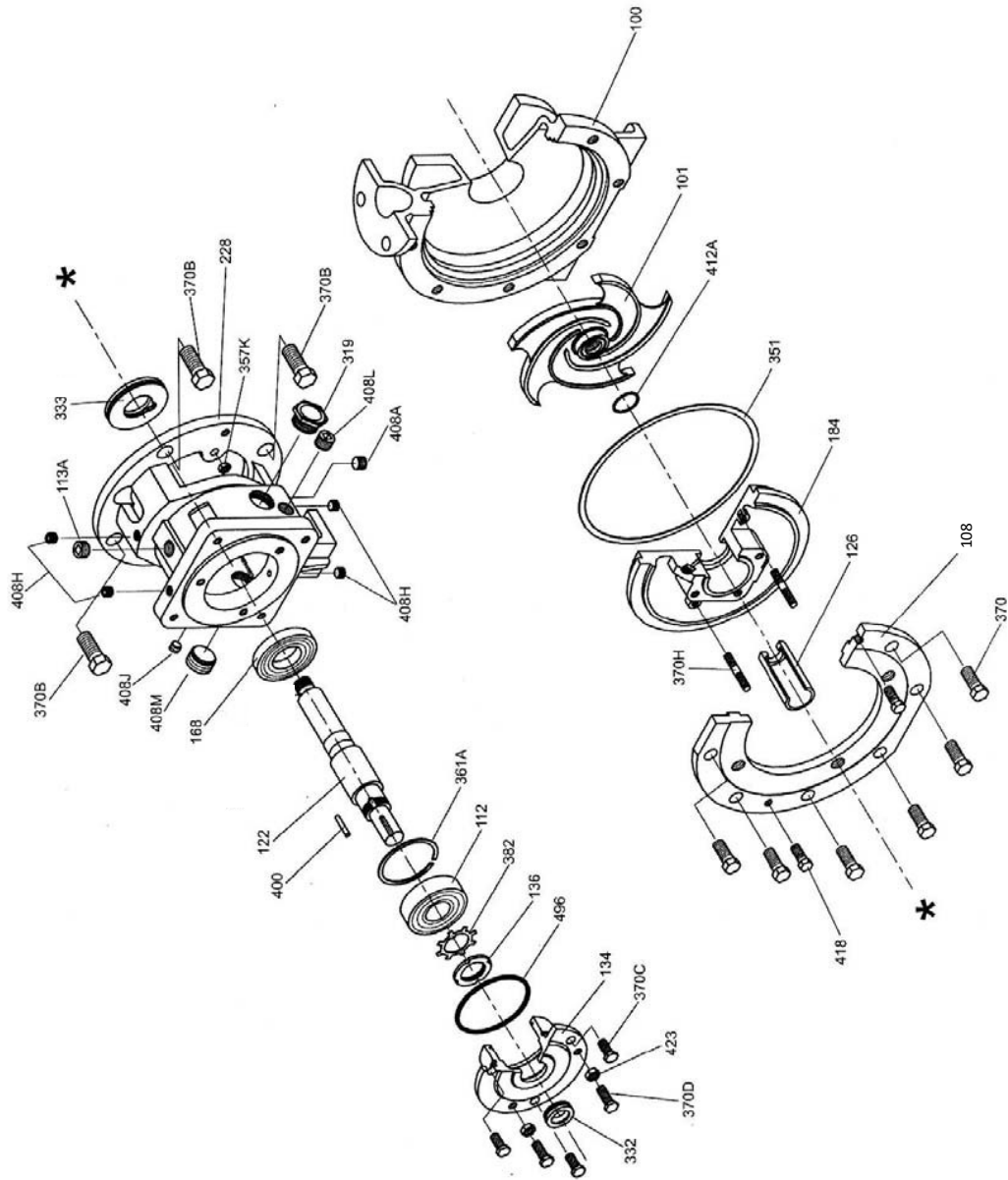
G.3 SECTIONAL DRAWING, MAGNATEX 3596M



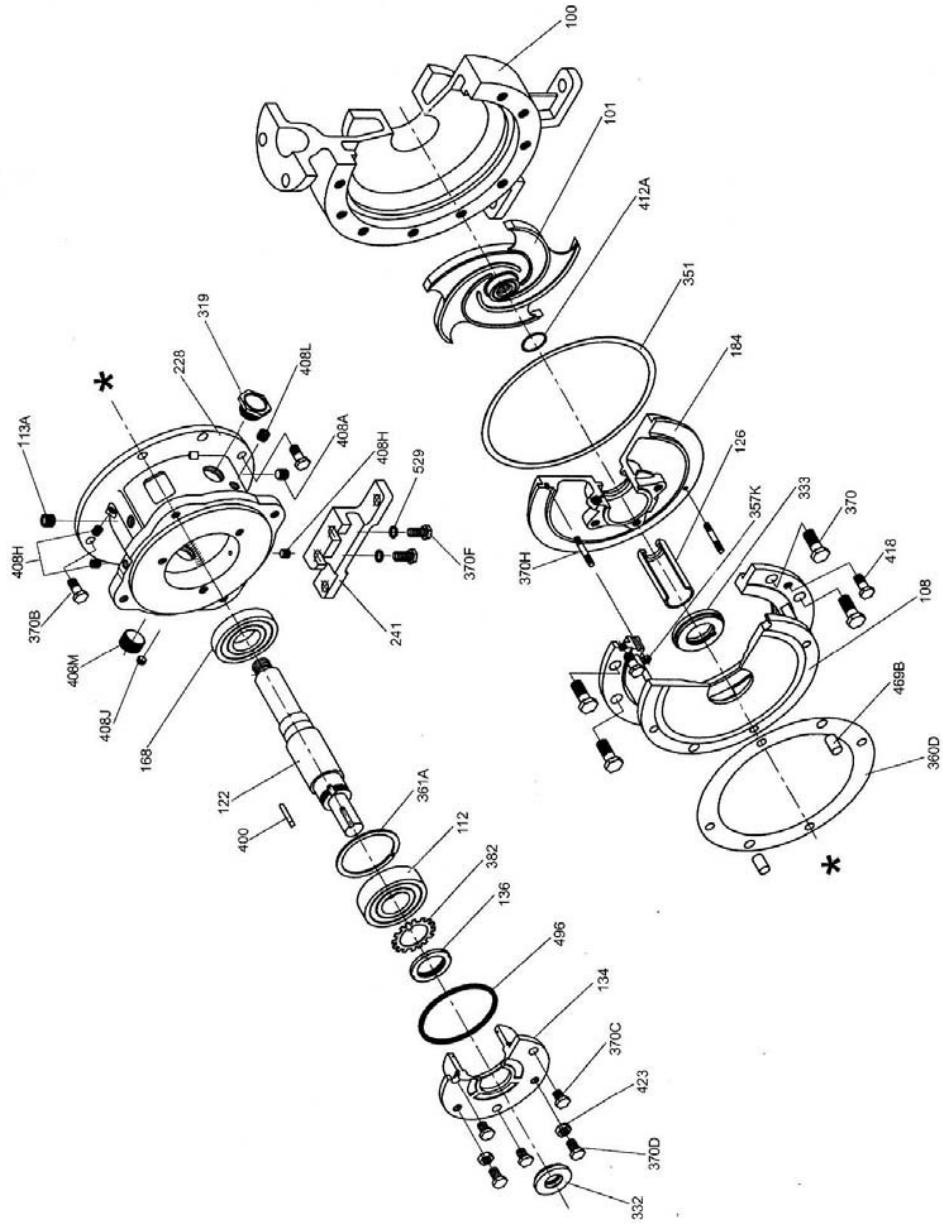
G.4 SECTIONAL DRAWING, MAGNATEX 3596L



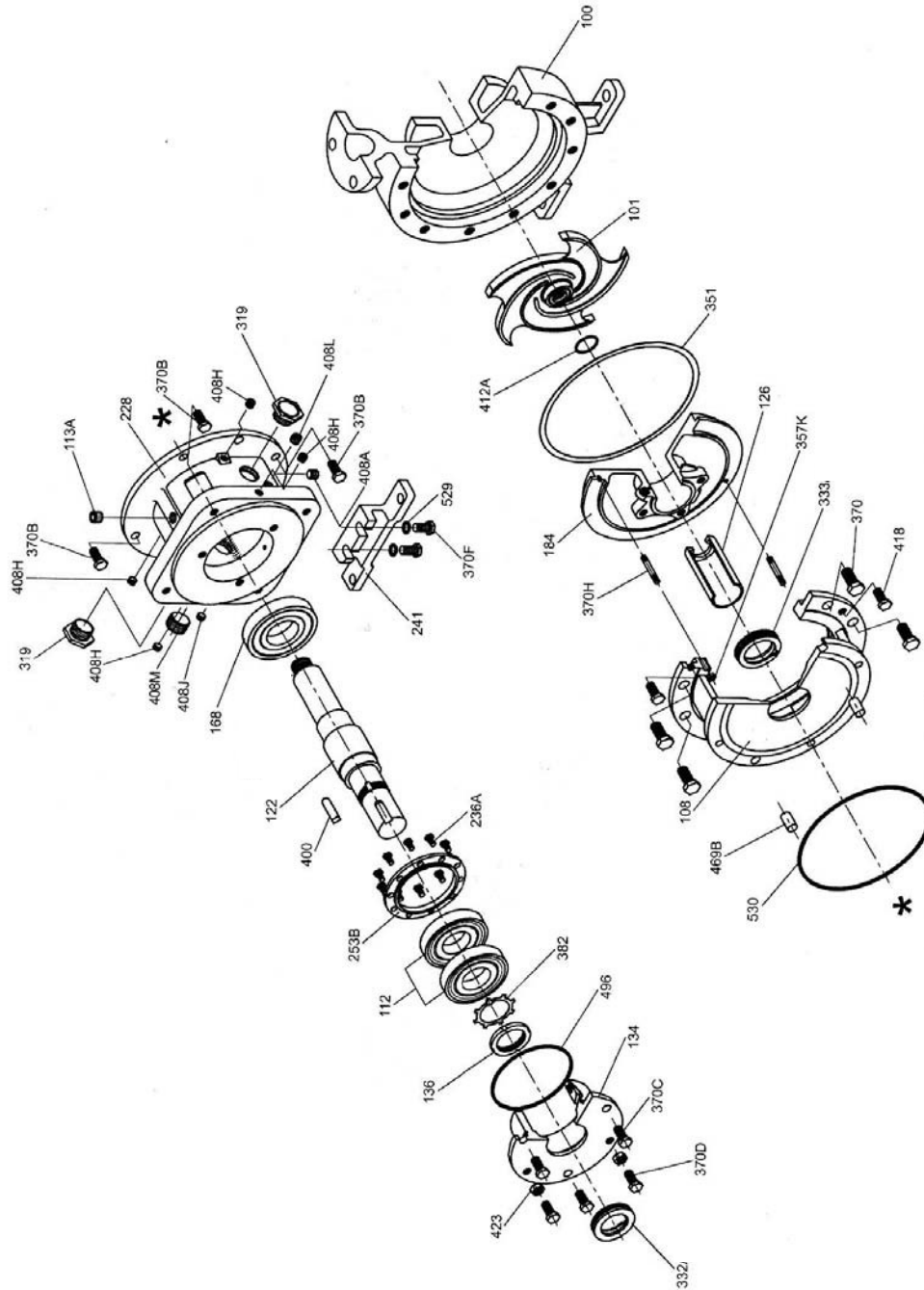
G.5 EXPLODED DRAWING, MAGNATEX 3596S



G.6 EXPLODED DRAWING, MAGNATEX 3596M



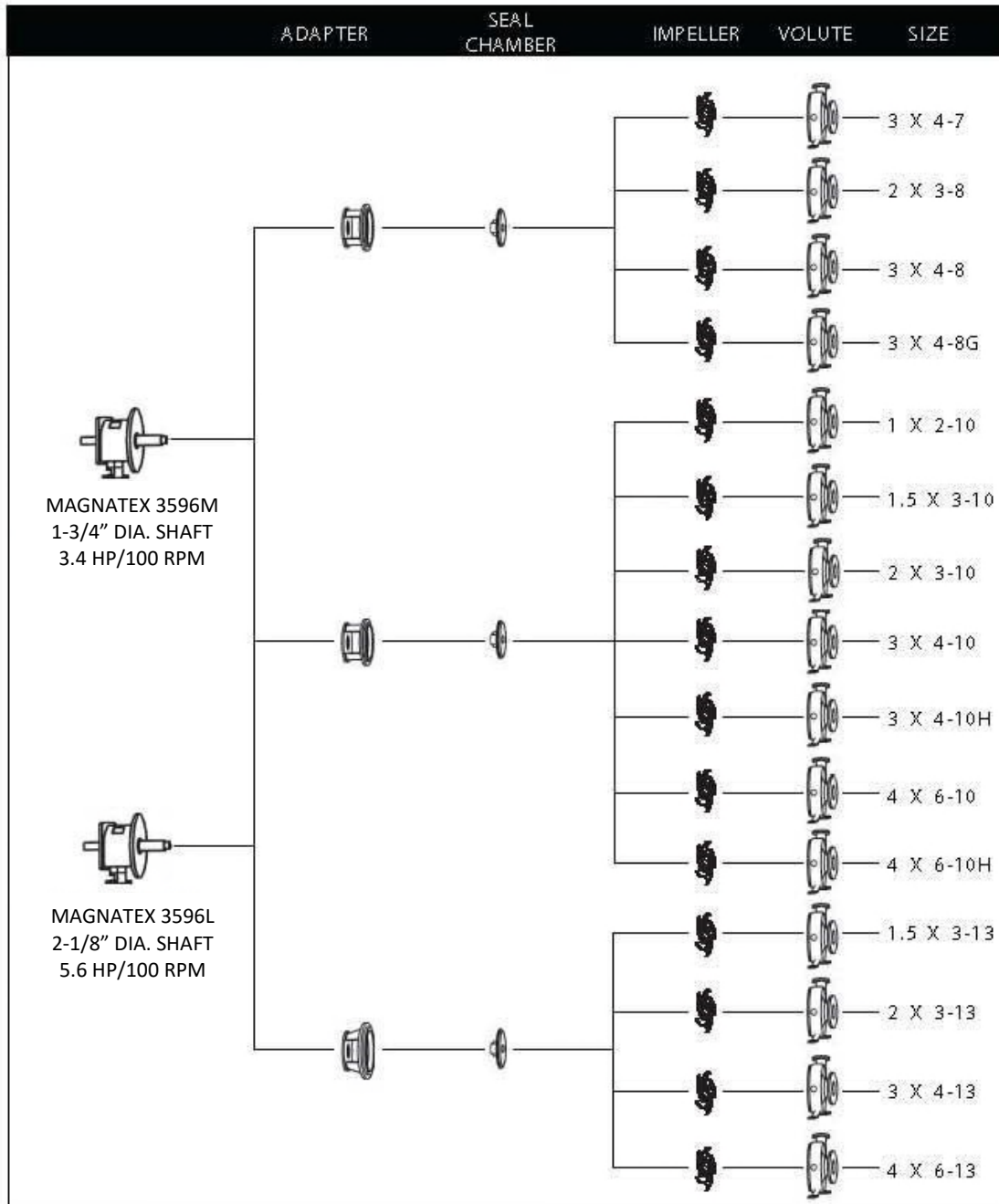
G.7 EXPLODED DRAWING, MAGNATEX 3596L



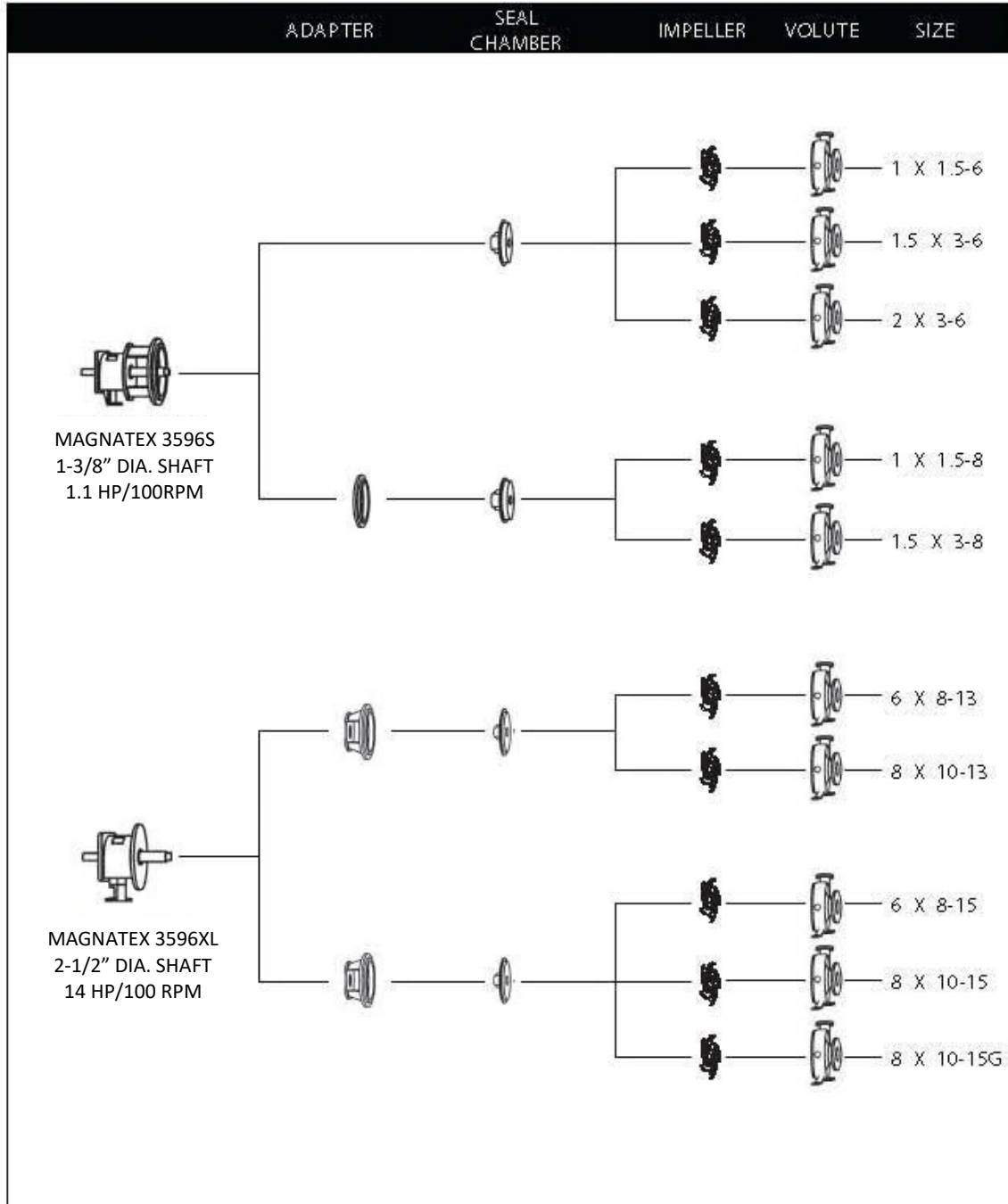
SECTION H

Pump Parts

H.1 MODULAR INTERCHANGEABILITY



H.1 MODULAR INTERCHANGEABILITY (cont.)



H.2 PARTS LIST AND MATERIALS OF CONSTRUCTION

ITEM	QTY PER PUMP	PART NAME	DUCTILE IRON	DUCTILE IRON WITH 316SS IMP	316SS	ALLOY 20	CD4MCu	MONEL	HASTELOY B&C	
