



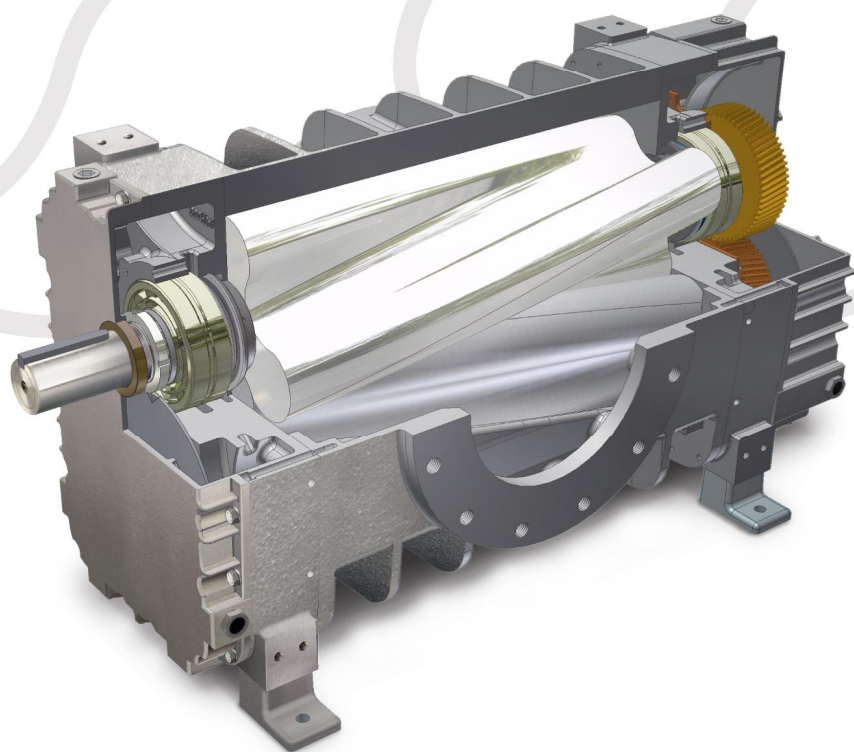
**PARTS LIST
OPERATING AND
SERVICE MANUAL**

HELIFLOW

**INDUSTRIAL
SERIES
BLOWERS**

5" GEAR DIAMETER

**Models
HYEL_AA
HYEL_AB**



**HF-7-602
Version: 06
January 6, 2017**

MAINTAIN BLOWER RELIABILITY AND PERFORMANCE WITH GENUINE GARDNER DENVER PARTS AND SUPPORT SERVICES

Factory genuine parts, manufactured to design tolerances, are developed for optimum dependability - - - specifically for your blower. Design and material innovations are born from years of experience with hundreds of different blower applications. When you specify factory genuine parts you are assured of receiving parts that incorporate the most current design advancements manufactured in our state-of-the-art blower factory under exacting quality standards.

Your AUTHORIZED DISTRIBUTOR offers all the backup you require. A worldwide network of authorized distributors provides the finest product support in the blower industry.

Your AUTHORIZED DISTRIBUTOR can support your blower investment with these services:

1. Trained parts technical representatives to assist you in selecting the correct replacement parts.
2. Complete inventory of new machines and new, genuine factory parts.
3. A full line of factory tested AEON[®] PD Series blower lubricants specifically formulated for optimum performance in all blowers.
4. Authorized distributor service technicians are factory-trained and skilled in blower maintenance and repair. They are ready to respond and assist you by providing fast, expert maintenance and repair service.

INSTRUCTIONS FOR DETERMINING BLOWER CONFIGURATION

1. Face the blower drive shaft.
2. In a **VERTICAL** configuration, air flow is horizontal.
3. In a **HORIZONTAL** configuration, air flow is vertical.
4. In a vertical configuration, a **BOTTOM HAND** exists when the drive shaft is below the horizontal center line of the blower. A **TOP HAND** exists when the drive shaft is above the horizontal center line of the blower.
5. In a horizontal configuration, a **RIGHT HAND** exists when the drive shaft is to the right of the vertical center line of the blower. A **LEFT HAND** exists when the drive shaft is to the left of the vertical center line of the blower.

INSTRUCTIONS FOR ORDERING REPAIR PARTS

For pricing, and ordering information contact your nearest AUTHORIZED FACTORY DISTRIBUTOR. When ordering parts, specify Blower **MODEL** and **SERIAL NUMBER** (see nameplate on unit).

Rely upon the knowledge and experience of you AUTHORIZED DISTRIBUTOR and let them assist you in making the proper parts selection for your blower.

To Contact Gardner Denver or locate your local distributor:

Visit: www.contactgd.com/blowers

or

call: (800)372-2222

FOREWORD

Gardner Denver® blowers are the result of advanced engineering and skilled manufacturing. To be assured of receiving maximum service from this machine, the owner must exercise care in its operation and maintenance. This book is written to give the operator and maintenance department essential information for day-to-day operation, maintenance and adjustment. Careful adherence to these instructions will result in economical operation and minimum downtime.



! DANGER

Danger is used to indicate the presence of a hazard which will cause severe personal injury, death, or substantial property damage if the warning is ignored.



! WARNING

Warning is used to indicate the presence of a hazard which can cause severe personal injury, death, or substantial property damage if the warning is ignored.



! CAUTION

Caution is used to indicate the presence of a hazard which will or can cause minor personal injury or property damage if the warning is ignored.

NOTICE

Notice is used to notify people of installation, operation or maintenance information which is important but not hazard-related.

SAFETY PRECAUTIONS

Safety is everybody's business and is based on your use of good common sense. All situations or circumstances cannot always be predicted and covered by established rules. Therefore, use your past experience, watch out for safety hazards and be cautious. Some general safety precautions are given below:



Failure to observe these notices could result in injury to or death of personnel.

- **Keep fingers and clothing away** from blower inlet and discharge ports, revolving belts, sheaves, drive coupling, etc.
- **Do not use the air discharge** from this unit for breathing – not suitable for human consumption.
- **Do not loosen or remove** the oil filler plug, drain plugs, covers, or break any connections, etc., in the blower air or oil system until the unit is shut down and the air pressure has been relieved.
- **Electrical shock** can and may be fatal.
- **Blower unit must be grounded** in accordance with the National Electrical Code. A ground jumper equal to the size of the equipment ground conductor must be used to connect the blower motor base to the unit base.
- **Open main disconnect switch**, tag and lockout before working on the control.
- **Disconnect the blower** from its power source, tag and lockout before working on the unit – this machine is automatically controlled and may start at any time.



Failure to observe these notices could result in damage to equipment.

- **Stop the unit** if any repairs or adjustments on or around the blower are required.
- **Disconnect the blower** from its power source, tag and lockout before working on the unit – this machine is automatically controlled and may start at any time.
- **Do not exceed** the rated maximum speed values shown on the nameplate.
- **Do not operate unit** if safety devices are not operating properly. Check periodically. Never bypass safety devices.
- **Ensure proper rotation of blower prior to start-up.** Failure to do so may result in damage to the blower.

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GARDNER DENVER HELIFLOW INDUSTRIAL SERIES BLOWERS MATRIX/MENU

NOTICE TO CUSTOMER . To find the construction options for
Your blower unit, FILL IN THE BALANCE OF LETTERS OR
NUMBERS FROM YOUR UNIT NAMEPLATE

	H	Y	E		B	A	
COLUMN NUMBER:	1	2	3	4	5	6	7
FOLLOW THE LINE DOWN AND OVER FROM EACH SPACE THUS FILLED IN TO FIND THE APPROPRIATE CONSTRUCTION OPTION WITH WHICH YOUR MACHINE IS EQUIPPED.							
COLUMN 1 . BASIC DESIGNATOR _____							
COLUMN 2 . PRODUCT FAMILY _____							
COLUMN 3 . GEAR DIAMETER _____							
A.			F. 6+				
B.			G.				
C. 4+			H.				
E. 5+							
COLUMN 4 . CASE LENGTH _____							
L - Low Pressure (HF 514)							
COLUMN 5 . CONFIGURATION _____							
E. Std Blower . Vertical-Bottom Hand-Right Discharged Timed, CCW							
F. Std Blower . Vertical-Bottom Hand-Left Discharge Timed, CW							
G. Std Blower . Vertical-Top Hand-Right Discharge Timed, CW							
H. Std Blower . Vertical-Top Hand-Left Discharge Timed, CCW							
J. Std Blower . Horizontal-Right Hand-Bottom Discharge Timed CW							
K. Std Blower . Horizontal-Right Hand-Top Discharge Timed CCW							
L. Std Blower . Horizontal-Left Hand-Top Discharge Timed CW							
M. Std Blower . Horizontal-Left Hand-Bottom Discharge Timed CCW							
COLUMN 6 . DESIGN VERSION _____							
COLUMN 7 . ADDITIONAL DESCRIPTION _____							
A. Lip Seal							
B. Mech. Seal							

INTRODUCTION

YOUR KEY TO TROUBLE FREE SERVICE

Thank you for investing in Gardner Denver quality. The Gardner Denver reputation for rugged dependability has been earned by over 50 years of service in demanding, industrial operations where downtime cannot be tolerated and efficient blower performance is expected.

Your Gardner Denver blower is a precision engineered blower that has been carefully manufactured and thoroughly tested at the state-of-the-art Gardner Denver Blower Factory in Sedalia, Missouri.

As with other precision machinery, there are several relatively simple installation, operation and maintenance procedures that you must observe to assure optimum blower performance. There is no guesswork in the manufacture of your highly advanced Gardner Denver blower and there must be none in preparing the blower to get the job done in the field.

The purpose of this manual is to help you properly install, operate and maintain your Gardner Denver blower. It is essential that you review all sections of this manual in preparation for installing your blower. Follow the instructions carefully and you will be rewarded with trouble-free Gardner Denver service 5 year in and year out.

IMPORTANT GARDNER DENVER TELEPHONE NUMBERS

YOUR AUTHORIZED GARDNER DENVER DISTRIBUTION

NAME: _____

TELEPHONE: _____

FAX: _____

CONTACT: _____

THANKS 5 FOR THE PRIVILEGE OF SERVING YOU WITH DEPENDABLE GARDNER DENVER QUALITY.

SECTION 1 EQUIPMENT CHECK

Before uncrating, check the packing slip carefully to be sure all the parts have been received. All accessories are listed as separate items on the packing slip, and small important accessories such as relief valves can be overlooked or lost. After every item on the packing slip has been checked off, uncrate carefully. Register a claim with the carrier for lost or damaged equipment.



Customers are cautioned to provide adequate protection, warning and safety equipment necessary to protect personnel against hazards involved in installation and operation of this equipment in the system or facility.

STORAGE

Your Gardner Denver Blower was packaged at the factory with adequate protection to permit normal storage for up to six (6) months.

If the unit is to be stored under adverse conditions or for extended periods of time, the following additional measures should be taken to prevent damage.

1. Store the blower in a clean, dry, heated (if possible) area.
2. Make certain inlet and discharge air ports are tightly covered to prevent foreign material from entering the air box.
3. All exposed, non-painted surfaces should be protected against rust and corrosion.
4. Provide adequate protection to avoid accidental mechanical damage.
5. In high humidity or corrosive environments, additional measures may be required to prevent rusting of the blower internal surfaces.
6. To prevent rusting of gears, bearings, etc., the oil reservoirs may be filled with normal operating oil.



Before running the blower, drain the oil and replace to the proper operating level with clean, fresh lubricant.

7. Rotate the blower shaft (10 to 25 turns) monthly during storage. Inspect the blower shaft (near the shaft seal area) monthly and spray with rust inhibitor if needed.
8. For long term storage (over six (6) months), contact Gardner Denver Customer Service for recommendations.

REMOVING PROTECTIVE MATERIALS

The shaft extension is protected with rust inhibitor which can be removed with any standard solvent.



Follow the safety directions of the solvent manufacturer.

Blower inlet and outlet are temporarily capped to keep out dirt and other contaminants during shipment. These covers must be removed before start-up.

The internal surfaces of all HeliFlow blowers are mist sprayed with a rust preventative to protect the machine during shipment. Remove this film upon initial startup, using any commercial safety solvent. Position the blower so that the inlet and discharge connections are in the vertical position (vertical airflow). On vertically mounted units, it will be necessary to lay the unit on its side supporting the ends of the unit so as not to restrict the portion on the bottom side. Place a shallow pan on the under side of the unit. With the blower disconnected from power, spray the solvent in the top port, rotating the impellers by spinning the shaft manually. Continue this procedure until the unit is visibly clean.



Rotating components will cause severe injury in case of personal contact. Keep hands away from blower inlet and discharge ports.

SECTION 2 INSTALLATION

LOCATION

If possible, install the blower in a well lit, clean, dry place with plenty of room for inspection and maintenance.

FOUNDATIONS

For permanent installations we recommend concrete foundations be provided, and the equipment should be grouted to the concrete. It is necessary that a suitable base be used, such as a steel combination base under blower and motor, or a separate sole plate under each. Before grouting, equipment must be leveled, free of all strains, and anchored so no movement will occur during setting of grout. After grout has completely hardened, a recheck is necessary to compensate for shrinkage, etc. If required, add shims under blower feet after final tightening of foundation anchor bolts to remove strain from the blower housing. Where jack screws or wedges are used during grouting, they must be backed off or removed before final tightening of anchor bolts.

Where a concrete foundation is not feasible, care must be taken to insure that equipment is firmly anchored to adequate structural members.

MOUNTING CONFIGURATIONS

The blower flex-mounting design enables horizontal and vertical mounting configurations with top or bottom hand, right or left hand shaft positioning. The units are discharge timed allowing rotation in only one direction (refer to FIGURE 2-1 page 12, FIGURE 2-2 page 13. If converting a blower from vertical bottom hand drive to vertical top hand drive or vice versa, the oil slinger on each end must be moved to the lower rotor.

