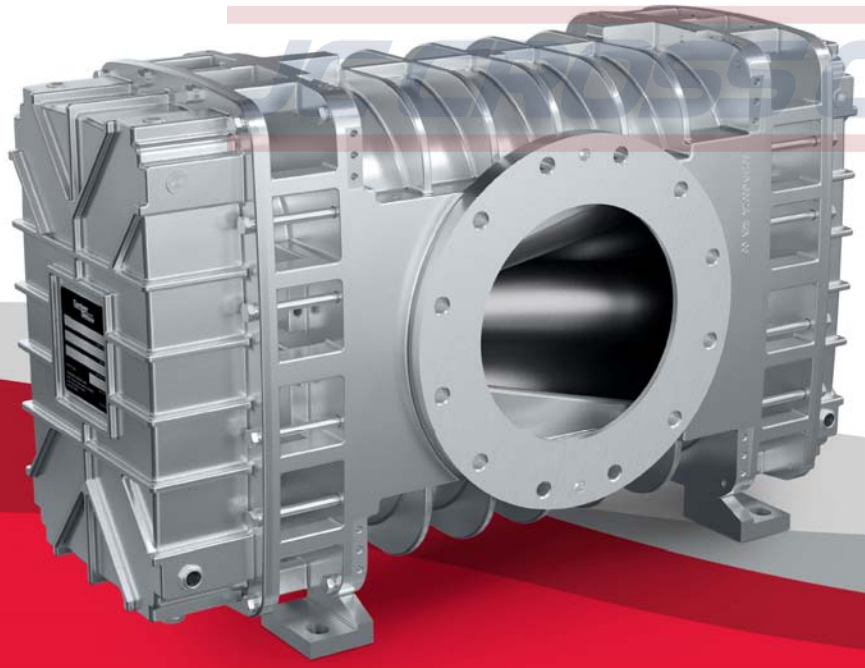
Gardner Denver

PD BLOWERS & VACUUM PUMPS
HELIFLOW INDUSTRIAL SERIES | 8" GEAR DIAMETER

Owner's Manual

8" HELIFLOW



HF-7-604
Version 01
March 15, 2018

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.

For the location of your local authorized Gardner Denver blower distributor refer to the yellow pages of your phone directory, check the Web site at www.gardnerdenverproducts.com or contact:

Gardner Denver Incorporated
1800 Gardner Expressway
Quincy, IL 62305
Phone: (217) 222-5400
Fax: (217) 221-8780

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.

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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:

⚠ DANGER

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.**

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⚠ WARNING

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
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

COLUMN NUMBER:	1	2	3	4	5	6	7
	H	Y	G			A	A

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.
B.
C.
E.
F.
G. 8”
H.

COLUMN 4 – CASE LENGTH

L- HF 825
M-HF 817

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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

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… year in and year out.

IMPORTANT GARDNER DENVER TELEPHONE NUMBERS

YOUR AUTHORIZED GARDNER DENVER DISTRIBUTION

NAME: _____

TELEPHONE: _____

FAX: _____

CONTACT: _____

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THANKS…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.

⚠WARNING

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.

⚠CAUTION

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.

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REMOVING PROTECTIVE MATERIALS

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

⚠ CAUTION
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.

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

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SECTION 2
INSTALLATION

LIFTING
The basic blower is supplied with lifting lugs at each top corner of the unit. Attach lifting equipment only to the lifting lugs.

LOCATION

Install the blower in well lit, clean and dry place with plenty of room for inspection and maintenance.

FOUNDATION

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.

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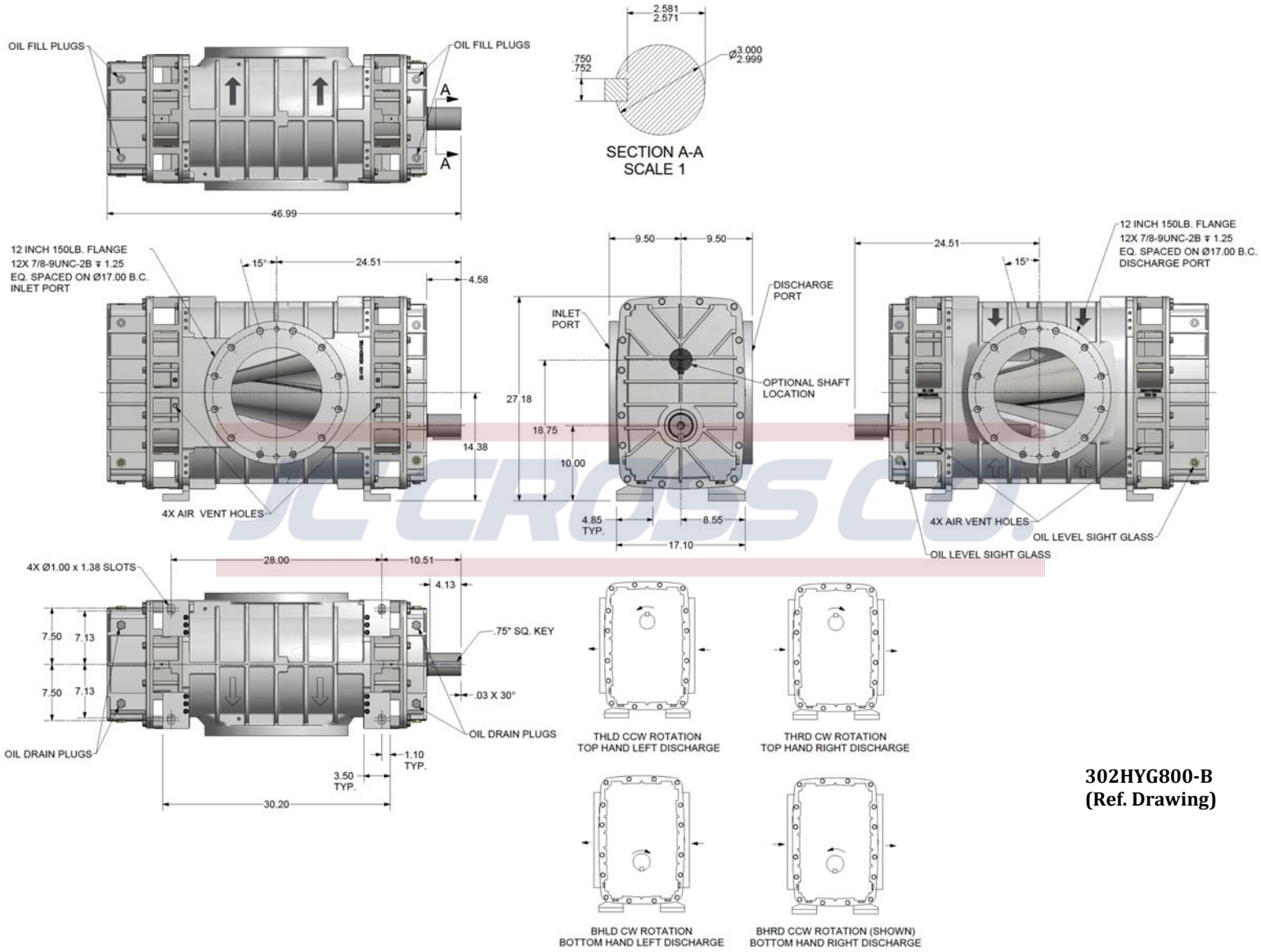
MOUNTING COFIGURATIONS

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 and 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.



302HYG800-B
(Ref. Drawing)

Figure 2- 1 – HF 825 VERTICAL BLOWER MOUNTING CONFIGURATIONS AND OUTLINE

303HYG800-B
(Ref. Drawing)

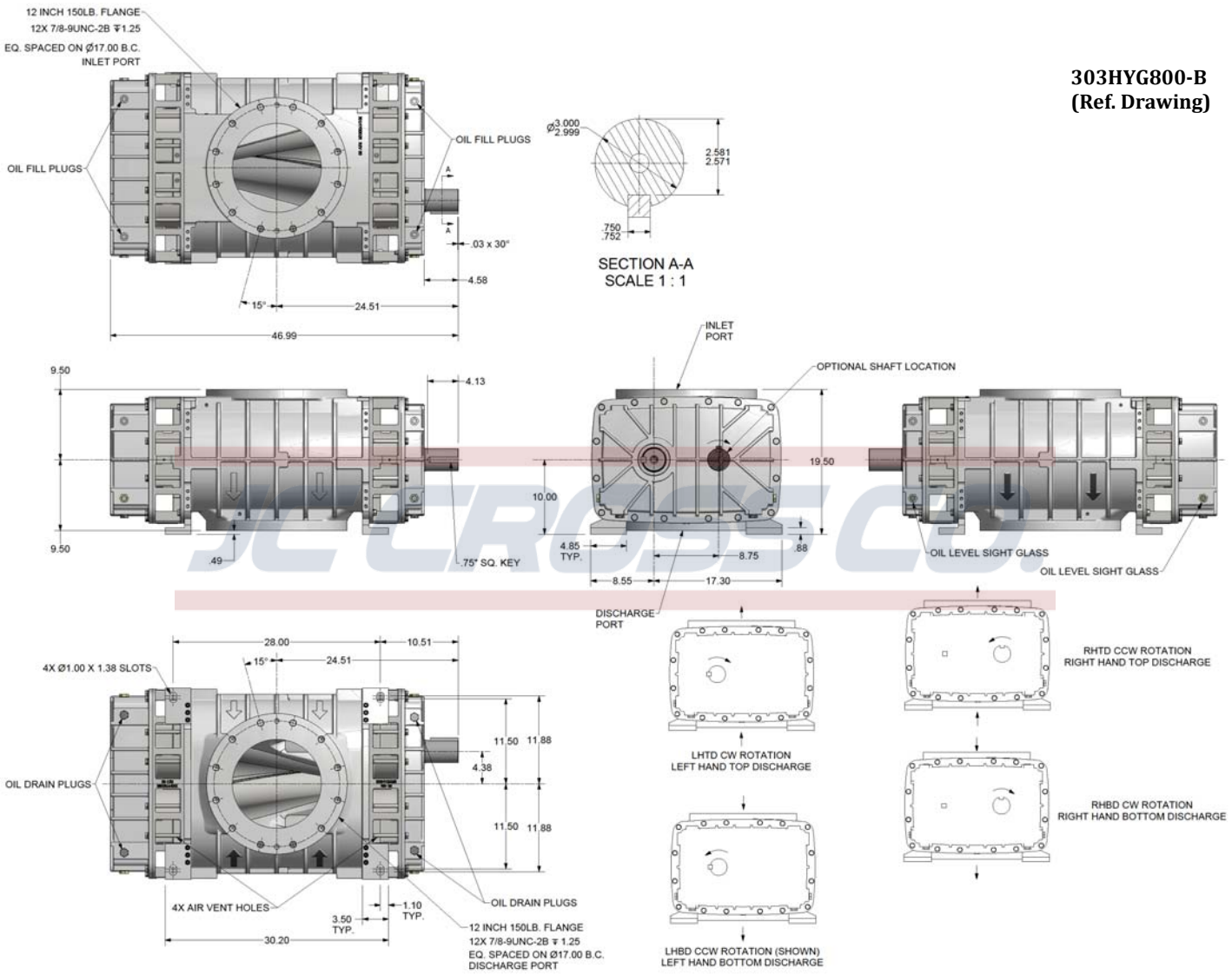


Figure 2- 2 – HF 825 HORIZONTAL BLOWER MOUNTING CONFIGURATIONS AND OUTLINE

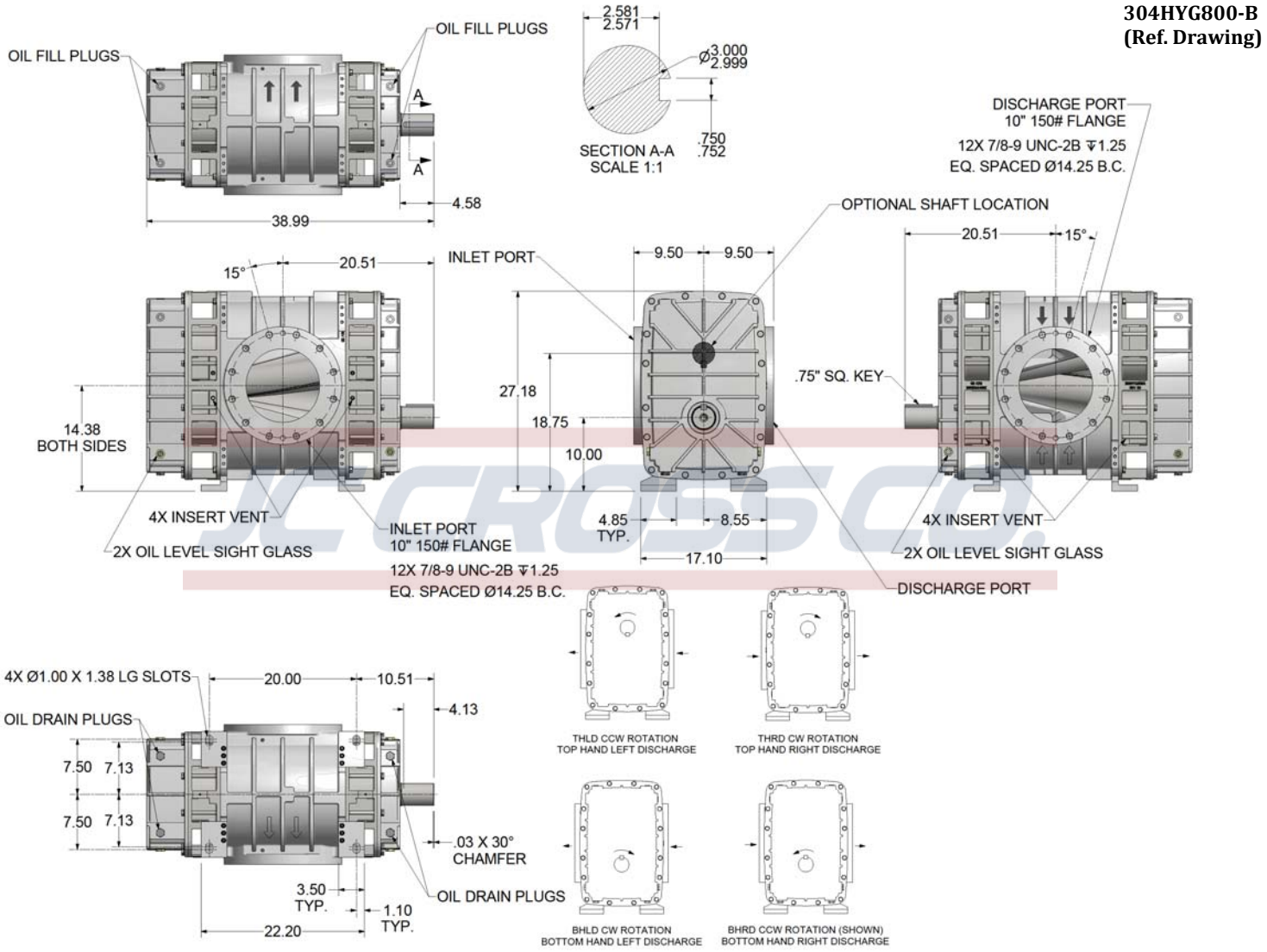


Figure 2- 3 – HF 817 VERTICAL BLOWER MOUNTING CONFIGURATIONS AND OUTLINE

305HYG800-B
(Ref. Drawing)