100	1	VOLUTE CASING	WCB	WCB	316SS	ALLOY 20	CD4MCu	MONEL	B&C	
101	1	IMPELLER	WCB	316SS	316SS	ALLOY 20	CD4MCu	MONEL	B&C	
105	1	LANTERN RING	TEFLON							
106	1	STUFFING BOX PACKING	TBD							
107	1	GLAND	316SS			ALLOY 20		MONEL	B&C	
108	1	FRAME ADAPTER (N/A FOR 6" PUMPS)	DUCTILE IRON							
112	1	THRUST BEARING	DOUBLE ROW ANGULAR CONTACT							
113A	1	PLUG – OIL FILL	CARBON STEEL							
122	1	SOLID SHAFT - NO SLEEVE (OPTIONAL)	316SS							
122	1	SHAFT MACHINED FOR SLEEVE	SAE - 4140					316SS		
126	1	SHAFT SLEEVE	316SS							
134	1	BEARING HOUSING	DUCTILE IRON							
136	1	BEARING LOCKNUT	STEEL							
168	1	RADIAL BEARING	SINGLE ROW DEEP GROOVE							
184	1	SEAL CHAMBER/STUFFING BOX COVER	DUCTILE IRON	316SS	ALLOY 20	CD4MCu	MONEL	B&C		
228	1	BEARING FRAME	DUCTILE IRON							
236A	10	CAP SCREW	CARBON STEEL							
241	1	FRAME FOOT	DUCTILE IRON							
236A	1	OIL DEFLECTOR	CARBON STEEL							
250	1	GLAND MECHANICAL SEAL	316SS			ALLOY 20				
253B	1	BEARING CLAMP RING	CARBON STEEL							
319	1	OIL SIGHT GLASS	GLASS /STEEL							
332	1	OUTBOARD LABYRINTH SEAL	BRONZE WITH VITON O-RINGS							
333	1	INBOARD LABYRINTH SEAL	BRONZE WITH VITON O-RINGS							
