



# **INSTALLATION, OPERATION, MAINTENANCE AND REPAIR MANUAL**

**MINK**

## **Rotary Claw Pressure or Vacuum Pumps**

**Models MI1122BV/BP, MI1124BV/BP, MI1352BV/BP,  
MI1354BV/BP, MI1502BV/BP, MI1504BV/BP  
and MI1252BV, MI2122BV and MI2124BV**

## TABLE OF CONTENTS

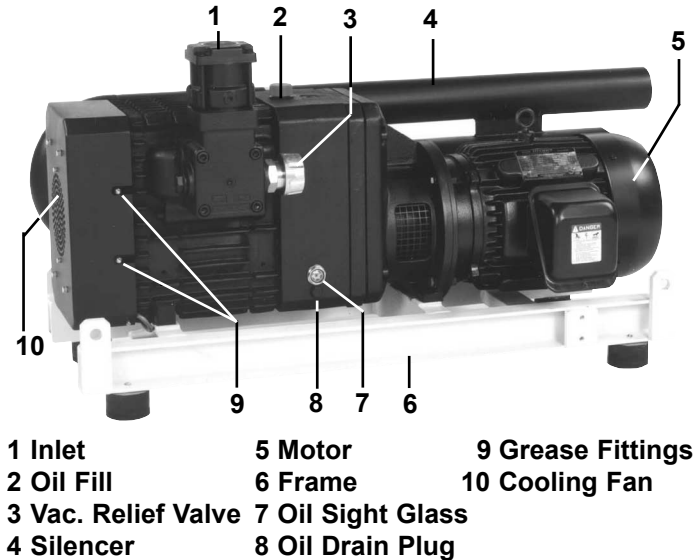
|                                                         | Page     |                                                               | Page      |
|---------------------------------------------------------|----------|---------------------------------------------------------------|-----------|
| <b>INTRODUCTION</b>                                     | <b>2</b> | <b>3.13 Removing the “A-side” Endplate</b>                    | <b>8</b>  |
|                                                         |          | <b>3.14 Removing the Gears</b>                                | <b>8</b>  |
| <b>1.0 INSTALLATION</b>                                 | <b>2</b> | <b>3.15 Removing the “A-side” Bearings</b>                    | <b>9</b>  |
|                                                         |          | <b>3.16 Removing the “A-side and B-side” Shaft Seals</b>      | <b>9</b>  |
| <b>1.1 Unpacking</b>                                    | <b>2</b> |                                                               |           |
| <b>1.2 Location</b>                                     | <b>2</b> | <b>4.0 REASSEMBLY</b>                                         | <b>10</b> |
| <b>1.3 Power Requirements</b>                           | <b>2</b> |                                                               |           |
| <b>1.4 Process Gas Stream</b>                           | <b>3</b> | <b>4.1 Installing Shaft Seals</b>                             | <b>10</b> |
| <b>1.5 Process Piping Connections</b>                   | <b>3</b> | <b>4.2 Installing the “A-side” Bearings</b>                   | <b>11</b> |
| <b>1.6 Exhaust Piping</b>                               | <b>3</b> | <b>4.3 Installing the Gears</b>                               | <b>11</b> |
|                                                         |          | <b>4.4 Removing/Reapplying the Liqui Moly Coating</b>         | <b>11</b> |
| <b>2.0 ROUTINE MAINTENANCE</b>                          | <b>4</b> | <b>4.5 Installing the “A-side” Endplate</b>                   | <b>11</b> |
|                                                         |          | <b>4.6 Setting Fixed Axial Clearance</b>                      | <b>12</b> |
| <b>2.1 Inlet Filter</b>                                 | <b>4</b> | <b>4.7 Setting Claw Tooth Clearance</b>                       | <b>12</b> |
| <b>2.2 Gear Box Oil</b>                                 | <b>4</b> | <b>4.8 Coating the “A-side” Endplate and Rotor Claws</b>      | <b>13</b> |
| <b>2.3 “B-Side” Bearings</b>                            | <b>4</b> | <b>4.9 Installing the “B-side” Endplate</b>                   | <b>13</b> |
| <b>2.4 Routine Cylinder and Rotor Inspection</b>        | <b>4</b> | <b>4.10 Installing the “B-side” Bearings</b>                  | <b>14</b> |
|                                                         |          | <b>4.11 Installing the “B-side” Fan Cover</b>                 | <b>14</b> |
| <b>3.0 DISASSEMBLY</b>                                  | <b>4</b> | <b>4.12 Installing the Gear Box Cover</b>                     | <b>14</b> |
|                                                         |          | <b>4.13 Installing the Motor</b>                              | <b>14</b> |
| <b>3.1 Tools</b>                                        | <b>4</b> | <b>4.14 Installing the Silencer and Inlet Flange Assembly</b> | <b>15</b> |
| <b>3.2 Draining the Oil</b>                             | <b>5</b> |                                                               |           |
| <b>3.3 Motor Removal</b>                                | <b>5</b> | <b>5.0 PREPARING TO RESTART THE PUMP</b>                      | <b>15</b> |
| <b>3.4 Silencer Removal</b>                             | <b>5</b> |                                                               |           |
| <b>3.5 Removing the Inlet Assembly</b>                  | <b>5</b> | <b>6.0 LIMITED WARRANTY</b>                                   | <b>15</b> |
| <b>3.6 Removing the Motor Mounting Bracket</b>          | <b>5</b> |                                                               |           |
| <b>3.7 “A-side” Cooling Fan Removal</b>                 | <b>6</b> | <b>7.0 TECHNICAL INFORMATION</b>                              | <b>16</b> |
| <b>3.8 Removing the Gear Housing Cover Plate</b>        | <b>6</b> |                                                               |           |
| <b>3.9 “B-side” Fan Removal</b>                         | <b>6</b> | <b>Clearances</b>                                             | <b>16</b> |
| <b>3.10 “B-side” Endplate Removal</b>                   | <b>6</b> | <b>Parts Lists</b>                                            | <b>17</b> |
| <b>3.11 Minor Inspection of the Cylinder and Rotors</b> | <b>7</b> | <b>Standard Specifications</b>                                | <b>19</b> |
| <b>3.12 Removing the Claw Rotors</b>                    | <b>7</b> | <b>Exploded View Drawings of Mink Pumps</b>                   | <b>20</b> |
|                                                         |          | <b>Distribution and Service Centers</b>                       | <b>25</b> |

We reserve the right to change the product at any time without any form of notification. The information in this publication is accurate to the best of our ability at the time of printing. Busch, Inc. will not be responsible for errors encountered when attempting to perform tasks outlined in this publication.

## INTRODUCTION

This manual is written to provide information on the following models:

|             |             |             |
|-------------|-------------|-------------|
| MI1122BV/BP | MI1124BV/BP | MI1352BV/BP |
| MI1354BV/BP | MI1502BV/BP | MI1504BV/BP |
| MI2122BV    | MI2124BV    | MI1252BV    |



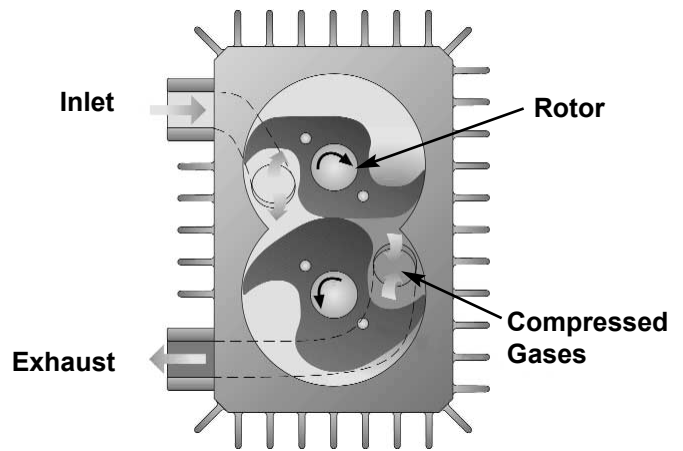
**Fig. 1 - MI 1504 BV**

### Identification

For model identification, see the nameplate mounted on the pump. When ordering parts, it is necessary to include the model and serial number identification stamped into the nameplate.

### Operating Principles

The Mink is an air-cooled, rotary claw, positive displacement pump. The Minks are single stage pumps, except for the MI2122 and MI2124 Series, which are two-stage pumps. The BV Series are vacuum pumps, while the BP Series are pressure pumps. The claw rotors rotate in opposite directions within a cylinder, drawing in and compressing gas. The shape of each claw is such that a small clearance is maintained between the claw tips and the cylinder walls and also adjacent lobe surfaces. As the claws rotate, a void is created, causing the gas to be drawn into the cylinder chamber, compression takes place with continued rotation due to the reduction of the gas confinement area, and finally, the higher pressure gas is discharged at the end of the cycle (see Fig. 2). The evacuation of the vessel connected to the inlet of the pump will continue until the desired pressure is reached or the pump capacity is reached. Since the pumps are dry running, it is not necessary to lubricate the pump with oil or grease in the compression chamber, although the gear housing does contain oil used to constantly bathe the gears in oil, and the "B-Side" bearings must be lubricated twice a year. Process gases do not mix with the oil in the gear housing.



**Fig. 2 - Basic Cycle**

## 1.0 INSTALLATION

### 1.1 Unpacking

Inspect the crate and pump for signs of damage incurred in transit. Pumps are usually shipped FOB our factory, and such damage is normally the responsibility of the carrier and should be reported to them.

Remove the top section of the crate and unscrew the lag screws, securing the pump to the bottom of the crate.

The inlet port of the pump is covered prior to shipment to prevent dirt and foreign material from entering the pump. Do not remove this cover until the pump is actually ready for connection to the system.

### 1.2 Location

The pump should be installed in a horizontal position on a level surface. The bottom of the mounting feet has a threaded hole that could be used to mount the pump frame to the floor. Allow adequate space between the pump and any obstructions to permit servicing the pump. Also, adequate ventilation must be provided for the fans on the pump and the motor. Do not locate the pump in a stagnant air location.

The pump is constructed to operate at normal atmospheric pressure and at a temperature between 12 to 40°C (54 to 104°F).

### 1.3 Power Requirements

The schematic diagram for the electrical connections is located in the junction box or on the nameplate of the pump motor.

The motor must be connected according to the electrical codes through a fused switch to provide protection for the motor against electrical or mechanical overloads. The motor starter has to be set consistent with the ampere rating listed on the motor nameplate. Refer to the motor man-

manufacturer's manual for start-up and maintenance of the motor. Also, note the motor rotation arrow located on the motor fan housing.

**CAUTION: The best and most reliable safeguard for the pump is the motor starter overload protection. It is very important that the starter be set to trip at the correct load rating. Consult the motor nameplate, starter manufacturer and the latest edition of the National Electrical Code to arrive at the correct trip setting.**

Open the inlet port and jog the motor briefly to make sure the rotation is correct. **Allow the pump to make no more than 6 to 8 revolutions.** Looking at the motor fan cover, the direction of rotation is clockwise for the MI1122, MI1124, MI1252, MI2122 and MI2124 Series, and counter-clockwise for all the other models. If it is backwards, reverse any two leads of the three at the power connection.

**CAUTION: Damage can result from running the pump backwards.**

Pump Models MI1354 BV/BP, MI1352 BV/BP, MI1504 BV/BP and MI1502 BV/BP have a separate motor driving the cooling fan. This motor (usually 115V AC but you must check the nameplate to be sure) must be wired to operate when the pump motor is powered. The other models have mechanical fans.

**CAUTION: Do not operate the pump without the cooling fan in operation.**

#### 1.4 Process Gas Stream

It is a good operating practice to install an inlet filter. It is necessary to install an inlet filter if the process contains solids or any material that is 10 microns or larger. It is also necessary to install a knock-out pot in the inlet piping if there is any chance of liquid entering the pump.

**CAUTION: Do not allow aggressive and/or corrosive gas to enter the pump.**

**WARNING: Do not allow explosive gas, liquid or solids to enter the pump.**

**Note: Consult the factory if there is any doubt about the quality of the process gas in your application, or if the process gas in your application will exceed 40°C (104°F) at the pump inlet.**

#### 1.5 Process Piping Connections

If the gas that is pumped contains dust or other foreign particles, a suitable inlet filter (10 micron rating or smaller) should be connected to the inlet port. Consult the factory for a recommendation.

**CAUTION: Piping connected to the pump flanges must be adequately supported to prevent stressing the flanges.**

Remove the plastic protective cap from the inlet port prior to connection of the pump to the system.

**For the BV Series (vacuum) pumps,** if the gas stream contains any liquid or vapor that will condense in the piping, install a knock-out pot on the horizontal piping, or a drip leg and a drain on the vertical pipe near the pump inlet. Drain the knock-out pot/drip leg often to prevent liquid from entering the pump.

The inlet flange of the BV Series pump can be connected with a vacuum-tight flexible hose or pipe. The nominal diameter of the connecting piping must be at least the same as the diameter of the pump inlet flange. Smaller lines will result in pumping speeds lower than the rated values.

If more than one BV Series pump is connected to a common header, each pump must have its own automatic operated inlet isolation valve or inlet check valve.

The BV Series pumps come equipped with an anti-suck-back valve. The valve is used to prevent the pump from running backwards when it is shut off. Without this valve, air at atmospheric pressure will rush back through the pump exhaust (when it is shut off) to the lower pressure of the system under vacuum, causing the pump to run backwards and potentially damaging the pump.

**WARNING: Do not use the anti-suck-back valve as a check or shut-off valve for your system.**

BV models MI 1122, 1354, 1352, 1504, 1502 and 1252 are also provided with a vacuum relief in order to avoid overloads of the pump.

**WARNING: The vacuum relief valve is set at the factory and must not be adjusted.**

**For the BP Series (pressure) pumps,** the outlet flange can be connected with a pressure-tight flexible hose or pipe designed for an overpressure of 2 bar (abs.) and 250°C. The nominal diameter of the connecting piping must be at least the same as the diameter of the pump inlet flange. Smaller lines will result in pumping speeds lower than the rated values.

The BP Series pump comes equipped with an overload safety valve that limits the overpressure to 2.0 bar (abs.) in order to protect the pump against overloads and damage. This valve is not meant to serve as a process system pressure relief valve.

