C.Emery Nelson, Inc.
INDUSTRIAL AND POWER PLANT EQUIPMENT
ESTABLISHED 1922
7631 Commerce Street, Hamel, MN 55340
Ph: 763/ 420-3844 Fax: 763/420-2542

Gardner Denver

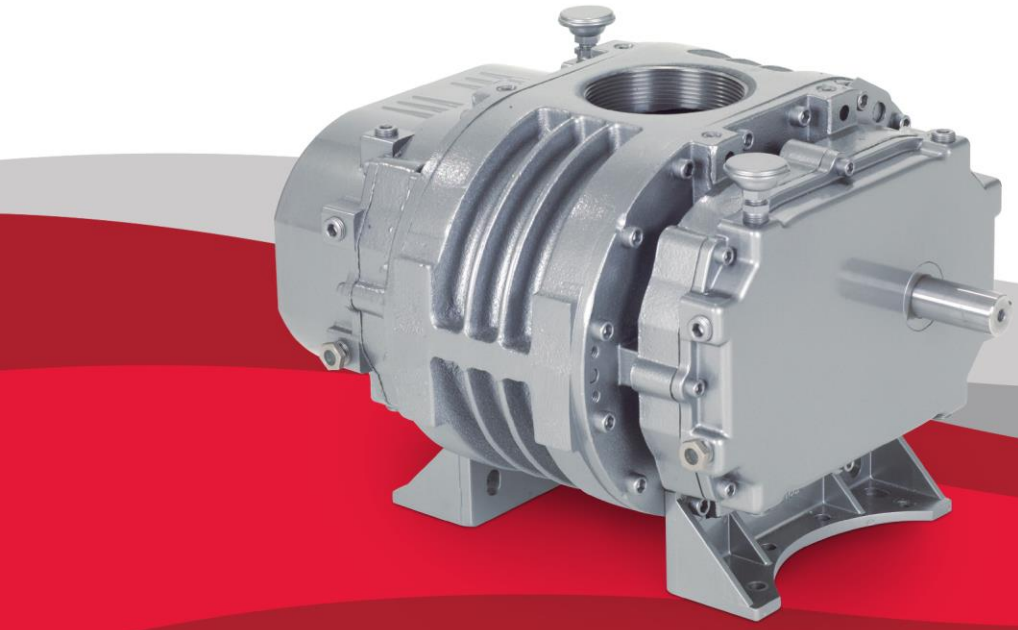
PD BLOWERS & VACUUM PUMPS
LEGEND BLOWER | 7” GEAR DIAMETER

Operating, Service & Parts List Manual

LEGEND 7” GEAR DIAMETER

MODELS:

GAG_ _R_



SB-7-638
Version 00
April 17, 2020

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:

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GARDNER DENVER LUBRICANT ORDER INFORMATION

Re-order Part Numbers for Factory Recommended Lubricants.

Gear and Drive End

AEON PD Synthetic Lubricant	
Description	**Part Number**
1 Quart	28G23
Case/12 Quarts	28G24
1 Gallon Container	28G40
Case/6 Gallons	28G41
5 Gallon Pail	28G25
55 Gallon Drum	28G28

AEON PD-XD Extreme Duty Synthetic Lubricant	
Description	**Part Number**
1 Quart	28G46
Case/12 Quarts	28G47
1 Gallon Container	28G42
Case/6 Gallons	28G43
5 Gallon Pail	28G44
55 Gallon Drum	28G45

AEON PD-FG Food Grade Synthetic Lubricant	
Description	**Part Number**
1 Quart	28H97
Case/12 Quarts	28H98
1 Gallon Container	28H333
Case/6 Gallons	28H334
5 Gallon Pail	28H99
55 Gallon Drum	28H100

Drive End

AEON PD Grease	
Description	**Part Number**
Case/10 Tubes (14oz/Tube)	28H283

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

_____

_____

FOREWORD

Sutorbilt® 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 manual 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 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 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 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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LIST OF ILLUSTRATIONS

SUTORBILT LEGEND 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

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

FOLLOW THE LINE DOWN AND OVER FROM EACH SPACE THUS FILLED IN TO FIND THE APPROPRICATE CONSTRUCTION OPTION WITH WHICH YOUR MACHINE IS EQUIPPED.