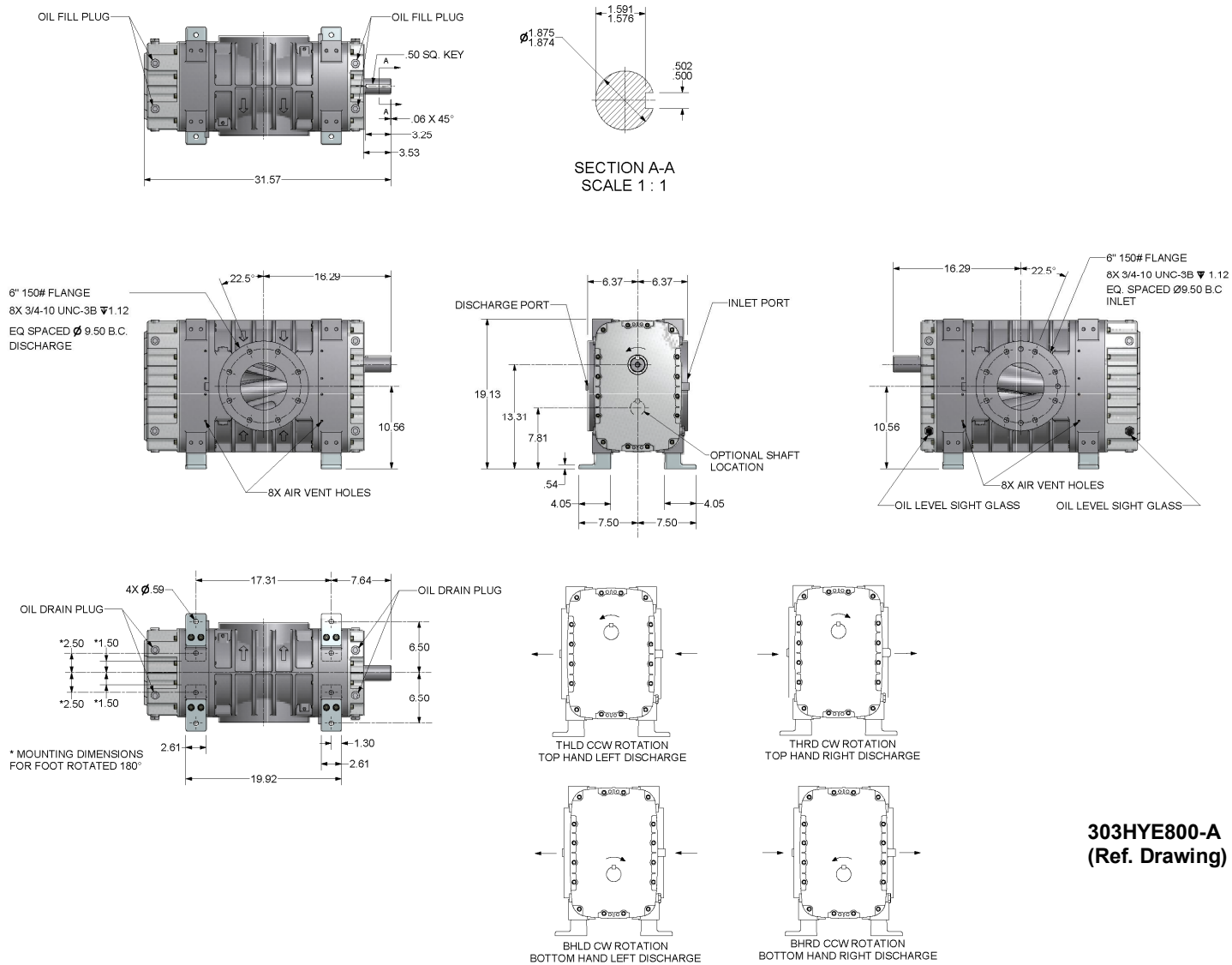


FIGURE 2-1 – VERTICAL BLOWER MOUNTING CONFIGURATIONS AND OUTLINE

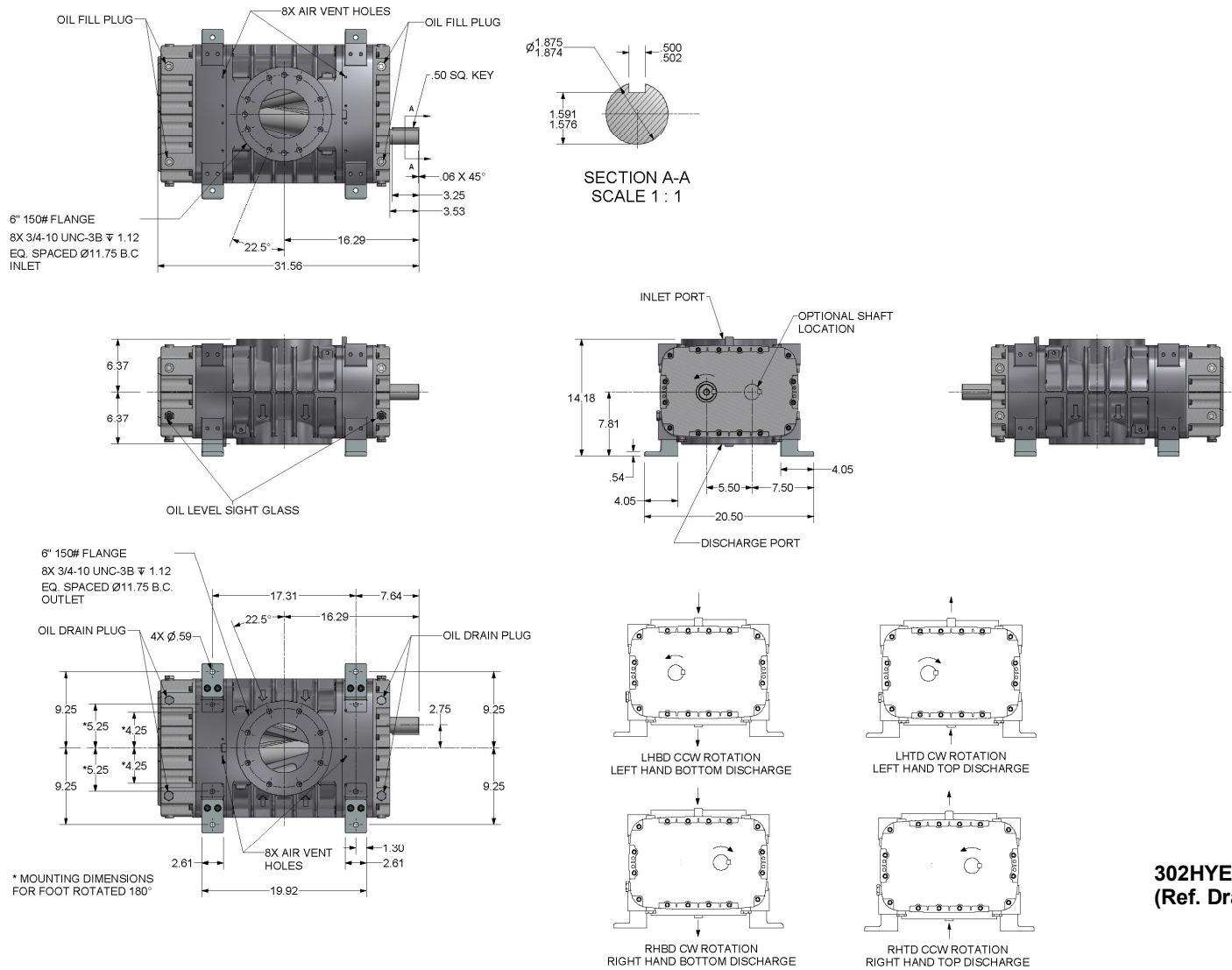


FIGURE 2-2 – 514 BLOWER MOUNTING CONFIGURATIONS AND OUTLINE

NOTICE

When changing mounting configuration, it will be necessary to reposition oil level gauge (H), and drain plug (A). Refer to FIGURE 3-1, page 17, for correct location.

WARNING

For Vertical Models, the oil slinger must be on the lower rotor or blower failure is immediate.

DRIVE INSTALLATION

When selecting a V-belt drive, check to be sure the shaft overhung load limitation is not exceeded. Refer to FIGURE 2-3, page 15, for overhung load calculations and limitations.

Belt drives must be carefully aligned. Motor and blower pulleys must be parallel to each other and in the same plane within 1/32 inch. Belt tension should be carefully adjusted to the belt manufacturer's recommendation using a belt tension gauge. Check tension frequently during the first day of operation.

WARNING

Over tightening belts leads to heavy bearing loads and premature failure.

On the direct connected units, alignment and lubrication of couplings to specifications of the coupling manufacturer is very important. When mounted drives are supplied from the factory, proper alignment has been established before shipment. However, during shipping, handling and installation, it is likely that the alignment has been disturbed and final adjustment must be made before startup.

WARNING

Exceeding overhung load limitations leads to unwarrantable premature bearing failure and shaft breakage.

The location of the sheave on the blower shaft greatly affects the stress in the shaft. The optimum blower sheave positioning is as close as possible to the blower drive cover, not to exceed dimension $\frac{1}{2}$ in Drive Shaft Illustration, FIGURE 2-3, page 15.

The calculated shaft moment must not exceed the maximum allowable moment listed in Maximum Allowable Moment Chart, FIGURE 2-3, page 15. If the calculated shaft moment exceeds the maximum allowable moment:

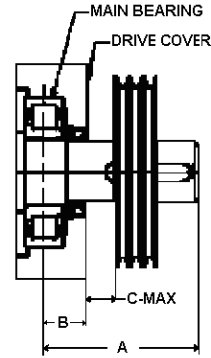
- “ Increase Sheave Diameters to Reduce Belt Pull
- “ Use Jackshaft Drive
- “ Use Direct Coupled or Gearbox Drive

To calculate shaft moment for a given V-Belt Drive Arrangement:

1. Use the formula for Calculation of Belt Pull, FIGURE 2-3, page 15, to calculate belt pull. Refer to Arc of Contact Factor Chart, FIGURE 2-3, page 15.
2. Insert the calculated belt pull into the formula for Calculation of Shaft Moment, FIGURE 2-3, page 15 to arrive at the calculated shaft moment.

Gear Diameter (Inches)	Dimensions (Inches)			Maximum Allowable Moment (LB-IN)
	A	B	C (Max)	
5	6.7	3.12	0.25	8100

MAXIMUM ALLOWABLE MOMENT



DRIVE SHAFT ILLUSTRATION

Z	Ac	Z	Ac	Z	Ac	Z	Ac	Z	Ac	Z	Ac
0.000	1.000	0.250	0.966	0.500	0.926	0.750	0.879	1.000	0.823	1.250	0.751
0.025	0.997	0.275	0.962	0.525	0.922	0.775	0.874	1.025	0.816	1.275	0.742
0.050	0.994	0.300	0.958	0.550	0.917	0.800	0.869	1.050	0.810	1.300	0.734
0.075	0.990	0.325	0.954	0.575	0.913	0.825	0.864	1.075	0.803	1.325	0.725
0.100	0.987	0.350	0.951	0.600	0.908	0.850	0.858	1.100	0.796	1.350	0.716
0.125	0.983	0.375	0.947	0.625	0.904	0.875	0.852	1.125	0.789	1.375	0.706
0.150	0.980	0.400	0.943	0.650	0.899	0.900	0.847	1.150	0.782	1.400	0.697
0.175	0.977	0.425	0.939	0.675	0.894	0.925	0.841	1.175	0.774	1.425	0.687
0.200	0.973	0.450	0.935	0.700	0.889	0.950	0.835	1.200	0.767		
0.225	0.969	0.475	0.930	0.725	0.884	0.975	0.829	1.225	0.759		

ARC OF CONTACT FACTORS

Belt Pull = $\frac{2.5 \cdot Ac}{Ac}$ $\frac{125954 \times Hp \times S.F.}{D \times RPM}$

Key: Ac = Arc of Contact Factor (Refer to Arc of Contact Factor Chart above)
 Hp = Blower Horsepower for Operating Conditions
 S.F. = Actual Drive Service Factor
 D = Blower Sheave Pitch Diameter in Inches
 RPM = Blower Sheave Speed

Z = $\frac{\text{Large Sheave Pitch Diameter (in)} \cdot \text{Small Sheave Pitch Diameter (in)}}{\text{Sheave Center Distance (in)}}$

CALCULATION OF BELT PULL

Shaft Moment (LB-IN) = Belt Pull \times $\left[B + C + \left(\frac{\text{Sheave Width}}{2} \right) \right]$

CALCULATION OF SHAFT MOMENT

FIGURE 2-3 – BELT DRIVE OVERHUNG LOAD CALCULATIONS

PIPING

Inlet and discharge connections on all blowers are large enough to handle maximum volume with minimum friction loss. Reducing the pipe diameter on either inlet or discharge will only create additional line loss and increase the overall pressure differential.

Excessive weight of piping and fittings will cause internal misalignment and premature wear. Never allow the blower to carry the weight of the pipe. If possible, a spool or sleeve-type expansion joint should be installed between the unit and the piping. Where a flexible connection is not practical, the weight of the rigid connection must be separately supported. All system piping must be cleaned internally before connecting to the blower.



Gardner Denver blowers are shipped dry from the factory. Do not attempt to operate the blower before following proper lubrication instructions. Permanent damage to the gears, bearings and seals will occur.

SECTION 3 MAINTENANCE

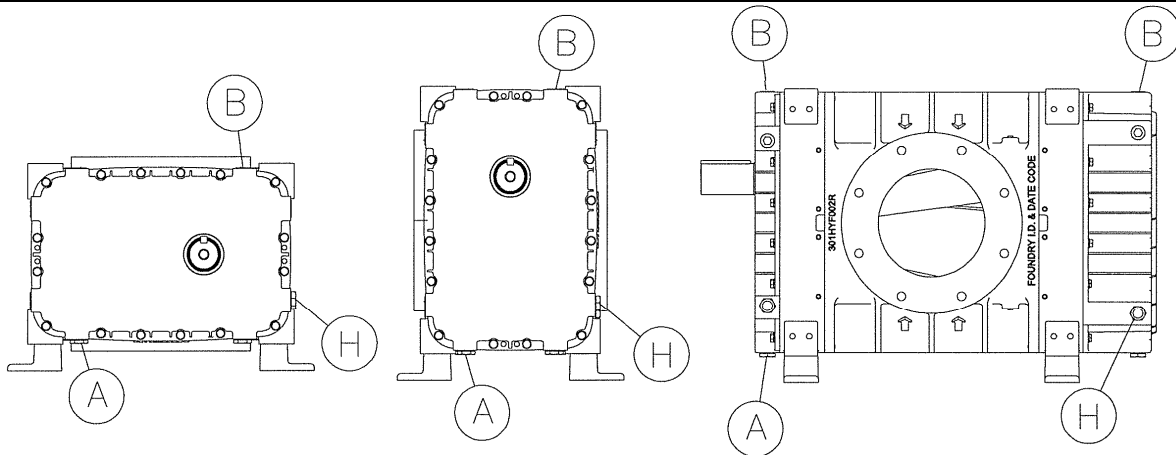


FIGURE 3-1 - LUBRICATION

- A. Oil Drain Plug
- B. Plug/Oil Fill
- H. Oil Level Sight Gauge

GENERAL

Blower efficiency and life depend on the quality of maintenance the blower receives. Maintenance must be done regularly and with care. Clean work space, tools, solvents and wiping rags are necessary to avoid transferring dirt into the unit. Scheduling regular maintenance of the blower will insure long trouble-free service.

LUBRICATION

Gears and bearings are splash lubricated by an oil slinger in each sump. Check the oil level in both sumps daily. Do not operate the blower if the oil level is not in the middle of the sight gauge for each sump when the blower is not running. An overfill or excess of oil can cause oil leaks. **DO NOT**

OVERFILL OIL.

FILLING PROCEDURE

Refer to FIGURE 3-1. **While the blower is not running** remove the plug (B) from each sump. Add oil to each sump until it reaches the **middle** of each oil level sight gauge (H). After adding oil wait for oil level to stabilize. Add or remove oil to maintain oil level at middle of oil level sight gauge. Secure the plug (B) in each end.

LUBRICATION SERVICE

Add fresh oil as required to maintain proper level. The oil change period is governed by operating conditions such as load, temperature, dirt, humidity, fumes and the quality of the oil used. The oil drain plug is located at (A). With AEON PD Series synthetic blower lubricant, perform the above oil-change maintenance after 4500 to 7500 hours.



Do not overfill oil as this will tend to cause excessive heating of the gears and may damage the unit. An overfill of oil can cause oil leaks.

RECOMMENDED LUBRICANT

Oil Fill Ports	Vertical	Horizontal
Shaft End	2.7	3.6
Gear End	3.0	5.4

Figure 3-2 – APPROXIMATE OIL CAPACITIES (PINTS)

GARDNER DENVER LUBRICANT ORDER INFORMATION

Re-order Part Numbers for AEON PD Series Factory-Recommended Synthetic Lubricants.

AEON PD Synthetic Lubricant

<u>Description</u>	<u>Part Number</u>
1 Quart	28G23
Case/ 12 Quarts	28G24
1 Gallon	28G40
5 Gallon Pail	28G25
55 Gallon Drum	28G28

AEON PD-Food Grade Synthetic Lubricant

<u>Description</u>	<u>Part Number</u>
1 Quart	28H97
Case/ 12 Quarts	28H98
1 Gallon	28H333
5 Gallon Pail	28H99
55 Gallon Drum	28H100

AEON PD-XD Extreme Duty Synthetic Lubricant

<u>Description</u>	<u>Part Number</u>
1 Quart	28G46
Case/ 12 Quarts	28G47
1 Gallon	28G42
5 Gallon Pail	28G44
55 Gallon Drum	28G45

Call your local Gardner Denver distributor to place your order for Gardner Denver Lubricants. Your Authorized Gardner Denver Distributor is:

AEON PD Series Lubricant is formulated especially for positive displacement blower service to provide maximum blower protection at any temperature. One fill of AEON PD Series Lubricant will last a minimum of 4 times longer than a premium mineral oil. Refer to FIGURE 3-3, page 19.

		Ambient Temperatures				
		Less than 10 ⁰ F *	10 ⁰ F to 32 ⁰ F **	32 ⁰ F to 60 ⁰ F	60 ⁰ F to 90 ⁰ F	Greater than 90 ⁰ F
Blower Discharge Temperatures	Less than 32 ⁰ F	AEON PD AEON PD FG	AEON PD AEON PD FG			
	32 ⁰ F to 100 ⁰ F	AEON PD AEON PD FG	AEON PD AEON PD FG	AEON PD AEON PD FG AEON PD XD	AEON PD AEON PD FG AEON PD XD	
	100 ⁰ F to 200 ⁰ F	AEON PD AEON PD FG	AEON PD AEON PD FG	AEON PD AEON PD FG AEON PD XD	AEON PD AEON PD FG AEON PD XD	AEON PD AEON PD FG AEON PD XD
	200 ⁰ F to 300 ⁰ F	AEON PD AEON PD FG	AEON PD AEON PD FG	AEON PD AEON PD FG AEON PD XD	AEON PD XD	AEON PD XD
	Greater than 300 ⁰ F		AEON PD AEON PD FG	AEON PD XD	AEON PD XD	AEON PD XD

* For ambient temperatures less than 10⁰ F, but not less than -20⁰ F, the use of oil sump heaters or heated enclosures is required.

** For ambient temperatures 10⁰ F to 32⁰ F, the use of oil sump heaters or heated enclosures is recommended.

FIGURE 3-3 – SYNTHETIC LUBRICANT CHART

AIR FILTERS AND FILTER SILENCERS



Servicing the air filters is one of the most important maintenance operations to be performed to insure long blower life.

Servicing frequency of filter elements is not time predictable. A differential pressure indicator, with a continuous gauge reading, should be installed across the inlet filter. It will tell how much of the service life of the filter element has been used. It will also eliminate both premature filter servicing and premature blower failure due to a plugged filter when the filter pressure drop is used to establish maintenance points.

In all cases refer to the filter manufacturer's service instructions. Due to the many types of filters, it is not practical to give specific instructions covering all models.