**CAUTION: The overload safety valve must not be installed directly at the pump because of the pulsation of the pump. Installation of a compensating tank is recommended.**

#### 1.6 Exhaust Piping

**WARNING: Do not touch the exhaust system when the pump is, or has recently been, in operation. The exhaust system can reach high temperatures and can get extremely hot, therefore, it should be insulated for personnel protection.**

Discharge piping should be the same size as the outlet of

the pump. Provide a knock-out pot or drip leg if there is any possibility of liquid forming in the exhaust. Install the exhaust piping so that it slopes away from the pump. Use a flexible connector when piping to a manifold or exhaust gas stack.

**CAUTION: Do not allow liquid to back up into the pump from the exhaust piping.**

Shut-off valves located on the exhaust discharge side of the pump(s) are not recommended; however, if more than one pump discharges into a common exhaust header, check valves are required in order to prevent back-up into any other pump. If shut-off valves are installed, in addition to check valves, special care must be taken to make sure the pump cannot start unless its check valve and any shut-off valves associated with that pump are open. ***Any exhaust discharge valving must be interlocked to prevent operation of the pump when the valving is closed.*** Failure to abide by this instruction will void the pump warranty.

## 2.0 ROUTINE MAINTENANCE

### 2.1 Inlet Filter

The optional inlet filter requires cleaning at regular intervals, depending on the amount of dust in the air being pumped. If the cartridge is too dirty to be cleaned, it must be replaced.

A protecting screen (Ref. 715) is integrated in the inlet housing. This screen must be cleaned at regular intervals, therefore, the inlet housing must be dismantled. Refer to Section 3.5 for instructions on removing the inlet flange.

### 2.2 Gear Box Oil

The gear box is completely separated from the rest of the pump. The gears and bearings are lubricated by oil contained within the gear box. The lower gear is partially covered by the oil. The rotating gears and a splash plate on the lower gear splash the oil onto all the mating surfaces within the gear box.

The oil level can be checked by monitoring the oil sight glass located on the lower side of the gear box.

The gear oil must be changed every 20,000 working hours, or whenever the gear box is opened. Busch recommends the use of a synthetic, extreme pressure gear oil with a viscosity of ISO 220, such as BP Enersyn HTX 220 (Busch part No. 0831.128.556). See page 19 for oil capacities.

Always depressurize the gear box by removing the oil fill plug, located on top of the gear box, before opening the oil drain plug.

### 2.3 “B-Side” Bearings

The “B-side” bearings on each of the two rotor shafts must

be lubricated twice each year with the high melting-point grease, Kluber Asonic HQ 72-102. Depending on which model pump is being worked on, grease can be added to the bearings by charging the bearings with grease through the grease fitting until grease comes out of the opening. Otherwise, the pump must be partially disassembled so the bearing cover can be removed. Fill the bearing area with grease and replace the cover (see Fig. 31).

## 2.4 Routine Cylinder and Rotor Inspection

If you wish to make a routine inspection of the rotors and cylinder, this can be accomplished by referring to Section 3.9 through Section 3.11.

## 3.0 DISASSEMBLY

The Mink pumps are easily dismantled and reassembled. Certain steps are recommended to be followed in the sequence outlined. Reasonable caution must be exercised to prevent damage to the parts during the operation and to insure proper pump performance after the repair.

You will note the reference numbers called out on the drawing in the back of this manual. Throughout the disassembly and assembly procedures, these reference numbers are used as an identification aid to the technician.

Also, the photos and descriptions given in this manual are based on the MI1222BV, and specific details may vary slightly for the other models. Drawings and parts lists are given for all models, so by following these instructions, the technician should be able to apply the procedures to the entire model line. **Note: If just a visual inspection of the claws and cylinder is required, refer to Section 3.9.**

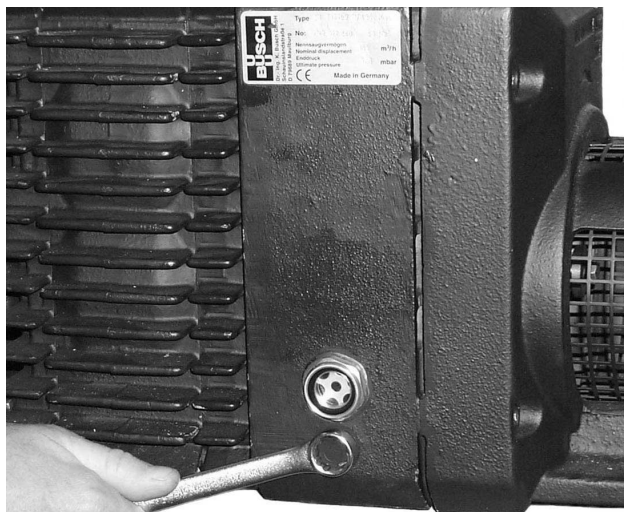
### 3.1 Tools

To completely disassemble/assemble the Mink pumps, the following tools are recommended:

Allen wrenches and socket end wrenches  
Bearing/seal installation tools  
Rubber mallet  
Loctite 242  
Wooden blocks and rags  
Gear puller  
Brass punch  
Large screwdrivers  
Emory cloth  
Electric hot plate  
Feeler gauge .04, .08, .10, .12 mm  
Vernier calipers  
Acetone  
Torque wrench  
Pick  
Liqui Moly spray (Busch Part No. 0832.000.100)  
Asonic grease, HQ 72-102 (Busch Part No. 0824.108.187)  
Hylomar PL32M sealer (Busch Part No. 0485.902.275)

### 3.2 Draining the Oil

The oil is drained by removing the oil fill cap (Ref. 72) to vent the gear housing (see Fig. 3). Next, remove the oil drain plug and gasket (Ref. 80/81).



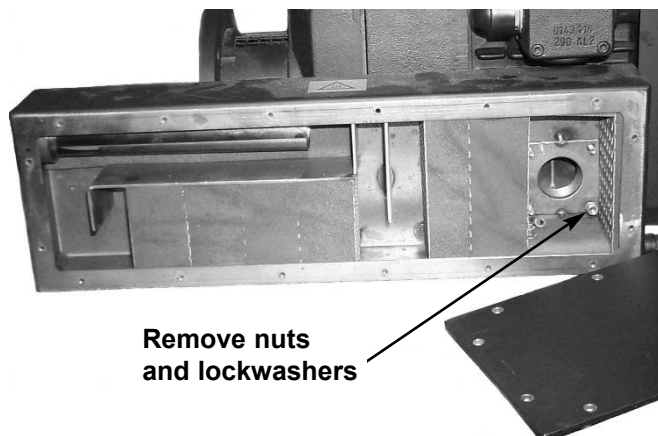
**Fig 3 - Draining the Oil Drain**

### 3.3 Motor Removal

To separate the motor (Ref. 550) from the motor mounting bracket (Ref. 500), remove the four socket head cap screws and lockwashers (Ref. 518/515). The motor side coupling half remains on the motor. Set the motor and coupling insert aside.

### 3.4 Silencer Removal

The silencer body (Ref. 800) can be separated from the pump assembly by removing the sixteen socket head screws and lockwashers from the silencer cover. Next, remove the four hex nuts and lockwashers from the studs protruding through the side of the silencer where it is attached to the cylinder housing (Ref. 155) (see Fig. 4).



**Fig 4 - Removing the Silencer**

Remove the silencer from the cylinder housing by pulling it away from the pump while sliding it off the four studs. Inspect the packing and metal screens for blockage by dirt or lint. Remove any debris found.

### 3.5 Removing the Inlet Assembly

The inlet flange assembly (Ref. 700) is removed from the cylinder housing by removing the four socket head cap screws and lockwashers (Ref. 705/706) (see Fig. 5).



**Fig 5 - Removing the Inlet Flange Assembly**

Remove the gasket (Ref. 701) from either the inlet flange assembly or the cylinder housing. If the filter screen (Ref. 715) needs to be cleaned, remove the four hex head screws and lockwashers (Ref. 797/798), remove and clean the screen, and reassemble valve internal parts if they were removed or replaced.

### 3.6 Removing the Motor Mounting Bracket

Removal of the motor mounting bracket (Ref. 500) from the cylinder is accomplished by removing the four socket head cap screws and lockwashers (Ref. 504/505) (see Fig. 6) from the motor cover mounting bracket. Lightly pry or tap the bracket loose from the gear housing (Ref. 60) and set it aside.

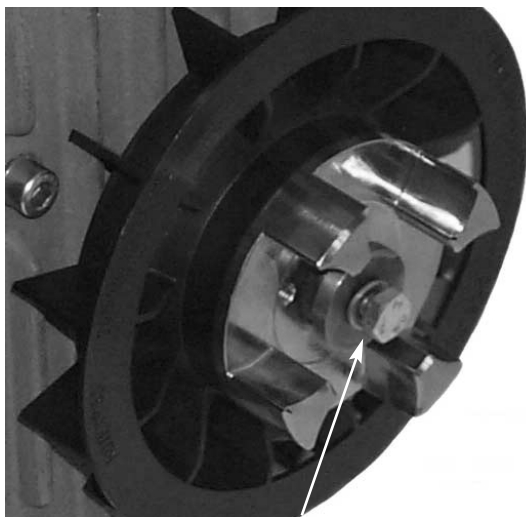


**Fig 6 - Removing the Motor Mounting Bracket**

The two dowel pins (Ref. 66), one at the top and one at the bottom of the gear housing, remain in place and assure proper alignment of the motor bracket and the gear housing cover plate during reassembly.

### 3.7 “A-side” Cooling Fan Removal

Removal of the “A-side” coupling/cooling fan (Ref. 510) is accomplished by removing the hex head cap screw, lock-washer and retaining disk (Ref. 529/530/531) (see Fig. 7).



**Remove nut, lockwasher and retaining disk**

**Fig. 7 - Removing the “A-side” Cooling Fan**

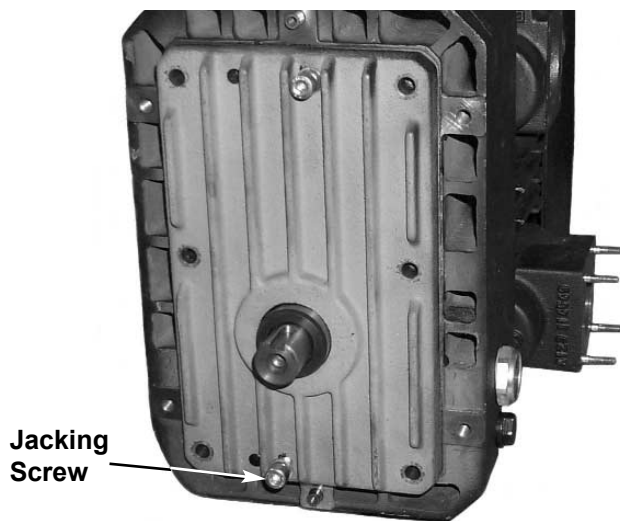
With a prying and pulling action, the fan should slide off the keyed lower rotor shaft (Ref. 8). Knock the shaft key (Ref. 525) loose from shaft slot using a brass punch and a mallet. Mark the key to identify that it was removed from this end of the shaft.

**Note: The shaft keys used in the Mink are precision made; therefore, caution must be used to prevent damage to the keys.**

### 3.8 Removing the Gear Housing Cover Plate

Remove the six socket head cap screws and lockwashers (Ref. 68/69) from the gear housing cover plate (Ref. 60). Install two of these screws into the gear housing cover plate jacking holes (see Fig. 8). Evenly tighten the two jacking screws. As the screws are tightened, the gear housing cover plate will begin to separate from the “A-side” gear housing (Ref. 1). While prying, slide the cover housing cover plate off and set it aside. Remove the jacking screws.

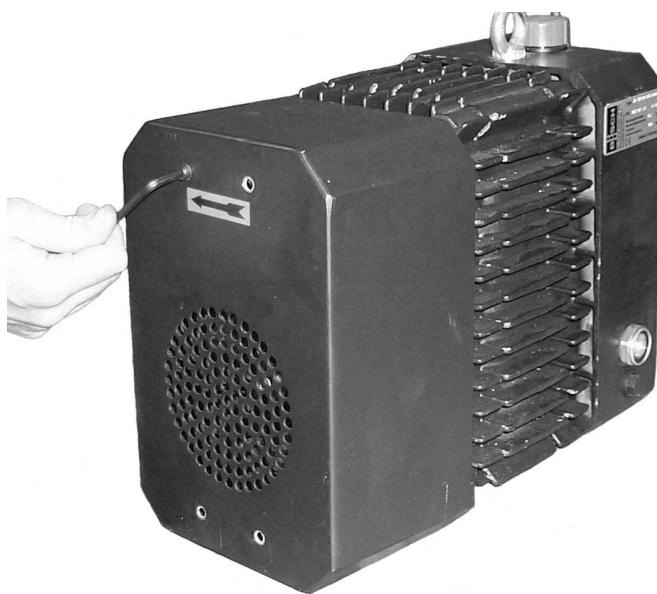
The two dowel pins (Ref. 66), one at the top of the gear housing cover plate and one at the bottom of the gear housing cover plate, remain in place and assure proper alignment during reassembly.



**Fig. 8 - Removing the Gear Housing Cover Plate**

### 3.9 “B-side” Fan Removal

The “B-side” fan cover (Ref. 424) must be removed next. Four socket head cap screws and washers (Ref. 425/426) hold the cover in place. Remove the four screws and washers, and set them aside (see Fig. 9). The “B-side” fan (Ref. 400) is now exposed (see Fig. 10).

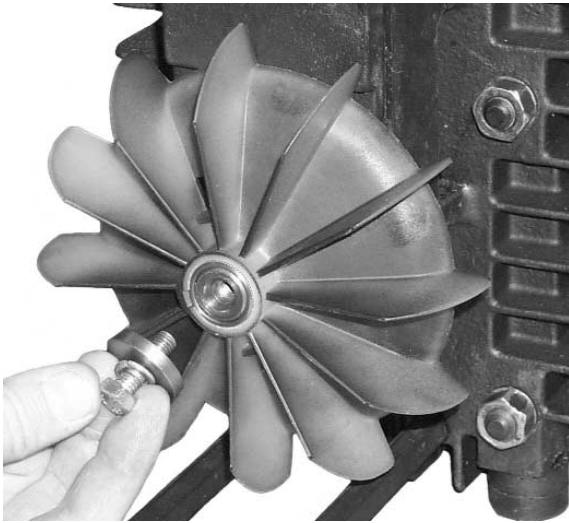


**Fig. 9 - Removing the “B-side” Fan Cover**

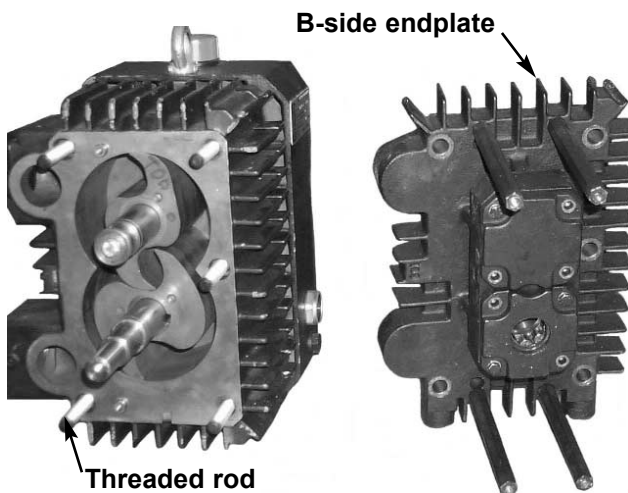
Remove the hex head cap screw, lockwasher, retention disk and adjusting disk (when applicable) (Ref. 403/404/405/409) from the end of the shaft. Slide the fan off the shaft, using a puller if necessary.