COLUMN 1 – BASIC DESIGNATOR

COLUMN 2 – PRODUCT FAMILY

COLUMN 3 – GEAR DIAMETER

G	7”

COLUMN 4 – CASE LENGTH

- L - Low Pressure
- M - Medium Pressure
- H - High Pressure

COLUMN 5 – CONFIGURATION

- A Vertical-Top Hand -Central Timed
- B Vertical-Bottom Hand – Central Timed
- C Horizontal – Left Hand – Central Timed
- D Horizontal – Right Hand – Central Timed

COLUMN 6 – DESIGN VERSION

COLUMN 7 – ADDITIONAL DESCRIPTION

SEALS

- A. Lip
- B. Mechanical

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.**

⚠ 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 value shown on the nameplate.**
- **Do not operate unit if safety devices are not operating properly. Check periodically. Never bypass safety devices.**

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 Sutorbilt 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 Sutorbilt 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 Sutorbilt blower. It is essential that you review all sections of this manual in preparation for installing your blower. Follow the instructions for installing your blower. Follow the instructions carefully and you will be rewarded with trouble-free Gardner Denver Sutorbilt service year in and year out.

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) weekly 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 Compressor Division Customer Service for recommendations.

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 Sutorbilt units 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 port on the bottom side. Place a shallow pan on the underside 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 and loose clothing away from blower inlet and discharge ports.

SECTION 2
INSTALLATION

GENERAL – The Sutorbilt Legend is a compact, rotary straight bi-lobe blower. The meshing of two bi-lobe type rotors synchronized by timing gears provides controlled compression of the air.

OPERATING PRINCIPLE – Compression is achieved by the driven (2 lobe) and drive (2 lobe) rotors meshing enclosed in the housing. The timing gears maintain close rotor clearances. The rotors do not touch each other or the housing. Although clearances are small, lubrication in the compression chamber is not required, insuring oil-free air delivery.

The compression cycle begins as the rotors unmesh at the inlet port. Air is drawn into the rotor cavities, trapped, and compressed by the reducing cavities as rotation continues. When full compression is made, the cavities cross the discharge port, completing the cycle. The cycle occurs two times for each revolution of the shaft and is continuous.

CONSTRUCTION – All models of the Sutorbilt Legend series of Blowers are of similar design and construction. The housing is a one-piece design with flanged or threaded inlet and discharge openings.

The rotors are ductile iron attached to a steel shaft. Rotors are dynamically balanced for vibration-free operation. Timing gears are made of alloy steel and are ground for quiet operation.

One double row angular-contact ball bearing is used on each rotor shaft at the gear end as a fixed bearing to maintain rotor axial end clearance.

A cylindrical roller bearing is used on the drive shaft rotor at the drive end as a floating bearing to maintain rotor radial clearance and to support belt loads. A single row deep groove ball bearing is used on the short shaft rotor at the drive end to maintain rotor radial clearance.

All gears and bearings on the gear end are oil splash lubricated. Drive end bearings may be splash or grease lubricated depending on type of unit configuration.

A vent opening is provided between the air chamber seal and the oil sump seal. This vent prevents any air seal leakage from flowing through the oil seal and must be left open to atmosphere.

LOCATION – Select a clean, dry, well-ventilated area for installing blower and allow ample room for normal maintenance. Proper ventilation is necessary for blower cooing and cool air intake. Do not exceed any of the limits listed in the table below without consulting the factory.