NOTICE

No matter what type of filter is used, always make sure all seats, gaskets, clamps and hose connections on the filter and inlet line are absolutely air tight. Each time the filter is serviced, inspect interior of the blower for dirt.

PERIODIC INSPECTIONS

A good maintenance program will provide for periodic inspections of the blower and drive components. The following inspections may prevent major repairs and downtime:

1. Observe the blower for vibration, heating, noise, oil leaks and excessive air leaks.
2. Check for proper operation of the filters, silencers, couplings, drive belts, motor (or power unit), relief valve, check valve, gauges and other controls.
3. Disconnect the drive and turn the blower by hand to check for drag, tight spots, bearing wear and gear backlash. Rotation should be free with no indication of drag or metallic interference.
4. Inspect the interior of the blower through the inlet or discharge port for cleanliness, corrosion and contact of internal parts.
5. Check the tightness of all screws, bolts and nuts.

SECTION 4 OPERATION

Future operating problems can be avoided if proper precautions are observed when the equipment is first put into service.

NOTICE

Machines are shipped without oil in the sumps. Do not operate before adding lubricant.

Before starting under power, the blower should be turned over by hand to make certain there is no binding, or internal contact.

Each size blower has limits on pressure differential, running speed and discharge temperature which must not be exceeded. These limits are shown in the following tabulation. Refer to FIGURE 4-1, page 21.

WARNING

Operating beyond the specified operating limitations will result in damage to the unit.

It is important that the pressures and temperatures are measured directly at the ports of the blower to avoid error that may be caused by intervening pipe runs, fittings, etc.

Relief valves should be used to protect against excessive pressure or vacuum conditions. These valves should be tested at initial startup to be sure they are adjusted to relieve at or below the maximum pressure differential rating of the blower.

NOTICE

Relief valves should be placed as close as possible to the blower inlet or discharge.

In some instances, pressure may be relieved at a lower point than the blower maximum in order to protect the motor or the equipment served by the blower.

Discharge temperature switches are recommended to protect against excessive inlet restriction or inlet temperatures. Check valves in the discharge line on pressure blowers and in the inlet line on vacuum blowers are recommended to protect the blower from motoring backwards when shut down under load.

LIMITATIONS

For information regarding limitations, refer to FIGURE 4-1, page 21.

MAXIMUM OPERATING LIMITATIONS					
SIZE	RPM	PRESSURE PSI	VACUUM IN HG	TEMPERATURE RISE ° F	DISCHARGE TEMPERATURE ° F
HF 514	4000	15	17	250	350
DO NOT EXCEED THESE LIMITS					
NOTICE					
Blower speed, line losses, elevation, and increased inlet temperatures will affect the maximum operating limitations.					

FIGURE 4-1 – MAXIMUM OPERATING LIMITATIONS

BLOWER STARTUP CHECKLIST

This startup procedure should be followed during the initial installation and after any shutdown periods or after the blower has been worked on or moved to new location. It is suggested that the steps be followed in sequence and checked off (✓) in the boxes provided.

1. Check the unit and all piping for foreign material and clean if required.
2. Check the flatness of the feet and the alignment of the drive. Feet that are bolted down in a bind can cause housing distortion and internal rubbing. Misaligned V-drives can cause the impellers to rub against the headplates and cause a reduction in the volumetric efficiency of the unit. Misaligned couplings can ruin bearings.
3. If the blower is V-belt driven, check the belt tension and alignment. Over-tensioned belts create heavy bearing loads which lead to premature failure.
4. Be sure adequate drive guards are in place to protect the operator from severe personal injury from incidental contact.
5. Check the unit for proper lubrication. Proper oil level cannot be over-emphasized. Too little oil will ruin bearings and gears. Too much oil will cause overheating and can ruin gears and cause other damage. Too much oil can cause oil leaks.
6. With motor electrical power locked out and disconnected, turn the drive shaft by hand to be certain the impellers do not bind.
7. ~~Log~~log the unit with the motor a few times to check that rotation is in the proper direction, and to be certain it turns freely and smoothly.
8. The internal surfaces of all Gardner Denver units are mist sprayed with a rust preventive to protect the machine during the shipping and installation period. This film should be removed upon initial startup.
9. Start the unit and operate 15 minutes at no load. During this time, check for hot spots and other indications of interference.
10. Apply the load and observe the operation of the unit for one hour. Check frequently during the first day of operation.
11. If malfunctions occur, do not continue to operate. Problems such as knocking rotors can cause serious damage if the unit is operated without correction.

SAFETY PRECAUTIONS

1. Do not operate blower with open inlet or outlet port.
2. Do not exceed specified vacuum or pressure limitations.
3. Do not operate above or below recommended blower speed range.
4. Blower is not to be used where non-sparking equipment is specified.
5. Do not operate without belt guard or coupling shield.



Do not exceed sheave or coupling manufacturer's rim speed limit.

6. The blower and blower discharge piping may be extremely hot and can cause skin burns on contact.

TROUBLE SHOOTING

No matter how well the equipment is designed and manufactured, there may be times when servicing will be required due to normal wear, the need for adjustment, or various external causes. Whenever equipment needs attention, the operator or repairman should be able to locate the cause and correct the trouble quickly. The Trouble Shooting Chart below is provided to assist the mechanic in those respects.

PROBLEM	POSSIBLE CAUSE	SOLUTION
Knocking	<ol style="list-style-type: none"> 1. Unit out of time. 2. Distortion due to improper mounting or pipe strains. 3. Excessive pressure differential. 4. Worn gears. 5. Worn bearings. 	<ol style="list-style-type: none"> 1. Retime impellers. 2. Check mounting alignment and relieve pipe strains. 3. Reduce to manufacturer's recommended pressure. Examine relief valve, re-set if necessary. 4. Replace timing gears. 5. Replace bearings.
Excessive blower temperature.	<ol style="list-style-type: none"> 1. Too much oil in gear case. 2. Too low operating speed. 3. Clogged filter or muffler. 4. Excessive pressure differential. 5. Worn impeller clearances. 6. Internal contact. 	<ol style="list-style-type: none"> 1. Reduce oil level. 2. Increase blower speed. 3. Remove cause of obstruction. 4. Reduce pressure differential across the blower. 5. Replace impeller. 6. Correct clearances.
Impeller end or tip drag.	<ol style="list-style-type: none"> 1. Insufficient assembled clearances. 2. Case or frame distortion. 3. Excessive operating pressure. 4. Excessive operating temperature. 	<ol style="list-style-type: none"> 1. Correct clearances. 2. Check mounting and pipe strain. 3. Remove causes. 4. Remove causes.
Lack of volume.	<ol style="list-style-type: none"> 1. Slipping belts. 2. Worn clearances. 3. Dirty air filter 	<ol style="list-style-type: none"> 1. Tighten belts. 2. Re-establish proper clearances. 3. Clean or replace air filter
Excessive bearing or gear wear.	<ol style="list-style-type: none"> 1. Improper lubrication. 	<ol style="list-style-type: none"> 1. Correct lubrication level. Replace dirty oil.
Loss of oil.	<ol style="list-style-type: none"> 1. Bearing housing vents plugged. 2. Worn seal. 	<ol style="list-style-type: none"> 1. Clean vents. 2. Replace seals.

**SECTION 5
SPECIAL TOOLS**

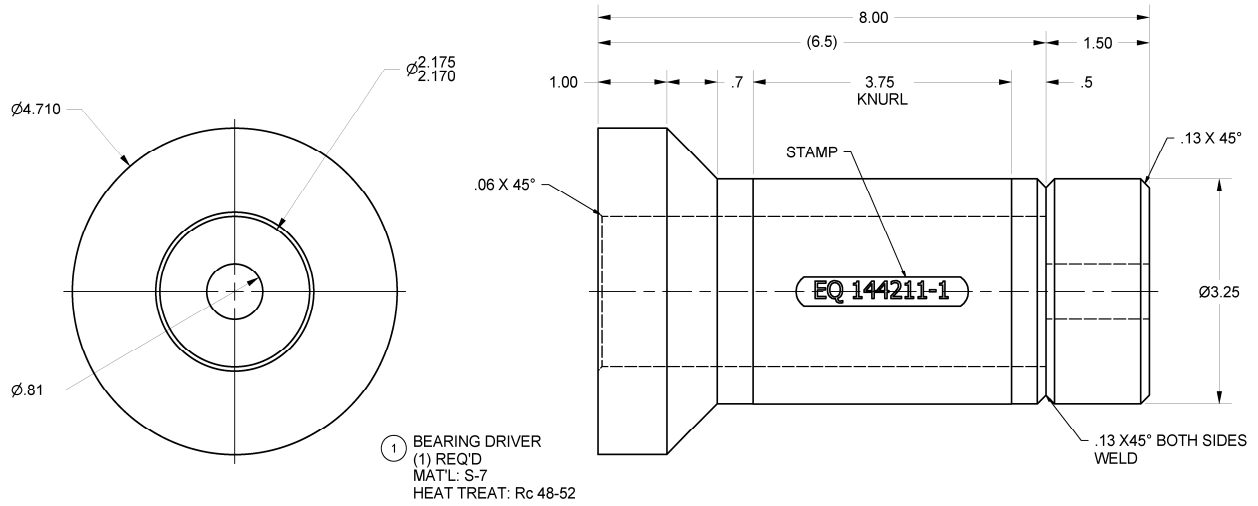


Figure 5-1 – BEARING DRIVER (EQ144211-1)

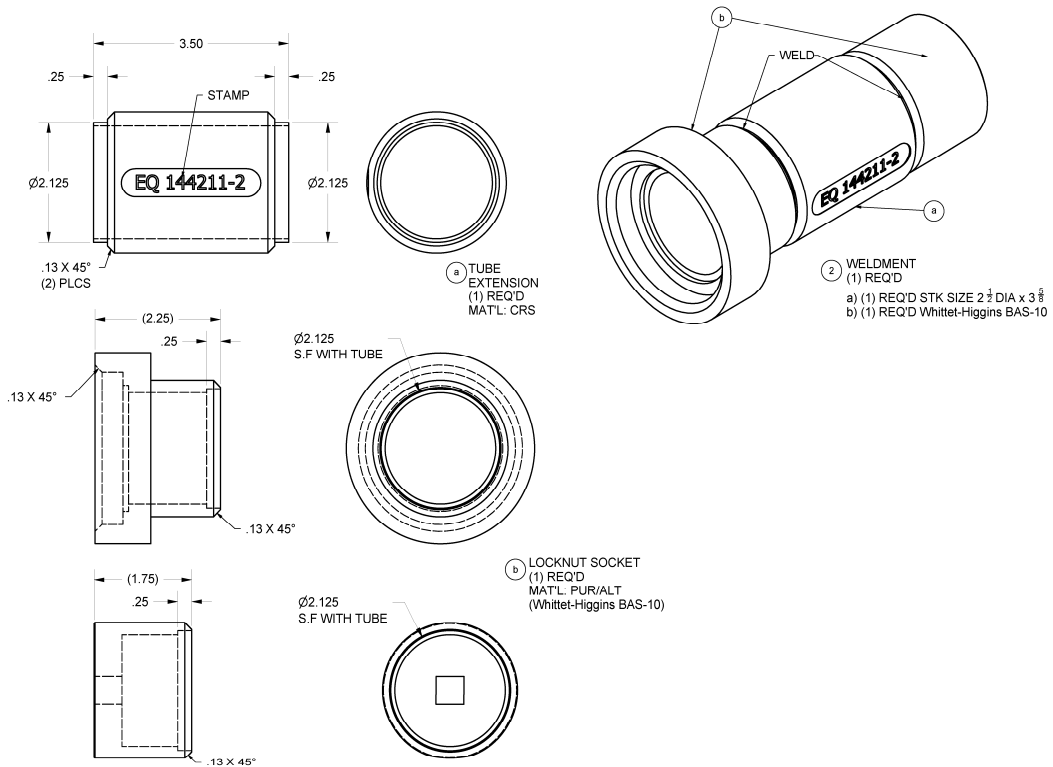


Figure 5-2 – LOCKNUT SOCKET (EQ144211-2)

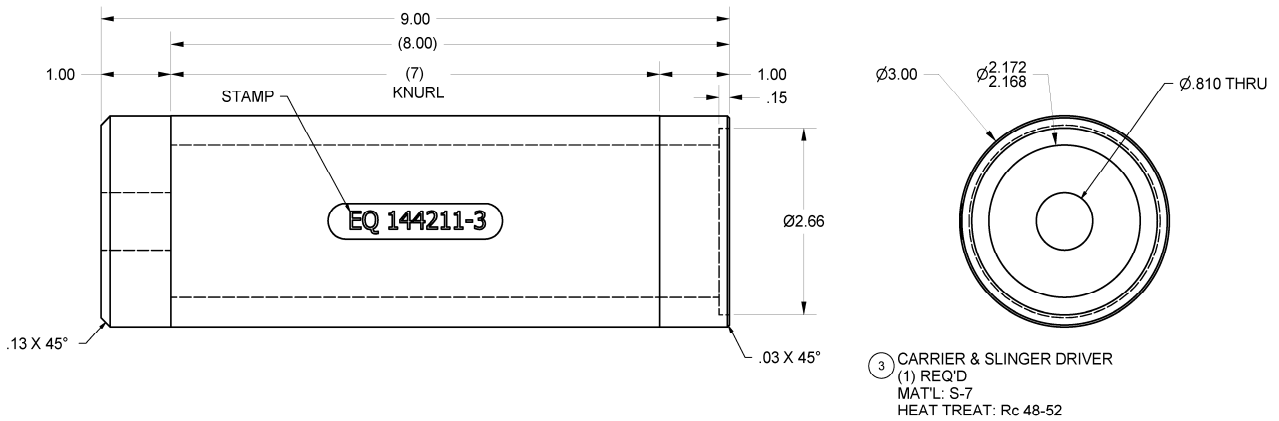


Figure 5-3 – CARRIER & SLINGER DRIVER (EQ144211-3)

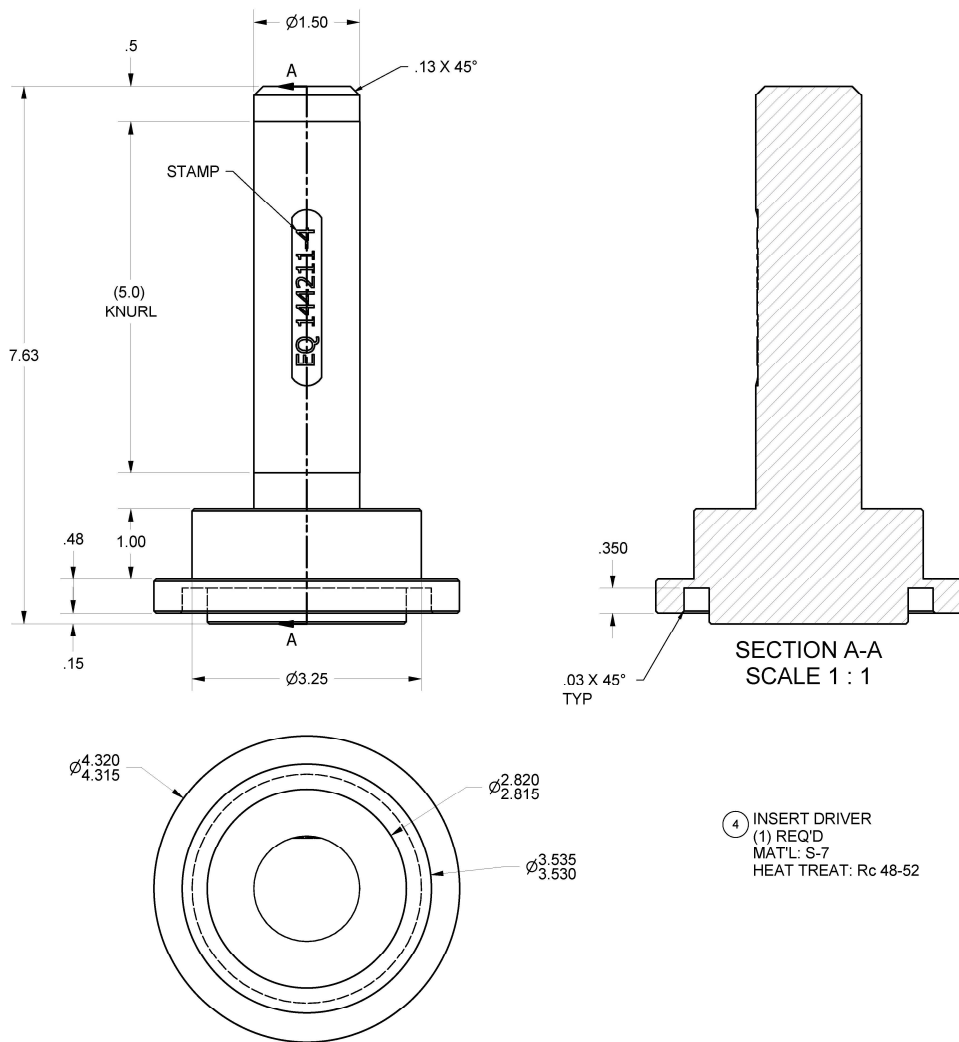


Figure 5-4 – INSERT DRIVER (EQ144211-4)