### 3.10 “B-side” Endplate Removal

Remove the five hex head cap nuts and lockwashers (Ref. 181/182) from the threaded rods (Ref. 108) protruding through the “B-side” endplate (Ref. 160). Lightly pry between the cylinder (Ref. 155) and the endplate until the endplate can be removed by sliding it off of the threaded rods (see Fig. 11).



**Fig. 10 - Removing the "B-side" Fan**



**Fig.11 - Removing the "B-side" Endplate**

Two dowel pins (Ref.110) located at the top and bottom of the endplates assure proper alignment during reassembly.

### 3.11 Minor Inspection of the Cylinder and Rotors

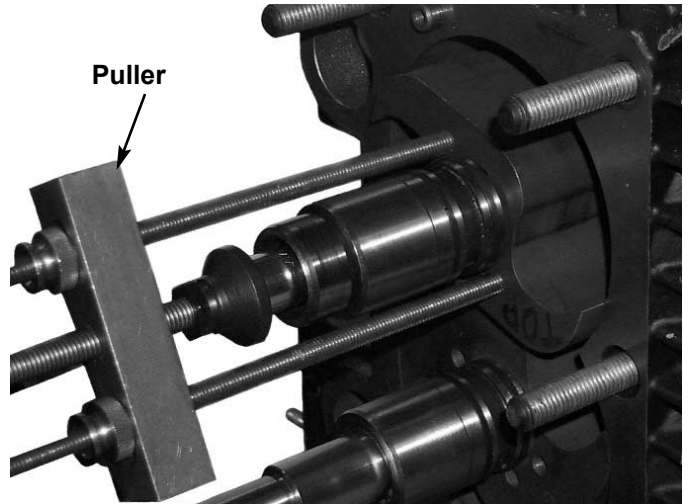
The cylinder (Ref. 155) and rotors (Ref. 150/151) can now be visually inspected for obvious damage or foreign objects. Also, look for any "run-in" or evidence of contact between the claws and endplate. This completes minor inspection. If you wish to proceed no further with disassembly, refer to Section 4.0 for the reassembly procedure.

### 3.12 Removing the Claw Rotors

Using a marker, label the upper claw (Ref. 151) with "upper" and the lower claw (Ref. 150) with "lower."

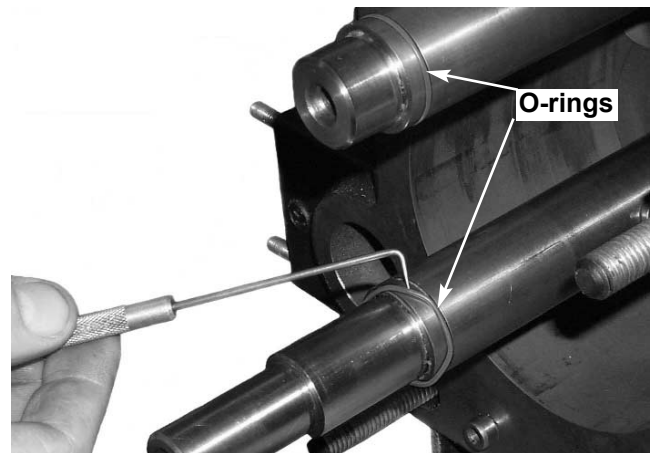
The upper and lower claw rotor shaft seal/labyrinth sleeves should be removed first. To accomplish this, attach a puller to the "B-side" of the top claw by inserting the threaded rods of the puller into the threaded holes in the end of the claw (see Fig. 12). Begin pulling the rotor by tightening the puller. As the puller is tightened, note that the rotor and the

shaft sleeves are forced off in the process. Slide these pieces off the shaft and set them aside. **Note: It is easier to remove the claws if the O-rings are removed first. The O-rings can be removed after the sleeves have been removed.**



**Fig. 12 - Pulling the Rotor**

Repeat the process for the lower claw rotor (Ref. 150). **Note: There is one additional shaft sleeve (Ref. 192) on the lower shaft.** Using a pick, remove the O-ring (Ref. 16) from each shaft (see Fig. 13).



**Fig. 13 - Remove O-rings from Shaft**

Separate the cylinder (Ref. 155) from the "A-side" endplate (Ref. 112) by prying between the cylinder and the endplate with screw drivers (see Fig. 15). As before, the dowel pins align the cylinder to the endplate. Set the cylinder aside.

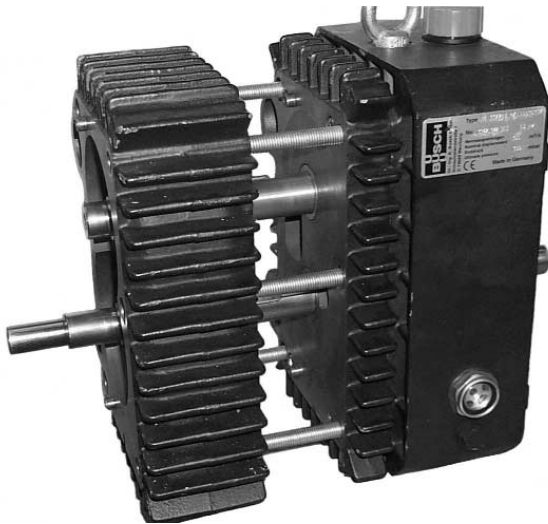
Mark each rotor shaft key (Ref. 147) with an arrow pointing toward the cylinder, and label each key and shaft sleeves with a "U" or "L", respectively. Also, mark the upper and lower shaft shims (Ref. 146) with the wording "upper" and "lower," respectively (see Fig. 14).

**Note: The shaft keys are precision fitted; therefore, it is very important that each key is properly labeled in order to insure each can be returned to its proper position.**

The shaft keys can now be removed by inserting a 5mm diameter jacking screw into the hole in the key and tightening until the key pops out of the keyway.



**Fig. 14 - Removing Shaft Keys and Shims**



**Fig. 15 - Removing the Gear Housing**

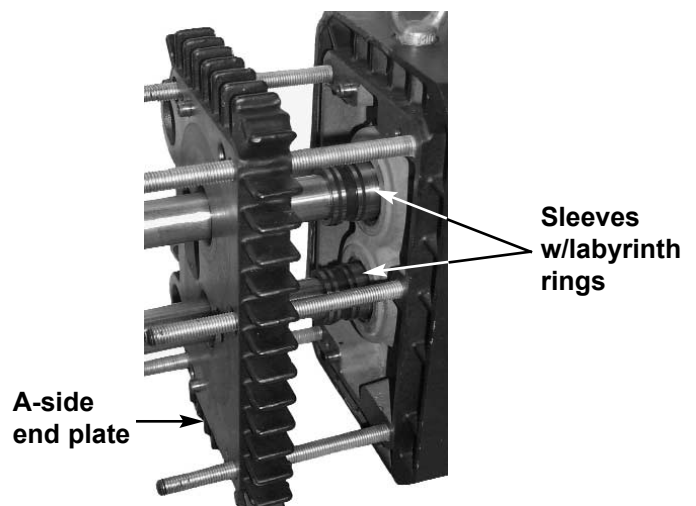
Using a pick as necessary, remove the shims. Set the keys and shims aside.

### 3.13 Removing the "A-side" Endplate

Remove the two socket head cap screws and lockwashers (Ref. 116/117) (see Fig. 16). With a screwdriver, carefully pry the "A-side" endplate away from the gear box (Ref. 1). Slide the endplate off the threaded rods (see Fig. 17) and set it aside.



**Fig. 16 - Removing the "A-side" Endplate**



**Fig. 17 - Removal of the "A-side" Endplate**

Slide the shaft seal sleeve with labyrinth rings (Ref. 100/104) off of each shaft. Lightly tap and pry the sleeves with a screwdriver if necessary.

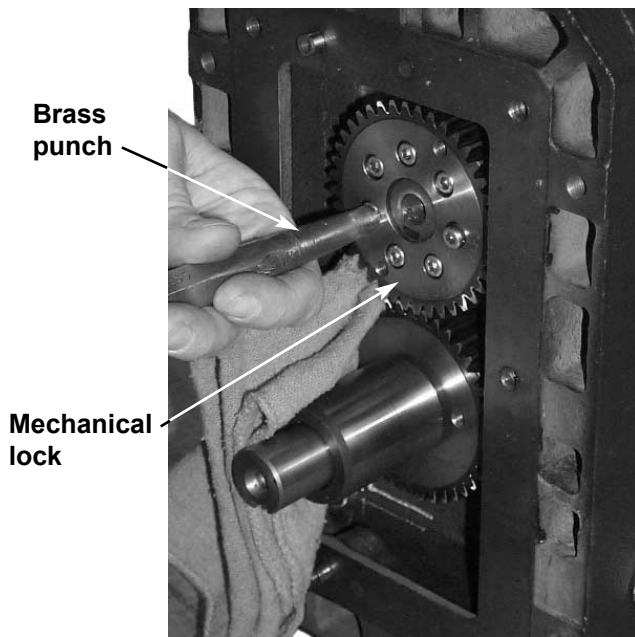
### 3.14 Removing the Gears

Jam a rag between the gears (Ref. 32/33) to prevent the gears from moving.

Remove the gear retention disk, lockwasher and hex head cap screw (Ref. 50/51/52).

Loosen the seven socket head cap screws (Ref. 35) holding the upper gear. **Leave two or three threads of each screw engaged.** With a brass punch, tap a few of the screws to break the mechanical lock free (see Fig. 18).

Match-mark the gear teeth of the upper and lower gears, so they can be reinstalled in the same relationship to each other.

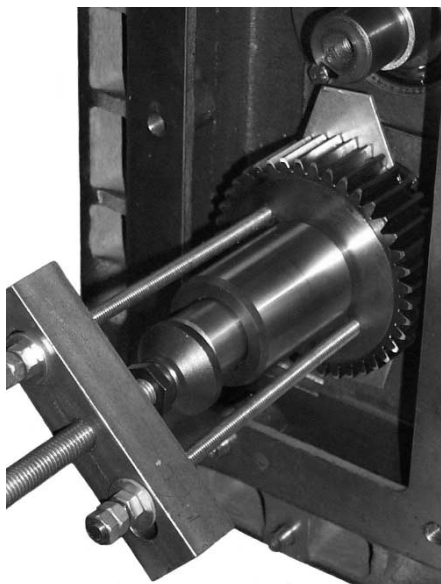


**Fig. 18 - Removing the Mechanical Lock**

**Note:** Be sure to match mark the gear teeth. Unnecessary tooth wear may result if the teeth are not matched up as they were originally.

A sleeve (Ref. 46) and an O-ring (Ref. 42) must also be removed along with the lower gear. Slide the sleeve off by hand, and remove the O-ring with a pick.

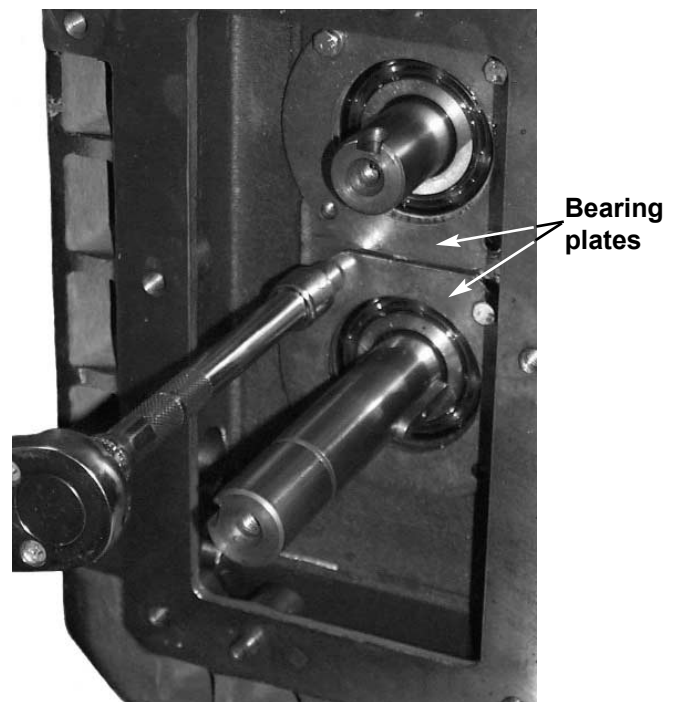
Slide the upper gear off the shaft. If it cannot be slid off by hand, use the jacking holes and a gear puller to pull the gear and sleeve (Ref. 39) off the shaft (see Fig. 19).



**Fig. 19 - Pulling the Gears**

### 3.15 Removing the "A-side" Bearings

Remove the bearing retaining plates (Ref. 24) from the gear/bearing housing (see Fig. 20) by removing the four hex head cap screws and lockwashers (Ref. 26/27) from each plate. Pull the lower shaft and bearing out toward the



**Fig. 20 - Removing the Bearing Retaining Plates**

motor side of the pump. Pull the upper shaft and bearing the same way. Inspect the shafts, bearings and O-rings. Mark and remove the key (Ref. 30) from the lower shaft. Check the shaft for straightness. Runout must not exceed .03mm.

Remove the O-ring (Ref. 16) from each shaft and press each bearing off the shaft using a bearing removal tool.

Slide the bearings (Ref. 20) off each of the shafts.

### 3.16 Removing the "A-side and B-side" Shaft Seals

Remove the two bearing covers (Ref. 190/200) by loosening the eight hex head cap screws and lockwashers (Ref. 204/205). Slide the two roller bearings out of their bores.