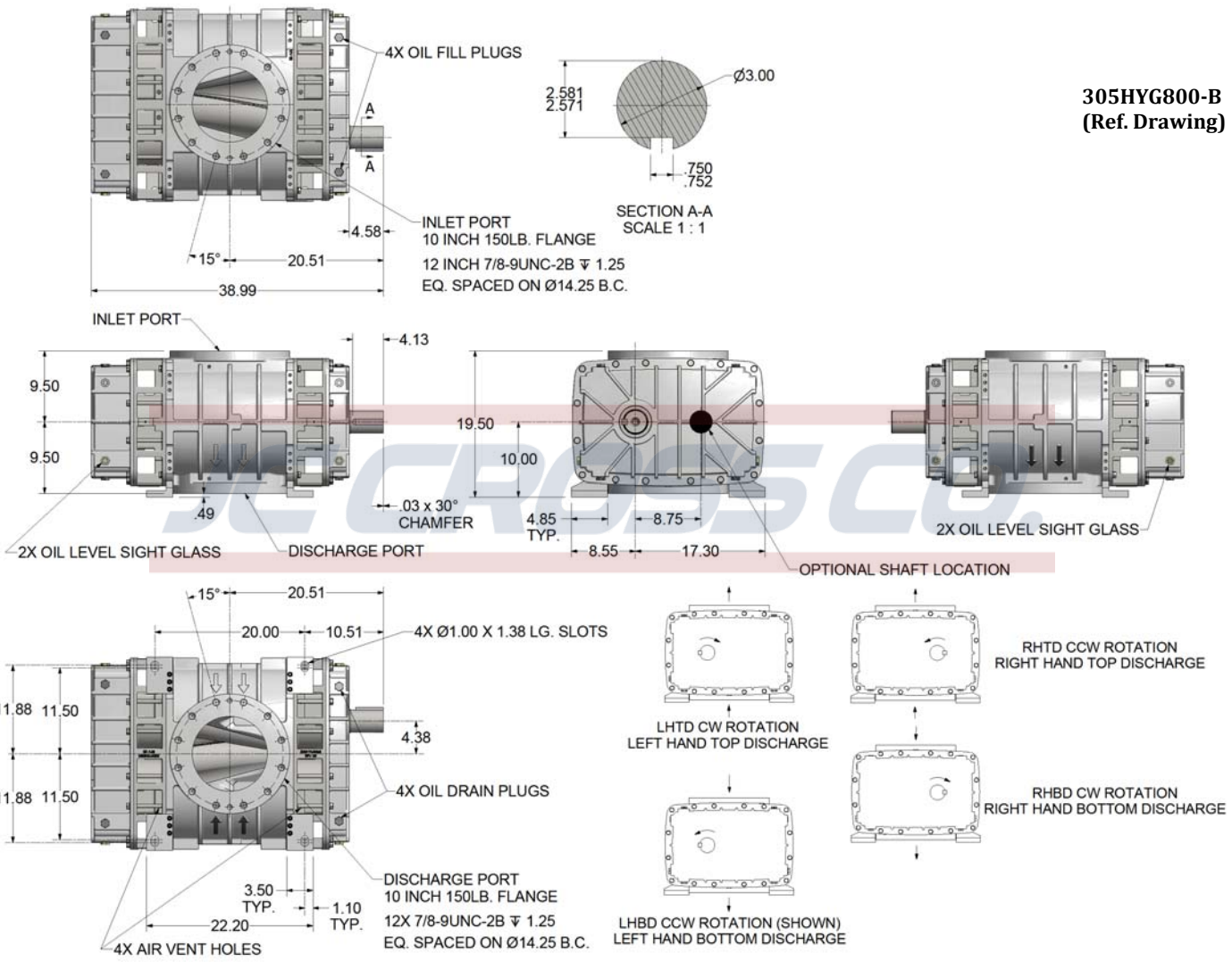


Figure 2- 4 – HF 817 HORIZONTAL BLOWER MOUNTING CONFIGURATIONS AND OUTLINE

NOTICE
When changing mounting configuration, it will be necessary to reposition oil level gauge (H), and drain plug (A).

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

⚠WARNING
The rotation direction must correspond to the direction of the arrows located on the machine body. Permitted speed ranges of the blower 1000-2500 RPM.

NOTICE
In any case, the rotation speed must be monitored after assembly of the Blower.

⚠WARNING
Axial thrust from the drive must not be transferred to the rotor shaft.

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DRIVE INSTALLATION

When selecting a V-belt drive, check to be sure the shaft overhung load limitation is not exceeded.

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
Overtightening 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 “C” in Drive Shaft Illustration, (Figure 2- 5).

The calculated shaft moment must not exceed the maximum allowable moment listed in Maximum Allowable Moment Chart, (Figure 2- 5). 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- 5) to calculate belt pull.
2. Insert the calculated belt pull into the formula for Calculation of Shaft Moment, (Figure 2- 5), to arrive at the calculated shaft moment.

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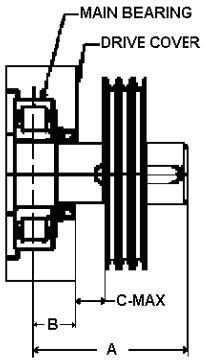
Gear Diameter (Inches)	Dimensions (Inches)			Maximum Allowable Moment (LB-IN)
	A	B	C (Max)	
8	8.44	3.86	0.50	19500

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

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$$\text{Belt Pull} = \left[\frac{2.5 - Ac}{Ac}\right]\left[\frac{125954 \times Hp \times S.F.}{D \times RPM}\right]$$

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

$$Z = \left[\frac{\text{Large Sheave Pitch Diameter (in)} - \text{Small Sheave Pitch Diameter (in)}}{\text{Sheave Center Distance (in)}}\right]$$

CALCULATION OF BELT PULL

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

CALCULATION OF SHAFT MOMENT

Figure 2- 5 – 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.

The suction pipe must be of a sufficient size, otherwise machine will be overloaded.
The suction pipe must incline downwards from the machine to prevent condensate from entering and drain plug must be fitted at the lowest point. For adherence to the acceptable operating vacuum, the vacuum gauge should be installed in the suction pipe directly in front of the suction port.
Vacuum relief valve is absolutely essential. Relief valve should be installed as close as possible to the inlet port of the blower.

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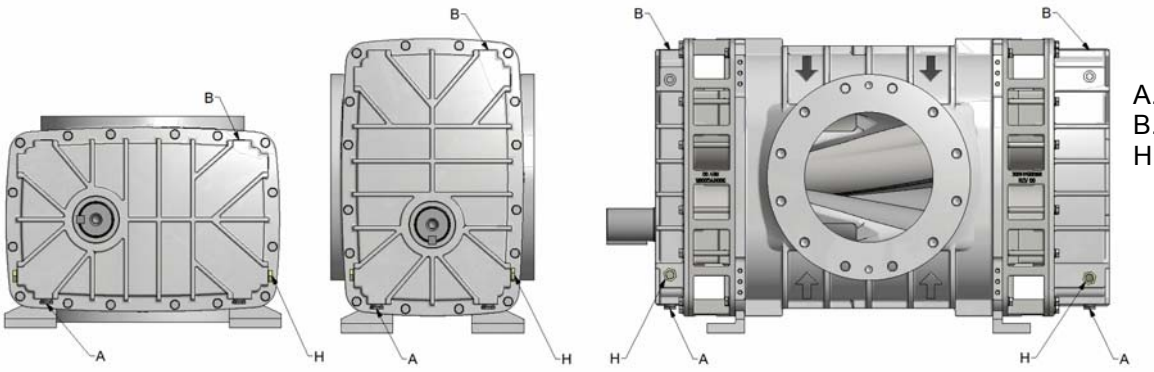
SECTION 3
MAINTENANCE



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

Figure 3- 1- LUBRICATION

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. Under severe operating conditions the oil should be changed every 500 hours or more often. Under ideal operating conditions oil maybe used up to 4500 to 7500 hours. Change the oil often enough that it appears clean and clear when drained from the sump. The oil drain plug is located at (A).

⚠WARNING

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.

⚠WARNING

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	2.0	2.5
Gear End	4.0	5

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

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

AEON PD-Food Grade Synthetic Lubricant

Description	Part Number
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

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Description	Part Number
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.

		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 AEON PD FG	
	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 XD
	200^0 F to 300^0F	AEON PD AEON PD FG	AEON PD AEON PD FG	AEON PD AEON PD FG	AEON PD XD	AEON PD XD
	Greater than 300^0 F			AEON PD XD	AEON PD XD	AEON PD XD

* For ambient temperatures less than 10^0 F, but not less than -20^0 F, the use of oil sump heaters or heated enclosures is required.

** For ambient temperatures 10^0 F to 32^0 F, the use of oil sump heaters or heated enclosures is recommended.

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Figure 3- 3 – SYNTHETIC LUBRICANT CHART

AIR FILTERS AND FILTER SILENCERS

⚠WARNING

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 24.

⚠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.

MAXIMUM OPERATING LIMITATIONS

SIZE	RPM	PRESSURE PSI	VACUUM IN HG	TEMPERATURE RISE ° F	DISCHARGE TEMPERATURE ° F
HF 825	2500	15	17	265	365
HF 817	2650	18	17	265	365

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 head plates 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 the blower disconnected from a drive, turn the drive shaft by hand to be certain the rotors do not bind.
- ☐ 7. "Jog" 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.

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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.

⚠WARNING
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.

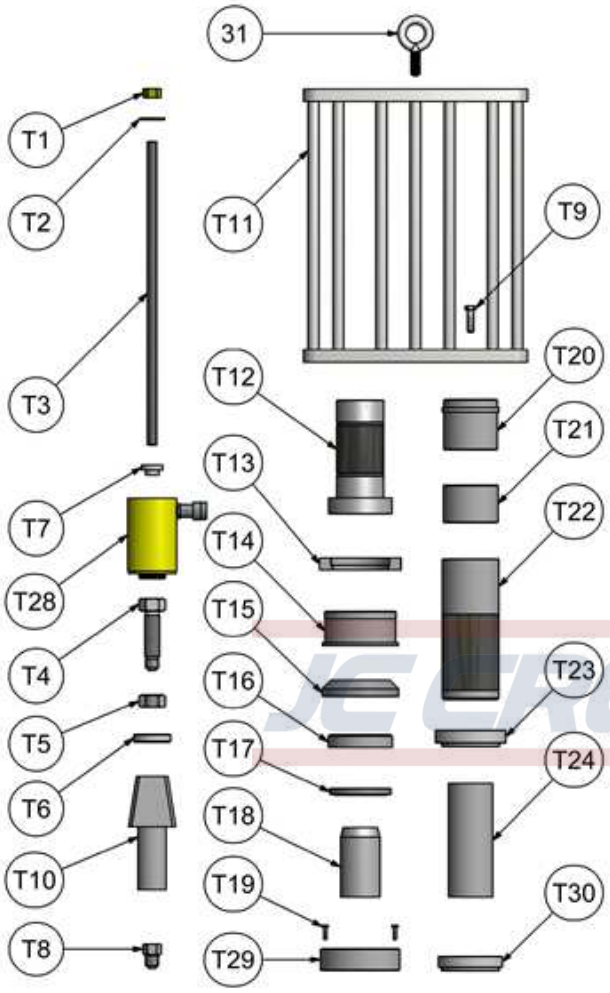
TROUBLE SHOOTING

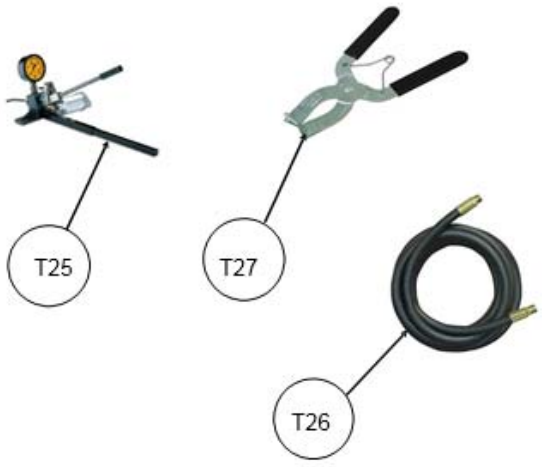
No matter how well the equipment is designed and manufactured, there may be times when servicing will be required due to normal wear, the need for adjustment, or various external causes. Whenever equipment needs attention, the operator or repairman should be able to locate the cause and correct the trouble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

PROBLEM	POSSIBLE CAUSE	SOLUTION
Knocking	1. Unit out of time. 2. Distortion due to improper mounting or pipe strains. 3. Excessive pressure differential. 4. Worn gears. 5. Worn bearings.	1. Retime rotors. 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.	1. Too much oil in gear case. 2. Too low operating speed. 3. Clogged filter or muffler. 4. Excessive pressure differential. 5. Worn rotor clearances. 6. Internal contact.	1. Reduce oil level. 2. Increase blower speed. 3. Remove cause of obstruction. 4. Reduce pressure differential across the blower. 5. Replace rotor. 6. Correct clearances.
Impeller end or tip drag.	1. Insufficient assembled clearances. 2. Case or frame distortion. 3. Excessive operating pressure. 4. Excessive operating temperature.	1. Correct clearances. 2. Check mounting and pipe strain. 3. Remove causes. 4. Remove causes.
Lack of volume.	1. Slipping belts. 2. Worn clearances. 3. Dirty air filter	1. Tighten belts. 2. Re-establish proper clearances. 3. Clean or replace air filter
Excessive bearing or gear wear.	1. Improper lubrication.	1. Correct lubrication level. Replace dirty oil.
Loss of oil.	1. Bearing housing vents plugged. 2. Worn seal.	1. Clean vents. 2. Replace seals.