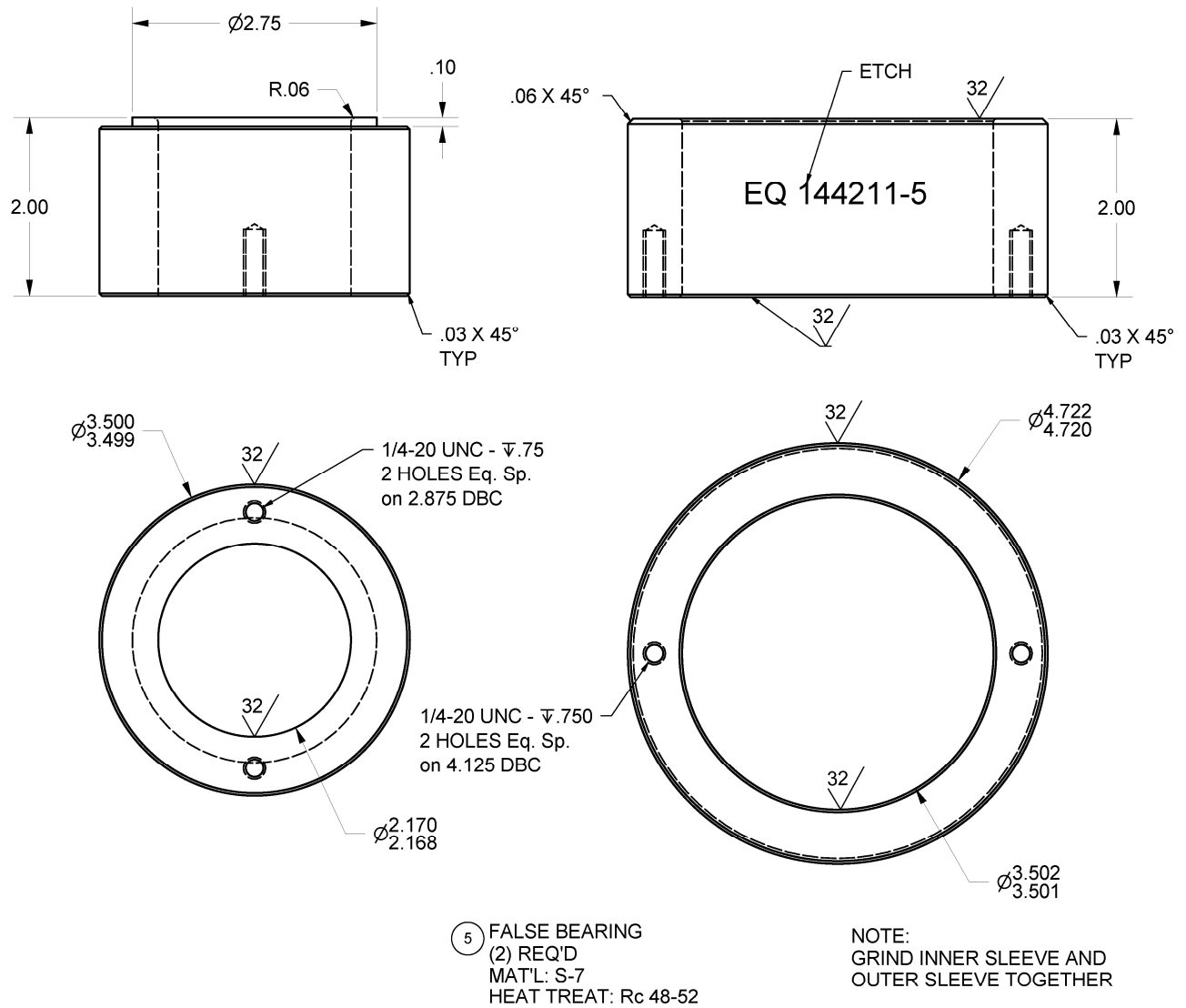


Figure 5-5 – FALSE BEARING (EQ144211-5)

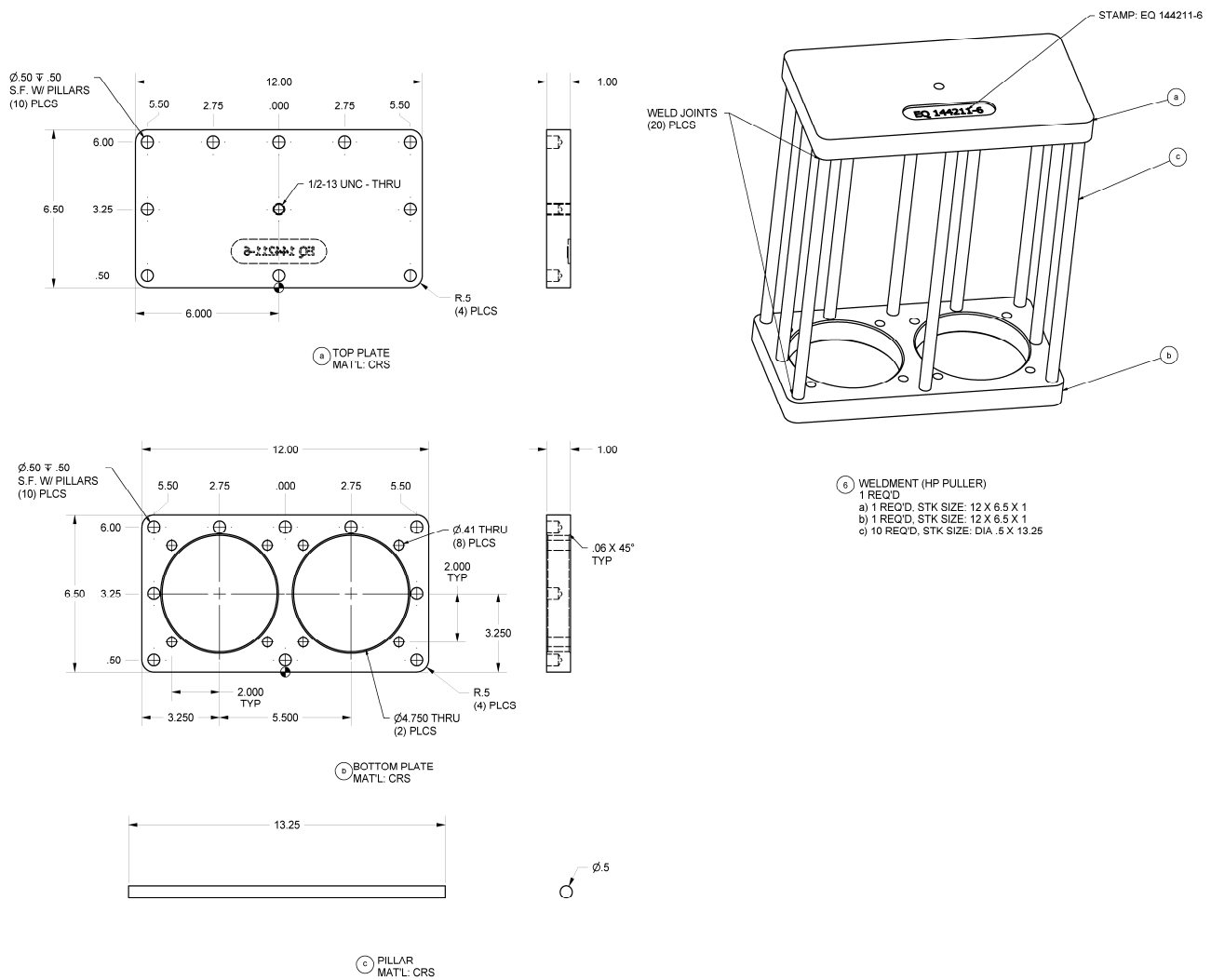


Figure 5-6 – SLINGER / BEARING HOUSING PULLER (EQ144211-6)

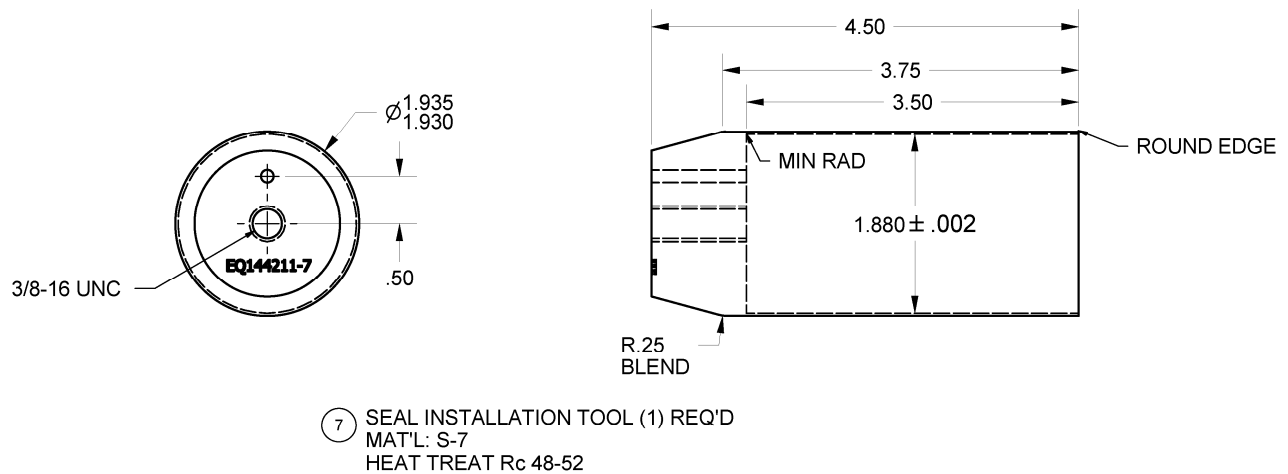
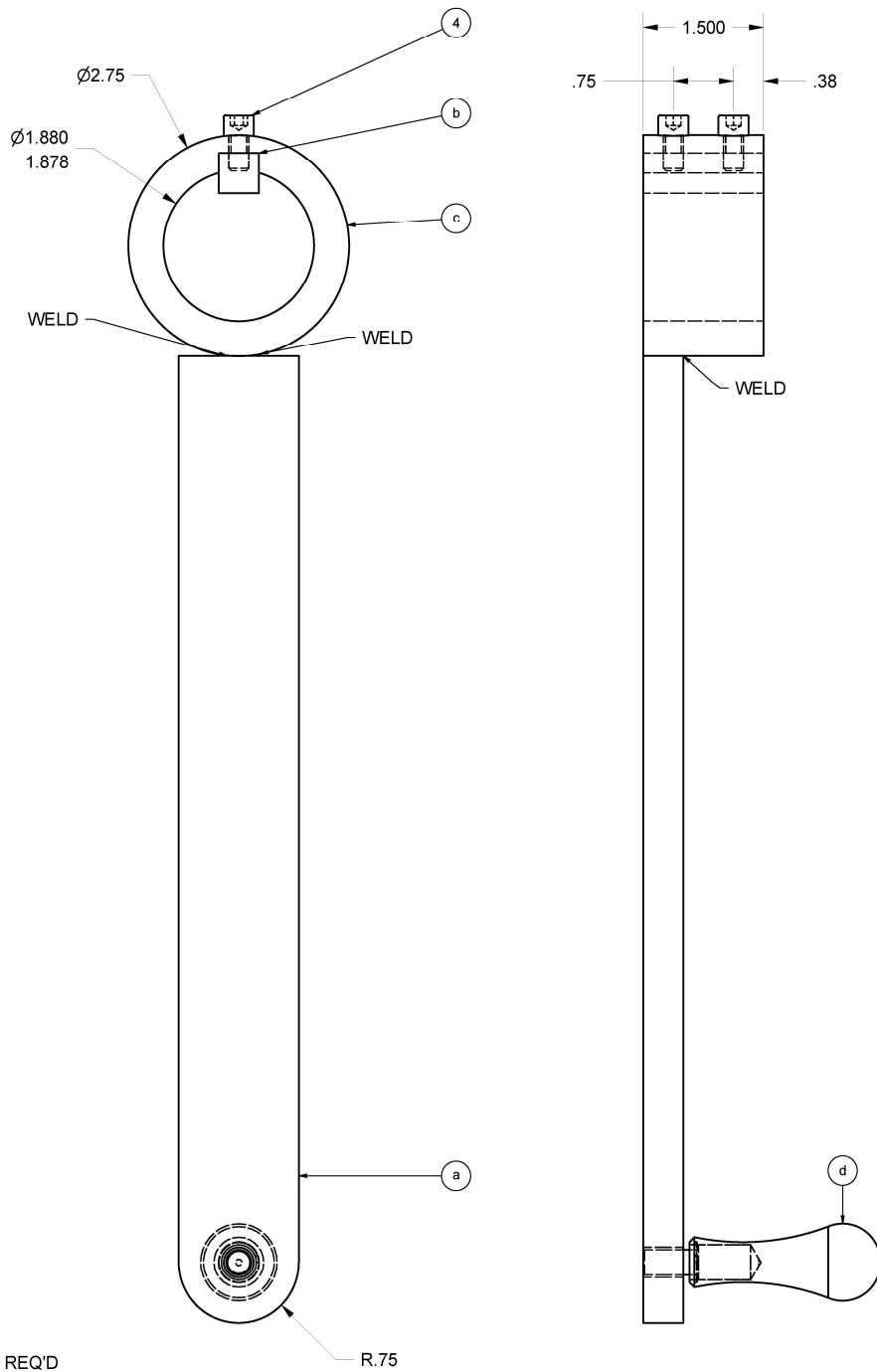
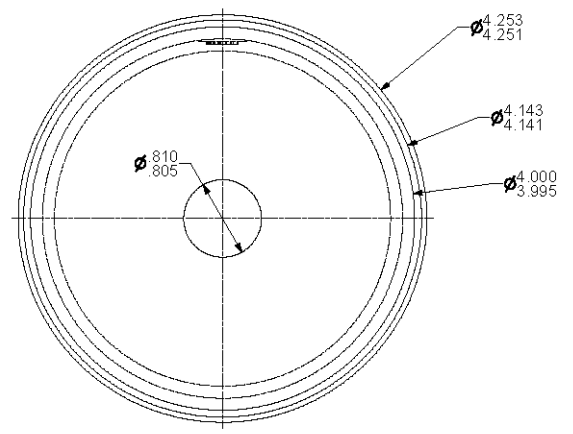
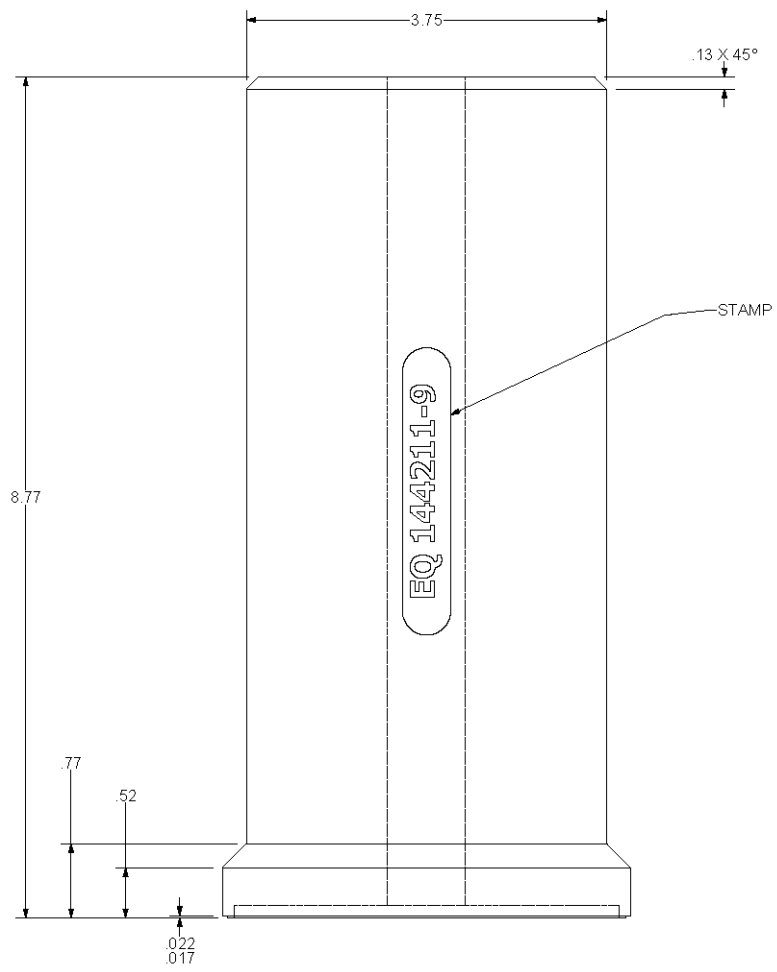