Turn the "B-side" endplate (Ref. 160) so that it is standing on the hexagon rods (Ref. 420). With a brass punch, drive the seal cartridge assembly (Ref. 172) out of the endplate (see Fig. 21, Fig. 22 and Fig. 23). Remove and replace the shaft seals (Ref. 174) from the seal cartridges (Ref. 172).

**Note which way the lip is facing before removing the seals.**

Proceed to the gear box (Ref. 1) and drive the two shaft seals (Ref. 4) out of their respective bores using a punch. Seals are removed by tapping the seals from the "B-side" of the gear box. **Note which way the lip is facing before removing the seals.** Remove the shaft seal (Ref. 64) from the gear housing cover plate (Ref. 60). Inspect the shaft seal sleeves (Ref. 100) and the labyrinth seals (Ref. 104). Replace if necessary (see Fig. 24). **Note that the gaps in the rings are staggered so that they do not line up in a straight line.**



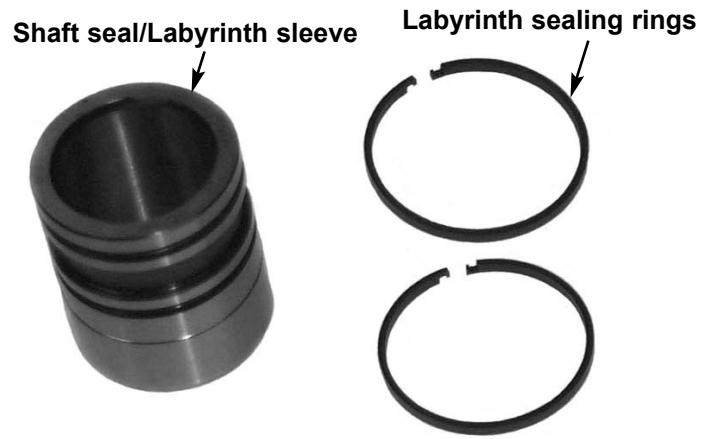
**Fig. 21 - Removing the Shaft Seal Cartridge Assembly**



**Fig. 22 - Seal Cartridge Assembly**



**Fig. 23 - Removing the "A-side" Endplate Seals**



**Fig. 24 - Shaft Seal/Labyrinth Sleeve Assembly**

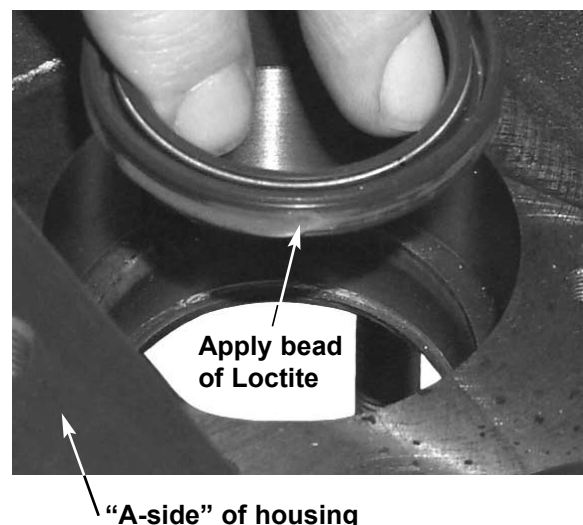
## 4.0 REASSEMBLY

For the purpose of this manual, it is assumed that the pump has been completely disassembled. After it has been determined what repair is required, and the necessary parts are on hand, the reassembly process can begin. Make sure all parts and mating surfaces are free of dirt, deposits, debris, nicks, burrs, etc.

### 4.1 Installing Shaft Seals

Six new shaft seals must be installed. A new shaft seal (Ref. 64) should be installed in the gear housing cover plate (Ref. 60). Two shaft seals (Ref. 4) should be installed in the "A-side" gear housing (Ref. 1). One shaft seal (Ref. 174) should be installed in each shaft seal cartridge (Ref. 172). One shaft seal (Ref. 196) should be installed in the bearing cover plate (Ref. 200).

Apply a bead of Loctite 242 to the outer edge of all the seals, and set each seal into its respective bore (see Fig. 25). Repeat the process for each shaft seal until all six have been installed.



**Fig. 25 - Install Shaft Seals into Gear Housing**

**Note:** Be sure to install each seal into the correct bore, and make sure that the seal lip faces the same direction as it did prior to its removal during the disassembly process.

| <u>(Ref. #)</u> | <u>Shaft Seal Lip Direction</u>           |
|-----------------|-------------------------------------------|
| 4               | Lip pointing towards the oil              |
| 64              | Lip pointing towards the oil              |
| 174             | Lip pointing towards the bearing (grease) |
| 196             | Lip pointing towards the bearing (grease) |

#### 4.2 Installing the “A-side” Bearings

**Note:** Pre-lubricate each bearing with oil prior to installation.

Press a new bearing (Ref. 20) onto the “A-side” end of each shaft (Ref. 8/12) until it butts up against the shaft shoulder. Install the O-ring onto each shaft. Once the bearings are on the shafts, set each shaft into the appropriate bore of the gear housing (Ref. 1). The long shaft goes on the bottom, and the short shaft goes on the top. Re-install the two bearing retaining plates (Ref. 24) using the appropriate bolts and lockwashers (Ref. 26/27)

**Note:** Do not damage the shaft seal while installing the shaft through the seal.

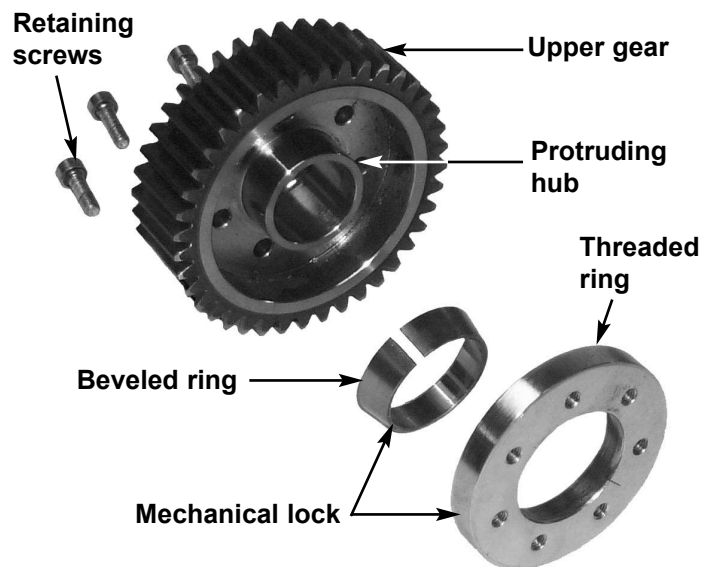
#### 4.3 Installing the Gears

Install the lower shaft key (Ref. 525) into the lower shaft (Ref. 8). **Be sure to note the marks previously made on the key so that the key is reinstalled in the same position it was in at the beginning of the disassembly procedure.** Slide the lower gear (Ref. 32) over the key onto the lower shaft. Make sure the oil splash plate (Ref. 36) is installed onto the gear if it was removed.

The upper gear (Ref. 33) must be reassembled (see Fig. 26) prior to installing it onto the shaft. Be sure all surfaces of the pieces are clean and smooth. Slide the spacer (Ref. 39) onto the “A-side” end of the upper shaft (Ref. 12). Slide the beveled ring onto the protruding hub that is located on the backside of the gear (see Fig. 26). The taper faces away from the gear. Position the threaded ring over the beveled ring and hub so that the seven retaining screw holes align with the holes in the gear. Thread the seven screws through the gear and onto the threaded ring. The screws should be left loose. Slide the upper gear/mechanical lock assembly onto the shaft until it rests against the spacer (Ref. 39).

**Note:** Make sure to observe the markings put onto the gear during disassembly.

Position and hand tighten the gear retention disk (Ref. 50) with the screw and lockwasher (Ref. 51/52). **Do not tighten securely. The upper shaft and the upper gear must be able to rotate independently of each other.**



**Fig. 26 - Upper Gear Assembly**

#### 4.4 Removing/Reapplying Liqui Moly Coating

Inspect the ends of the claw rotors (Ref. 150/151), the running surfaces of each endplate and the inside of the cylinder. These surfaces are coated with Liqui Moly (molydisulfide) spray at the factory. The coating will have to be removed and reapplied. Removal is accomplished by lightly sanding the surfaces by hand and wiping with acetone. To properly measure the claws for clearance purposes, the ends must be free of all coating, dings and bruises. Remove the coating from the “A-side” endplate and the ends of the claws at this time.

A new coating will be applied later during the reassembly procedure as detailed in Section 4.8.

#### 4.5 Installing the “A-side” Endplate

Slide the “A-side” endplate (Ref. 112) over the threaded rods (Ref. 108) protruding from the gear housing (Ref. 1). Align the two dowel pins (Ref. 110) of the gear housing and the holes in the endplate. Gently knock the endplate into position against the gear housing using a rubber mallet. Install the two socket head cap screws and lockwashers (Ref. 116/117) and tighten securely.

**Note:** No sealer or gasket material is used between the endplate and the cylinder.

**Note:** Make sure the gaps in the rings are 180° apart. Apply a light coating of oil to the outside of the seal sleeve, but make sure no oil gets onto the labyrinth rings.

Slide the shaft seal sleeve with labyrinth rings assembly (Ref. 100) onto each shaft with the rings toward the cylinder (see Fig. 27). Start pushing the seal/sleeve assembly into the opening of the “A-side” endplate until a slight resistance is felt when the assembly comes in contact with the shaft O-ring (Ref. 16). Continue pushing the assembly,

using a sleeve installation tool (pipe sleeve) if necessary, until the assembly slides over the O-ring. The sleeve is also pushing through the lip seal (Ref. 4) installed previously in the gear housing.



**Fig. 27 - Installing "A-side" Shaft Seal Sleeves**

#### 4.6 Setting Fixed Axial Clearance

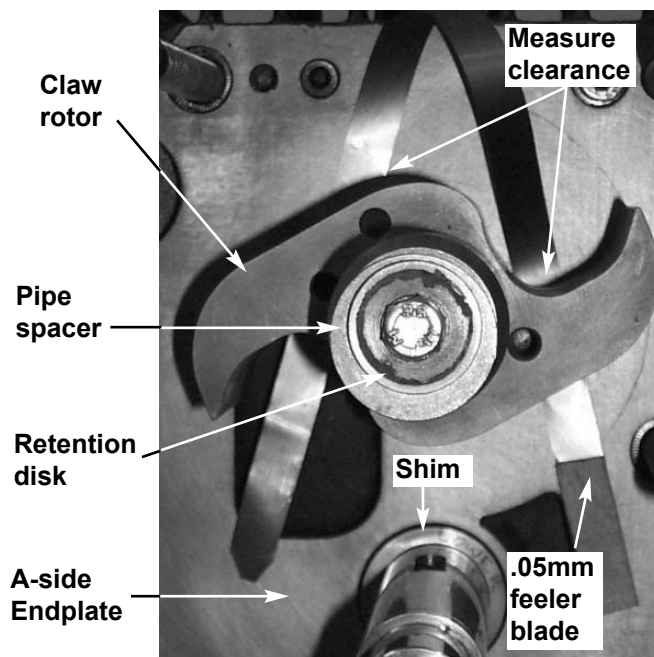
Measure the length of the upper and lower claw rotors (Ref. 150/151) and the length of the cylinder (Ref. 155) using a vernier caliper. Subtract the claw length from the cylinder length to obtain the total axial clearance. Compare this value to the value indicated in the tolerance and clearance chart (Fig. 32). If the measured clearance is not within the allowed chart clearance, then excessive wear has occurred to either the endplates or the claw. Consult the factory at Busch, Inc. in Virginia Beach, Virginia for further instructions. Assuming the measurements were within tolerance, proceed with the next step.

Install the original shims (Ref. 146) over both the upper and lower shafts (Ref. 8/12). Slide the appropriate claw onto the respective shaft until it contacts the shim or endplate.  
**Note: The location and number of shims used depends on the model of the pump being repaired. Refer to the drawing and parts list of your particular model pump.**

**Note: The end of the claw with the threaded holes will face the "B-side" endplate.** Slide a pipe spacer over the shaft and up against the claw. Insert the gear retention disk and socket head cap screw (Ref. 184/186) onto the upper shaft. Tighten the socket head cap screw to apply force against the claw in order to firmly compress the shim.

Using a feeler gauge, measure the gap between the claw and the endplate. This value is the fixed axial clearance. Measure the clearance in at least two spots opposite each other (see Fig. 28), since the shafts can still move at this point. Compare it to the chart value. Rotate the shaft by hand to get equal resistance. If the value is out of the allowed range, remove the shaft, rotor and shim. Install a different thickness shim, reinstall the items and retake the measurement until the proper clearance is achieved. Once the proper clearance is achieved, remove the pipe spacer,

shim and retention disk. Repeat the steps for the lower shaft. Remember, these clearances are set with the claw ends and endplate free of any coating.



**Fig. 28 - Measuring the Fixed Axial Clearance**

#### 4.7 Setting Claw Tooth Clearance

Remove both claws and shims from each shaft. Make sure each shim stays with its respective claw.

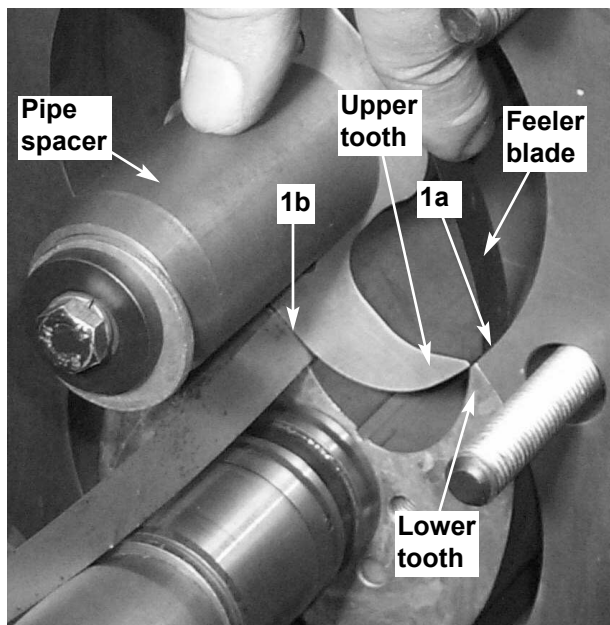
Install the shaft keys (Ref. 147) into the key slot of each shaft. Tap the key lightly in order to set it into the keyway.