SECTION 5
SPECIAL TOOL REQUIRED

All Tools Required for Disassembly and Assembly





Item	Part Number	Qty	Description
T1	50B8Z	1	3/4-10UNC Heavy Hex
T2	95A8Z	1	3/4" Flat Washer
T3	TST000135	1	3/4-10UNC All Thread
T4	307CRL074	1	Hydraulic Pump Injector
T5	668RMCA30Z	1	M30 Hex Nut
T6	308CRL074	1	Gear Washer Tool
T7	303CRL450	1	Rod Bushing
T8	318HYG074	1	Adapter,MG3/4 x F3/4-
T9	655EE070	7	SCREW ,1/2-13UNC x
T10	316HYG074	2	Timing Wedge Tool
T11	313HYG074	1	Bearing Housing Dis.
T12	300HYG074	1	Rotor Nut Driver Tool
T13	315HYG074	1	Ring Carrier Puller Tool
T14	303HYG074	1	Ring Compressor Guide
T15	307HYG074	1	Bearing Insert Tool
T16	306HYG074	1	Oil Slinger Insert Tool
T17	304HYG074	1	Seal Insert Tool
T18	302HYG074	1	Drive Shaft Cover Seal Tool
T19	655EC040	2	Screw,1/4-20UNC x
T20	305HYG074	1	Sump Cover Alignment
T21	314HYG074	1	Gear Driver Tool
T22	308HYG074	1	Driver Tool (Mul -Use)
T23	309HYG074	1	Insert Installation Tool
T24	319HYG074	1	Bearing Housing Dis.
*T25	TEN001430	1	SKF Oil Injector Kit (729101/300MPA)
*T26	**Part of T25 Kit**	1	SKF Hydraulic Tube
T27	TEN001429	1	Piston Ring Expander
+T28	TEN001154	2	Hydraulic Cylinder RCH-202)
T29	301HYG074	1	False Bearing Tool
T30	312HYG074	1	Insert ExtractionTool
T31	15P34	1	Eyebolt,3/4-10UNCx2.00LG

*** Tools T25 and T26 are supplied as part of "SKF Oil Injector Kit 729101". This kit can be purchased from an authorized Gardner Denver or SKF distributor.**

+ Enerpac hydraulic cylinder tool T28 is sold separately. It must be used with a hand pump or electric pump which can be purchased from an authorized Enerpac distributor. Tool T28 can be purchased from Enerpac as a set (SCH-202H) which includes a RCH202 cylinder, hand pump, 6 hose, calibrated gauge with adapter.

SECTION 6
DISASSEMBLY INSTRUCTIONS

1. Initial Blower Inspection, Oil Draining and Cover Removal

NOTICE
1. Numbers in parenthesis ( ) refer to balloon numbers in figures and in assembly drawings. **2. Oil seal should be replaced during overhaul as a matter of service policy.**.

⚠ CAUTION
Exercise care not to damage the Sump cover oil seal bore when removing the oil seal.

1. Inspect the interior of the blower for any signs of rotor contact (rotor to rotor, rotor tip to case, rotor end to bearing housing). If there are signs of contact then the various clearances should be measured with feeler gauges prior to any disassembly.
2. Inspect the areas around the drive shaft seal, vent passages in the bearing housing, and air cylinder for any signs of oil leaks.
3. Drain the oil from the gear and drive end sumps by removing their drain plugs (37). A small amount of oil from each sump should be saved in the event that an oil analysis will be required.
4. Mark all parts with a marker so that they can be reassembled in the same position (Cylinder, Bearing Housings, Rotors etc.).
5. Remove the screws (29) and (30) from the drive end (5) and gear end sump covers. Remove the drive end sump cover by sliding it off the drive shaft. Remove the gear end sump cover.
6. Inspect the drive shaft in the area of the oil seal for damage and wear. Inspect the oil seal (26).
7. Support the external surface of the drive end sump cover near the oil seal with blocks of wood. Drive the oil seal out of the cover with small hammer and punch. Discard the seal as it will not be reused.

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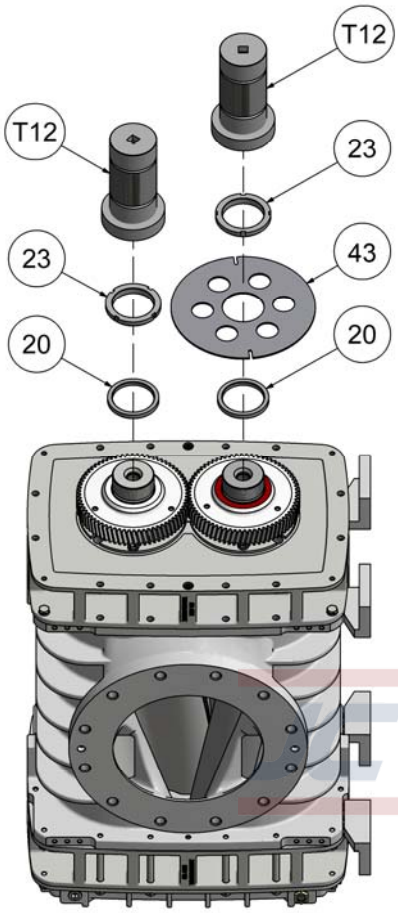
2. Oil Slinger/Spacer Removal and Gear Inspection



8. Remove the locknut (23), oil slinger (43), and gear spacer (20) from the gear end rotor shaft using the nut driver tool (T12).

9. Remove the locknut (23), and gear spacer (20) from the gear end second rotor shafts using the nut driver tool (T12).

10. Reinstall locknuts (23) on both rotors until flush with end of rotor. This will keep gear from shooting off of the rotor when pressurized.

11. If it appears the gears can be reused their backlash should be measured. Lock the idler rotor from turning by wedging a shop rag between the tip of a lobe and the air cylinder. Measure the backlash of the gears using a dial indicator and a magnetic base. The backlash should be measured in 3 places (every 1/3 turn). Permissible gear backlash is 0.001”-0.0045”.

12. Match mark the gears by making small punch marks on the ends of two meshing teeth.

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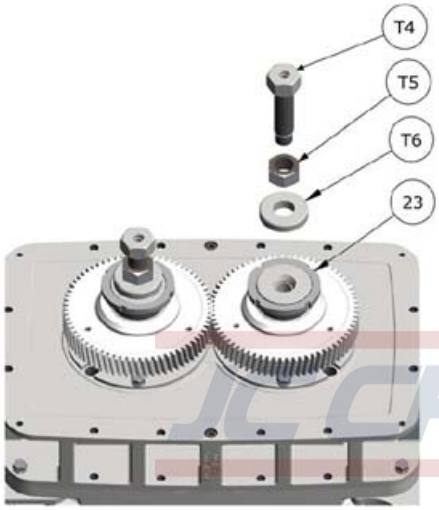
3. Gear Removal

⚠WARNING

Do not remove the locking nut (23), this will keep gear from shooting off of the rotor when pressurized. The pressure of the oil during disassembly may reach 2000 bar and the incorrect assembly of the injector or pump may cause serious physical damage due to the jets of oil under pressure.



13. Screw the hydraulic pump injector tool (T4) through nut (T5), washer (T6), and into drive rotor shaft. Attach the hydraulic tube (T26) to hydraulic pump injector tool (T4).
14. Using the SKF hydraulic hand pump pressurize the gear until released.
15. Disassemble equipment and remove locknut reassembled on the same rotor. (23) from rotor shaft to remove gear completely.
16. Repeat steps 13, 14 and 15 for idler rotor.
17. Match mark gears so that they can be
18. Remove spacers and adjusting shims from each rotor. Mark spacers and shims so that they can be reassembled on the same rotor.

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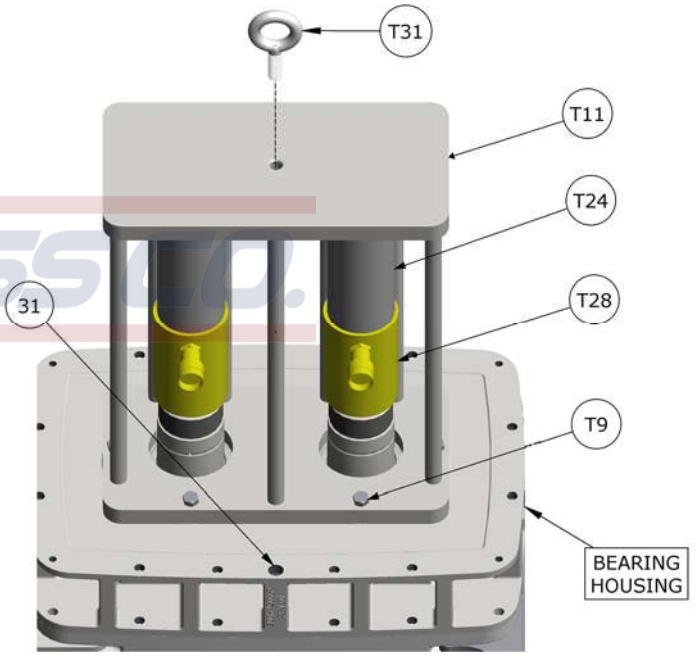
4. Bearing Housing, Bearings and Oil Slinger Removal

NOTICE
Bearings and internal oil slinger should be replaced during overhaul as a matter of service policy.

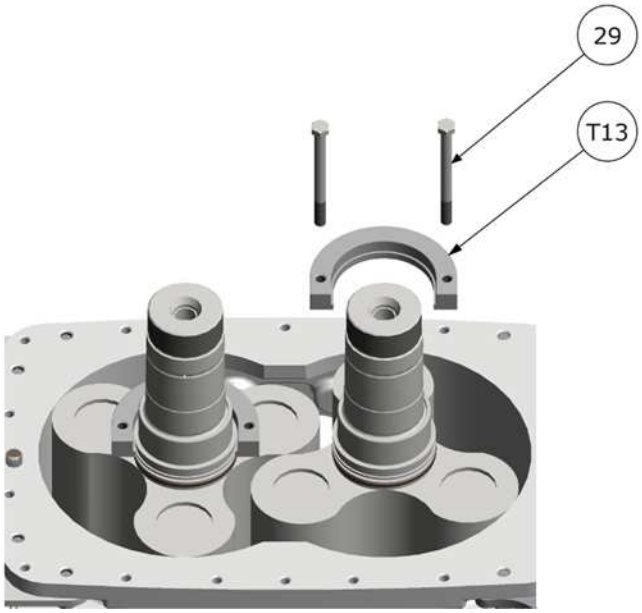
⚠ CAUTION
Exercise care not to damage the bearing bores on the bearing housing when removing bearings and oil seals.