351	1	CASING GASKET	ARAMID FIBER WITH EDPM or ETFE							
353	2	GLAND STUD	316SS							
355	2	GLAND STUD NUT	304SS							
357K	2	PLUG	304SS							
358A	1	CASING DRAIN PLUG (OPTIONAL)	CARBON STEEL	316SS	ALLOY 20	CD4MCu	MONEL	B&C		
360D	1	GASKET – FRAME ADAPTER	VELLUMOID							
361A	1	SNAP RING (BEARING RETAINING)	STEEL							
370	*	BOLT – ADAPTER TO CASING (N/A for 6" PUMPS)	CARBON STEEL							
370B	4	BOLT – FRAME TO ADAPTER	CARBON STEEL							
370C	3	CLAMP BOLT – BEARING HOUSING	CARBON STEEL							
370D	3	JACK BOLT – BEARING HOUSING	CARBON STEEL							
370F	2	BOLT – FRAME FOOT TO FRAME	CARBON STEEL							
370H	2	STUD & NUT – STUFFING BOX COVER TO ADAPTER	316SS							
382	1	LOCK WASHER – BEARING	STEEL							
408A	1	PLUG – OIL DRAIN	STEEL							
408H	4	PLUG – OIL MIST CONNECTION	STEEL							
408J	1	PLUG OILER	STEEL							
408L	1	PLUG – OIL COOLER INLET	STEEL							
408M	1	PLUG – OIL COOLER OUTKLET	STEEL							
412A	1	O-RING – IMPELLER	TEFLON							
418	3	JACKBOLT – ADAPTER TO CASE	304SS							
423	3	JAM NUT – BEARING HOUSING JACK BOLT	CARBON STEEL							
469B	2	DOWEL PIN	1018							
496	1	O-RING – BEARING HOUSING	BUNA-N							
529	2	LOCKWASHER FRAME FOOT TO BEARING FRAME	STEEL							
530	1	GASKET – BEARING FRAME TO ADAPTER	BUNA							