**Note: Make sure each key is oriented in the same slot and position as when it was originally removed by observing the markings previously made.**

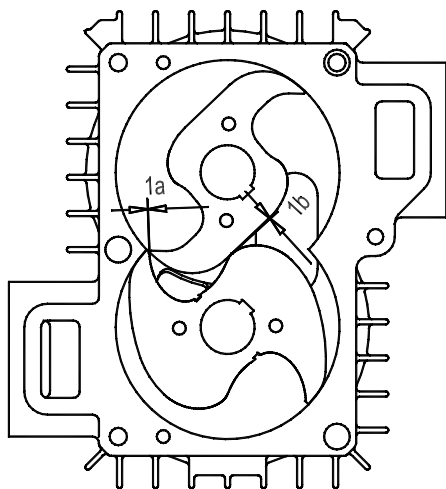
Slide the claws onto the shaft, over the key and up against the "A-side" endplate (Ref. 112). Do not install the axial shims at this time.

Slide the cylinder over the threaded rods (Ref. 108). Align the dowel holes in the cylinder with the dowel pins in the "A-side" endplate (Ref. 112). Temporarily install two hex head cap screws and lockwashers (Ref. 181/182) diagonally across from each other, one at the top and one at the bottom, to snug up the "A-side" endplate to the cylinder. Neither a gasket nor sealer is required between the endplate and cylinder.

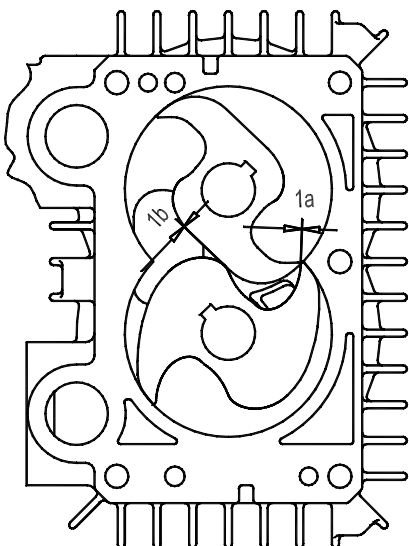
Slide two pipe sleeve tools up against the claw. Temporarily install the gear retention disks, socket head cap screws and lockwashers onto the "B-side" end of the shaft. The claws should be free to rotate. Claw orientation for all the pumps covered by this manual is shown in Fig. 29b and Fig. 29c. For the MI1122BV, orient the rotor claws as shown in Fig. 29a. The lower right claw tooth should be flush with the upper cylinder bore circumference. Lock the



**Fig. 29a - Measuring Claw Tooth Clearance on MI1222**



**Fig. 29b - Claw Orientation on MI1354/1352/1504/1502**



**Fig. 29c - Claw Orientation on MI1122/1124/2122/2124/1252**

lower rotor claw against the endplate by fully tightening the gear retention disk. The upper rotor claw should be left free to rotate. Insert a feeler blade with the correct thickness (see the tooth clearance chart in Fig. 32) between the upper claw tooth and the lower claw tooth. Tighten the gear retention disk, socket head cap screw and lockwasher on the upper shaft, then recheck the claw tooth clearances, making sure they have not changed. At this point, both claws should be firmly pressed against the endplate with the tooth clearance properly set. Both claws should not be allowed to move. Proceed to the gears where the mechanical lock on the upper gear can be tightened. Firmly tighten the gear retention disk (Ref. 50), securing the gear to the shaft.

Proceed by tightening the seven socket head cap screws (Ref. 35). Tighten the bolts using a crisscross pattern. Using a torque wrench, gradually tighten the screws to 78 inch-pounds. A light coat of oil applied to the screws will help assist in even tightening. Recheck the gear retention disk and retighten if necessary.

Move to the "B-side" shaft ends and remove the retention disks. Slide the rotor claws off the shafts and out of the cylinder. Loosen the two head cap screws and lockwashers (Ref. 116/117), which were securing the cylinder to the endplate. Pull the cylinder back and remove the shaft keys (Ref. 147).

Slide the correct shim (Ref. 146) onto each respective shaft (Ref. 8/12). Slide the cylinder back against the endplate (Ref. 112).

#### **4.8 Coating the "A-side" Endplate and Rotor Claws**

The mating surfaces of the rotor claws and the "A-side" endplate must be recoated with Liqui Moly spray. Tape or cover the shafts and shims with pipe sleeves to prevent overspray onto the shafts. Spray the Liqui Moly into the cylinder in order to coat the endplate. Apply two or three coats to the endplate allowing a few minutes of drying time between each coat.

Spray the sides of the rotor claws where the claw rubs the endplate with two or three coats also, again allowing a few minutes of drying time between coats.

Separate the cylinder from the endplate, reposition the shaft keys and tap them into the keyslots. Tap the cylinder back against the endplate. Slide the rotor claws back onto the shafts and into the cylinder, up over the keys. The build-up of the Liqui Moly might cause a slight drag to be felt.

#### **4.9 Installing the "B-side" Endplate**

Lay the "B-side" endplate (Ref. 160) flat side down. Place a shaft seal bushing (Ref. 172) into each bore and press it into place using a pipe sleeve tool. Make sure the O-ring (Ref. 173) is in position on the shaft seal bushing, and

install a shaft O-ring (Ref. 16) onto each shaft.

Take the “B-side” shaft seal sleeves (Ref. 171) and make sure the gaps in the labyrinth rings are 180° apart. Also, make sure the labyrinth rings are toward the rotor claw. Using a tool (pipe sleeve), tap the assembled sleeves onto each shaft, up and over the shaft O-rings, until they butt up against the end of the rotor claws (see Fig. 30).



**Fig. 30 - Installing the B-side Shaft Seal Sleeve**

Using a hot plate, heat up the two bearing sleeves (Ref. 180) and one shaft seal sleeve (Ref. 192). Slide one bearing sleeve on each “B-side” shaft. Slide the shaft seal sleeve on the lower shaft after the bearing sleeve. Stuff a rag into the gears on the “A-side” to prevent them from turning. Set the retention disk, lockwasher and hex head cap screw (Ref. 184/185/186) onto the end of the upper shaft and fully tighten. **Note: Heat the bearing and seal sleeves to 275°. The sleeves should slide on without force. The bearing sleeves are part of the bearings and are separated from the bearings for installation.**

Slide the “B-side” endplate up against the cylinder, aligning it with the dowel pins and tap it in place until it touches. Install five hex head cap nuts and lockwashers (Ref. 181/182) onto the threaded rod (Ref. 108) and fully tighten the nuts.

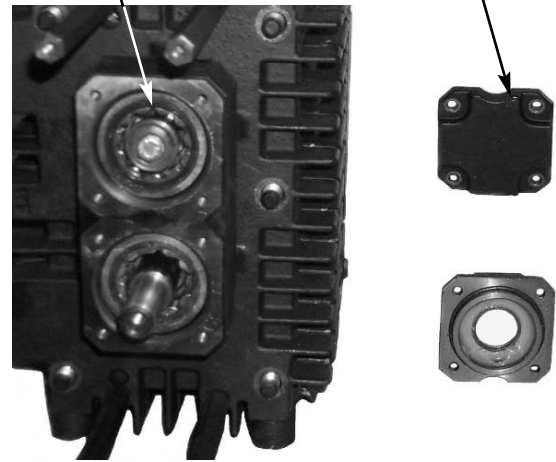
#### 4.10 Installing the “B-side” Bearings

Make sure each bearing is packed with grease and slide them over each shaft into each bearing bore. Make sure the shaft seal (Ref. 196) was installed into the lower bearing cover plate (Ref. 200). Lightly grease the lip of the seal. Install the O-rings (Ref. 191) onto the cover plates.

Install the upper bearing cover plate (Ref. 190) over the upper bearing and the lower (Ref. 200) over the lower bearing. Use four hex head cap screws and lockwashers (Ref. 204/205) to secure a cover plate over each bearing (see Fig. 31).

#### Upper bearings

#### Bearing cover plate



**Fig. 31 - Installing “B-side” Bearing Cover Plates**

#### 4.11 Installing the “B-side” Fan Cover

Slide the fan bushing (Ref. 402) onto the end of the shaft. Make sure the shaft key (Ref. 401) has been placed into the slot on the bushing. **Note: The fan, fan bushing and shaft key will normally come off and be re-installed as an assembly.**

Slide the cooling fan (Ref. 400) onto the shaft. Secure it to the shaft with the retention disk, hex head cap screw and lockwasher (Ref. 403/404/405/409). Tighten the screw securely.

Install the “B-side” fan cover (Ref. 424) over the fan and attach it to the hexagon rods (Ref. 420) using the four socket head cap screws and washers (Ref. 426/425).

#### 4.12 Installing the Gear Box Cover

Remove the rag from between the gears. Install the O-ring (Ref. 42) onto the “A-side” lower shaft. Make sure the shaft seal (Ref. 64) has been installed in the gear box cover.

Make sure the mating surface of the gear box cover and the gear housing are clean and smooth. Apply a thin coating of Hylomar sealer around the mating surfaces of the gear box cover and the gear box. Let it set up until the solvent has evaporated, usually two or three minutes.

Slide the gear box cover plate up to the gear housing, taking care not to damage the gear box cover shaft seal. The cover is attached by tightening the six socket head cap screws and lockwashers (Ref. 68/69).

Slide the shaft seal sleeve (Ref. 46) over the end of the shaft and into the gear housing cover plate.

#### 4.13 Installing the Motor

Tap the shaft key (Ref. 525) into the slot on the “A-side” end of the lower shaft. Slide the “A-side” cooling fan/cou-

pling half onto the shaft. If necessary, tap lightly on the fan hub to push it back. Secure it to the shaft with the retention disk, hex head cap screw and lockwasher (Ref. 529/530/531). Tighten the screw securely.

Secure the motor mounting bracket (Ref. 500) to the "A-side" gear housing (Ref. 1) with the four socket head cap screws and lockwashers (Ref. 504/505). Tighten them securely. Proper alignment is maintained by the dowel pins (Ref. 66).

Clean the mating surfaces of the motor mounting bracket, and position the coupling insert into the pump side coupling half.

Determine the distance that the motor coupling half (Ref. 510) must be pushed back onto the motor shaft so that the coupling insert will have about one to two millimeters total lateral travel. **Note: Several attempts might have to be made to get the necessary travel.**

Slide the motor coupling half onto the motor shaft and over the shaft key. Apply a small amount of Loctite 242 to the coupling set screw and insert it into the hole in the motor coupling half. After the proper travel distance was determined above, tighten down the coupling set screw.

Align the motor flange/coupling with the motor mounting bracket and push them together, making sure the coupling halves mesh. Secure the motor (Ref. 550) to the motor mounting bracket using the four socket head cap screws and washers (Ref. 518/515).

#### **4.14 Installing the Silencer and Inlet Flange Assembly**

Reattach the inlet flange assembly (Ref. 700) to the side of the cylinder housing (Ref. 155) using the four socket heads cap screws and lockwashers (Ref. 705/706). Be sure to install the flange cylinder gasket (Ref. 701) between the assembly and cylinder.

Position the silencer body and slide it over the four studs protruding from the side of the cylinder housing. Attach the silencer to the cylinder body using the four hex head nuts and lockwashers. Install the silencer cover back onto the silencer body (Ref. 800) using the sixteen socket head screws and lockwashers.

### **5.0 PREPARING TO RESTART THE PUMP**

Now that the pump has been completed reassembled, it is ready to be filled with oil, reconnected and started. Refer to Section 1 for installation instructions and Section 2 for adding oil to the gear box.

### **6.0 LIMITED WARRANTY**

Busch, Inc. warrants that all products furnished by it are free from defects in material and workmanship at the time of shipment for a period of eighteen months from the date

of shipment, or one year from the date of installation, whichever occurs first. Claims must be made during that period and are limited to the replacement or repair of parts claimed to be defective.

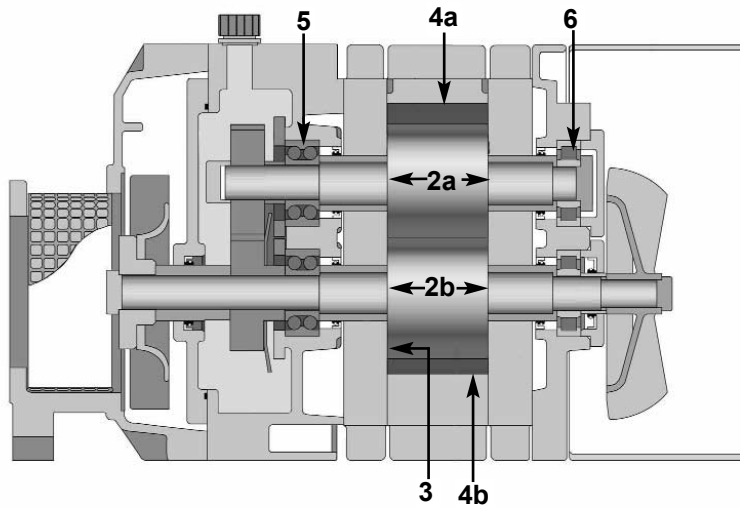
In the case of components purchased by Busch, Inc., such as starters, controls, mechanical seals, motors, couplings, etc., the warranty of that manufacturer will be extended to the purchaser in lieu of any warranty by us. The replacement of maintenance items including but not limited to packings, oil seals, bearings, coils, etc., made in connection with normal maintenance service, is not covered by this Warranty.

This Limited Extended Warranty is valid only when the product has been properly installed, used in a normal manner, and serviced according to the operating manual. This Warranty shall not extend to products that have been misused, neglected, altered or repaired without factory authorization during the warranty period. Operating conditions beyond our control such as improper voltage or water pressure, excessive ambient temperatures or other conditions that would affect the performance or life of the product will also void the Warranty.