Figure 5-7 – SEAL INSTALLATION SLEEVE (EQ144021-7)



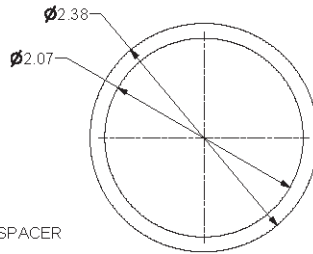
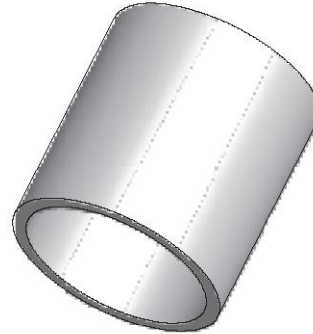
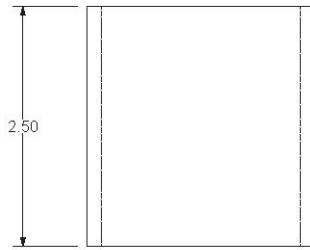
- 8 CRANK - WELDMENT (1) REQ'D
 MAT'L: HRS
- a) (1) REQ'D, STK SIZE: $\frac{1}{2} \times 1 \frac{1}{2} \times 12$
 - b) (1) REQ'D, STK SIZE: $\frac{1}{2} \times \frac{1}{2} \times 1 \frac{1}{2}$
 - c) (1) REQ'D, STK SIZE: DIA $2 \frac{3}{4} \times 1 \frac{1}{2}$
 - d) (1) REQ'D, MATERIAL #: MCMMASTER 6037K25
 - e) (2) REQ'D, $\frac{1}{4} - 20 \times \frac{7}{16}$

Figure 5-8 – HAND CRANK (EQ144211-8)



MECHANICAL SEAL DRIVER
 (1) REQ'D
 MAT'L: S-7
 HEAT TREAT: Rc 48-52

Figure 5-9 - MECHANICAL SEAL DRIVER (EQ144211-9)



- 10 FALSE BEARING SPACER
- (1) REQ'D
- a) (1) REQ'D STK SIZE 2 3/8 X 2 1/2
- MATL: CARBON STEEL

Figure 5-10 – FALSE BEARING SPACER (EQ144211-10)

SECTION 6

DISASSEMBLY INSTRUCTIONS

Required tooling:

- Trunnion should be used during disassembly. If a trunnion is not available, an overhead hoist and heavy duty work table can be used. Work table should be capable of holding 700+ lbs.
 - Gear puller
 - Hydraulic cylinder, portable, hollow center
 - (2) 3/4-10 eye bolts
 - (2) 1/2-13 eye bolts
1. Inspect interior of blower for any signs of rotor contact (rotor to rotor, rotor tip to case, rotor end to bearing housing). If signs of contact exist, use feeler gauges to measure clearances and record.
 2. Inspect areas around drive shaft seal and vent passages in the bearing housing and air cylinder for any signs of oil leaks.
 3. Drain oil from gear-end and drive-end sumps by removing drain plugs (41). A small amount of oil from each sump should be saved in the event that an oil analysis will be required.
 4. Remove drive-end sump cover (5) by removing key (35) and screws (27 & 31). Slide cover off drive shaft.
 5. Inspect drive shaft where shaft seal mates for damage and wear. Inspect oil seal (37).
 6. Remove shaft seal by supporting external surface of drive-end sump cover near shaft seal with blocks of wood and driving the oil seal from the cover using a seal driver tool (slightly smaller diameter than seal bore) and a press or small hammer.
 7. Remove gear-end sump cover (5) by removing bolts (27 & 31)
 8. Using nut driver tool EQ144211-2, remove locknuts (24), washers (25), oil slinger (23), and spacers (20) from gear-end of rotor shaft.
 9. Inspect gears (18) for damage or excessive wear. Measure gear backlash using a dial indicator with a magnetic base. Lock idler rotor from turning by wedging a shop rag between rotor tip and air cylinder. Position dial indicator tip on drive rotor gear tooth perpendicular to gear. Rotate gear in both directions to measure total backlash. Backlash should be measured in three places (every 1/3 rotor rotation) and be 0.0028-0.0042".
 10. Match mark gears by making small punch marks on ends of two meshing teeth.
 11. Remove timing gear and shrink disk assembly (19) by loosening the 12 bolts. If necessary, remove the three bolts with washers to access 3/8-16 tapped holes. Use three 3/8-16 bolts as jack bolts to break assembly.
 12. Using a gear puller, remove gear from idler rotor.
 13. Remove bearing retaining plate bolts (17) and washers (16) from bearing housing.
 14. Using nut driver tool EQ144211-2, remove locknuts (24), oil slinger (23), and spacers (21 & 22) from drive-end of rotor shaft.
 15. Attach mounting bracket to inlet side of air cylinder and mount blower on a trunnion and rotate until gear-end of unit is up.

16. Remove socket head bolts (29) that attach the gear-end bearing housing (3) to air cylinder (1).
17. Using bearing housing puller EQ144211-6, remove gear-end bearing housing. Install fixture and place hydraulic cylinder between rotor shaft and fixture as shown in FIGURE 6-1. Apply pressure back and forth between both rotor shafts evenly until bearing housing is free. Bearings (14), shims (39), and internal slingers (11) will be removed in this process.

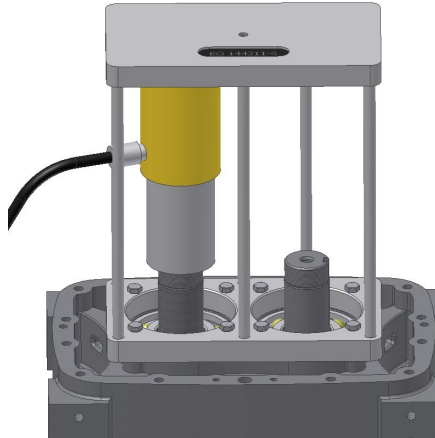



Figure 6-1 – BEARING HOUSING REMOVAL

18. Reinstall gear-end bearing housing with two bolts (29) and rotate unit so drive-end is up.
19. Remove drive-end bearing housing (4) by repeating process in step 17.
20. Match mark rotors by making small punch marks on end of meshing lobes.
21. Using 3/4-10 UNC eye bolts and a hoist, remove both rotors (2) from cylinder.
22. Rotate unit so gear-end is up.
23. Remove two bolts (29) and remove gear-end bearing housing.
24. Position blower assembly horizontally.
25. Inspect piston rings (10) on both ends of both rotors for signs of damage and abnormal wear. Remove piston rings from each of the four ring carriers (9).
26. Inspect ring carriers for signs of damage and abnormal wear. Piston ring carrier replacement is typically not required. If no damage is visible, skip step 27.
27.  Remove ring carrier by placing rotors in a vertical position and heating ring carriers evenly with a torch. Caution should be used when performing this procedure as rotor can be damaged by uneven and/or extreme heating.
28. Inspect inserts (7) in bearing housings (two in each bearing housing) for signs of damage and abnormal wear. Insert replacement is typically not required. If no damage is visible, skip step 29.
29. Remove insert by removing retaining rings (8) and using a hydraulic press and suitable driver tool. It must be pressed from air side of bearing housing.

SECTION 7 ASSEMBLY INSTRUCTIONS - HYEL_AA

Required tooling:

- Trunnion and mounting plate - If a trunnion is not available, an overhead hoist and heavy duty work table can be used. Work table should be capable of holding 700+ lbs.
- Hydraulic Press
- 3/4-10 UNC threaded rod, Grade 8, 14" length
- 3/4" flat washer, Grade 8
- 3/4-10 UNC hex nut, Grade 8
- Hydraulic cylinder, portable, hollow center
- Torque wrench
- Induction heater or oven
- (2) 3/4-10 eye bolts
- (2) 1/2-13 eye bolts

1. Position drive rotor in a vertical orientation for piston ring carrier (9) installation.
2. Apply Loctite 620 to rotor shaft diameter next to rotor body. Reference FIGURE 7-1



Figure 7-1 – APPLY LOCTITE TO ROTOR SHAFT

LOCTITE 620 APPLIED TO ROTOR SHAFT



3. Heat piston ring carrier to 275° F.
4. Using heat resistant gloves remove piston ring carrier from heat source and quickly install onto rotor shaft so large diameter is closest to rotor body. Carrier should slide into position against step next to rotor face. If carrier does not easily install, use driver tool EQ144211-3 to ensure carrier is up against step next to rotor body until cooled. Reference FIGURE 7-2.

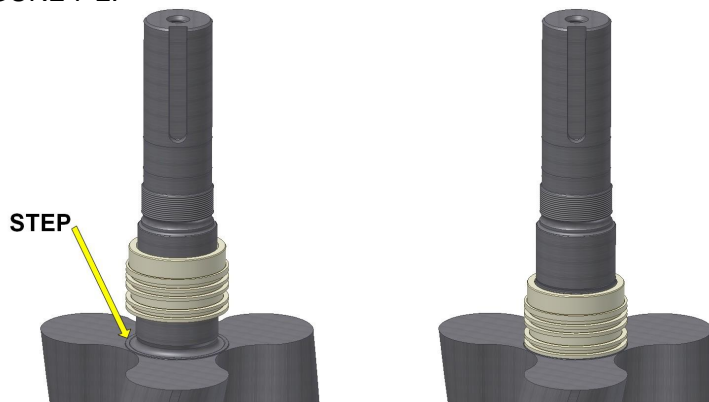


Figure 7-2 – PISTON RING CARRIER INSTALLATION

5. Repeat steps 1 through 4 for remaining piston ring carriers, also for idler (short) rotor.
6. Install piston rings (10) into the piston ring carrier on gear-end and drive-end of both rotors, one at a time, starting with ring closest to rotor body. Ensure ring ends are hooked together properly. Position ring end gaps 180° from each other.
7. Install bearing housing inserts.
 - 7a. Place drive-end bearing housing (4) in a horizontal position in a hydraulic press with air side surface facing down.
 - 7b. Apply a small continuous bead of Loctite 620 to insert mating face and through bore I.D. in bearing housing as shown in FIGURE 7-3.
 - 7c. Apply a continuous bead of Loctite 620 to bearing housing insert edges as shown in FIGURE 7-4.
 - 7d. Place an insert (7) in one of the insert bores in the bearing housing with drilled ports closest to air side of the bearing housing.
 - 7e. Orient inserts with drilled ports in 12:00 and 6:00 o'clock positions as shown in FIGURE 7-5.
 - 7f. Using driver tool EQ144211-3, press insert into bearing housing. Verify it does not extend beyond the air side surface of the bearing housing.

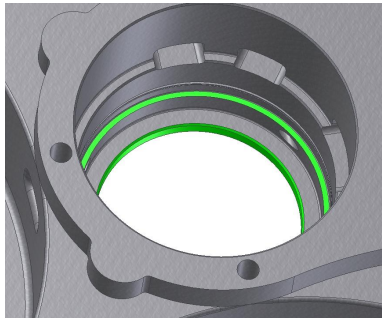


Figure 7-3 - LOCTITE 620 APPLIED TO BEARING HOUSING

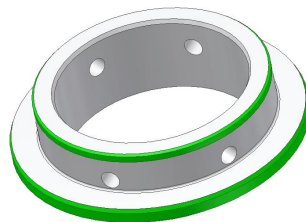


Figure 7-4 - LOCTITE 620 APPLIED TO INSERT

8. Install a retaining ring (8) into groove in bearing housing by inserting one end into groove while pushing down around the circumference until the entire ring is in groove. Reference FIGURE 7-5.

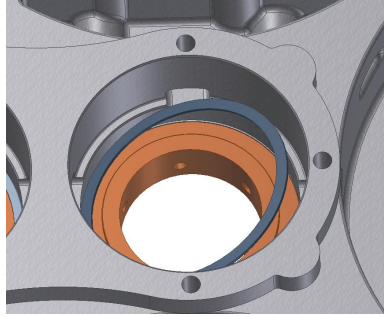


Figure 7-5 – RETAINING RING INSTALLATION

9. Repeat steps 7 and 8 for remaining insert and retaining ring.
 10. Repeat steps 7 through 9 for gear-end bearing housing (3).
 11. Attach mounting bracket to inlet port of air cylinder (1) and mount air cylinder on trunnion.
 12. Determine drive shaft (long rotor) location and rotational direction from blower model designation. Refer to arrows cast into air cylinder to determine air flow direction.
 13. Position air cylinder vertically with drive-end up.
 14. Install two dowel pins (34) into drive-end of air cylinder.
 15. Orient bearing housing so dowel holes align with dowels in air cylinder and mount drive-end bearing housing to air cylinder.
 16. Fasten drive-end bearing housing to air cylinder using two socket head bolts (29) in counter bored holes in bearing housing. Tighten bolts.
- Torque: 40 ft-lbs**
17. Rotate air cylinder vertically so drive-end is down. Verify adequate clearance for rotor shafts to extend through bearing housing.
 18. Apply light coat of AEON PD oil to inside diameter of two inserts in drive-end bearing housing. Do not apply oil to outside diameter of piston rings.
 19. Thread 3/4-10 eye bolts into the appropriate end of rotor shaft. Using a hoist, carefully install both rotors into air cylinder ensuring piston rings do not catch on insert. Verify long end of drive rotor extends through drive-end bearing housing and is in correct bore. Ensure rotation of each rotor matches arrows on outside of air cylinder. Ensure rotor lobe helix angles match triangular shape of discharge port. Reference FIGURE 7-6.

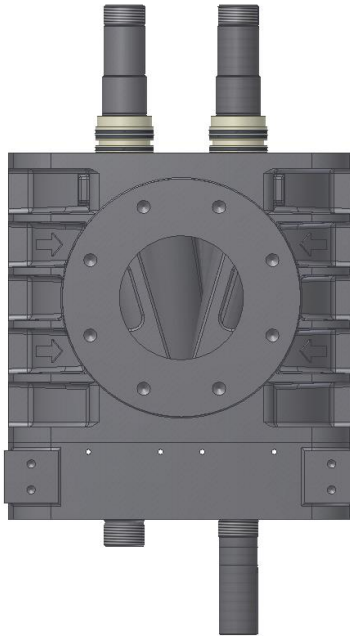


Figure 7-6 – ROTOR INSTALLATION

20. Using a depth micrometer, measure and record total rotor to bearing housing end clearance for each rotor. This is accomplished by measuring distance from top edge of air cylinder to top of rotor lobe while rotors are in vertical position.
21. Apply light coat of oil to inside diameter of two inserts in gear-end bearing housing. Do not apply oil to outside diameter of the piston rings.
22. Install two dowel pins (34) into gear-end of air cylinder.
23. Orient bearing housing so dowel holes align with dowels in air cylinder and mount gear-end bearing housing onto air cylinder.
24. Fasten gear-end bearing housing to air cylinder using two socket head bolts (29) in counter bored holes in the bearing housing. Carefully draw down bearing housing as not to damage piston rings. Tighten bolts.

Torque: 40 ft-lbs

25. Apply a continuous bead of Loctite 620 to internal slinger I.D. as shown in FIGURE 7-7 and place over rotor shaft onto piston ring carrier.



Figure 7-7 – LOCTITE 620 APPLIED TO INTERNAL SLINGER

26. Thread 3/4" pull rod into end of idler rotor shaft. Place slinger driver EQ144211-3 over pull rod. Place portable hydraulic cylinder over pull rod and onto driver tool. Install 3/4" flat washer and nut onto pull rod and draw slinger onto ring carrier. Ensure each slinger is seated against shoulder of piston ring carrier and is recessed below end of piston ring carrier.
27. Install slinger on drive-end similar to Step 25-26.
28. Place false bearing assembly EQ144211-5 over idler rotor shaft and into bearing bore. Reference FIGURE 7-8.

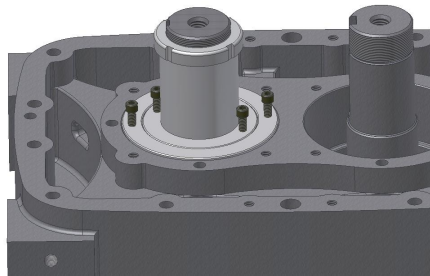


Figure 7-8 – FALSE BEARING INSTALLATION

29. Thread 3/4" eyebolt into end of idler rotor and lift rotor until ends of rotor lobes contact bearing housing.
30. Using a depth micrometer, measure and record distance from top surface of outer ring of false bearing to top surface of inner ring. Inner ring of the false bearing should extend above the outer ring .005-.007". If inner ring does not extend above outer ring .005-.007", lower rotor and remove eyebolt and false bearing. Install required shims (8) to achieve proper gear-end clearance. Repeat steps 28-30.
31. Lower rotor and remove eye bolt and false bearing.
32. Repeat steps 29 through 31 for drive (long) rotor.
33. Apply AEON PD oil to drive and idler rotor bearing bores in the gear-end bearing housing as well as internal surfaces and rollers of double angular contact bearings (14). Drain excess oil from bearing before installation. Oil should not be dripping from bearing in mounted position.
34. Install bearing by placing bearing over idler rotor shaft with the identification numbers facing up. Thread 3/4" pull rod into end of idler rotor shaft. Place bearing driver EQ144211-1 over pull rod. Place a portable hydraulic cylinder over pull rod and onto driver tool. Install 3/4" flat washer and nut onto pull rod and tighten it up against hydraulic cylinder. Reference FIGURE 7-9. Press bearing onto rotor shaft using hydraulic cylinder.