- * QTY MODEL
- 8 MAGNATEX 3596S/M for 8" casing, N/A for 3596S 6" casing – See item 370B
 - 12 MAGNATEX 3596M/L for 10" casing
 - 16 MAGNATEX 3596M/L/XL for 13" casing
 - 24 MAGNATEX 3596XL for 15" casing

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
 Mobil – DTE Premium R&O Oil ISO68

MAGNATEX 3596 SERIES OIL SUMP CAPACITY		
Model	oz.	ml.
3596S	16	475
3596M	42	1250
3596L	48	1425
3596XL	96	2850

DO NOT OVERFILL! SLOWLY FILL RESERVOIR UNTIL OIL LEVEL COMES UP TO THE MIDDLE OF BEARING FRAME SIGHT GAUGE

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

MAGNATEX 3596 SERIES RELUBRICATION INTERVALS (OIL)			
After initial operation not to exceed 300 hours			
Power End Type	Mineral Oil	Synthetic Oil	Grease
Standard	2000 hrs. or 3 mos.	4000 hrs. or 6 mos.	Sealed for Life
Sealed	4000 hrs. or 6 mos.	24 mos.	Sealed for Life

OPERATING TEMPERATURES

MAGNATEX 3596 SERIES MAXIMUM RECOMMENDED PROCESS OPERATING TEMPERATURE						
Lubrication	Mineral Oil			Synthetic Oil		
	Without Cooling	With Finned Tube Oil Cooler	With High Temp. Option	Without Cooling	With Finned Tube Oil Cooler	With High Temp. Option
Flood Oil	350°F (177°C)	500°F (260°C)	700°F (371°C)	450°F (232°C)	500°F (260°C)	700°F (371°C)
Oil Mist	350°F (177°C)	500°F (260°C)	700°F (371°C)	450°F (232°C)	500°F (260°C)	700°F (371°C)
Grease	Up to 350°F (177°C)			Standard Pump With No Modifications		
	350°F to 500°F (177°C to 260°C)			High temperature Grease and Stuffing Box Cooling.		

I.2 – IMPELLER CLEARANCE SETTINGS

It is imperative that these procedures for proper impeller clearance are followed. Improper setting of the impeller clearance can result in sparks, greater heat generation and equipment failure.



Lock out driver power to prevent accidental startup and physical injury

IMPELLER CLEARANCES

MAGNATEX 3596 SERIES IMPELLER CLEARANCES						
Service Temperature	3596S		3596M & 3596L		3596XL	
	inches	mm	inches	mm	inches	mm
-20 to 150°F (-29 to 66°C)	0.005	0.13	0.008	0.20	0.014	0.38
Up to 175°F (79°C)	0.005	0.13	0.008	0.20	0.014	0.38
Up to 200°F (93°C)	0.005	0.13	0.008	0.20	0.014	0.38
Up to 250°F (121°C)	0.006	0.16	0.009	0.23	0.016	0.41
Up to 300°F (149°C)	0.007	0.19	0.010	0.26	0.017	0.44
Up to 350°F (177°C)	0.009	0.22	0.012	0.29	0.018	0.47
Up to 400°F (204°C)	0.010	0.25	0.013	0.32	0.019	0.50
Up to 450°F (232°C)	0.012	0.28	0.014	0.35	0.020	0.53
Up to 500°F (260°C)	0.013	0.30	0.015	0.38	0.022	0.56
Up to 550°F (288°C)	0.014	0.33	0.016	0.41	0.023	0.59
Up to 600°F (316°C)	0.015	0.36	0.017	0.44	0.024	0.62
Up to 650°F (343°C)	0.016	0.39	0.019	0.47	0.025	0.65
Up to 700°F (371°C)	0.017	0.42	0.020	0.50	0.026	0.68

DIAL INDICATOR METHOD

1. Remove coupling guard.
2. Remove coupling.
3. Set dial indicator to contact machined coupling face or shaft end.
4. On pumps equipped with cartridge style mechanical seal refer to seal instructions to re-install the seal setting clips and disengage the seal drive set screws to allow free movement of the pump shaft/shaft sleeve within the cartridge seal mounting sleeve.
5. After loosening jam nuts on the jack bolts turn the jack bolts several turns backing them out away from the bearing housing.
6. Evenly tighten the three clamp bolts while turning the shaft in the direction of rotation until impeller contacts the pump casing. Slowly turn shaft to verify that contact has been made as indicated by slight drag when turning the shaft.