19. Mount Blower on trunnion with gear end up.
20. Remove seven bearing retaining screws (14), washers (15) and two bearing retaining plates (13).
21. Remove two bolts (31) attaching the gear end bearing housing to the cylinder.
22. Secure disassembly fixture (T11) on the gear end bearing housing with seven bolts (T9) using the same holes as the bearing retainer plates.
23. Attach overhead hoist to disassembly fixture using the eye bolt (T31).
24. Place a hydraulic cylinder (T28) and spacer (T24) on top of each rotor shaft to press against fixture as shown. Apply pressure evenly to each hydraulic cylinder (T28) until the bearing housing is released.-
25. Remove hydraulic cylinder (T28) and spacer (T24). Lift bearing housing off cylinder using the overhead



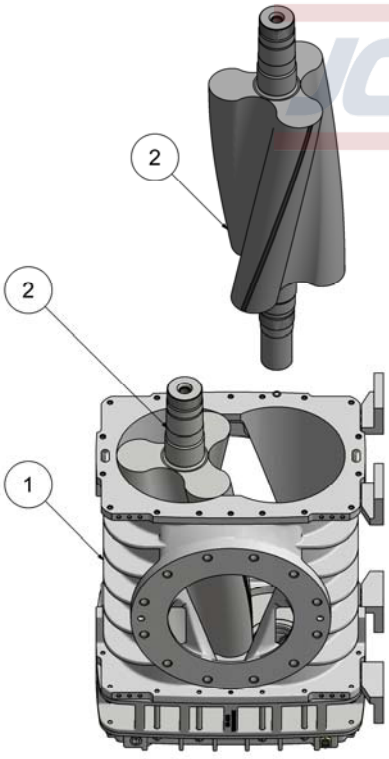
26. Pull bearings from housing with hands.
27. Drive the oil slinger (9) out of the bearing housing with small hammer and punch. Discard the oil slingers as they will not be reused.
28. Proceed to page-32 to remove piston rings and ring carriers. Return to step 29 below when finished removing piston rings and ring carriers on the gear end.
29. Reinstall gear end bearing housing to cylinder with two long bolts (31) and rotate assembly so the drive end is up.
30. Remove the locknuts (23), oil slingers (21) and spacers (19) from the drive end rotor shafts using the nut driver tool (T12). (See page-46 illustration).
31. Remove the two bolts (31) attaching the drive end bearing housing to the cylinder.
32. Repeat steps 22 through 27 for drive end.
33. Reinstall drive end bearing housing with two long bolts (31) and rotate assembly so the gear end is up. Proceed to step 38.

5. Ring Carrier Removal



34. Remove the piston rings from each ring carrier.
35. Pull ring carriers from both rotor shafts using ring carrier puller (T13) and two bolts (29).
36. Inspect all piston rings for signs of damage and abnormal wear. Rings with damage and abnormal wear should be replaced.
37. Inspect the ring carriers for signs of damage and abnormal wear. Normally it is not required to replace the ring carriers.

6. Rotor Removal



38. Match mark the rotors (2) by making small punch marks on the end of meshing lobes.
39. Insert eye bolt (T31) into the drive rotor shaft. Connect chain to overhead hoist. Center the hoist over rotor to allow rotor to be removed smoothly without swinging. Slowly raise and remove the rotor.
40. Repeat Step 39 for idler rotor.
41. Rotate assembly so gear end is up. Remove two screws (31) and remove bearing housing.
42. Inspect Rotors.
43. Inspect the inserts in the four bearing bosses (two in each bearing housing) for the sign of damage and abnormal wear. Normally is not required to replace the inserts. If any insert is damaged it may be removed. Support the external surface of the bearing housing near the insert with blocks of wood with the oil side facing up. Drive the insert out with hydraulic press and insert extraction tool (T30). Inserts must be removed from oil side of the bearing housing.

Torque Specifications

Description	Item number	Torque FT-LBS
Socket Head Cap Screw	31	110
Hex Head Cap Screw	14	75
Bearing Locknut	23	250
Hex Head Cap Screw	29	75
Hex Head Cap Screw	30	75
Hex Head Cap Screw	38	75
Socket Head Screw	49	45

Key Symbols Used

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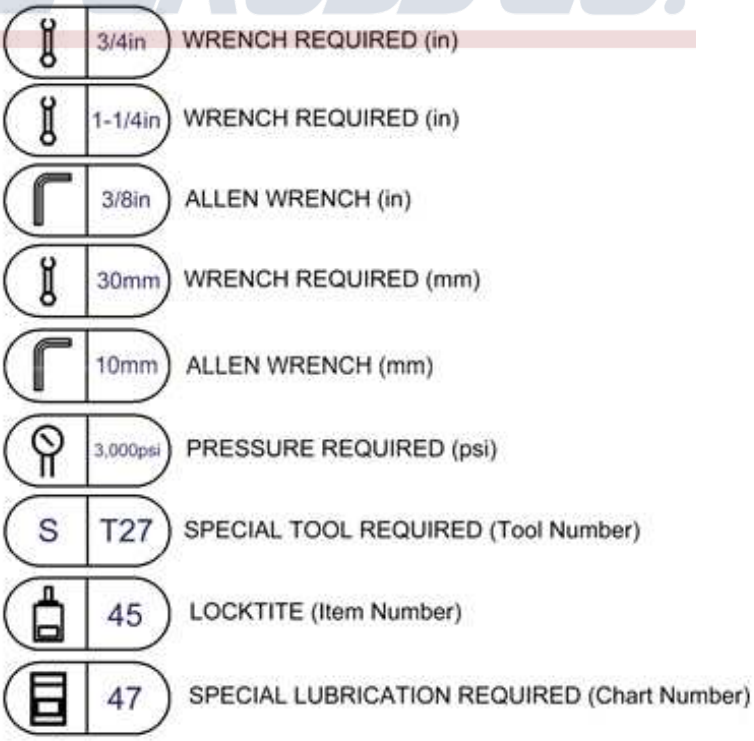
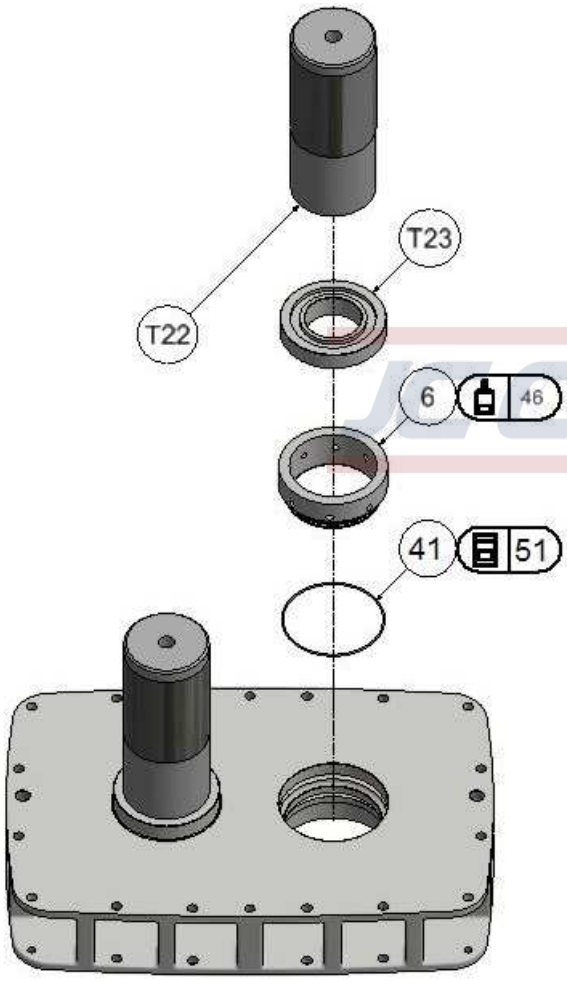


1. Bearing Housing Insert Installation

NOTICE
***N*umbers in parenthesis ( ) refer to balloon numbers in figures and in assembly drawings.** **Make sure Insert is fully seated. Use extreme care when installing.**

Cleaning and Inspection

Before reassembling the blower and any parts that are to be reused should be inspected and cleaned thoroughly. Ensure all threads are clean, if needed run tap through threads. Clean and undamaged threads will ensure correct bolt torque. Parts need to be free from rust, Loctite residue, gasket eliminator residue, burns and nicks.



1. Place one bearing housing (3) horizontally in a hydraulic press with the air side facing up. Support the bearing housing on blocks of wood.
2. Lubricate o–ring (41) with o-ring grease (51) (Parker Super Lube Hi-Temp 884-2 or similar). Place o-ring in the bearing housing o-ring groove.
3. Apply a small bead of Loctite 620 (46) to insert bore lips (Chamfer & I.D.) in the bearing housing. Run bead all the way around. Locate the insert (6). The end of the insert with holes in it should face toward the oil side of the bearing housing. Orient insert with holes in the 12:00 and 6:00 o'clock position. Press the insert into the bearing housing using tools (T22) and (T23). After the insert is installed, verify that it does not extend above the air side surface of the bearing housing.
4. Repeat steps 2 and 3 for the second bore.
5. Repeat steps 1, 2 and 3 for the second bearing housing.

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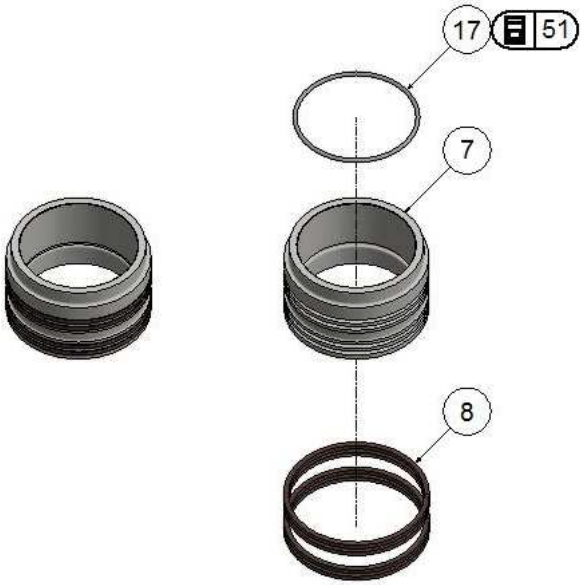
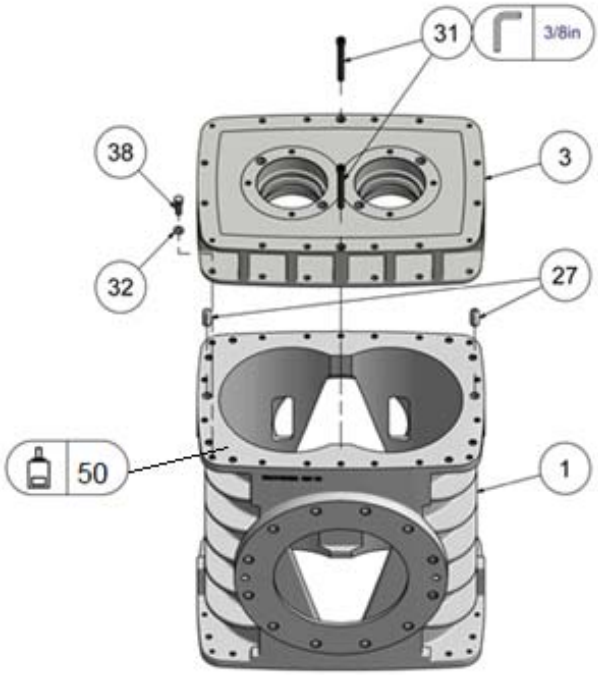
2. Piston Ring Installation



6. Lubricate o-ring (17) with o-ring grease (51) (Parker Super Lube Hi-Temp 884-2 or similar) and insert into the groove on the inner diameter of the ring carrier (7).
7. Install four piston rings (8) into the piston ring carrier (7). Offset the gaps in the rings 180°.
8. Repeat steps 6 and 7 for the remaining three ring carriers.

3. Bearing Housing Assembly - Drive End

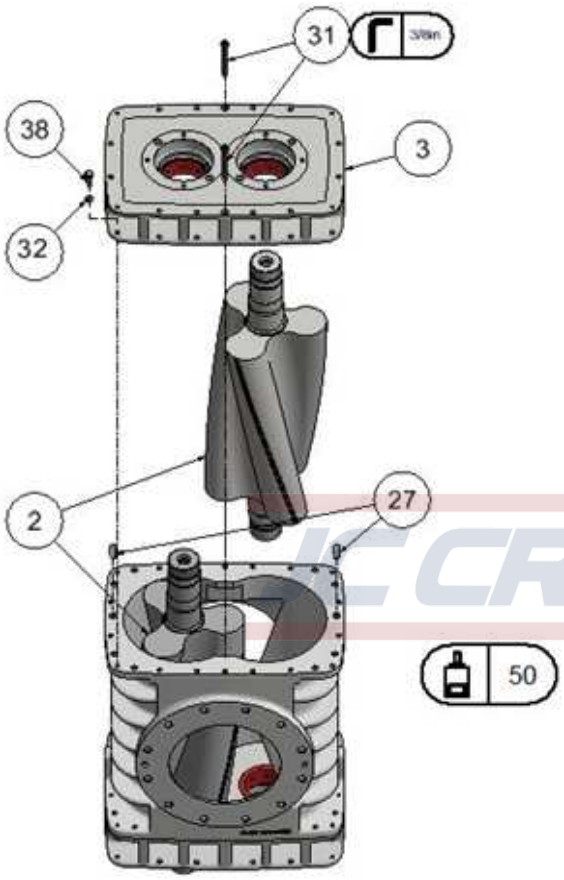
⚠ CAUTION
Bearing housing must be oriented so that dowel holes in bearing housing lines up with dowels in air cylinder.



9. Attach mounting bracket to the inlet port of the air cylinder (1) and mount cylinder (1) to trunnion. Refer to the arrows cast into the air cylinder by discharge port to determine the air flow direction. The discharge port has two feedback slots adjacent to the triangular opening. Position cylinder vertically with the drive end on the top. The feedback slots should be up.
10. Apply Loctite Gasket Eliminator 515 (50) to the sealing surface of the cylinder and install two dowel pins (27) into the cylinder. Install the bearing housing (3) onto the cylinder using two sock- et head bolts (31), four hex head bolts (38) and four lock washers (32).
11. Tighten bolts (31) to 110-lbs. and (38) bolts to 75-lbs.
12. Reposition the air cylinder vertically with the drive end on the bottom for the next step.

4. Rotors and Bearing Housing Assembly - Gear End

⚠ CAUTION
Bearing housing must be oriented so that dowel holes in bearing housing lines up with dowels in air cylinder.