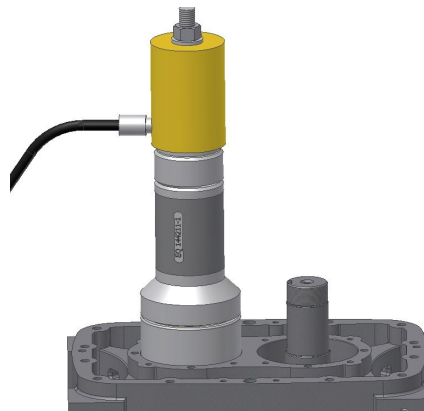


Figure 7-9 – BEARING INSTALLATION

Note: Maximum load applied to threaded rod must NEVER EXCEED 5 TONS.

35. Repeat step 34 to install bearing on gear-end of drive rotor shaft.
36. Verify gear-end axial clearance for both rotors. With gear-end up, rotate rotors so a feeler gauge can be inserted between end of the rotor lobe and the inner surface of the bearing housing. Clearance should be measured and recorded for all three lobes on both rotors.

Gear-end clearance: 0.005" min / 0.009" max (when rotors are pushed to drive end)

Note: Do not proceed with assembly if gear-end clearance is not correct! Refer to step 17 in Section 6 'Disassembly Instructions' to remove bearing housing. Repeat steps 25 through 36 making necessary shim adjustments to achieve proper gear-end clearance.

37. Install bearing retainer plate (15) onto gear-end bearing housing with eight bolts (17) and lock washers (16). Reference FIGURE 7-10.

Torque: 40 ft-lbs

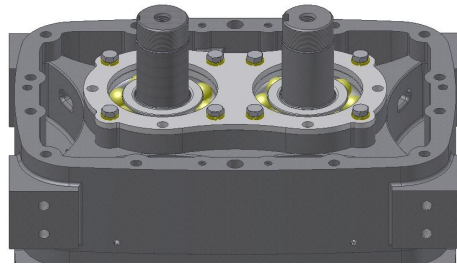


Figure 7-10 – BEARING RETAINER PLATE INSTALLATION

38. Rotate assembly vertical with drive-end on top.
39. Apply AEON PD oil to drive and idler rotor bearing bores in drive-end bearing housing. Lubricate internal surfaces and rollers of bearings with oil. Drain all excess oil from bearing before installation. Oil should not be dripping from bearing in mounted position.
40. Install spherical roller bearing (13) by placing bearing over drive rotor shaft with identification numbers facing up. Thread 3/4" pull rod into end of idler rotor shaft. Place bearing driver EQ144211-1 over pull rod. Place a portable hydraulic cylinder over pull rod and onto driver tool. Install 3/4" flat washer and nut onto pull rod and tighten against hydraulic cylinder. Press bearing onto rotor shaft using hydraulic cylinder. Reference FIGURE 7-9.

Note: Maximum load applied to threaded rod must NEVER EXCEED 5 TONS.


41. Repeat step 40 to install deep-groove ball bearing (12) on idler rotor shaft.
42. Verify drive-end axial clearance for both rotors. Rotate unit so gear-end is up. Rotate rotors into a position so a feeler gauge can be inserted between the end of the rotor lobe and the inner surface of the bearing housing. Clearance should be measured and recorded for all three lobes on both rotors.

Drive-end clearance: 0.017" min / 0.025" max (when rotors are pushed to drive end)

Note: Do not proceed with assembly if these drive end clearance is not correct!

43. Install key (36) into keyway on idler rotor shaft.

44. Thread pull rod into end of the idler rotor shaft.

45.  Heat pinion gear to 350° F.

46. Place heated gear onto idler rotor shaft (over pull rod) and align keyway with key in shaft. Place driver tool EQ144211-1 over pull rod. Reference FIGURE 7-11. Place portable hydraulic cylinder over pull rod and onto driver tool. Install 3/4" flat washer and nut onto pull rod and tighten against hydraulic cylinder. Press gear onto rotor shaft until tight against bearing inner race. Piston ring carrier, bearing inner race, and pinion gear must be clamped tight against rotor. To ensure gear remains tight against bearing race, do not remove tooling until gear has cooled to at least 120°F.

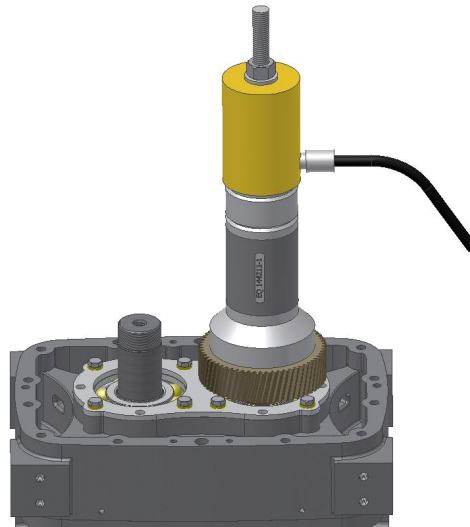


Figure 7-11 – PINION GEAR INSTALLATION

Note: Maximum load applied to threaded rod must NEVER EXCEED 5 TONS.

47. Remove assembly from trunnion and place in a horizontal position on a work table.

48. Measure rotor tip to air cylinder clearances for both rotors at inlet and discharge side of air cylinder. Clearance should be measured along entire length of lobe and for all three lobes on each rotor and recorded.

Rotor tip to case clearance (inlet): 0.011" min

Rotor tip to case clearance (discharge): 0.005" min

49. Clean and lightly apply AEON PD oil inside and outside diameter of timing gear hub where shrink disk half assembly mates.

Note: Do not use molybdenum disulfide, molykote, or any other similar lubricants!

50. Lightly oil bolt threads, bolt head bearing areas and tapered surfaces of inner ring of shrink disk half (19).

51. Install shrink disk assembly over timing gear hub projection. Insert locking bolts (metric) through collar and loosely screw them into threaded holes in timing gear.

52. Install shrink disk/timing gear assembly onto rotor shaft and align teeth so timing gear and pinion gear mesh. Firmly push against bearing inner race. Finger tighten the 12 locking bolts ensuring the gear can still be rotated on shaft. Reference FIGURE 7-12.

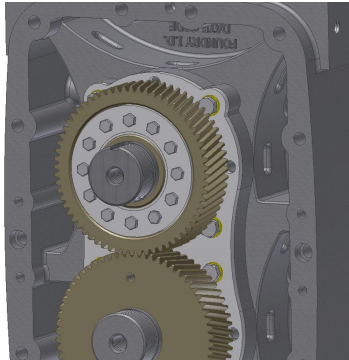


Figure 7-12 – SHRINK DISK/TIMING GEAR INSTALLATION

53. Verify total interlobe clearance. Through discharge port, insert feeler gauges between rotor lobes. Measurement is taken at pitch diameter of rotor lobes, just above widest cross sectional width of rotor lobe. Clearance is measured along entire length of meshing lobes for all three interlobe meshes.

Total interlobe clearance: 0.017" min

54. Set closed side interlobe clearance. Closed clearance is measured between two meshing rotor lobes inside air cylinder on trailing side of drive rotor lobe as it rotates in same direction of arrows cast in air cylinder. Measurement is taken at the pitch diameter of rotor lobes, just above widest cross sectional width of the rotor lobe. Clearance is measured along the entire length of meshing lobes for all three interlobe meshes.

54a. Lock idler rotor from turning by wedging a feeler gauge or shop rag between tip of a lobe and air cylinder at inlet port. Through discharge port, insert a 0.007+min feeler gauge between trailing side of drive rotor and meshing idler rotor (locked). Using a weighted shaft crank, apply rotational force to pull drive rotor tight against feeler gauge.

54b. While drive rotor is tight against feeler gauge, apply rotational force to timing gear in same direction until teeth firmly mesh against teeth on pinion gear. Using a socket, tighten bolts of the gear locking assembly in a diametrically opposite sequence only enough to secure timing gear to rotor shaft when applying rotational force by hand. Ensure gear is pressed firmly against bearing inner race.

Closed side interlobe clearance: 0.007" min

55. Verify open side interlobe clearance. Lock idler rotor from turning by wedging a feeler gauge or shop rag between tip of a lobe and air cylinder at discharge port. Apply rotational force to drive rotor in same direction of cast arrows on air cylinder. Measure clearance by inserting feeler gauge between leading side of drive rotor and meshing idler rotor (locked) at pitch diameter of rotor lobes through inlet port.

Open side interlobe clearance: 0.010" min

56. Tighten shrink disk bolts to 30 in-lbs in a diametrically opposite sequence and verify interlobe clearances are still within spec (See note below). Tighten shrink disk bolts to 106 in-lbs in a diametrically opposite sequence. Repeat process to ensure screws will not turn when 106 in-lbs is applied to them a second time.

Note: Do not turn any screw more than 1/4 turn during torque process!

57. Measure backlash of the gears using a dial indicator with a magnetic base. Gear backlash is distance (in the circumferential direction) a gear tooth can freely move when the mating gear is fixed and should be measured in three places (every 1/3 turn). Lock idler rotor from turning by wedging a feeler gauge or shop rag between tip of a lobe and air cylinder. Position indicator probe perpendicular to drive gear tooth in a 3 o'clock position. Apply rotational force to drive gear in opposite directions to obtain total backlash.

Gear backlash tolerance: .0027" min / .0040" max

58. Install shaft spacers (20) onto both rotor shafts on gear-end.

59. Install the oil slinger (23) on the gear-end of appropriate rotor shaft. For models with a fifth column that is a G, H, J, or K, oil slingers are mounted on idler rotor. For models with a fifth column that is an E, F, L, or M, oil slingers are mounted on drive rotor.

60. Install a bearing lock washer (25) and locknut (24) on the gear-end of both rotor shafts. Apply Loctite 246 to locknut threads prior to screwing it onto shaft. Use locknut tool EQ144211-2 and a torque wrench to tighten locknut. Bend one tab of lock washer into a slot in the locknut.

Torque: 85 ft-lbs

61. Install drive rotor spacer (21), idler rotor spacer (22), oil slinger (23), and bearing locknuts (24) onto drive-end of rotor shafts. Reference step 59.

Note: No lock washers are used with drive-end bearing locknuts.

62. Using a pump type oil can, apply AEON PD oil to all four bearings. Turn rotors to distribute oil throughout bearings.

63. Install shaft seal (37). Verify shaft seal bore in drive-end sump cover (4) is clean, dry, and free of nicks or burrs. Lay cover flat with external surface facing up. Support area under seal bore with a block of wood. Position shaft seal with flat side of seal casing facing outward and cupped side inward. Using tool EQ144211-1, drive shaft seal into sump cover until flat side of seal casing is flush with external surface. Apply AEON PD oil to both lips of shaft seal.

64. Slide protective sleeve EQ144211-7 over drive shaft. Apply AEON PD oil to outside surface of sleeve. Gently slide drive-end sump cover over drive shaft. Reference Figure 7-13

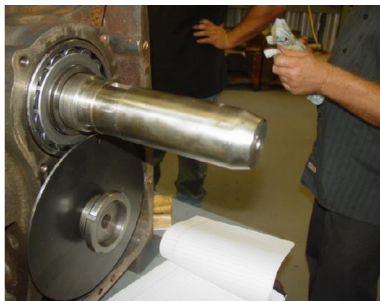


Figure 7-13 – DRIVE-END SUMP COVER INSTALLATION

65. Attach sump cover to bearing housing using four socket head cap screws (31) in two center holes on each long side of cover. Install and tighten remaining screws in a diametrically opposed pattern (27).

Torque: 37 ft-lbs

66. Remove protective sleeve from drive shaft.

67. Apply Loctite 515 gasket eliminator to the flange of sump cover prior to installation.

68. Attach sump cover to gear end bearing housing using four socket head cap screws (31) in two center holes on each long side of cover. Install remaining screws (27). Tighten all screws.

Torque: 37 ft-lbs

69. Install plugs (32) in the four instrument holes in the air cylinder near the inlet and discharge ports.

70. Install oil level sight glass (28) in appropriate location each sump cover. Apply Loctite 243 to threads of each sight glass.

71. Install magnetic plugs (41) in appropriate holes of each sump cover.

72. Install plugs (26) in remaining holes in each sump cover.

Note: There are no external sump breathers used on this blower.

73. Install four mounting feet (38) to air cylinder with eight screws (30). Feet should be pointing outward from air cylinder center line. Tighten screws.

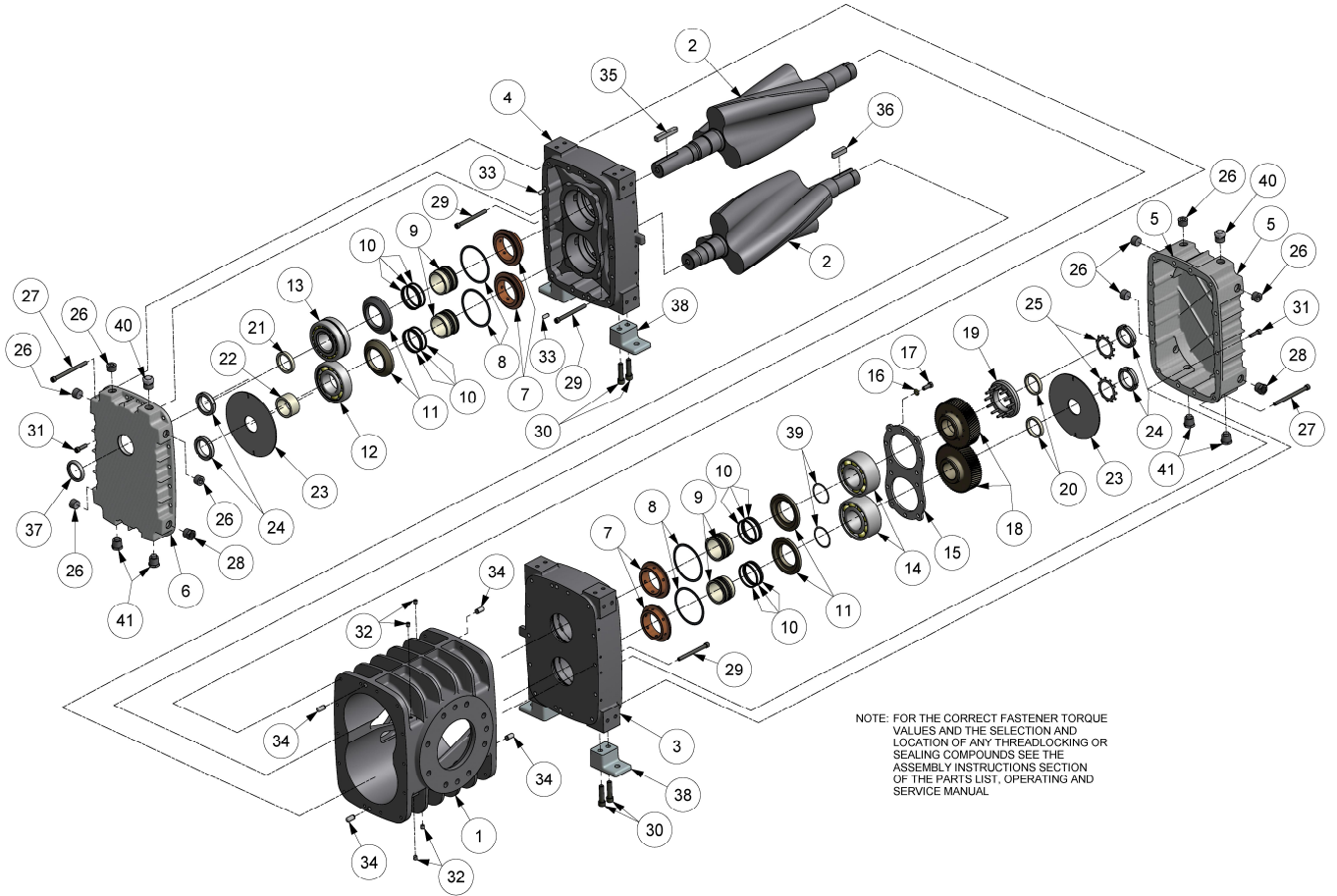
Torque: 100 ft-lbs.

74. Measure runout of drive shaft using a dial indicator and a magnetic base.

Drive shaft runout: .001" max

75. Install drive shaft key (35) into keyway in drive rotor shaft.

**SECTION 8
PARTS LIST - HYEL_AA**



**300HYE810-D
(Ref. Drawing)**

Order by Part Number and Description. Reference Numbers are for your convenience only.