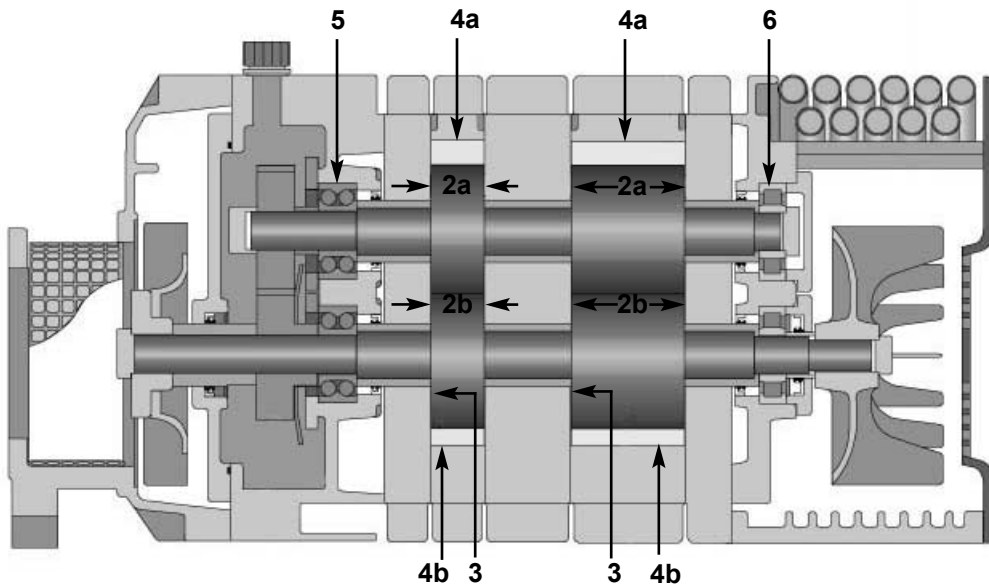
Permission to return parts for warranty repair must be obtained, and all returns must be prepaid to the factory. If, after examination, the product or part is found to be defective, it will be repaired or replaced on a no-charge basis and returned, FOB the factory. On the other hand, if it is determined that the Warranty has not been breached by Busch, Inc., then the usual charges for repair or replacement will be made, FOB the factory. Parts or products that are obsolete or those made to special order are not returnable.

This Limited Warranty applies only to the above and is for the period set forth. Busch, Inc.'s maximum liability shall not, in any case, exceed the contract price for the product, part or component claimed to be defective; and Busch, Inc. assumes no liability at all for any special, indirect or consequential damages arising from defective equipment.

THERE ARE NO WARRANTIES IMPLIED OR EXPRESSED THAT EXTEND BEYOND THOSE CONTAINED IN THIS LIMITED WARRANTY.



**Single Stage Mink**



**Two Stage Mink**

|         | Pos. | Clearance             | MI1124/MI1122 | MI1354/MI1532 | MI1504/MI1502 | MI2124      | MI2122      | MI1252       |
|---------|------|-----------------------|---------------|---------------|---------------|-------------|-------------|--------------|
| Stage 1 | 1a   | Tooth clear.          | 0.07-0.13     | 0.12-0.18     | 0.12-0.18     | 0.07-0.13   | 0.07-0.13   | 0.07-0.13    |
|         | 1b   | Tooth clear.          | 0.07-0.13     | 0.15-0.19     | 0.15-0.19     | 0.07-0.13   | 0.07-0.13   | 0.07-0.13    |
|         | 2a   | Total axial clear.    | 0.34-0.38     | 0.25-0.29     | 0.28-0.32     | 0.18-0.22   | 0.18-0.22   | 0.18-0.22    |
|         | 2b   | Total axial clear.    | 0.34-0.38     | 0.25-0.29     | 0.33-0.37     | 0.18-0.22   | 0.24-0.28   | 0.18-0.22    |
|         | 3    | Fixed axial clear.    | 0.04-0.06     | 0.05-0.07     | 0.05-0.07     | 0.04-0.06   | 0.04-0.06   | 0.04-0.06    |
|         | 4a   | Radial clear.         | 0.08-0.14     | 0.15-0.19     | 0.17-0.21     | 0.08-0.14   | 0.08-0.14   | 0.08-0.14    |
|         | 4b   | Radial clear.         | 0.08-0.14     | 0.15-0.19     | 0.24-0.28     | 0.08-0.14   | 0.08-0.14   | 0.08-0.14    |
|         | 5    | A-side bearing clear. | 0.008-0.027   | 0.021-0.040   | 0.021-0.040   | 0.008-0.027 | 0.008-0.027 | 0.008-0.0027 |
|         | 6    | B-side bearing clear. | 0.02-0.045    | 0.045-0.07    | 0.045-0.07    | 0.02-0.045  | 0.02-0.045  | 0.02-0.045   |
| Stage 2 | 1a   | Tooth clear.          | ---           | ---           | ---           | 0.07-0.13   | 0.07-0.13   | 0.07-0.13    |
|         | 1b   | Tooth clear.          | ---           | ---           | ---           | 0.07-0.13   | 0.07-0.13   | 0.07-0.13    |
|         | 2a   | Total axial clear.    | ---           | ---           | ---           | 0.34-0.38   | 0.34-0.38   | 0.37-0.41    |
|         | 2b   | Total axial clear.    | ---           | ---           | ---           | 0.34-0.38   | 0.34-0.38   | 0.45-0.49    |
|         | 3    | Fixed axial clear.    | ---           | ---           | ---           | 0.04-0.06   | 0.04-0.06   | 0.04-0.06    |
|         | 4    | Radial clear.         | ---           | ---           | ---           | 0.08-0.14   | 0.08-0.14   | 0.08-0.14    |

**Fig. 32 - Clearances**

| Ref. | Description/Qty.                    | MI1122<br>BV/BP | MI1124<br>BV/BP | MI1352<br>BV/BP | MI1354<br>BV/BP | MI1502<br>BV/BP | MI1504<br>BV/BP | MI2122<br>BV | MI2124<br>BV | MI1252<br>BV |
|------|-------------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|--------------|--------------|--------------|
| 1    | Gear/bearing housing, A-side        | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 4    | Shaft seal                          | 2               | 2               | 2               | 2               | 2               | 2               | 2            | 2            | 2            |
| 8    | Lower rotor shaft                   | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 12   | Upper rotor shaft                   | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 16   | Viton O-ring                        | 4               | 4               | 4               | 4               | 4               | 4               | 4            | 4            | 4            |
| 18   | Spacer                              | na              | na              | 2               | 2               | 2               | 2               | na           | na           | na           |
| 20   | Angular ball bearing                | 2               | 2               | 2               | 2               | 2               | 2               | 2            | 2            | 2            |
| 24   | Bearing retaining plate             | 2               | 2               | 2               | 2               | 2               | 2               | 2            | 2            | 2            |
| 26   | Hex head cap screw                  | 8               | 8               | 8               | 8               | 8               | 8               | 8            | 8            | 8            |
| 27   | Lockwasher                          | 8               | 8               | 8               | 8               | 8               | 8               | 8            | 8            | 8            |
| 30   | Shaft key                           | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 32   | Lower drive gear                    | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 33   | Upper driven gear                   | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 34   | Mechanical lock                     | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 35   | Socket head cap screw               | 7               | 7               | na              | na              | na              | na              | 7            | 7            | 7            |
| 36   | Gear splash disk                    | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 37   | Lockwasher                          | na              | na              | 2               | 2               | 2               | 2               | na           | na           | na           |
| 38   | Countersunk socket screw            | 2               | 2               | 2               | 2               | 2               | 2               | 2            | 2            | 2            |
| 39   | Spacer                              | 1               | 1               | 2               | 2               | 2               | 2               | 1            | 1            | 1            |
| 42   | Viton O-ring                        | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 44   | Spacer                              | na              | na              | 1               | 1               | 1               | 1               | na           | na           | na           |
| 46   | Sleeve                              | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 50   | Gear retention disk                 | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 51   | Lockwasher                          | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 52   | Hex head cap screw                  | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 60   | Gear housing cover plate            | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 62   | O-ring                              | na              | na              | 1               | 1               | 1               | 1               | na           | na           | na           |
| 64   | Shaft seal                          | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 66   | Alignment pin                       | 4               | 4               | 4               | 4               | 4               | 4               | 4            | 4            | 4            |
| 68   | Socket head cap screw               | 6               | 6               | 6               | 6               | 6               | 6               | 6            | 6            | 6            |
| 69   | Lockwasher                          | 6               | 6               | na              | na              | na              | na              | 6            | 6            | 6            |
| 72   | Oil fill cap w/vent valve           | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 76   | Oil sight glass                     | 2               | 2               | 2               | 2               | 2               | 2               | 2            | 2            | 2            |
| 77   | Ring gasket                         | 2               | 2               | 2               | 2               | 2               | 2               | 2            | 2            | 2            |
| 80   | Plug                                | 2               | 2               | 2               | 2               | 2               | 2               | 2            | 2            | 2            |
| 81   | Ring gasket, copper                 | 2               | 2               | 2               | 2               | 2               | 2               | 2            | 2            | 2            |
| 100  | Shaft seal sleeve w/labyrinth rings | 2               | 2               | 2               | 2               | 2               | 2               | 2            | 2            | 2            |
| 104  | Labyrinth seal                      | 8               | 8               | 8               | 8               | 8               | 8               | 12           | 12           | 12           |
| 108  | Threaded rod                        | 5               | 5               | 5               | 5               | 5               | 5               | 5            | 5            | 5            |
| 110  | Alignment pin                       | 6               | 6               | 8               | 8               | 8               | 8               | 10           | 10           | 10           |
| 112  | Endplate, A-side                    | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 116  | Socket head cap screw               | 2               | 2               | 2               | 2               | 2               | 2               | 2            | 2            | 2            |
| 117  | Lockwasher                          | 2               | 2               | 2               | 2               | 2               | 2               | 2            | 2            | 2            |
| 120  | Shim                                | na              | na              | 2               | 2               | 2               | 2               | 2            | 2            | na           |
| 122  | Rotor shaft key                     | na              | na              | 2               | 2               | 2               | 2               | 2            | 2            | na           |
| 124  | Small stage lower claw rotor        | na              | na              | na              | na              | na              | na              | 1            | 1            | na           |
| 125  | Small stage upper claw rotor        | na              | na              | na              | na              | na              | na              | 1            | 1            | na           |
| 128  | Cylinder                            | na              | na              | na              | na              | na              | na              | 1            | 1            | na           |
| 132  | Labyrinth sleeve                    | na              | na              | na              | na              | na              | na              | 2            | 2            | 2            |
| 136  | Intermediate stage flange           | na              | na              | na              | na              | na              | na              | 1            | 1            | 1            |
| 140  | Socket head cap screw               | na              | na              | na              | na              | na              | na              | 2            | 2            | 2            |
| 141  | Lockwasher                          | na              | na              | na              | na              | na              | na              | 2            | 2            | 2            |
| 146  | Shim                                | 2               | 2               | na              | na              | na              | na              | 2            | 2            | 4            |
| 147  | Shaft key                           | 2               | 2               | na              | na              | na              | na              | 2            | 2            | 4            |
| 150  | Lower claw rotor                    | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 151  | Upper claw rotor                    | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 153  | Lockwasher                          | na              | na              | na              | na              | na              | na              | na           | na           | 2            |
| 155  | Cylinder                            | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 157  | Cylinder                            | na              | na              | na              | na              | na              | na              | na           | na           | 1            |
| 160  | Endplate, B-side                    | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 166  | Socket head cap screw               | na              | na              | 1               | 1               | 1               | 1               | na           | na           | na           |
| 167  | Lockwasher                          | na              | na              | 1               | 1               | 1               | 1               | na           | na           | na           |
| 170  | B-side bearing housing              | na              | na              | 1               | 1               | 1               | 1               | na           | na           | na           |
| 171  | Shaft seal sleeve w/labyrinth rings | 2               | 2               | 2               | 2               | 2               | 2               | 2            | 2            | 2            |
| 172  | Shaft seal bushing, B-side          | 2               | 2               | na              | na              | na              | na              | 2            | 2            | 2            |
| 173  | Viton O-ring                        | 2               | 2               | na              | na              | na              | na              | 2            | 2            | 2            |
| 174  | Buna shaft seal                     | 2               | 2               | 2               | 2               | 2               | 2               | 2            | 2            | 2            |
| 175  | Bearing/shaft spacer                | na              | na              | 2               | 2               | 2               | 2               | na           | na           | na           |
| 180  | Roller bearing                      | 2               | 2               | 2               | 2               | 2               | 2               | 2            | 2            | 2            |
| 181  | Hex head cap nut                    | 5               | 5               | 5               | 5               | 5               | 5               | 5            | 5            | 5            |
| 182  | Lockwasher                          | 5               | 5               | 5               | 5               | 5               | 5               | 5            | 5            | 5            |
| 184  | Gear retention disk                 | 1               | 1               | 2               | 2               | 2               | 2               | 1            | 1            | 1            |