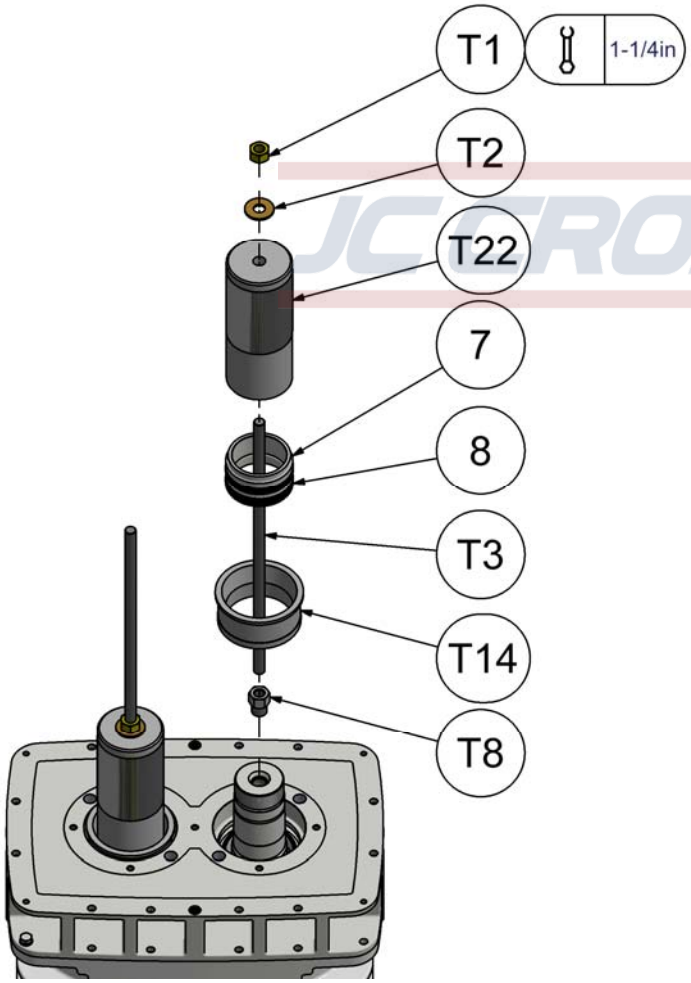


13. From the blower model designation, determine drive shaft (long rotor) location and the direction it rotates.
14. Insert rotors (2) into the cylinder individually using an overhead hoist. Verify that the long end of the drive rotor extends through the drive end bearing housing and that it is in the correct bore. Ensure that the rotation of each rotor matches the arrows on the outside of the air cylinder. Ensure that rotor lobes match the triangular shape of the discharge port.
15. Measure and record the total rotor to bearing housing end clearance for each rotor. This is accomplished by using a depth micrometer to measure the distance from the top edge of the air cylinder to the top of the rotor lobe while the rotor is supported by the bottom bearing housing and held as vertically as possible.
16. Apply Loctite Gasket Eliminator 515 (50) to the sealing surface of the cylinder and install two dowel pins (27) into the cylinder. Install the bearing housing (3) onto the cylinder using two socket head bolts (31), four hex head bolts (38) and four lock washers (32).
17. Tighten bolts (31) to 110lbs. and (38) bolts to 75lbs.

5. Ring Carrier Installation - Gear and Drive Ends

NOTICE
Make sure Ring Carriers are fully seated. This is important in order to set up right fix end clearance.

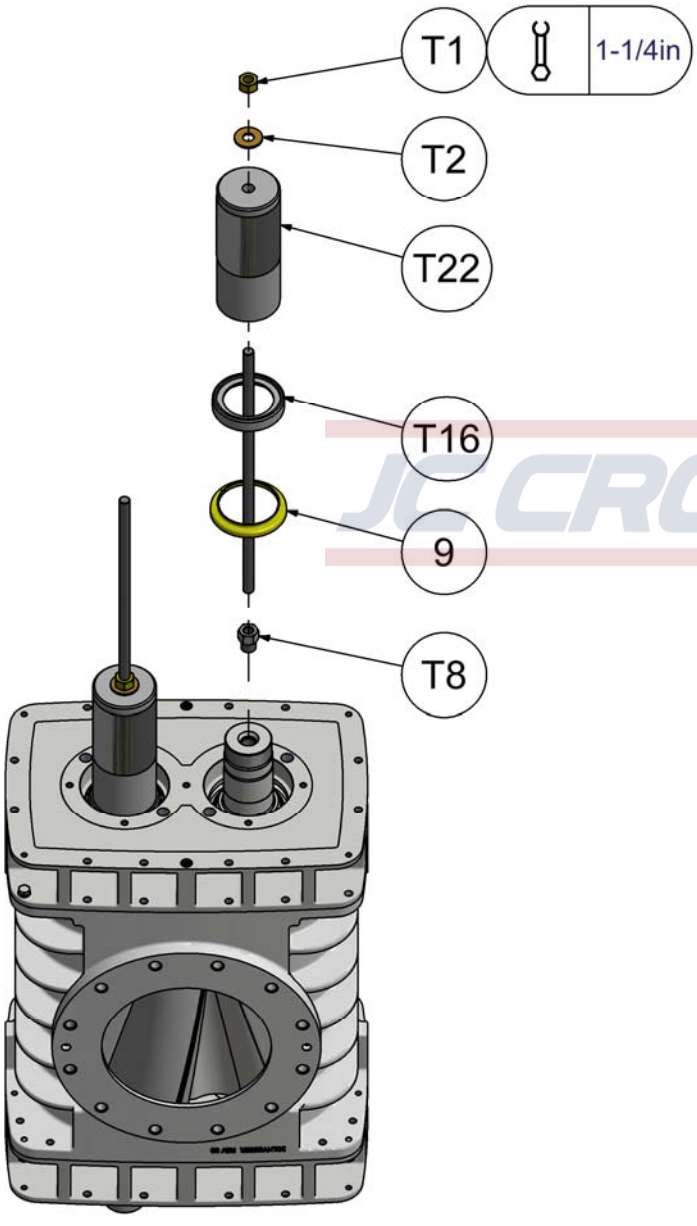
⚠ CAUTION
Use extreme care when installing ring carriers and piston rings in the bearing housing. Do not attempt to perform installation without the use of specified tools in step 21. Blows from hammer or mallet can damage the fragile piston ring surface. Too much force can crush the piston ring. Make certain the piston ring and ring carriers are properly seated and undamaged before proceeding.



18. Reposition the air cylinder vertically with the drive end on the top for the next step.
19. Apply light coat of oil to the inside diameter of the two inserts in the drive end bearing housing. Also apply light coat of oil to the shaft diameter closest to rotor body of both rotors. DO NOT apply oil to the outside diameter of the piston rings.
20. Insert tool (T14) into the drive rotor bearing housing until seated.
21. Place the ring carrier on the drive rotor with the ring side toward the rotor body.
22. Using tools T1, T2, T3, T8 and T22, press the piston ring carrier against the face of the rotor body. Ensure that ring carrier is seated against rotor face.
23. Repeat steps 20 through 22 for the idler rotor.
24. Position the assembly vertically with the gear end on the top. Repeat steps 19 through 22 to install ring carriers and piston rings on the gear end.

6. Slinger Installation - Gear End

NOTICE
1. **Make sure oil slinger are fully seated.**
2. **New oil slinger should be installed each time the bearing housing is removed.**



25. Position the assembly vertically with the gear end on the top.
26. Apply a light coat of oil to the outside diameter of the previously installed ring carriers on drive rotor and to the Inside diameter of the oil slinger 9
27. Press oil slinger (9) using tools T1, T2, T3, T8, T16, and T22 until seated against shoulder of ring carrier.
28. Repeat steps 26 and 27 for the idler rotor on this end.

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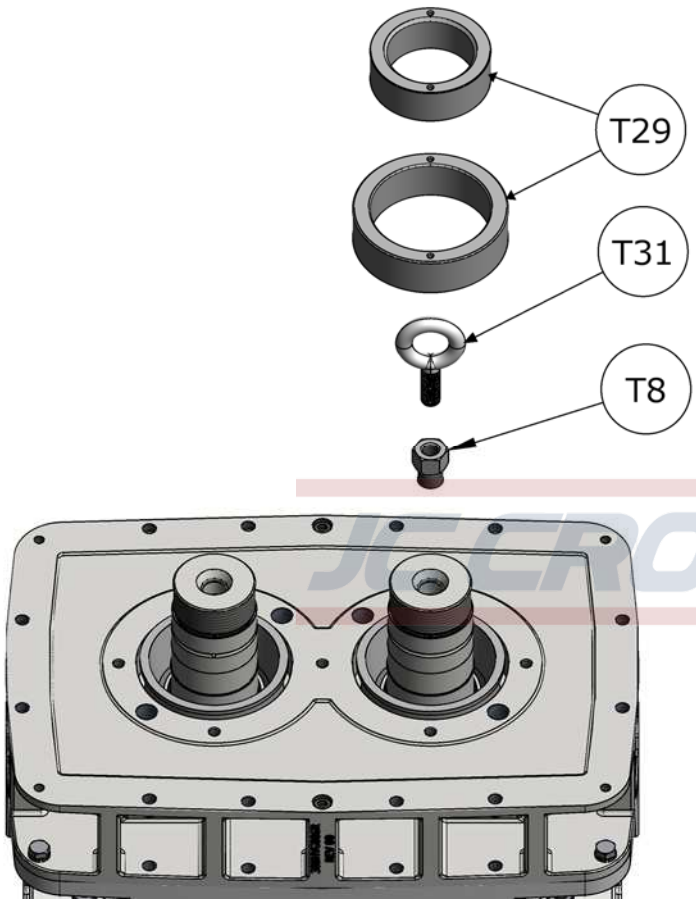
7. Setting Fix End Clearances - Gear End

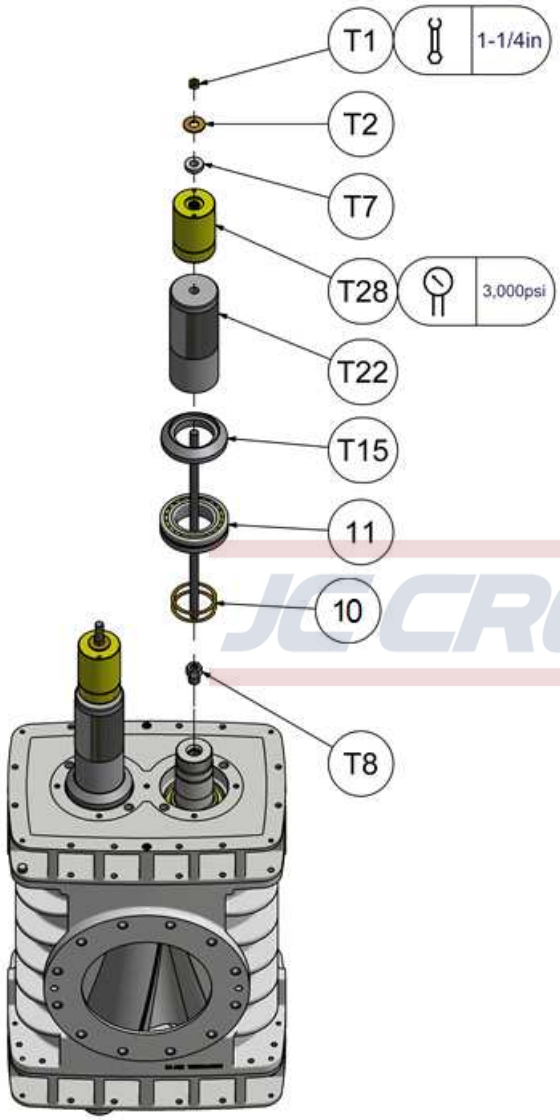
NOTICE
Make sure Ring Carriers are fully seated. This is important in order to set up correct fix end clearance.



29. Make sure the ring carrier on Idler rotor is properly seated against rotor face by Inserting tools (T22) on the ring carrier and pressing it slightly by hand.
30. Place the false bearing (T29) into the bearing bore of the idler (short) shafts' gear end.
Thread adaptor (T8) and eyebolt (T31) into the end of the idler rotor and li the rotor until the ends of the rotor lobes contact the top bearing housing.
Using a depth micrometer, measure and record the distance from the top surface
of the outer ring of the false bearing to the top surface of the inner ring. The inner ring of the false bearing should be above the outer ring. The number measured should be .010 - .011 inches. If it is less than .010 - .011 inches,
shims (10) equal to the difference must be installed on the shaft of the rotor.
31. Lower the rotor and remove the eyebolt.
Remove the false bearing. Install the required amount of shims (10) as determined in step 30 onto the idler rotor shaft.
32. Repeat steps 29, 30 and 31 for the drive (long) rotor.

8. (C2) Bearings Installation - Gear End

NOTICE
The maximum load applied to this all thread rod must never exceed 5 tons.



33. Locate the 2 spherical roller bearings (11) that are to be installed on the gear end of both rotors. The gear end bearings and the drive end bearings are the same physical size and appear to be the same part. It is important that the correct bearings are installed on the gear end as they have tighter internal clearances that the drive end bearings. The part number and C2 should also be marked on these bearings.
34. Apply oil to the drive and idler rotor bearing bores in the gear end bearing housing. Lubricate internal surfaces and rollers of bearings with oil. Drain excess oil from bearing before installation . Oil should not be dripping from bearing in mounted position.
35. Place a bearing over the idler rotor shaft with the numbers on the bearing facing up. Screw (T8) and (T3) into the end of the idler rotor shaft. Place (T15) and (T22) over the all thread rod (T3). Place a portable hydraulic cylinder with a hollow center (T28) over the all thread rod and onto the driver tool. Put (T7), (T2) and (T1) over the all thread rod and tighten it up against the hydraulic cylinder. Press the bearing onto the rotor shaft using the hydraulic cylinder.
36. Repeat step 34 for the drive rotor on the gear end.