Ref. No.	Description	No. Req.	MODEL 514 HYEL_AA
1	CYLINDER.....	1	300HYE002
2	ROTOR GROUP		
	CLOCKWISE DRIVE ROTATION	1	302HYE4028
	COUNTER CLOCKWISE DRIVE ROTATION	1	303HYE4028
3	HOUSING-BEARING GEAR	1	301HYE006
4	HOUSING-BEARING DRIVE	1	300HYE006
5	COVER-GEAR	1	300HYE602
6	COVER-DRIVE.....	1	300HYE477
7	INSERT.....	4	300HYE248
8	RETAINING RING	4	74D38
9	CARRIER-PISTON RING.....	4	300HYE1148
**10	PISTON RING	12	300HYE163
11	INTERNAL-SLINGER	4	300HYE173
**12	BALL BEARING.....	1	80107339
**13	BEARING-SPHERICAL	1	903639090110
**14	BEARING-DBL ANGL CONTACT	2	8500162
15	RETAINER PLATE-BEARING.....	1	300HYE253
16	WASHER-LOCK.....	40	95B3
17	SCREW	8	655ED040
18	KIT-GEAR.....	1	302HYE601
19	HALF SHRINK DISC.....	1	22G46
20	SPACER GEAR END	2	301HYE144
21	SPACER DRIVE END, LONG	1	300HYE144
22	SPACER DRIVE END, SHORT	1	302HYE144
23	SLINGER-OIL SUMP	2	301HYE173
**24	LOCKNUT-BRG	4	50Z10
**25	WASHER BEARING, LOCK.....	2	95N10
26	PLUG	8	64AC5
27	SCREW	24	75P70
28	GAUGE-OIL LEVEL.....	2	40P45
29	SCREW	4	75P67
30	SCREW	8	76P77
31	SCREW	8	75P56
32	PLUG.....	4	64AC1
33	DOWEL PIN	2	62M48
34	DOWEL PIN	4	62M82
35	KEY-SQUARE.....	1	35L110
36	KEY-SQUARE.....	1	8500115
**37	SEAL SHAFT	1	VP1032092
38	FOOT.....	4	301HYF166
**39	SET SHIM.....	2	77H53
40	VENT PLUG.....	2	5L369
41	PLUG-MAGNETIC.....	4	64BJ4

*NOT SHOWN

** INCLUDED IN OVERHAUL KIT

SECTION 9

ASSEMBLY INSTRUCTIONS - HYEL_AB

Required tooling:

- Trunnion and mounting plate - If a trunnion is not available, an overhead hoist and heavy duty work table can be used. Work table should be capable of holding 700+ lbs.
- Hydraulic Press
- 3/4-10 UNC threaded rod, Grade 8, 14" length
- 3/4" flat washer, Grade 8
- 3/4-10 UNC hex nut, Grade 8
- 3/4" Wrench
- Hydraulic cylinder, portable, hollow center
- Torque wrench
- Induction heater or oven
- (2) 3/4-10 eye bolts
- (2) 1/2-13 eye bolts

1. Position drive rotor in a vertical orientation for mechanical seal spacer (42) installation.
2. Apply Loctite 620 to rotor shaft diameter next to rotor body. Reference FIGURE 9-1.



Figure 9-1 – LOCTITE 620 APPLIED TO ROTOR SHAFT



3. Heat mechanical seal spacer to 275° F.
4. Using heat resistant gloves, remove spacer from heat source and quickly install onto rotor shaft so large diameter of spacer is closest to rotor body. Spacer should slide into position against rotor body step. If spacer does not easily install, use driver tool EQ144211-3 to ensure spacer is up against rotor body step until cooled. Reference FIGURE 9-2.

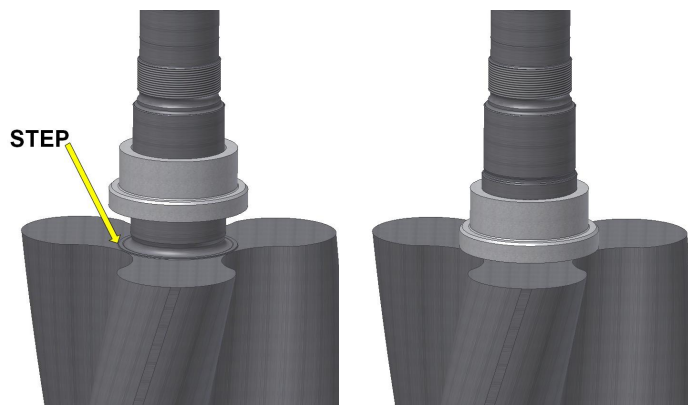


Figure 9-2 – MECHANICAL SEAL SPACER INSTALLATION

5. Repeat steps 1 through 4 for remaining mechanical seal spacers, also for idler (short) rotor.

6. Install mechanical seals.

6a. Place drive-end bearing housing (4) in a horizontal position in a hydraulic press with air side surface facing down.

6b. Place spring loaded carbon half of mechanical seal assembly (43) in one of the bearing housing bores with the carbon facing up. Reference Figure 9-3.

Note: Handle with care! Scratching or chipping the carbon sealing face may cause seal to leak!

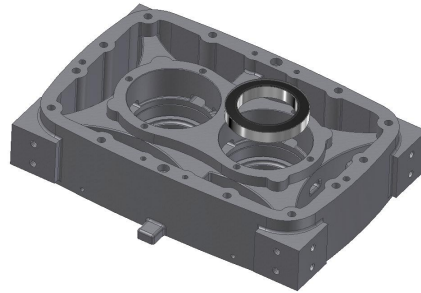


Figure 9-3 – MECHANICAL SEAL INSTALLATION

6c. Using driver tool EQ144211-9, press insert into bearing housing until seated.

7. Repeat step 6 for remaining mechanical seals.

8. Attach mounting bracket to inlet port of air cylinder (1) and mount air cylinder on trunnion.

9. Determine drive shaft (long rotor) location and rotational direction from blower model designation. Refer to arrows cast into air cylinder to determine air flow direction.

10. Position air cylinder vertically with drive-end up.

11. Install two dowel pins (34) into drive-end of air cylinder.

12. Orient bearing housing so dowel holes align with dowels in air cylinder and mount drive-end bearing housing to air cylinder.

13. Fasten drive-end bearing housing to air cylinder using two socket head bolts (29) in counter bored holes in bearing housing. Tighten bolts.

Torque: 40 ft-lbs

14. Rotate air cylinder vertically so drive-end is down. Verify adequate clearance for rotor shafts to extend through bearing housing.

15. Thread 3/4-10 eye bolt into gear-end of drive rotor shaft. Using a hoist, carefully install drive rotor into air cylinder, verifying long end of drive rotor shaft extends through drive-end bearing housing. Verify it is in correct bore by matching rotor rotation to arrows cast in cylinder. Verify rotor lobe helix angle matches triangular shape of discharge port.

16. Thread 3/4-10 eye bolt into gear-end of non-drive rotor shaft. Using a hoist, carefully install non-drive rotor into air cylinder. Orient both rotors to eliminate interference between mechanical seal sleeve of drive rotor and lobe of non-drive rotor. Reference FIGURE 9-4.

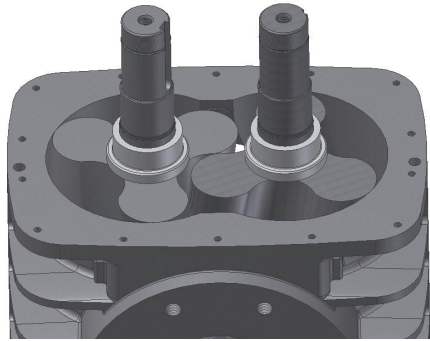


Figure 9-4 – ROTOR INSTALLATION (MECH. SEAL)

17. Using a depth micrometer, measure and record total rotor to bearing housing end clearance for each rotor. This is accomplished by measuring distance from top edge of air cylinder to top of rotor lobe while rotors are in vertical position.
18. Install two dowel pins (34) into gear-end of air cylinder.
19. Orient gear-end bearing housing so dowel holes align with dowels in air cylinder and mount bearing housing onto air cylinder.
20. Fasten gear-end bearing housing to air cylinder using two socket head bolts (29) in counter bored holes in the bearing housing. Carefully draw down bearing housing as not to damage piston rings. Tighten bolts.

Torque: 40 ft-lbs

21. Install mating ring of mechanical seal assembly (43) onto rotor shafts. Reference FIGURE 9-5.

Note: Ensure chamfer on rotor shaft is smooth. Sharp edge can cut o-ring of mating ring during installation!

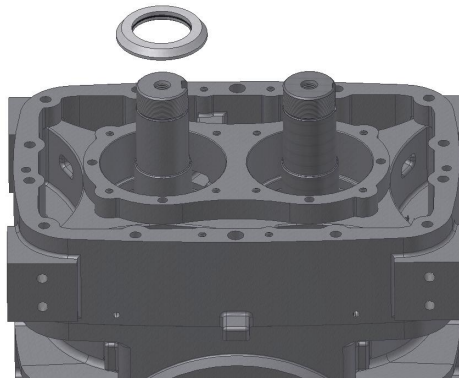


Figure 9-5 – MATING RING INSTALLATION

22. Thread 3/4" pull rod into end of rotor shaft. Place slinger driver EQ144211-3 over pull rod. Install 3/4" flat washer and nut onto pull rod and using a 3/4" wrench, draw mating ring on rotor shaft. Ensure each mating ring is seated firmly against mechanical seal spacer. Repeat for opposite rotor.
23. Place false bearing assembly EQ144211-5 over idler rotor shaft and into bearing bore. Place false bearing spacer EQ144211-10 over shaft and install locknut. Tighten locknut by hand using locknut socket EQ144211-2 to ensure mechanical seal mating ring is firmly against mechanical seal spacer. Reference FIGURE 9-6.

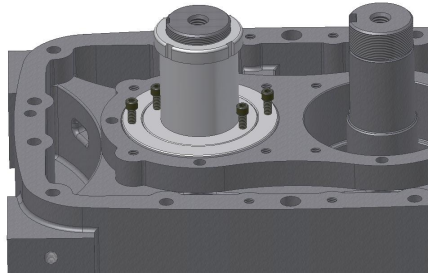


Figure 9-6 – FALSE BEARING INSTALLATION

24. Thread 3/4" eye bolt into end of idler rotor and lift rotor until ends of rotor lobes contact bearing housing.
25. Using a depth micrometer, measure and record distance from top surface of outer ring of false bearing to top surface of inner ring. Inner ring of the false bearing should extend above the outer ring .005-.007". If inner ring does not extend above outer ring .005-.007", lower rotor and remove eye bolt and false bearing. Install required shims (8) to achieve proper gear-end clearance. Repeat steps 23 through 25 if necessary.
26. Lower rotor and remove eye bolt and false bearing.
27. Repeat steps 23 through 26 for drive (long) rotor.
28. Apply AEON PD oil to drive and idler rotor bearing bores in the gear-end bearing housing as well as internal surfaces and rollers of double angular contact bearings (14). Drain excess oil from bearing before installation. Oil should not be dripping from bearing in mounted position.
29. Install bearing by placing bearing over idler rotor shaft with identification numbers facing up. Thread 3/4" pull rod into end of idler rotor shaft. Place bearing driver EQ144211-1 over pull rod. Place a portable hydraulic cylinder over pull rod and onto driver tool. Install 3/4" flat washer and nut onto pull rod and tighten it up against hydraulic cylinder. Reference FIGURE 9-7. Press bearing onto rotor shaft using hydraulic cylinder.

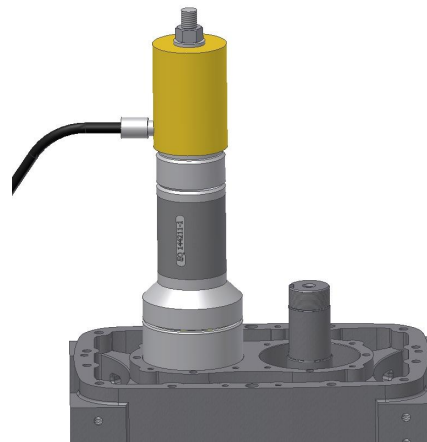


Figure 9-7 – BEARING INSTALLATION

Note: Maximum load applied to threaded rod must NEVER EXCEED 5 TONS.

30. Repeat step 29 to install bearing on gear-end of drive rotor shaft.

31. Verify gear-end axial clearance for both rotors. With gear-end up, rotate rotors so a feeler gauge can be inserted between end of the rotor lobe and the inner surface of the bearing housing. Clearance should be measured and recorded for all three lobes on both rotors.

Gear-end clearance: 0.005" min / 0.009" max (when rotors are pushed to drive end)

Note: Do not proceed with assembly if gear-end clearance is not correct! Refer to step 17 in Section 6 'Disassembly Instructions' to remove bearing housing. Repeat steps 23 through 31 making necessary shim adjustments to achieve proper gear-end clearance.

32. Mount bearing retainer plate (15) onto gear-end bearing housing with eight bolts (17) and lock washers (16). Reference FIGURE 9-8.

Torque: 40 ft-lbs

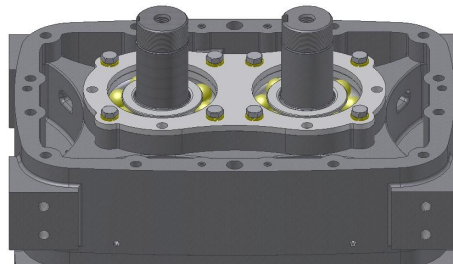


Figure 9-8 – RETAINER PLATE INSTALLATION

33. Rotate assembly vertical with drive-end on top
34. Apply AEON PD oil to drive and idler rotor bearing bores in drive-end bearing housing. Lubricate internal surfaces and rollers of bearings with oil. Drain all excess oil from bearing before installation. Oil should not be dripping from bearing in mounted position.
35. Install spherical roller bearing (13) by placing bearing over drive rotor shaft with identification numbers facing up. Thread 3/4" pull rod into end of idler rotor shaft. Place bearing driver EQ144211-1 over pull rod. Place a portable hydraulic cylinder over pull rod and onto driver tool. Install 3/4" flat washer and nut onto pull rod and tighten against hydraulic cylinder. Press bearing onto rotor shaft using hydraulic cylinder. Reference FIGURE 9-7.


Note: Maximum load applied to threaded rod must NEVER EXCEED 5 TONS.

36. Repeat step 35 to install deep-groove ball bearing (12) on idler rotor shaft.
37. Verify drive-end axial clearance for both rotors. Rotate unit so gear-end is up. Rotate rotors into a position so a feeler gauge can be inserted between the end of the rotor lobe and the inner surface of the bearing housing. Clearance should be measured and recorded for all three lobes on both rotors.

Drive-end clearance: 0.017" min / 0.025" max (when rotors are pushed to drive end)

Note: Do not proceed with assembly if these drive-end clearance is not correct!

38. Install key (36) into keyway on idler rotor shaft.
39. Thread 3/4" pull rod into end of the idler rotor shaft.

40.  Heat pinion gear to 350° F.

41. Place heated gear onto idler rotor shaft (over pull rod) and align keyway with key in shaft. Place driver tool EQ144211-1 over pull rod. Place portable hydraulic cylinder over pull rod and onto driver tool. Install 3/4" flat washer and nut onto pull rod and tighten against hydraulic cylinder. Press gear onto rotor shaft until tight against bearing inner race. To ensure gear remains tight against bearing race, do not remove tooling until gear has cooled to at least 120°F. Reference FIGURE 9-9.

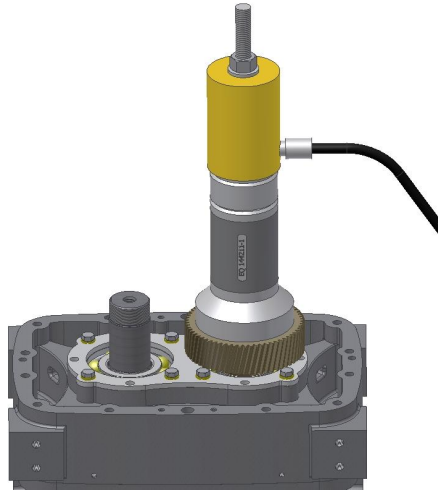


Figure 9-9 – PINION GEAR INSTALLATION

Note: Maximum load applied to threaded rod must NEVER EXCEED 5 TONS.

42. Remove assembly from trunnion and place in a horizontal position on a work table.
43. Measure rotor tip to air cylinder clearances for both rotors at inlet and discharge side of air cylinder. Clearance should be measured along entire length of lobe and for all three lobes on each rotor. Record these clearances.

Rotor tip to case clearance (inlet): 0.011" min

Rotor tip to case clearance (discharge): 0.005" min

44. Clean and lightly apply AEON PD oil inside and outside diameter of timing gear hub where shrink disk half assembly mates.

Note: Do not use molybdenum disulfide, molykote, or any other similar lubricants!