| Ref.               | Description/Qty.              | MI1122<br>BV/BP | MI1124<br>BV/BP | MI1352<br>BV/BP | MI1354<br>BV/BP | MI1502<br>BV/BP | MI1504<br>BV/BP | MI2122<br>BV | MI2124<br>BV | MI1252<br>BV |
|--------------------|-------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|--------------|--------------|--------------|
| 185                | Lockwasher                    | 1               | 1               | 2               | 2               | 2               | 2               | 1            | 1            | 1            |
| 186                | Hex head cap screw            | 1               | 1               | 2               | 2               | 2               | 2               | 1            | 1            | 1            |
| 190                | Bearing cover plate           | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 191                | Viton O-ring                  | 2               | 2               | 2               | 2               | 2               | 2               | 2            | 2            | 2            |
| 192                | Sleeve                        | 1               | 1               | na              | na              | na              | na              | 1            | 1            | 1            |
| 196                | Shaft seal                    | 1               | 1               | na              | na              | na              | na              | 1            | 1            | 1            |
| 200                | Bearing cover plate           | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 204                | Hex head cap screw            | 8               | 8               | 8               | 8               | 8               | 8               | 8            | 8            | 8            |
| 205                | Lockwasher                    | 8               | 8               | 8               | 8               | 8               | 8               | 8            | 8            | 8            |
| 400                | B-side cooling fan            | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 401                | Shaft key                     | 1               | 1               | na              | na              | na              | na              | 1            | 1            | 1            |
| 402                | Fan bushing                   | 1               | 1               | na              | na              | na              | na              | 1            | 1            | 1            |
| 402                | Fan wiring bracket            | na              | na              | 1               | 1               | 1               | 1               | na           | na           | na           |
| 403                | Gear retention disk           | 1               | 1               | na              | na              | na              | na              | 1            | 1            | 1            |
| 403                | Socket head cap screw         | na              | na              | 1               | 1               | 1               | 1               | na           | na           | na           |
| 404                | Socket head cap screw         | na              | na              | 1               | 1               | 1               | 1               | na           | na           | na           |
| 404                | Lockwasher                    | 1               | 1               | na              | na              | na              | na              | 1            | 1            | 1            |
| 405                | Hex head cap screw            | 1               | 1               | na              | na              | na              | na              | 1            | 1            | 1            |
| 405                | Toothed washer                | na              | na              | 1               | 1               | 1               | 1               | na           | na           | na           |
| 406                | Socket head cap screw         | na              | na              | 2               | 2               | 2               | 2               | na           | na           | na           |
| 408                | Washer                        | na              | na              | 2               | 2               | 2               | 2               | na           | na           | na           |
| 409                | Adjusting disk                | 1               | 1               | na              | na              | na              | na              | 1            | 1            | 1            |
| 420                | Hexagon rod                   | 4               | 4               | na              | na              | na              | na              | 4            | 4            | 4            |
| 424                | Fan cover, B-side             | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 425                | "Dubo" washer                 | 4               | 4               | na              | na              | na              | na              | 4            | 4            | 4            |
| 426                | Socket head cap screw         | 4               | 4               | 4               | 4               | 4               | 4               | 4            | 4            | 4            |
| 427                | Washer                        | na              | na              | 4               | 4               | 4               | 4               | na           | na           | na           |
| 432                | A-side cooling fan            | na              | na              | 1               | 1               | 1               | 1               | na           | na           | na           |
| 434                | A-side fan flange             | na              | na              | 1               | 1               | 1               | 1               | na           | na           | na           |
| 435                | Socket head cap screw         | na              | na              | 4               | 4               | 4               | 4               | na           | na           | na           |
| 436                | Lockwasher                    | na              | na              | 4               | 4               | 4               | 4               | na           | na           | na           |
| 450                | Cable                         | na              | na              | 1               | 1               | 1               | 1               | na           | na           | na           |
| 455                | Electric fan wiring bracket   | na              | na              | 2               | 2               | 1               | 1               | na           | na           | na           |
| 456                | Socket head cap screw         | na              | na              | 2               | 2               | 1               | 1               | na           | na           | na           |
| 457                | Socket head cap screw         | na              | na              | 2               | 2               | 1               | 1               | na           | na           | na           |
| 500                | Motor mounting bracket        | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 504                | Socket head cap screw         | 4               | 4               | 4               | 4               | 4               | 4               | 4            | 4            | 4            |
| 505                | Lockwasher                    | 4               | 4               | na              | na              | na              | na              | 4            | 4            | 4            |
| 510                | Coupling                      | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 514                | Motor mounting bracket screen | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 515                | Washer                        | 2               | 2               | 1               | 1               | 1               | 1               | 2            | 2            | 2            |
| 516                | Screw                         | na              | na              | 1               | 1               | 1               | 1               | na           | na           | na           |
| 518                | Socket head cap screw         | 4               | 4               | 4               | 4               | 4               | 4               | 4            | 4            | 4            |
| 519                | Lockwasher                    | na              | na              | 4               | 4               | 4               | 4               | na           | na           | 4            |
| 521                | Nut                           | na              | na              | 1               | 1               | 1               | 1               | na           | na           | na           |
| 525                | Shaft key                     | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 529                | Gear retention disk           | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 530                | Hex head cap screw            | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 531                | Lockwasher                    | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 550                | Motor                         | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 600                | Rubber foot                   | 4               | 4               | 4               | 4               | 4               | 4               | 4            | 4            | 4            |
| 601                | Slotted set screw             | na              | na              | 4               | 4               | 4               | 4               | na           | na           | na           |
| 609                | Threaded stud                 | na              | na              | 2               | 2               | 2               | 2               | na           | na           | na           |
| 610                | Threaded stud                 | na              | na              | 2               | 2               | 2               | 2               | na           | na           | na           |
| 611                | Hex head cap nut              | na              | na              | 4               | 4               | 4               | 4               | na           | na           | na           |
| 612                | Disk                          | na              | na              | 4               | 4               | 4               | 4               | na           | na           | na           |
| 615                | Eye bolt                      | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 620                | Base frame                    | na              | na              | 1               | 1               | 1               | 1               | na           | na           | na           |
| 700                | Inlet elbow flange            | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 701                | Inlet flange/cylinder gasket  | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 705                | Socket head cap screw         | 4               | 4               | 4               | 4               | 4               | 4               | 4            | 4            | 8            |
| 706                | Lockwasher                    | 4               | 4               | 4               | 4               | 4               | 4               | 4            | 4            | 8            |
| 707                | Set screw                     | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | na           |
| 713                | Inlet flange, complete        | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 715                | Inlet screen                  | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 719 <sup>(1)</sup> | Steel plug                    | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | na           |
| 720 <sup>(2)</sup> | Vacuum relief valve           | 1               | na              | 1               | 1               | 1               | 1               | na           | na           | 1            |
| 721                | Ring gasket                   | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | na           |
| 725                | Elbow                         | na              | na              | na              | na              | na              | na              | 1            | 1            | na           |
| 728                | Elbow                         | na              | na              | na              | na              | na              | na              | 1            | 1            | na           |
| 730                | Elbow                         | na              | na              | na              | na              | na              | na              | 1            | 1            | na           |
| 731                | Gasket                        | na              | na              | na              | na              | na              | na              | 1            | 1            | na           |

| Ref.  | Description/Qty.      | MI1122<br>BV/BP | MI1124<br>BV/BP | MI1352<br>BV/BP | MI1354<br>BV/BP | MI1502<br>BV/BP | MI1504<br>BV/BP | MI2122<br>BV | MI2124<br>BV | MI1252<br>BV |
|-------|-----------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|--------------|--------------|--------------|
| 733   | Threaded nipple       | na              | na              | na              | na              | na              | na              | 1            | 1            | 1            |
| 735   | Reducing fitting      | na              | na              | na              | na              | na              | na              | 1            | 1            | na           |
| 739   | Oil drain plug        | na              | na              | na              | na              | na              | na              | 1            | 1            | na           |
| 741   | Gasket ring           | na              | na              | na              | na              | na              | na              | 1            | 1            | na           |
| 790   | Lower inlet flange    | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 791   | Inlet valve guide     | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 792   | Inlet valve spring    | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 793   | Inlet valve plate     | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 794   | O-ring                | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 795   | O-ring                | 2               | 2               | 2               | 2               | 2               | 2               | 2            | 2            | 2            |
| 796   | Upper inlet flange    | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 797   | Hex head screw        | 4               | 4               | 4               | 4               | 4               | 4               | 4            | 4            | 4            |
| 798   | Lockwasher            | 4               | 4               | 4               | 4               | 4               | 4               | 4            | 4            | 4            |
| 799   | Plug                  | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 799.1 | Gasket                | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | 1            |
| 800   | Exhaust silencer      | 1               | 1               | 1               | 1               | 1               | 1               | 1            | 1            | na           |
| 800   | Exhaust manifold      | na              | na              | na              | na              | na              | na              | na           | na           | 1            |
| 806   | Socket head cap screw | na              | na              | na              | na              | na              | na              | na           | na           | 4            |
| 807   | Socket head cap screw | na              | na              | na              | na              | na              | na              | na           | na           | 4            |
| 870   | Exhaust flange        | na              | na              | 1               | 1               | 1               | 1               | 1            | 1            | na           |
| 871   | Gasket                | na              | na              | 1               | 1               | 1               | 1               | 1            | 1            | na           |
| 873   | Plug                  | na              | na              | 1               | 1               | 1               | 1               | na           | na           | na           |
| 875   | Socket head cap screw | na              | na              | 2               | 2               | 2               | 2               | 2            | 2            | na           |
| 876   | Washer                | na              | na              | 2               | 2               | 2               | 2               | 2            | 2            | na           |
| 877** | Nipple                | 1               | 1               | na              | na              | na              | na              | na           | na           | na           |
| 878** | Reducing tee          | 1               | 1               | na              | na              | na              | na              | na           | na           | na           |
| 885*  | Plug                  | na              | na              | 1               | 1               | 1               | 1               | na           | na           | na           |
| 886*  | Gasket                | na              | na              | 1               | 1               | 1               | 1               | na           | na           | na           |
| 887** | Fitting adapter       | 1               | 1               | 1               | 1               | 1               | 1               | na           | na           | na           |
| 888** | Elbow                 | 1               | 1               | 1               | 1               | 1               | 1               | na           | na           | na           |
| 889** | Overload Safety Valve | 1               | 1               | 1               | 1               | 1               | 1               | na           | na           | na           |

Notes: 1) Only the BP versions and the 1124BV, 2124BV and 2122BV have a plug at this position.

2) Only the BV versions, except for the 1124BV, 2124BV and 2122BV, have a vacuum relief valve at this position.

3) Exhaust silencers for BV versions are not shown on drawings.

4) Motor adapter flanges (if required) are not shown on drawings or in parts list

\* For the BV (vacuum) versions only

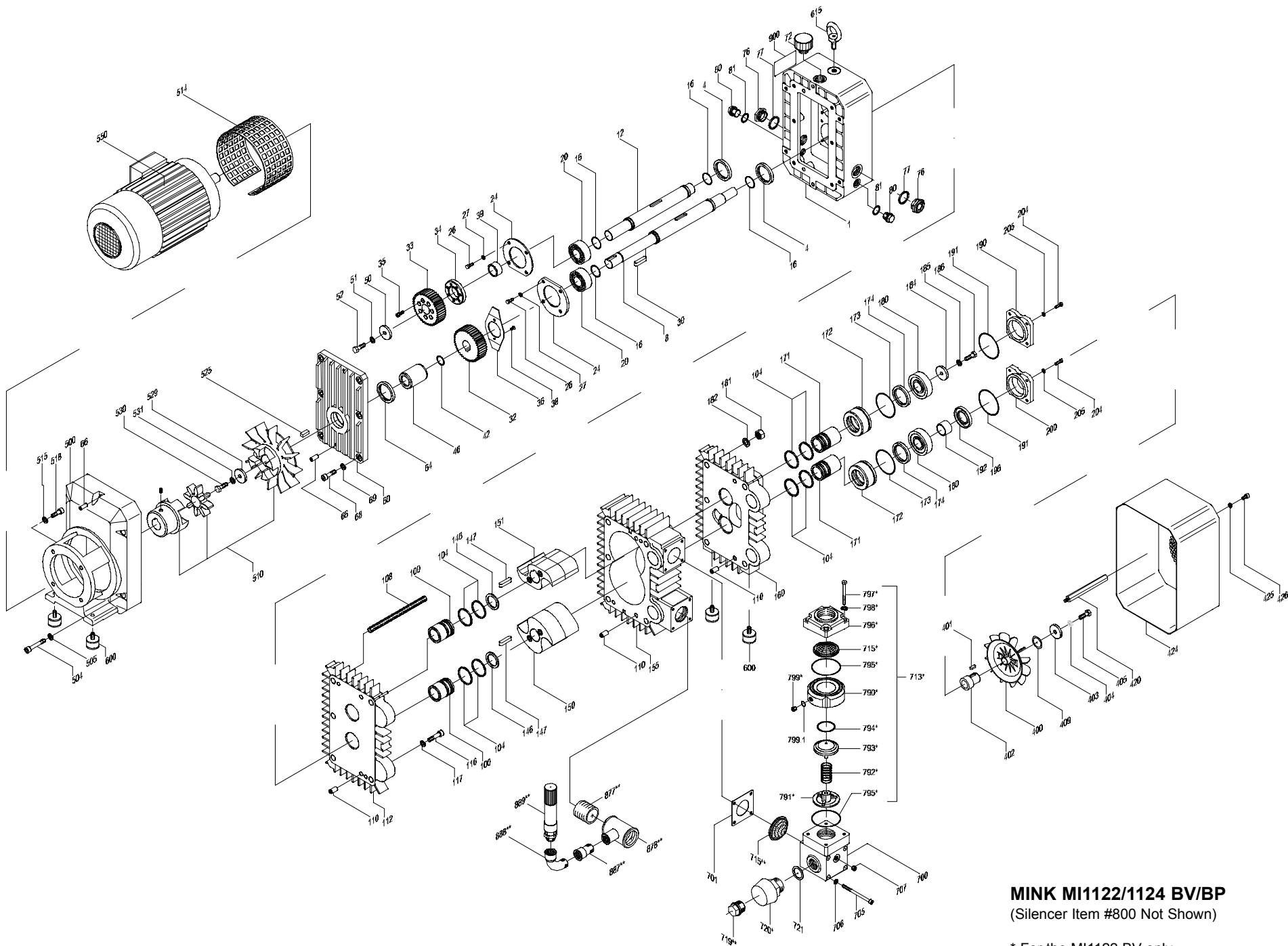
\*\* For the BP (pressure) versions only

## STANDARD SPECIFICATIONS FOR VACUUM MODELS

| Model                       | MI1124BV | MI1122BV | MI1354BV | MI1504BV | MI1352BV | MI1502BV | MI2124BV | MI2122BV | MI1252BV |
|-----------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| Nom. pump. speed (ACFM)     | 38       | 85       | 108      | 160      | 216      | 325      | 38       | 85       | 160      |
| Free air displacement (CFM) | 50       | 100      | 125      | 188      | 250      | 376      | 50       | 100      | 200      |
| End vacuum ("Hg)            | 26.9     | 26.9     | 22.5     | 22.5     | 22.5     | 22.5     | 29.3     | 29.3     | 22.5     |
| End vacuum (torr)           | 75       | 75       | 188      | 188      | 188      | 188      | 15       | 15       | 188      |
| Motor rating (HP)           | 3.0      | 5.0      | 5.0      | 7.5      | 10       | 20       | 3        | 7.5      | 10       |
| Motor speed (RPM)           | 1800     | 3600     | 1800     | 1800     | 3600     | 3600     | 1800     | 3600     | 3600     |
| Approximate weight (lbs)    | 231      | 253      | 474      | 571      | 550      | 682      | 325      | 352      | 474      |
| Inlet pipe connection (NPS) | 1 1/4"   | 1 1/4"   | 2"       | 2"       | 2"       | 3"       | 1 1/4"   | 1 1/4"   | 2"       |
| Discharge pipe connection   | 1 1/2"   | 1 1/2"   | 2"       | 2"       | 2"       | 3"       | 1 1/2"   | 1 1/2"   | 1 1/2"   |
| Sound level dBA             | 78       | 85       | 81       | 82       | 87       | 89       | 77       | 88       | 87       |
| Gear box oil capacity (qts) | .45      | .45      | .63      | .63      | .63      | .63      | .45      | .45      | .45      |