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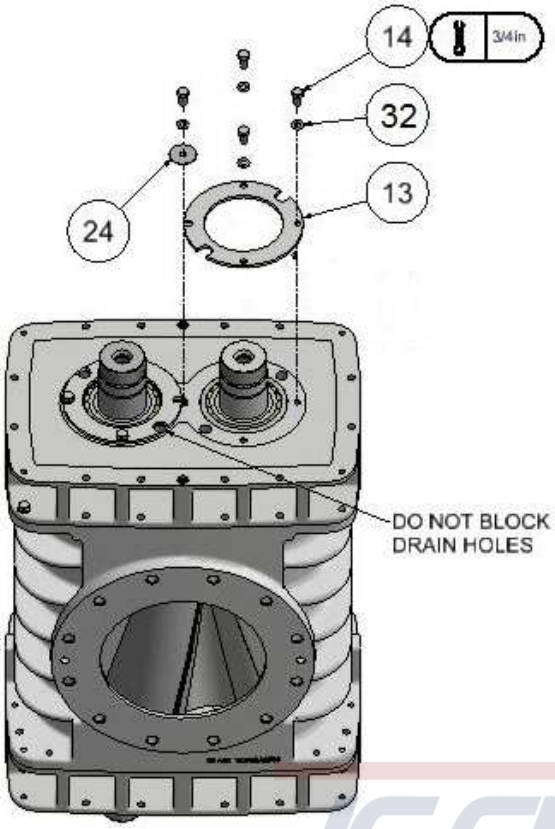
9. Bearing Retainer Plates Installation



37. Place two bearing retainer plates (13) on the gear end housing. Ensure the oil drain slots on the plates are positioned over drain holes in the bearing housing as to not block the drain holes.

38. Mount bearing retainer plates onto the gear end bearing housing with seven screws (14) and lock washers (32). The center bolt, be- tween the two plates, has an oversized flat washer (24) between the plates and the lock washer.

39. Tighten the screws to 75-lbs. torque.

40. Position the assembly vertically with the drive end on the top for the next step.

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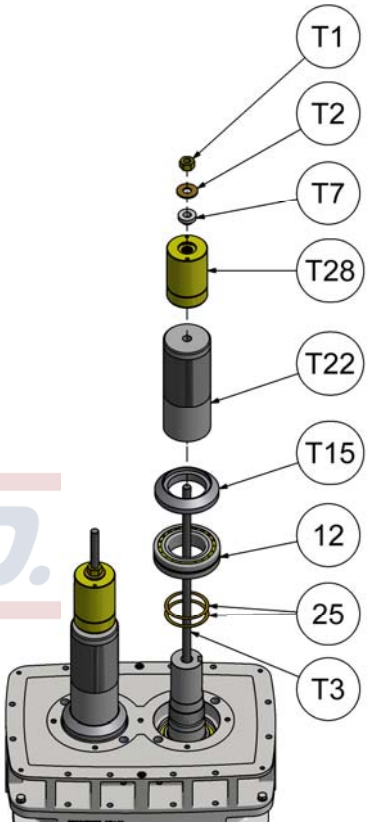
CLEARANCE TABLE		
CLEARANCES	**HF825**	**HF817**
IMPELLER TO DRIVE HEADPLATE	**0.027” Minimum**	**0.020” Minimum**
IMPELLER TO GEAR HEADPLATE	**0.008”-0.011”**	**0.008”-0.011”**
IMPELLER INTERLOBE TIMING Min. (A)	**0.01" Closed / 0.013" Open**	**0.01" Closed / 0.013" Open**
TIP TO CASE CLEARANCE INLET (B)	**0.021” Minimum**	**0.017” Minimum**
TIP TO CASE CLEARANCE DISCH. (C)	**0.010” Minimum**	**0.009” Minimum**
GEAR BACKLASH	**0.001”-0.0045”**	**0.001”-0.0045”**

10. Bearings and Oil Slingers Installation - Drive End

NOTICE
1. Make sure oil slinger are fully seated.
2. New oil slinger should be installed each time the bearing housing is removed.
3. The maximum load applied to this all thread rod must never exceed 5 tons.

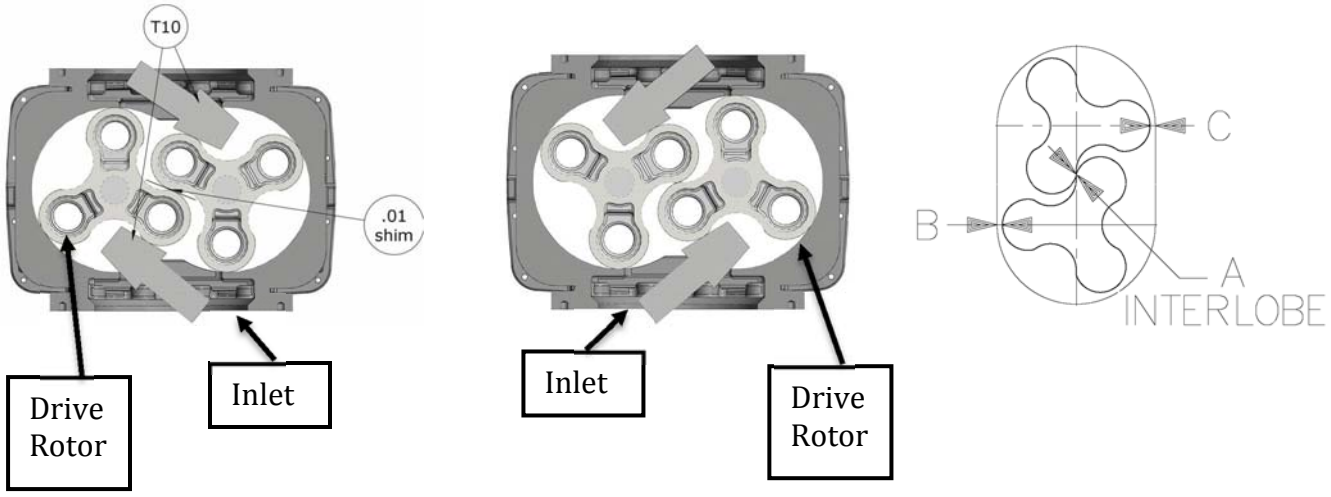
41. Repeat steps 26, 27 and 28 to install oil slingers on the drive end.
42. Install three 0.030 inch shims (25) onto the idler (short) rotor shaft.
43. Install three 0.030 inch shims (25) onto the drive (long) rotor shaft.
44. Locate the two spherical roller bearings (12) that are to be installed on the drive end of both rotors. The gear end bearings and the drive end bearings are the same physical size and appear to be the same part.
45. Apply oil to the drive and idler rotor bearing bores in the drive end bearing housing. Lubricate internal surfaces and rollers of bearings with oil. Drain excess oil from bearing before installation. Oil should not be dripping from bearing in mounted position.
46. Place a bearing over the idler rotor shaft with the numbers on the bearing facing up. Screw the all thread rod (T3) into the end of the idler rotor shaft . Place the bearing insert tool (T15) and the driver tool (T 22) over the all thread rod (T3). Place the hydraulic cylinder (T28) over the all thread rod (T3) and onto the driver tool. Place the bushing (T7), flat washer (T2) and the heavy hex nut (T1) over the all thread rod and tighten it up against the hydraulic cylinder. Press the bearing onto the rotor shaft using the hydraulic cylinder.
47. Repeat step 45 for the drive rotor on the drive end.
48. Measure the fixed end (gear end) axial clearance for both rotors (with the assembly in the vertical position and the drive end on top). This can be accomplished by inserting feeler gauges between the end of the rotor lobe and the inner surface of the bearing housing. This clearance should be measured and recorded for all 3 lobes on both rotors. Compare these clearances to the requirements for the clearance shown in table. Do not proceed with the assembly if these measurements are not equal to or greater than the minimum specified in clearance table on page 41.



49. Position the assembly vertically with the gear end on the top.
50. Repeat step 48 (with gear end on top) to measure and record the floating end (drive end) axial clearance.
51. With the gear end on top, measure and record the gear end axial clearance for all three lobes on both rotors. Note there are no specifications on the clearance drawing for this measurement. This measurement will be used to determine the axial movement of the bearings.
52. Using feeler gauges measure the clearance between the rotor tips and the air cylinder. This measurement should be taken for the drive rotor and the idler rotor. The first measurement for both rotors should be taken on the inlet side of the air cylinder (by going through the inlet port). The second measurement should be taken on the discharge side of the air cylinder (by going through the discharge port). The clearance should be measured along the entire length of the lobe and for all three lobes on each rotor. Record these clearances and verify that they are equal to or greater than the minimum specified in clearance table.

11. Preparation for Gear Installation

NOTICE
It is extremely important to maintain gap dimension (distance between gear back face and spacer) in range 0.175”-0.200” or timing will be lost.



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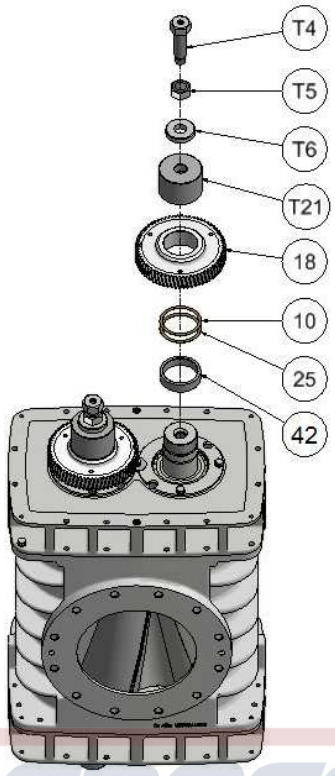
53. Carefully clean tapered ends of the shafts and tapering bores of the gears. Every gear and rotor will be stamped with **L** or **R** to match each gear with its paired rotor. Match gear helix angle with rotor helix angle.
54. Install spacer gear end (42) and lightly set gear (18) on idler rotor. Measure the distance between gear and spacer. This distance should be in range from .175” to .200” If it is more, add shims equal to the difference.
55. Repeat step 53 for drive rotor.
56. Align rotors in timing position shown on images depending on which rotor is drive rotor. Insert .010” shims between trailing side of the drive rotor lobe and Idler Rotor lobe. One 0.010” shim should be placed close to top and second 0.010” shim close to bottom of rotors. The trailing side of the drive rotor lobe is determined by looking through either the inlet or discharge port and rotating the rotor in the correct direction (as indicated by the arrows cast into the air cylinder). The first drive rotor lobe sur- face that meshes with an idler (short) rotor lobe is the leading side. As the drive rotor continues to rotate the trailing side of this same lobe will mesh with a different lobe on the idler rotor.
57. Jam wedge tools (T10) between rotor lobes and cylinder to press rotors against shim and prevent rotor movement during gear installation.

12. Gear Installation



58. Fixed gear should be on left rotor looking from discharge port. Always install fix gear first.

59. Place fixed gear (18), with screw holes facing up, on its matching rotor shaft. Place gear tool (T21) over rotor shaft and onto gear.

60. Screw the hydraulic bolt (T4), with nut (T5) and flat washer (T6), through gear tool (T21) and into the rotor shaft. Attach hydraulic hose (T26) and pump (T25) to the hydraulic bolt. Tighten nut (T5) against tool.

61. Begin both tightening nut and pressurizing gear. Press gear down against shims.

62. Verify that the gear is fully seated against shim using 0.002" feeler gauge. Feeler should not go be- tween bottom gear face and shims.

63. Release the pressure and drain the oil for at least 1 minute. Disassemble the Injector tool.

64. Repeat steps 59 thru 63 for floating gear.

65. Take out 0.010" shims used for timing and (T10) tools used to protect (fix) rotors rotation.

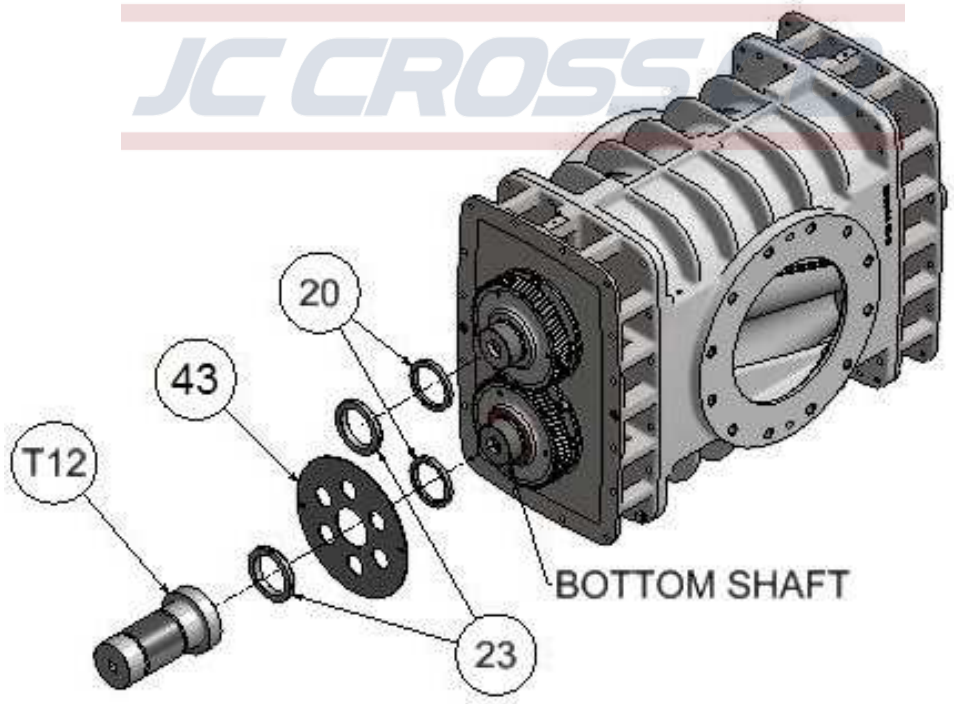
66. Measure and record the interlobe clearance on both sides of each drive rotor lobe. The clearances must be measured along the entire length of the lobes. Verify that these clearances are within the range specified on the clearance table.