7. Zero out dial indicator.
8. Loosen the clamp bolts several turns to allow space under the hex head between the bolt head and bearing cartridge.
9. Watching the dial indicator evenly turn jack bolts (make sure jam nuts are away from the bearing cartridge) to move the shaft and bearing cartridge assembly and impeller away from the pump casing. Move the impeller away from the casing ONLY the amount specified in the impeller clearance table above based on the normal operating temperature of the pumped liquid.
10. Still watching the dial indicator evenly turn the jack bolts until they contact the bearing housing putting the bearing cartridge in tension against the clamp bolts. The setting should not change during this operation.
11. Tighten the jam nuts against the bearing cartridge and check that the clamp bolts are tight. Again, the setting on the dial indicator should not change during this operation.
12. Verify shaft turns freely and remove the dial indicator.
13. Referring to the mechanical seal manufacturer's installation instructions re-engage the seal drive set screws and re-position the seal setting tabs to return the seal to operating position.
14. Again verify the shaft turns freely.
15. Install Coupling and verify free rotation.
16. Install Coupling guard.

FEELER GAUGE METHOD

1. Remove coupling guard.
2. Remove coupling.
3. On pumps equipped with cartridge style mechanical seal refer to seal instructions to re-install the seal setting clips and disengage the seal drive set screws to allow free movement of the pump shaft/shaft sleeve within the cartridge seal mounting sleeve.
4. After loosening jam nuts on the jack bolts turn the jack bolts several turns backing them out away from the bearing housing.
5. Evenly tighten the three clamp bolts while turning the shaft in the direction of rotation until impeller contacts the pump casing. Slowly turn shaft to verify that contact has been made as indicated by slight drag when turning the shaft.
6. Using feeler gauges measure the gap between the bearing cartridge flange and the bearing housing. This is the zero clearance reading.

7. Refer to the impeller clearance table above and determine the clearance for the pumped liquid temperature and the pump model bearing frame size of S, M/L, or XL. Add the clearance amount to the zero clearance reading. This is the clearance reference dimension.
8. Assemble the appropriate feeler gauge combination to equal the clearance reference dimension.
9. Loosen the clamp bolts several turns to allow space under the hex head between the bolt head and bearing cartridge.
10. With the assembled feeler gauges handy evenly turn jack bolts (make sure jam nuts are away from the bearing cartridge) to move the shaft and bearing cartridge assembly and impeller away from the pump casing. Move the impeller away from the casing ONLY the distance necessary for the feeler gauge pack to fit into the gap between the bearing cartridge flange and the bearing housing.
11. Alternately checking the gap in different locations with the feeler gauge pack, evenly turn the jack bolts until they contact the bearing housing putting the bearing cartridge in tension against the clamp bolts. The setting should not change during this operation.
12. Tighten the jam nuts against the bearing cartridge and check that the clamp bolts are tight. Again, the setting on the dial indicator should not change during this operation.
13. Verify shaft turns freely and remove the dial indicator.
14. Referring to the mechanical seal manufacturer's installation instructions re-engage the seal drive set screws and re-position the seal setting tabs to return the seal to operating position.
15. Again verify the shaft turns freely.
16. Install Coupling and verify free rotation.

ALIGNMENT - Coupling to be aligned to within 0.002in. T.I.R. for both parallel and angular readings.

VIBRATION - Maximum Vibration Level 0.25in/sec unfiltered at inboard and outboard bearing location.

TEMPERATURE – Normal Power End operating temperature 120 to 180°F (50 to 82°C)