## STANDARD SPECIFICATIONS FOR PRESSURE MODELS

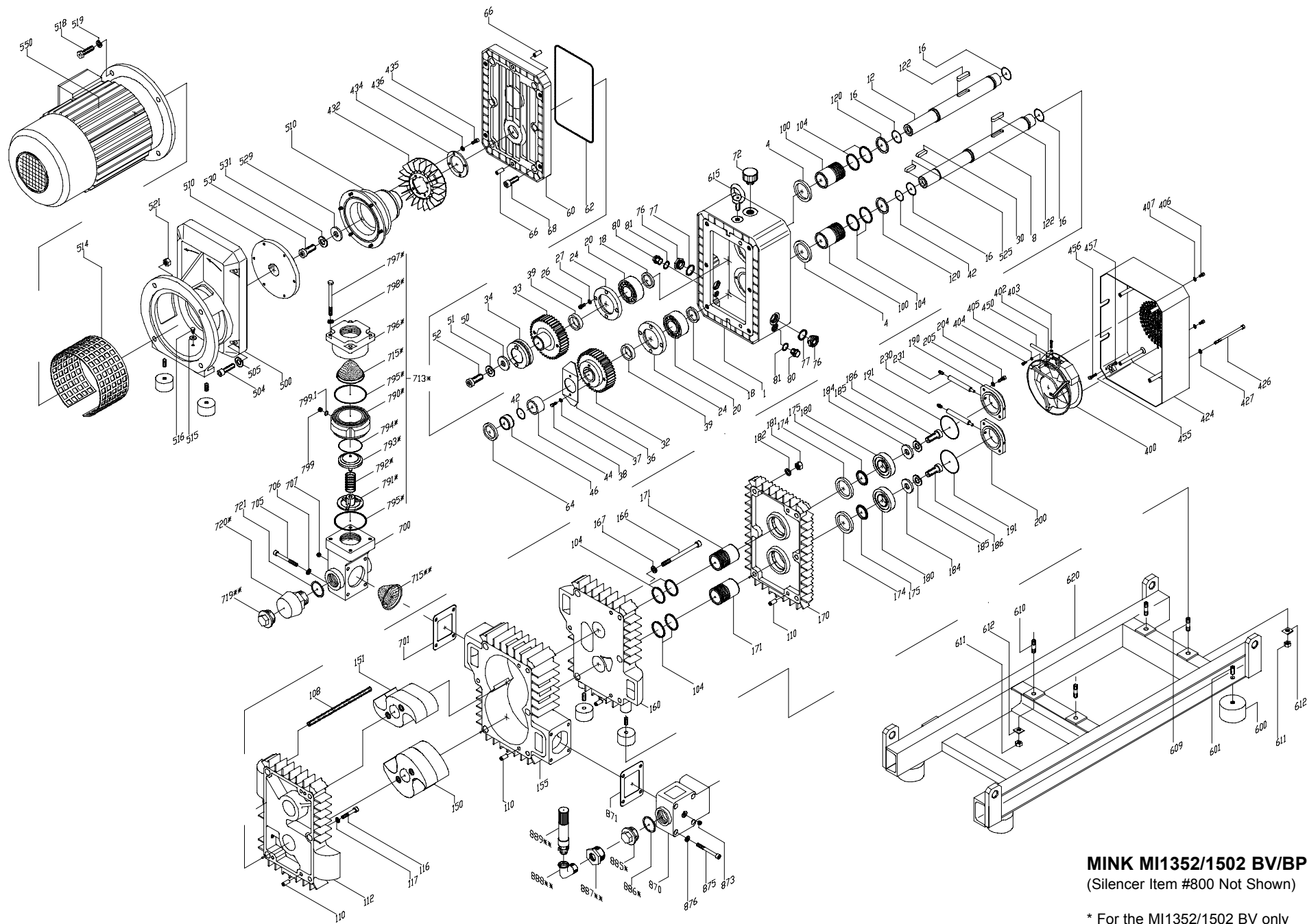
| Model                       | MI1124BP | MI1122BP | MI1354BP | MI1504BP | MI1352BP | MI1502BP |
|-----------------------------|----------|----------|----------|----------|----------|----------|
| Nom. pump. speed (SCFM)     | 38       | 85       | 108      | 160      | 216      | 325      |
| Free air displacement (CFM) | 50       | 100      | 125      | 188      | 250      | 376      |
| Maximum pressure (psig)     | 29.4     | 29.4     | 29.4     | 29.4     | 29.4     | 29.4     |
| Motor rating (HP)           | 7.5      | 15       | 15       | 20       | 30       | 40       |
| Motor speed (RPM)           | 1800     | 3600     | 1800     | 1800     | 3600     | 3600     |
| Approximate weight (lbs)    | 243      | 297      | 716      | 671      | 850      | 860      |
| Inlet pipe connection (NPS) | 1 1/4"   | 1 1/4"   | 2"       | 2"       | 2"       | 3"       |
| Sound level dBA             | 79       | 86       | 85       | 85       | 88       | 90       |
| Gear box oil capacity (qts) | .45      | .45      | .63      | .63      | .63      | .63      |



**MINK MI1122/1124 BV/BP**  
(Silencer Item #800 Not Shown)

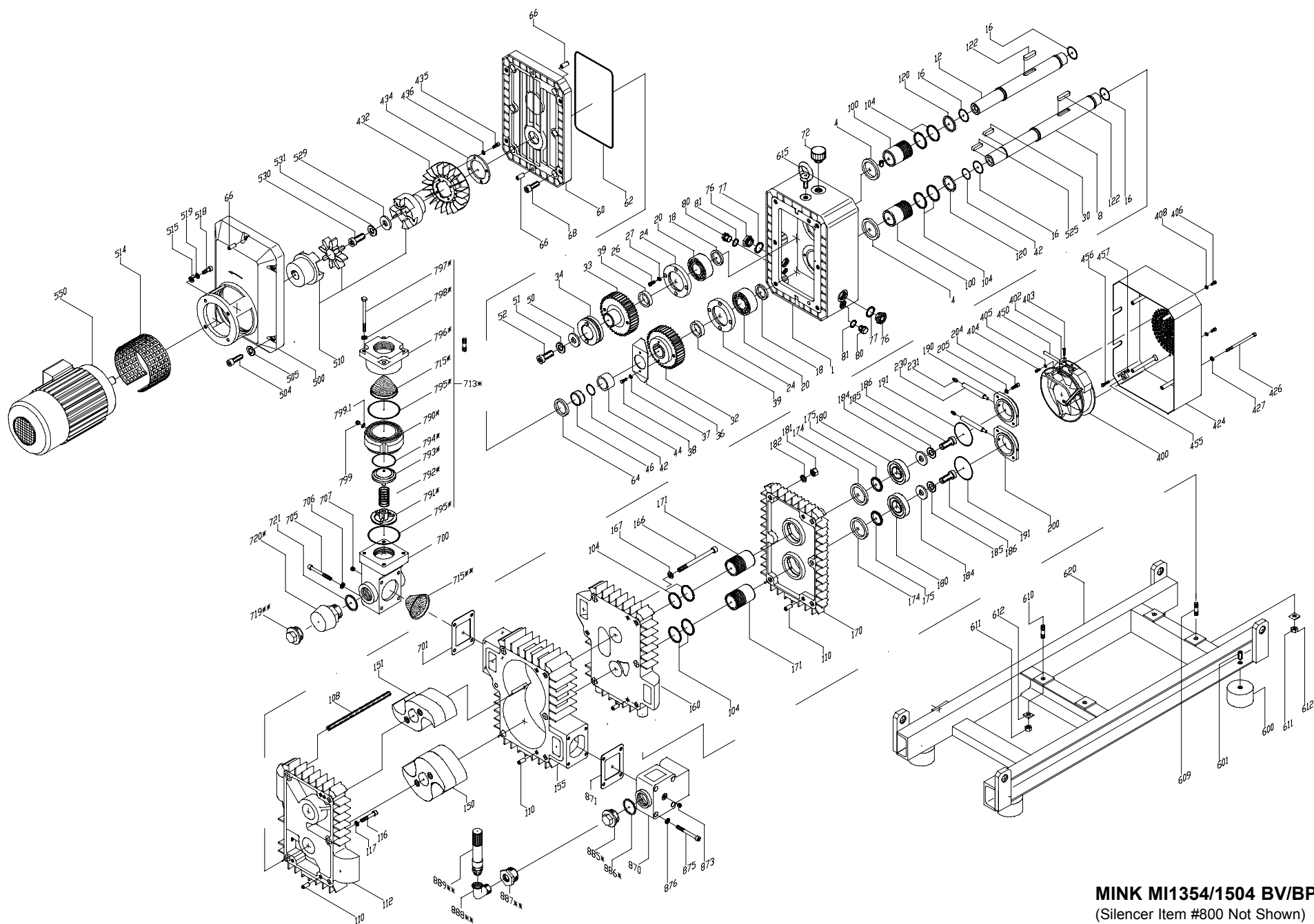
\* For the MI1122 BV only

\*\* For the MI1122/1124 BP & MI1124 only



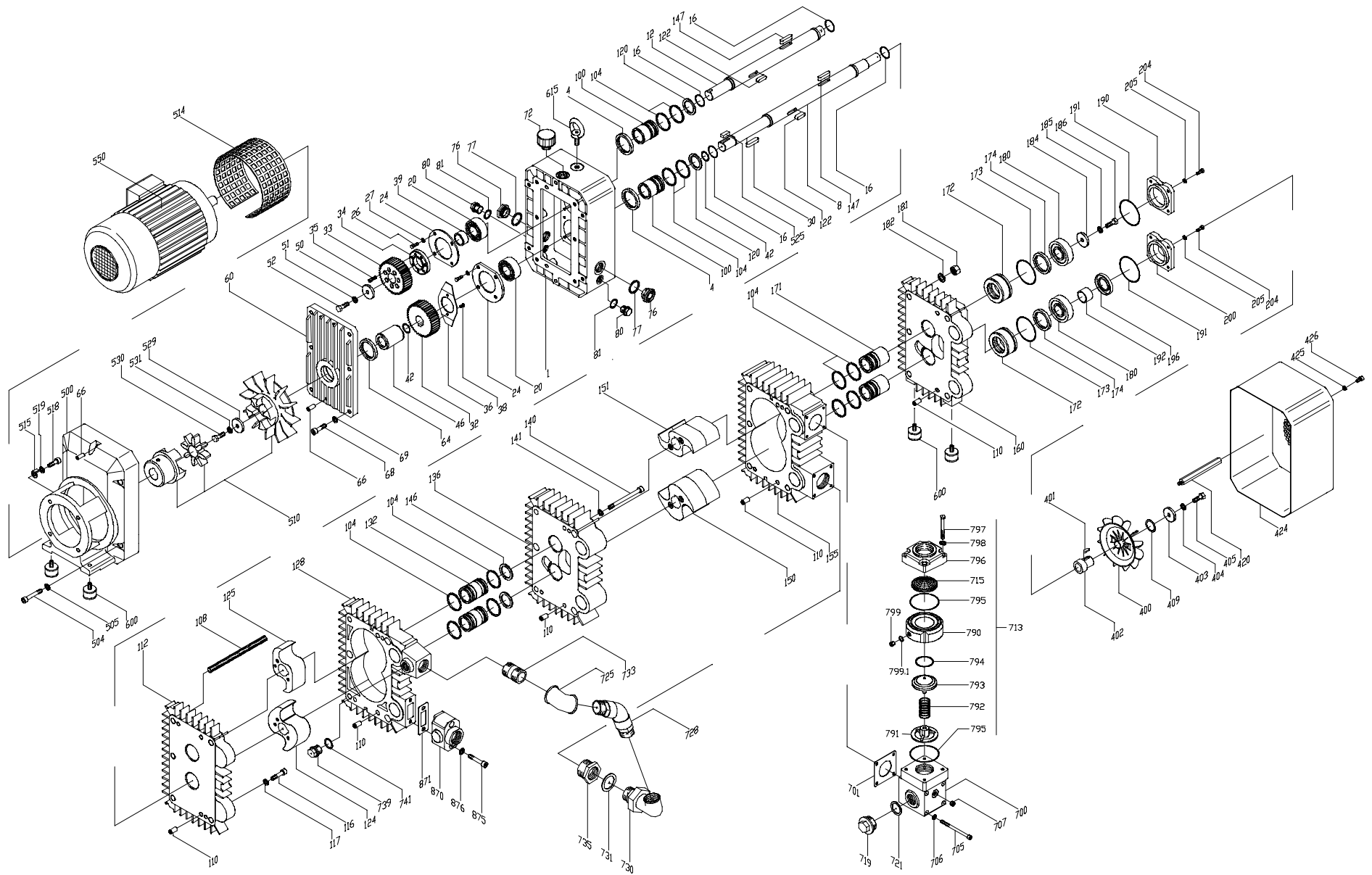
**MINK MI1352/1502 BV/BP**  
(Silencer Item #800 Not Shown)

\* For the MI1352/1502 BV only  
\*\* For the MI1352/1502 BP only



**MINK MI1354/1504 BV/BP**  
(Silencer Item #800 Not Shown)

\* For the MI1354/1504 BV only  
\*\* For the MI1354/1504 BP only



**MINK MI2122/2124 BV**  
 (Silencer Item #800 Not Shown)

**MINK MI1252 BV**  
(Silencer Not Shown)



## **Busch Inc. Factory Service Centers**

### **California**

#### **Kurt Kauffman**

13826 Struikman Road  
Cerritos, CA 90703  
562-926-8422

### **Illinois**

#### **Steve Looman**

430 Windy Point Drive  
Glendale Heights, IL 60139  
630-545-1310

### **New Jersey**

#### **Jose Concepcion**

39 Davis Street  
South Plainfield, NJ 07080  
908-561-3233

### **Puerto Rico**

#### **Angel Diaz**

#420 E. Street, Suite 4  
Minillas Industrial Park  
Bayamon, PR 00959-1901  
787-798-5045

### **Texas**

#### **Dave Parsons**

15411 Vantage Pkwy W., Suite 216  
Houston, TX 77032  
281-449-2381

### **Virginia**

#### **Mark Madeyski**

516 Viking Drive  
Virginia Beach, VA 23452  
757-463-7800

P/N 0872.908.099  
Models MI1122-MI2124  
MINK I/O/M/R 03/01 XX



**Busch, Inc.**  
516 Viking Drive  
Virginia Beach, Virginia 23452  
Phone: (757) 463-7800  
FAX: (757) 463-7407