67. Lock the idler rotor from turning by wedging a feeler gauge or shop rag between the tip of a lobe and the air cylinder. Measure the backlash of the gears using a dial indicator and a magnetic base. Gear backlash is the distance (in the circumferential direction) a gear tooth can freely move when the mating gear is fixed. This should be measured in 3 places (every 1/3 turn) and recorded. Verify that the back- lash is within the range of 0.001"-0.0045".

13. Slinger and Nut Installation - Vertical Configuration

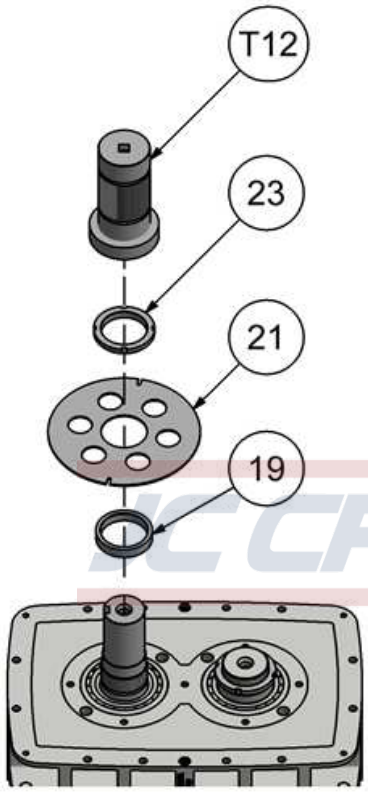
NOTICE
The oil slingers must be installed on the bottom shaft. Assure the slingers are installed on the drive and gear ends. The drive end slinger is smaller in diameter than the gear end slinger.

68. Position the assembly vertically with the gear end on the top.
69. Install a spacer (20) onto both of the rotor shafts of the gear end.
70. Install the oil slinger (43) on the bottom rotor shaft. In order to be in contact with the oil, the slinger must be installed on the bottom shaft.
71. Install a bearing locknut (23) on each rotor shaft on both ends. Apply Loctite246 (45) to the locknut threads prior to screwing it onto the shaft. Use locknut tool (T12) and a torque wrench to tighten the locknut to 250-lbs.
72. Reposition the assembly vertically with the drive end on the top.
73. Install a spacer (19) onto both rotor shafts on the drive end.
74. Install the oil slinger (21) on the bottom shaft of the drive end. In order to be in contact with the oil, the slinger must be installed on the bottom shaft.
75. Repeat step 71 to install the bearing locknut.



14. Slinger and Nut Installation - Horizontal Configuration

NOTICE
The oil slingers must be installed on the bottom shaft. Assure the slingers are installed on the drive and gear ends. The drive end slinger is smaller in diameter than the gear end slinger.



76. Position the assembly vertically with the drive end on the top.

77. Install spacer (19) onto the drive rotor shaft.

78. Install the oil slinger (21) on the drive rotor shaft.

79. Install spacer (19) onto Idler rotor shaft.

80. Install a bearing locknut (23) on the drive end of both rotor shafts. Apply Loctite246 (45) to the locknut threads prior to screwing it onto the shaft. Use locknut tool (T12) and a torque wrench to tighten the locknut to 250lbs.

81. Reposition the assembly vertically with the gear end on the top.

82. Install spacer (19) onto the drive rotor shaft.

83. Install the oil slinger (21) on the drive rotor shaft.

84. Install a spacer (19) onto Idler rotor shaft.

85. Repeat step 80 to install (23) bearing locknuts on both rotor shafts.

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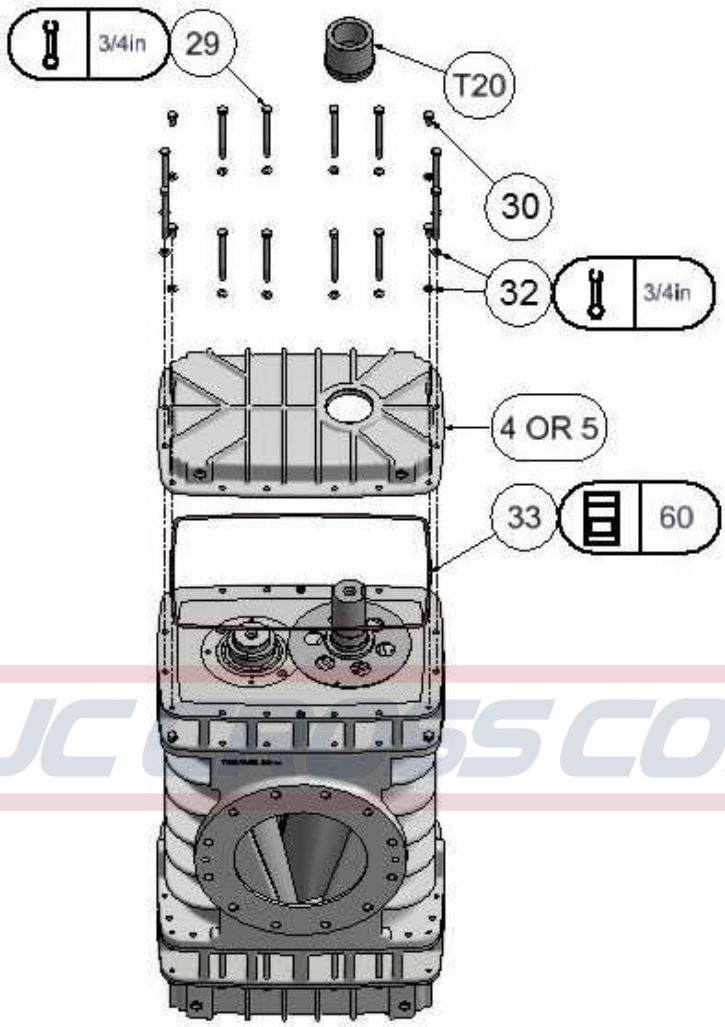
15. Sump Cover Installation



86. Position the assembly vertically with the drive end on the top.

87. Using a pump type oil can apply oil (AEON PD) to all of the bearings. Turn the rotors to distribute the oil throughout the bearings. This will ensure that the bearings are lubricated when the blower is first started.

88. Lubricate o-ring (33) with o-ring grease (Parker Super Lube Hi-Temp 884-2 or similar) and install the o-ring in the sump covers (4 gear end and 5 drive end).

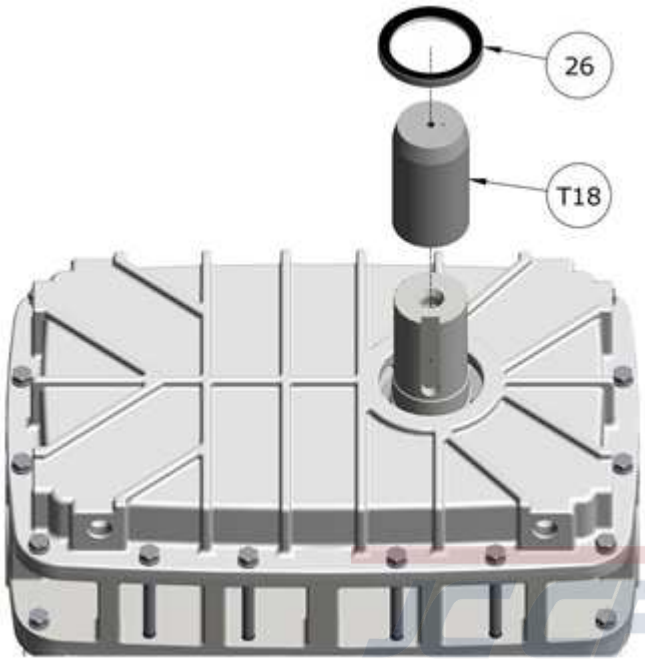
89. Install the drive end sump cover (5) to bearing housing. Use tool (T20) to position drive end sump cover (5) bore with tight concentricity to rotor shaft.

90. Attach sump cover (5) to bearing housing using short hex head bolts (30) and long hex head bolts (29) along with lock washers (32) tightened evenly to 75ft-lbs. Use short bolts (30) on the four corners and use long bolts (29) on all other hole locations.

91. Reposition the assembly vertically with the gear end on the top and repeat steps 89, 90 and 92 to install gear end sump cover (4).

16. Drive Seal Installation

NOTICE
Use extreme care when installing oil seals to prevent cutting the seal lip.



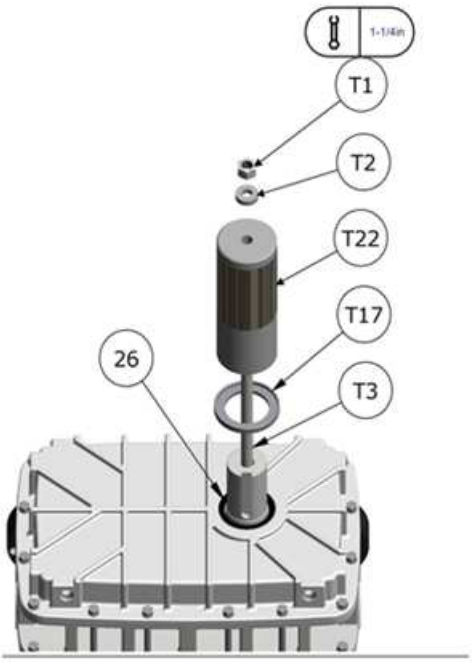
92. Position the assembly vertically with the drive end on the top.

93. Determine the proper orientation of the cover seal (26). The seal has two lips. The outer lip is shorter and when installed should point to- ward the keyway end of the drive rotor shaft. Apply oil to both of the seal lips and outer diameter of seal.

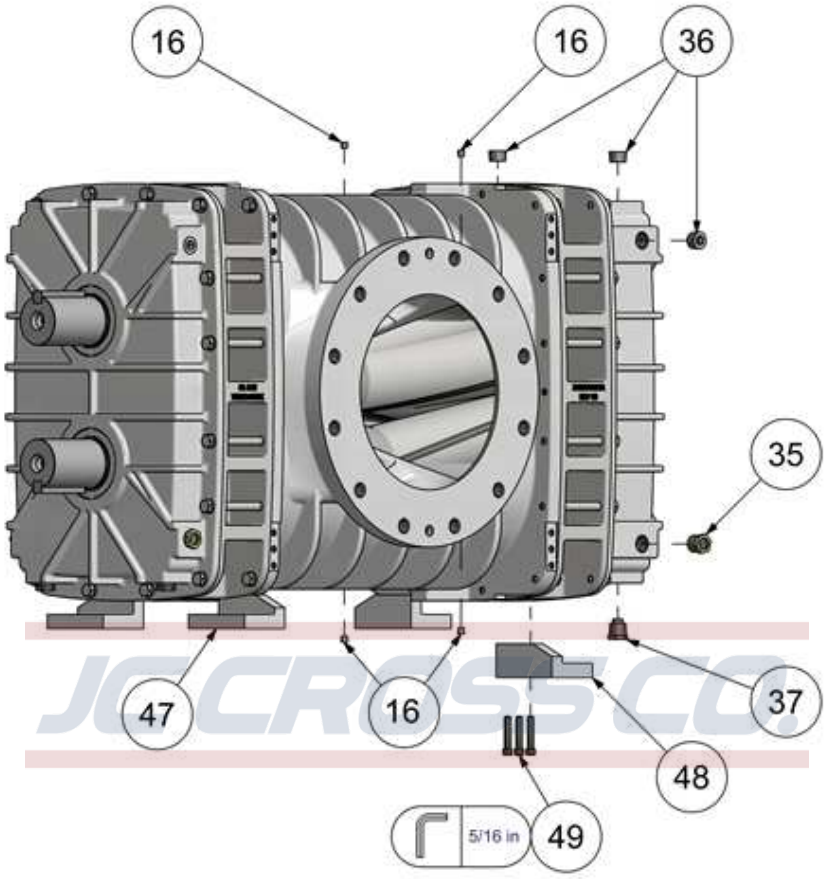
94. Slide drive shaft cover tool (T18) on shaft. Apply oil to the outside surface of the sleeve. Gently slide seal over tool to prevent seal from being damaged. Remove tool from the shaft, leaving seal against cover.

95. Screw rod (T3) into drive rotor shaft. Slide tools (T17) and (T22) over rod and secure with nut (T1) and washer (T2).

96. Slowly tighten nut (T1), driving the oil seal (26) into the sump cover from the external surface. After installation the seal should be flush with the external surface of the sump cover.