45. Lightly oil bolt threads, bolt head bearing areas and tapered surfaces of inner ring of shrink disk half (19).
46. Install shrink disk assembly over timing gear hub projection. Insert locking bolts (metric) through collar and loosely screw them into threaded holes in timing gear.
47. Install shrink disk/timing gear assembly onto rotor shaft and align teeth so timing gear and pinion gear mesh. Firmly push against bearing inner race. Finger tighten the 12 locking bolts ensuring the gear can still be rotated on shaft. Reference FIGURE 9-10.

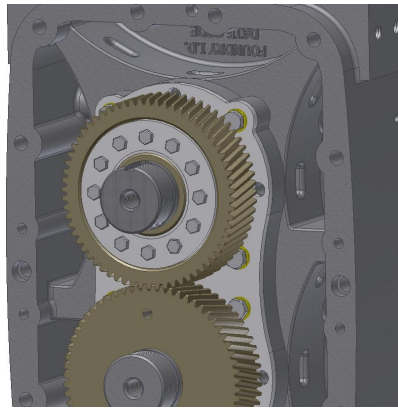


Figure 9-10 – SHRINK DISK/TIMING GEAR INSTALLATION

48. Verify total interlobe clearance. Through discharge port, insert feeler gauges between rotor lobes. Measurement is taken at pitch diameter of rotor lobes, just above widest cross sectional width of rotor lobe. Clearance is measured along entire length of meshing lobes for all three interlobe meshes.

Total interlobe clearance: 0.017" min

49. Set closed side interlobe clearance. Closed clearance is measured between two meshing rotor lobes inside air cylinder on leading side of drive rotor lobe as it rotates in same direction of arrows cast in air cylinder. Measurement is taken at the pitch diameter of rotor lobes, just above widest cross sectional width of the rotor lobe. Clearance is measured along the entire length of meshing lobes for all three interlobe meshes.

49a. Lock idler rotor from turning by wedging a feeler gauge or shop rag between tip of a lobe and air cylinder at inlet port. Through discharge port, insert a .007" feeler gauge between leading side of drive rotor and meshing idler rotor (locked) and apply rotational force to pull drive rotor tight against feeler gauge.

49b. While holding drive rotor tight against feeler gauge, apply rotational force to timing gear in same direction until teeth firmly mesh against teeth on pinion gear. Using a socket, tighten bolts of the gear locking assembly in a diametrically opposite sequence only enough to secure timing gear to rotor shaft when applying rotational force by hand. Ensure gear is pressed firmly against bearing inner race.

Closed side interlobe Clearance: 0.007" min

50. Verify open side interlobe clearance. Lock idler rotor from turning by wedging a feeler gauge or shop rag Between tip of a lobe and air cylinder at discharge port. Apply rotational force to drive rotor in same direction of cast arrows on air cylinder. Measure clearance by inserting feeler gauge between trailing side of drive rotor and meshing idler rotor (locked) at pitch diameter of rotor lobes through inlet port.

Open side interlobe Clearance: 0.010" min

51. Tighten shrink disk bolts to 30 in-lbs in a diametrically opposite sequence and verify interlobe clearances are still within spec (See note below). Tighten shrink disk bolts to 106 in-lbs in a diametrically opposite sequence. Repeat process to ensure screws will not turn when 106 in-lbs is applied to them a second time.

Note: Do not turn any screw more than 1/4 turn during torque process!

52. Measure backlash of the gears using a dial indicator with a magnetic base. Gear backlash is distance (in the circumferential direction) a gear tooth can freely move when the mating gear is fixed and should be measured in three places (every 1/3 turn). Lock idler rotor from turning by wedging a feeler gauge or shop rag between tip of a lobe and air cylinder. Position indicator probe perpendicular to drive gear tooth in a 3 o'clock position. Apply rotational force to drive gear in opposite directions to obtain total backlash.

Gear backlash tolerance: .0027" min / .0040" max

53. Install shaft spacers (20) onto both rotor shafts on gear-end.

54. Install the oil slinger (23) on the gear-end of appropriate rotor shaft. For models with a fifth column that is a G, H, J, or K, oil slingers are mounted on idler rotor. For models with a fifth column that is an E, F, L, or M, oil slingers are mounted on drive rotor.

55. Install a bearing lock washer (25) and locknut (24) on the gear-end of both rotor shafts. Apply Loctite 246 to locknut threads prior to screwing it onto shaft. Use locknut tool EQ144211-2 and a torque wrench to tighten locknut. Bend one tab of lock washer into a slot in the locknut.

Torque: 85 ft-lbs

56. Install drive rotor spacer (21), idler rotor spacer (22), oil slinger (23), and bearing locknuts (24) onto drive-end of rotor shafts. Reference step 54.

Note: No lock washers are used with drive-end bearing locknuts.

57. Using a pump type oil can, apply AEON PD oil to all four bearings. Turn rotors to distribute oil throughout bearings.

58. Install shaft seal (37). Verify shaft seal bore in drive-end sump cover (4) is clean, dry, and free of nicks or burrs. Lay cover flat with external surface facing up. Support area under seal bore with a block of wood. Position shaft seal with flat side of seal casing facing outward and cupped side inward. Using tool EQ144211-1, drive shaft seal into sump cover until flat side of seal casing is flush with external surface. Apply AEON PD oil to both lips of shaft seal.

59. Slide protective sleeve EQ144211-7 over drive shaft. Apply AEON PD oil to outside surface of sleeve. Gently slide drive-end sump cover over drive shaft. Reference FIGURE 9-11.

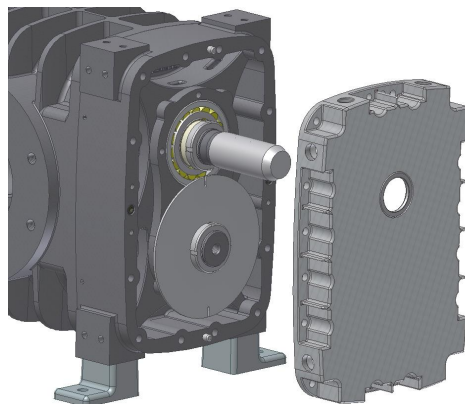


Figure 9-11 – DRIVE-END SUMP COVER INSTALLATION

60. Attach sump cover to bearing housing using four socket head cap screws (31) in two center holes on each long side of cover. Install and tighten remaining screws in a diametrically opposed pattern (27).

Torque: 37 ft-lbs

61. Remove protective sleeve from drive shaft.

62. Attach sump cover to gear end bearing housing using four socket head cap screws (31) in two center holes on each long side of cover. Install remaining screws (27). Tighten all screws.

Torque: 37 ft-lbs

63. Install plugs (32) in the four instrument holes in the air cylinder near the inlet and discharge ports.

64. Install oil level sight glass (28) in appropriate location each sump cover. Apply Loctite 243 to threads of each sight glass.

65. Install magnetic plugs (41) in appropriate holes of each sump cover.

66. Install plugs (26) in remaining holes in each sump cover.

Note: There are no external sump breathers used on this blower.

67. Install four mounting feet (38) to air cylinder with eight screws (30). Feet should be pointing outward from air cylinder center line. Tighten screws.

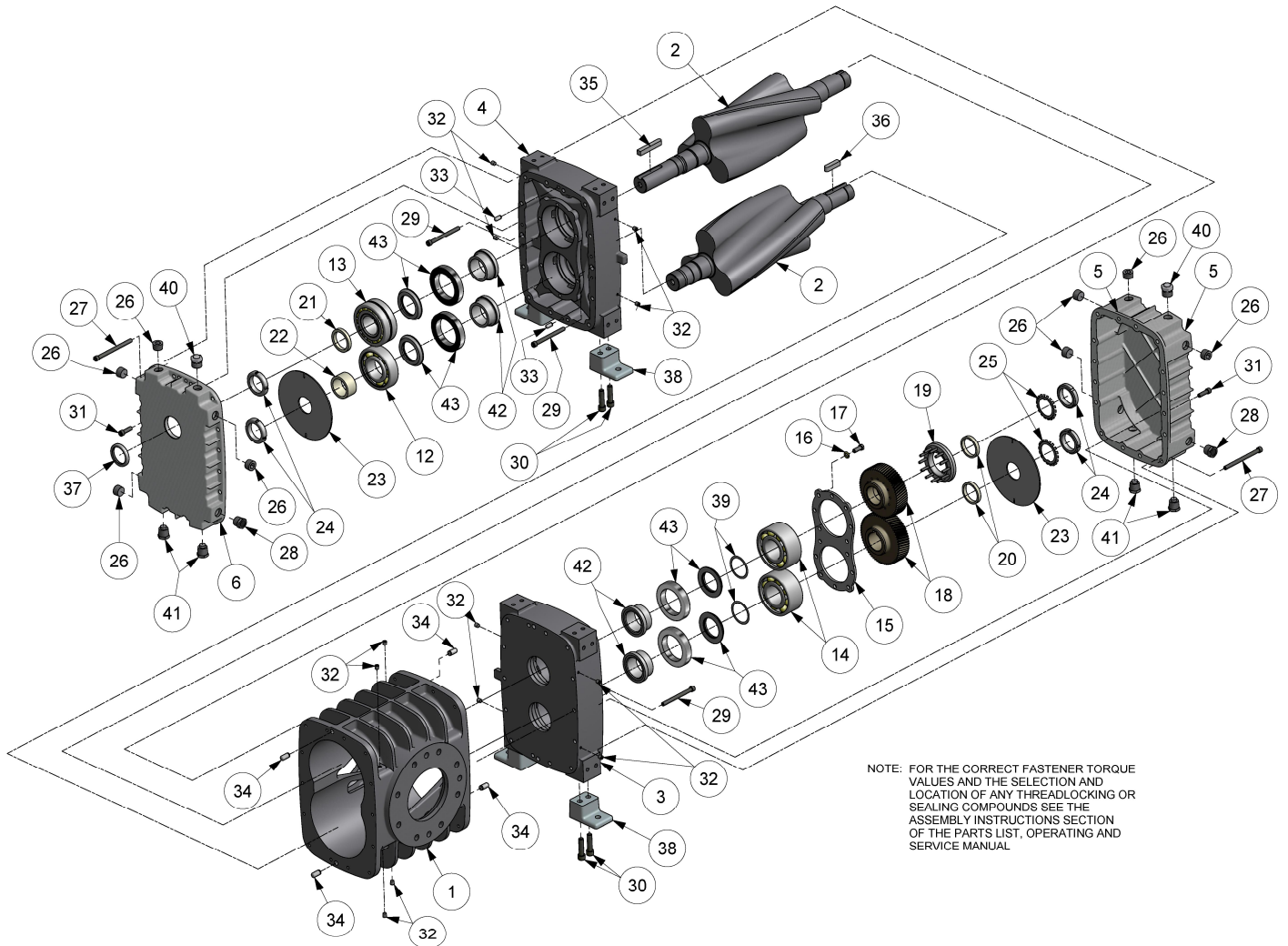
Torque: 100 ft-lbs.

68. Measure run out of drive shaft using a dial indicator and a magnetic base.

Drive Shaft Runout: .001" max

69. Install drive shaft key (35) into keyway in drive rotor shaft.

SECTION 10
PARTS LIST - HYTEL_AB



301HYE810-B
(Ref. Drawing)

Order by Part Number and Description. Reference Numbers are for your convenience only.

Ref. No.	Description	No. Req.	MODEL 514 HYEL_AB
1	CYLINDER.....	1	300HYE002
2	ROTOR GROUP.....		
	CLOCKWISE DRIVE ROTATION.....	1	302HYE4028
	COUNTER CLOCKWISE DRIVE ROTATION.....	1	303HYE4028
3	HOUSING-BEARING GEAR.....	1	303HYE006
4	HOUSING-BEARING DRIVE	1	302HYE006
5	COVER-GEAR.....	1	300HYE602
6	COVER-DRIVE	1	300HYE477
**12	BALL BEARING	1	80107339
**13	BEARING-SPHERICAL.....	1	903639090110
**14	BEARING-DBL ANGL CONTACT	2	8500162
15	RETAINER PLATE-BEARING	1	300HYE253
16	WASHER-LOCK	40	95B3
17	SCREW	8	655ED040
18	KIT-GEAR.....	1	302HYE601
19	HALF SHRINK DISC	1	22G46
20	SPACER GEAR END.....	2	301HYE144
21	SPACER DRIVE END, LONG.....	1	300HYE144
22	SPACER DRIVE END, SHORT	1	302HYE144
23	SLINGER-OIL SUMP	2	301HYE173
**24	LOCKNUT-BRG	4	50Z10
**25	WASHER BEARING, LOCK	2	95N10
26	PLUG.....	10	64AC5
27	SCREW	24	75P70
28	GAUGE-OIL LEVEL	2	40P45
29	SCREW	4	75P67
30	SCREW	8	76P77
31	SCREW	8	75P56
32	PLUG.....	12	64AC1
33	DOWEL PIN.....	2	62M48
34	DOWEL PIN.....	4	62M82
35	KEY-SQUARE	1	35L110
36	KEY-SQUARE	1	8500115
**37	SEAL SHAFT	1	VP1032092
38	FOOT	4	301HYF166
**39	SET SHIM.....	2	77H53
40	VENT PLUG	2	5L369
41	PLUG-MAGNETIC	4	64BJ4
42	SLEEVE-MECH SEAL.....	4	303HYE144
**43	MECH SEAL ASSY	4	VP1091803

*NOT SHOWN

** INCLUDED IN OVERHAUL KIT

HELIFLOW INDUSTRIAL SERIES BLOWERS

GENERAL PROVISIONS AND LIMITATIONS

Gardner Denver, Inc. (the "Company") warrants to each original retail purchaser ("Purchaser") of its products from the Company or its authorized distributor that such products are, at the time of delivery to the Purchaser, made with good material and workmanship. No warranty is made with respect to:

1. Any product which has been repaired or altered in such a way, in the Company's judgment, as to affect the product adversely.
2. Any product which has, in the Company's judgment, been subject to negligence, accident, improper storage, or improper installation or application.
3. Any product which has not been operated or maintained in accordance with the recommendations of the Company.
4. Components or accessories manufactured, warranted and serviced by others.
5. Any reconditioned or prior owned product.

Claims for items described in (4) above should be submitted directly to the manufacturer.

WARRANTY PERIOD

The Company's obligation under this warranty is limited to repairing or, at its option, replacing, during normal business hours at an authorized service facility of the Company, any part which in its judgment proved not to be as warranted within the applicable Warranty Period as follows.

BARE BLOWERS

Basic bare blowers, consisting of all parts within, are warranted for 24 months from date of initial use or 30 months from date of shipment to the first purchaser, whichever occurs first. Any disassembly or partial disassembly of the blower, or failure to return the unopened blower per Company instructions, will be cause for denial of warranty.

LABOR TRANSPORTATION AND INSPECTION

The Company will provide labor, by Company representative or authorized service personnel, for repair or replacement of any product or part thereof which in the Company's judgment is proved not to be as warranted. Labor shall be limited to the amount specified in the Company's labor rate schedule.

Labor costs in excess of the Company rate schedules caused by, but not limited to, location or inaccessibility of equipment, or labor provided by unauthorized service personnel is not provided for by this warranty.

Transportation of Company's choice, within the continental United States, is covered by this warranty for replacement of any blower which in the Company's judgment proved not to be as warranted. For user locations outside the continental United States, the Company will provide transportation, by the carrier of its choice, to and from the nearest Authorized Distributor and the Company's designated facility. The Company may require the return of any blower or part claimed not to be as warranted to one of its facilities as designated by the Company, transportation prepaid by Purchaser, to establish a claim under this warranty.

Replacement parts provided under the terms of the warranty are warranted for the remainder of the Warranty Period of the product upon which installed to the same extent as if such parts were original components thereof.

DISCLAIMER

THE FOREGOING WARRANTY IS EXCLUSIVE AND IT IS EXPRESSLY AGREED THAT, EXCEPT AS TO TITLE, THE COMPANY MAKES NO OTHER WARRANTIES, EXPRESSED, IMPLIED OR STATUTORY, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.

THE REMEDY PROVIDED UNDER THIS WARRANTY SHALL BE THE SOLE, EXCLUSIVE AND ONLY REMEDY AVAILABLE TO THE PURCHASER AND IN NO CASE SHALL THE COMPANY BE SUBJECT TO ANY OTHER OBLIGATIONS OR LIABILITIES. UNDER NO CIRCUMSTANCES SHALL THE COMPANY BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, EXPENSES, LOSSES OR DELAYS HOWSOEVER CAUSED.

No statement, representation, agreement, or understanding, oral or written, made by any agent, distributor, representative, or employee of the Company which is not contained in this Warranty will be binding upon the Company unless made in writing and executed by an officer of the Company.

This warranty shall not be effective as to any claim which is not presented within 30 days after the date upon which the product is claimed not to have been as warranted. Any action for breach of this warranty must be commenced within one year after the date upon which the cause of action occurred.

Any adjustment made pursuant to this warranty shall not be construed as an admission by the Company that any product was not as warranted.

Gardner Denver®

For additional information, contact your local representative or visit:
www.contactgd.com/blowers

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Please recycle after use.