I.3 – REBUILD CHECKS

BEARING FIT AND TOLERANCES

MAGNATEX 3596 SERIES BEARING FIT AND TOLERANCES				
MODEL	3596S in.(mm)	3596M in.(mm)	3596L in.(mm)	3596XL in.(mm)
SHAFT O.D. IN-BOARD	1.3785 (35.013)	1.7722 (45.013)	2.1660 (55.015)	2.5597 (65.015)
	1.3781 (35.002)	1.7718 (45.002)	2.1655 (55.002)	2.5592 (65.002)
	0.0010 (0.025) TIGHT	0.0010 (0.025) TIGHT	0.0012 (0.030) TIGHT	0.0012 (0.030) TIGHT
	0.0001 (0.002) TIGHT	0.0001 (0.002) TIGHT	0.0001 (0.002) TIGHT	0.0001 (0.002) TIGHT
BEARING I.D. INBOARD	1.3780 (35.000)	1.7717 (45.000)	2.1654 (55.000)	2.5591 (65.000)
	1.3775 (34.988)	1.7712 (44.988)	2.1648 (54.985)	2.5585 (64.985)
FRAME I.D. INBOARD	2.8346 (72.000)	3.9370 (100.000)	4.7244 (120.000)	5.8118 (140.000)
	2.8353 (71.987)	3.9379 (100.022)	4.7253 (120.022)	5.5128 (140.025)
	0.0012 (0.032) LOOSE	0.0015 (0.037) LOOSE	0.0015 (0.037) LOOSE	0.0017 (0.043) LOOSE
	0.0000 (0.000) LOOSE	0.0000 (0.000) LOOSE	0.0000 (0.000) LOOSE	0.0000 (0.000) LOOSE
BEARING O.D. INBOARD	2.8346 (72.000)	3.9370 (100.000)	4.7244 (120.000)	5.8118 (140.000)
	2.8341 (71.987)	3.9364 (99.985)	4.7238 (119.985)	5.5111 (139.982)
SHAFT O.D. OUTBOARD	1.1815 (30.011)	1.7722 (45.013)	1.9690 (50.013)	2.5597 (65.015)
	1.1812 (30.002)	1.7718 (45.002)	1.9686 (50.002)	2.5592 (65.002)
	0.0008 (0.021) TIGHT	0.0010 (0.025) TIGHT	0.0010 (0.025) TIGHT	0.0012 (0.030) TIGHT
	0.0001 (0.002) TIGHT	0.0001 (0.002) TIGHT	0.0001 (0.002) TIGHT	0.0001 (0.002) TIGHT
BEARING I.D. OUTBOARD	1.1811 (30.00)	1.7717 (45.000)	1.9685 (50.000)	2.5591 (65.000)
	1.1807 (29.990)	1.7712 (44.002)	1.9680 (49.988)	2.5585 (64.985)
HOUSING I.D. OUTBOARD	2.8346 (72.000)	3.9370 (100.000)	4.3307 (110.000)	5.5118 (140.000)
	2.8353 (72.019)	3.9379 (100.022)	4.3316 (110.022)	5.5128 (140.025)
	0.0012 (0.032) LOOSE	0.0015 (0.037) LOOSE	0.0015 (0.037) LOOSE	0.0017 (0.043) LOOSE
	0.0000 (0.000) LOOSE	0.0000 (0.000) LOOSE	0.0000 (0.000) LOOSE	0.0000 (0.000) LOOSE
BEARING O.D. OUTBOARD	2.8346 (72.000)	3.9370 (100.000)	4.3307 (110.000)	5.8118 (140.000)
	2.8341 (71.987)	3.9364 (99.985)	4.3301 (109.985)	5.5111 (139.982)

IMPELLER BALANCE CRITERIA (ISO G6.3)

0.011 oz.in/lb. @ 3600RPM

18 g-mm/kg @ 3600RPM

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 3596 SERIES SHAFT END PLAY in. (mm)					
		3596S	3596M	3596L	3596XL
Double row	min	0.0011(.028)	0.0013(.033)	N/A	0.0014(.036)
	max	0.0019(.047)	0.0021(.054)		0.0023(.058)
Duplex	min	0.0007(.012)	0.0009(.022)	0.0010(.026)	0.0010(.026)
	max	0.0010(.026)	0.0012(.030)	0.0015(.038)	0.0015(.038)

TORQUE VALUES

MAGNATEX 3596 SERIES TORQUE VALUES			
Location		Lubricated Threads	Dry Threads
(370) Casing bolts ASTM F593 Group 1 or 2 (304SS or 316SS) Alternate fastener specification BS EN ISO 3506 Grade A2-70 or A4-70 (304SS or 316SS, respectively)	6" 3596S	71 ft-lbs (96 N·m)	107 ft-lbs (145 N·m)
	8" 3596S	35 ft-lbs (77 N·m)	54 ft-lbs (73 N·m)
	3596M, 3596L/XL	71 ft-lbs (96 N·m)	107 ft-lbs (145 N·m)
	3596XL – 17"	141 ft-lbs (191 N·m)	212 ft-lbs (287 N·m)
(370B) Frame to Adapter Bolts		ALL	20 ft-lbs (27 N·m)
Bearing Clamp ring Bolts		3596S, 3596M	10 in-lbs (1.1 N·m)
(236A) Duplex bearing only		3596L	17 in-lbs (1.9 N·m)
(371C) Bearing End Covers		3596L	55 in-lbs (6.2 N·m)
(265) Dynamic Seal Cap Screw		3596XL	9 ft-lbs (12 N·m)
		3596S, 3596M, 3596L	9 ft-lbs (12 N·m)
		3596XL	55 in-lbs (6.2 N·m)
		3596XL	83 in-lbs (9.4 N·m)
		3596XL	12 ft-lbs (16 N·m)