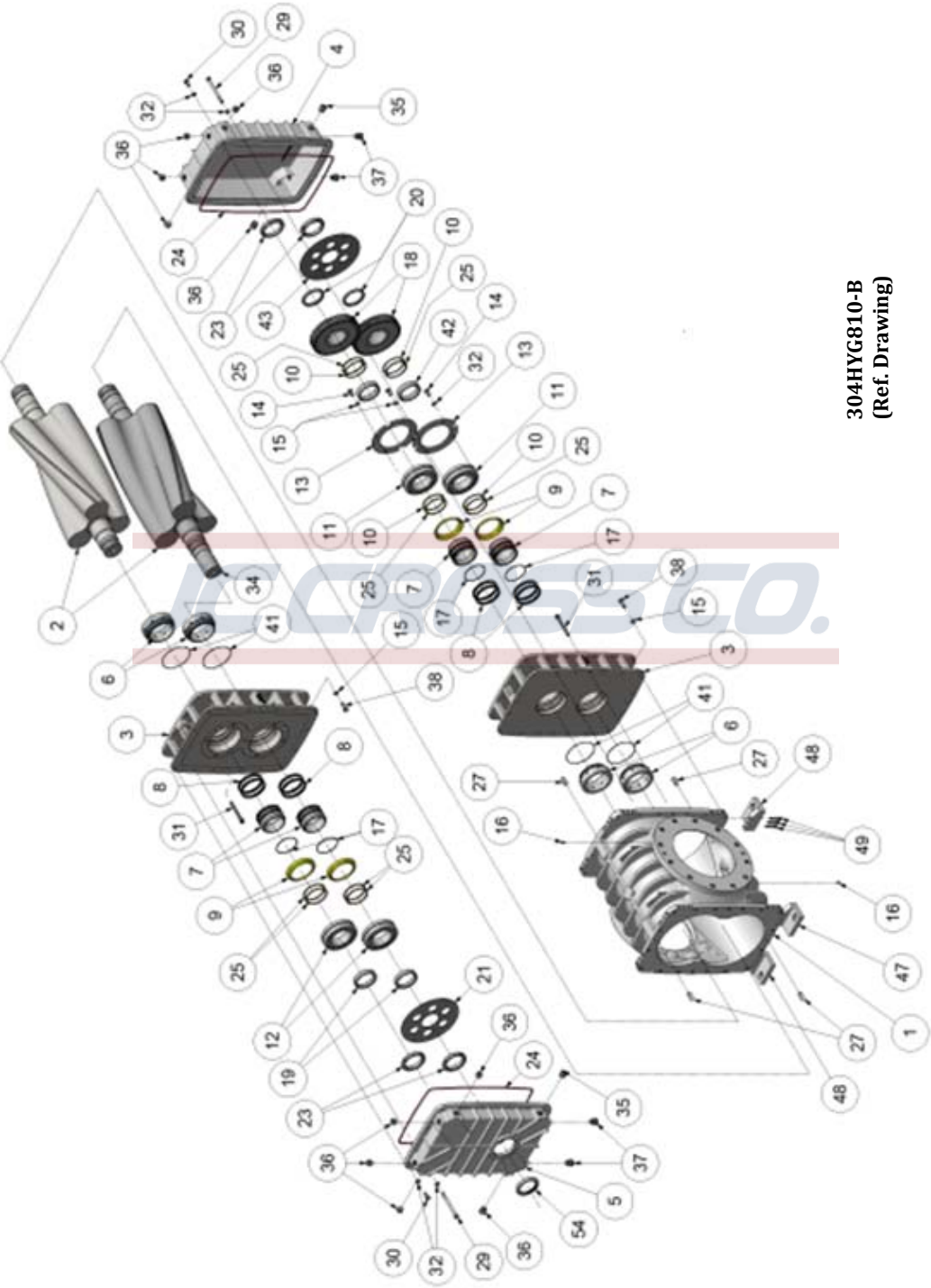


17. Plugs and Mounting Feet Installation



97. Install 1/8”plugs (16) in the four instrument holes in the air cylinder near the inlet and discharge ports.
98. Determine the appropriate hole in each sump cover for the oil level gauge (35). The oil level will be in the lower part of the oil sump. Apply Loctite243 to the threads of each gauge. Install one oil level gauge in each sump.
99. Determine the location of the two drain holes in each sump cover. Install a magnetic plug (37) in each of these 4 holes.
100. Install plugs (36) in the 5 remaining holes in each sump cover. Note there are no external sump breathers used on this blower.
101. Install the four mounting feet to the blower with 12 bolts (49). The feet should be pointing outward from the blower centerline. Tighten the bolts in three steps to 45 foot-pounds.
102. Measure the run out of the end of the drive shaft using a dial indicator and a magnetic base. Verify that the runout is less than 0.002 inches.
103. Check the keyway on the end of the drive rotor for burrs. Install the drive shaft key (34) into the drive rotor. Ensure that it is a snug fit. Tape the key to the shaft so that it does not get lost.

18. Parts List – Models HYGL_AA and HYGM_AA



304HYG810-B
(Ref. Drawing)

Parts List – Models HYGL_AA

Ref. No.	Description	Quantity	Part Number
1	CYLINDER, MACH, HF825	1	301HYG002
2	ROTOR, LONG HF825 RIGHT HAND HELIX	1	308HYG010
2	ROTOR, SHORT HF825 LEFT HAND HELIX	1	309HYG010
3	BRG HOUSING, MACH, 8" HELIFLOW	2	300HYG006
4	COVER, GEAR END, 8" HELIFLOW	1	300HYG602
5	COVER, DRIVE END, 8" HELIFLOW	1	300HYG477
6	INSERT, 8" HELIFLOW	4	300HYG248
7	CARRIER, PISTON RING 8" HELIFLOW	4	300HYG1148
8	RING-PISTON, 4.606 X .1574	16	300HYG163
9	SLINGER, INTERNAL SEAL - 8" HELIFLOW	4	300HYG173
10	SHIM, 0.005" THICK	6	304HYG732
11	BEARING, SPH ROLLER, 22218C2	2	TEN001039
12	BEARING, SPH ROLLER, 22218	2	TEN001038
13	PLATE-BEARING RETAINER	2	300HYG253
14	SCREW 1/2-13UNC x 1.00 LG NYLON INSERT	7	655EE04N
16	PLUG 1/8"MPT HEX SOCKET HEAD - PRESSURE	4	64AC1
17	O-RING -24075D VITON	4	25BC242
18	GEAR KIT, 8" HELIFLOW	1	300HYG601
19	SPACER, DRIVE END, 8" HELIFLOW	2	303HYG144
20	SPACER, GEAR END, 8" HELIFLOW	2	302HYG144
21	SLINGER, DRIVE END, 8" HELIFLOW	1	301HYG173
23	LOCKNUT-BRG AN 17	4	50Z17
24	WASHER-PLAIN 1/2 BOLT STD TYPE A	1	95A5
25	SHIM, 0.030" THICK, 8" HELIFLOW	6	306HYG732
26	SEAL, OIL	1	TEN001800
27	PIN-DOWEL .75" X 1.5" LG	4	62V18
29	SCREW 1/2-13UNC X 5.75" LG, HEX HD	24	655EE230
30	SCREW 1/2-13UNC x 1.00 LG, HEX HD	8	655EE040
31	SCREW 1/2 x 4-1/2 LG SOCKET HDCAP	4	75P87
32	WASHER-LOCK 1/2 HELICAL SPRING	47	95B5
33	O-RING,VITON,22.00ID,.19W,A.R.P. 391	2	TST000067
34	KEY 0.750 x 0.750 x 4.125" LG - SQUARE	1	TST000091
35	GAUGE-OIL LEVEL 3/4-14 NPT TYPE THD WIN	4	40P45
36	PLUG 3/4" MNPT HEX SOCKET HEAD PRESS	8	64AC5
37	PLUG-MAGNETIC 3/4 MPT MAG OUTSIDE HEX S	4	64BJ4
38	SCREW 1/2-13UNC x 1.50 LG HEX HD	8	655EE060
41	O-RING	4	25BC409
*	**NOT SHOWN ON DRAWING ON PAGE 50**		

KELLOGG

Parts List – Models HYGL_AA

Ref. No.	Description	Quantity	Part Number
42	SPACER, GEAR END, 8" HELIFLOW	2	301HYG144
43	SLINGER, GEAR END, 8" HELIFLOW	2	302HYG173
*45	LOCTITE 246, 250 ML BOTTLE	0.016	25BC884
*46	LOCTITE 620, 250 ML BOTTLE	1	25BC749
47	FOOT, HORZ RIGHT, 8" HELIFLOW	2	306HYG166
48	FOOT, HORZ LEFT, 8" HELIFLOW	2	307HYG166
49	SCREW 3/8 – 16UNC X 2.00” LG, SOCKET HDCAP	12	75P59
50	GASKET-ELIMINATOR 10.15 FL. OZ.	1	25BC256
51	PARKER SUPER LUBE	1	----------

* **NOT SHOWN ON DRAWING ON PAGE 50**

JC CROSS CO.

Parts List – Models HYGM_AA

Ref. No.	Description	Quantity	Part Number
1	CYLINDER, MACH, HF817	1	305HYG002
2	ROTOR, LONG HF817 RIGHT HAND HELIX	1	304HYG010
2	ROTOR, SHORT HF17 LEFT HAND HELIX	1	305HYG010
3	BRG HOUSING, MACH, 8" HELIFLOW	2	300HYG006
4	COVER, GEAR END, 8" HELIFLOW	1	300HYG602
5	COVER, DRIVE END, 8" HELIFLOW	1	300HYG477
6	INSERT, 8" HELIFLOW	4	300HYG248
7	CARRIER, PISTON RING 8" HELIFLOW	4	300HYG1148
8	RING-PISTON, 4.606 X .1574	16	300HYG163
9	SLINGER, INTERNAL SEAL - 8" HELIFLOW	4	300HYG173
10	SHIM, 0.005" THICK	6	304HYG732
11	BEARING, SPH ROLLER, 22218C2	2	TEN001039
12	BEARING, SPH ROLLER, 22218	2	TEN001038
13	PLATE-BEARING RETAINER	2	300HYG253
14	SCREW 1/2-13UNC x 1.00 LG NYLON INSERT	7	655EE04N
16	PLUG 1/8"MPT HEX SOCKET HEAD - PRESSURE	4	64AC1
17	O-RING -24075D VITON	4	25BC242
18	GEAR KIT, 8" HELIFLOW	1	300HYG601
19	SPACER, DRIVE END, 8" HELIFLOW	2	303HYG144
20	SPACER, GEAR END, 8" HELIFLOW	2	302HYG144
21	SLINGER, DRIVE END, 8" HELIFLOW	1	301HYG173
23	LOCKNUT-BRG AN 17	4	50Z17
24	WASHER-PLAIN 1/2 BOLT STD TYPE A	1	95A5
25	SHIM, 0.030" THICK, 8" HELIFLOW	6	306HYG732
26	SEAL, OIL	1	TEN001800
27	PIN-DOWEL .75" X 1.5" LG	4	62V18
29	SCREW 1/2-13UNC X 5.75" LG, HEX HD	24	655EE230
30	SCREW 1/2-13UNC x 1.00 LG, HEX HD	8	655EE040
31	SCREW 1/2 x 4-1/2 LG SOCKET HDCAP	4	75P87
32	WASHER-LOCK 1/2 HELICAL SPRING	47	95B5
33	O-RING,VITON,22.00ID,.19W,A.R.P. 391	2	TST000067
34	KEY 0.750 x 0.750 x 4.125" LG - SQUARE	1	TST000091
35	GAUGE-OIL LEVEL 3/4-14 NPT TYPE THD WIN	4	40P45
36	PLUG 3/4" MNPT HEX SOCKET HEAD PRESS	8	64AC5
37	PLUG-MAGNETIC 3/4 MPT MAG OUTSIDE HEX S	4	64BJ4
38	SCREW 1/2-13UNC x 1.50 LG HEX HD	8	655EE060
41	O-RING	4	25BC409

* **NOT SHOWN ON DRAWING ON PAGE 50**

Parts List – Models HYGM_AA

Ref. No.	Description	Quantity	Part Number
42	SPACER, GEAR END, 8" HELIFLOW	2	301HYG144
43	SLINGER, GEAR END, 8" HELIFLOW	2	302HYG173
*45	LOCTITE 246, 250 ML BOTTLE	0.016	25BC884
*46	LOCTITE 620, 250 ML BOTTLE	1	25BC749
47	FOOT, HORZ RIGHT, 8" HELIFLOW	2	306HYG166
48	FOOT, HORZ LEFT, 8" HELIFLOW	2	307HYG166
49	SCREW 3/8 – 16UNC X 2.00” LG, SOCKET HDCAP	12	75P59
50	GASKET-ELIMINATOR 10.15 FL. OZ.	1	25BC256
51	PARKER SUPER LUBE	1	----------

* **NOT SHOWN ON DRAWING ON PAGE 50**

JC CROSS CO.

Overhaul Kit – 302HYG6010

Ref. No.	Description	Quantity	Part Number
8	RING-PISTON	8	300HYG163
9	SLINGER, INTERNAL SEAL - 8" HELIFLOW	4	300HYG173
10	SHIM SET	2	300HYG732
11	BEARING, SPH ROLLER	2	TEN001039
12	BEARING, SPH ROLLER	2	TEN001038
14	SCREW 1/2-13UNC x 1.00 LG NYLON INSERT	7	655EE04N
15	WASHER-LOCK 1/2 HELICAL SPRING	7	95B5
23	LOCKNUT, BEARING	4	50Z17
25	SHIM, 0.030" THICK	6	306HYG732
26	SEAL,OIL,DRIVE SHAFTFT	1	TEN001800
* 33	GASKET-ELIMINATOR, 10.15 Fl. Oz.	1	25BC256
*45	LOCTITE 246, 10ML	1	25BC885
*46	LOCTITE 620, 10ML	1	25BC886

* **NOT SHOWN ON DRAWING ON PAGE 50**

JC CROSS CO.

Gardner Denver

WARRANTY

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.

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