Maximum Ambient	113°F (45°C)
Minimum Inlet Temperature	-20°F (-29°C)
Minimum Ambient Temperature*	-10°F (-23°C)

*Operation at ambient temperatures below 10°F requires sump heaters, heated enclosure, and synthetic lubricant. These precautions are recommended for operation below 32°F.

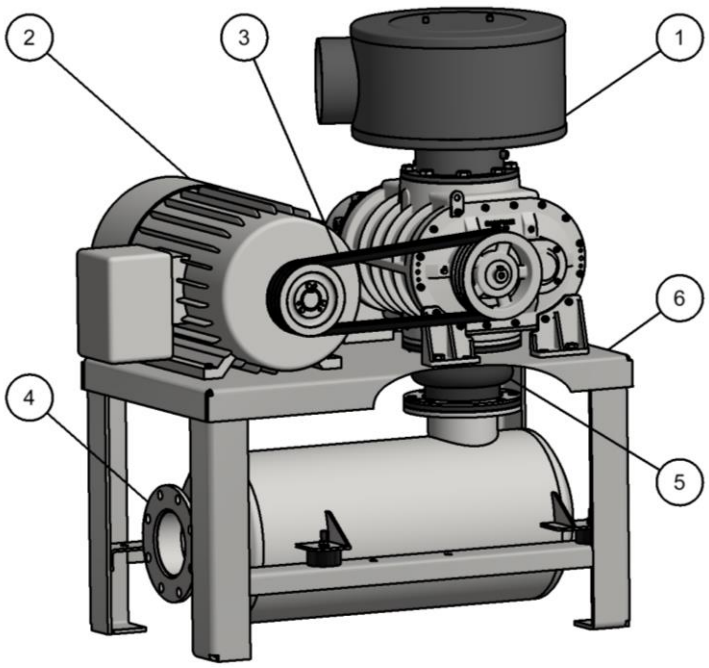
FIGURE 2-1 ENVIRONMENTAL LIMITS

⚠WARNING

Do not electric weld on the blower or base; bearings can be damaged by the passage of current.

FOUNDATIONS – Correct supporting is important. Distortion by incorrect supporting will affect internal operating clearances. The foundation or base must provide a level, rigid, nonworking support for the blower. It must be on a uniform and solid footing. Complete foundation design cannot be given because of varying conditions. Contact the factory for application specific recommendations.

For permanent installations, we recommend concrete foundations be provided. The equipment should be grouted to the concrete. Use non-shrinking grout only. It is necessary that a suitable base be used, such as steel combination base under the blower and motor, or a separate sole plate under each. The blower feet must be 100% supported. Before grouting, equipment must be leveled, free of all strains, and anchored so no movement will occur during curing of grout. After grout has completely hardened, a recheck is necessary to compensate for shrinkage. 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. The blower must be installed on a flat, level surface and bolted down evenly to prevent warping or strain. Internal clearances are very critical and serious damage or failure can result from housing distortion. Shim under the blower feet as required to achieve less than 0.002” [50 µm] gap.



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ACCESSORIES– The type of service determines the accessory group required. The typical items are listed as follows:

1. Inlet Filter or Filter-silencer.
2. Driver (Electric Motor)
3. Simple V-Belt Drive
4. Discharge Silencer
5. Expansion Joint(s), Inlet and/or Discharge.
6. Base Plate.

MOUNTING CONFIGURATIONS

The blower flex-mount design enables horizontal and vertical mounting configurations with top or bottom hand, right or left hand shaft positioning. The units are center timed allowing rotation in either direction (refer to Figure 2-2). If converting a blower from vertical to horizontal, or horizontal to vertical mounting configuration, additional mounting feet will be required.

REPOSITIONING THE MOUNTING FEET.

1. Position the mounting feet to the desired location and snug the cap screw.
2. Place the blower on its feet on a flat surface.
3. Loosen mounting feet cap screws and level unit up. The bench or blower base flatness should be within .002 of an inch.

NOTICE
If the unit is not flat within .002 of an inch, it will be necessary to shim the blower feet at installation.

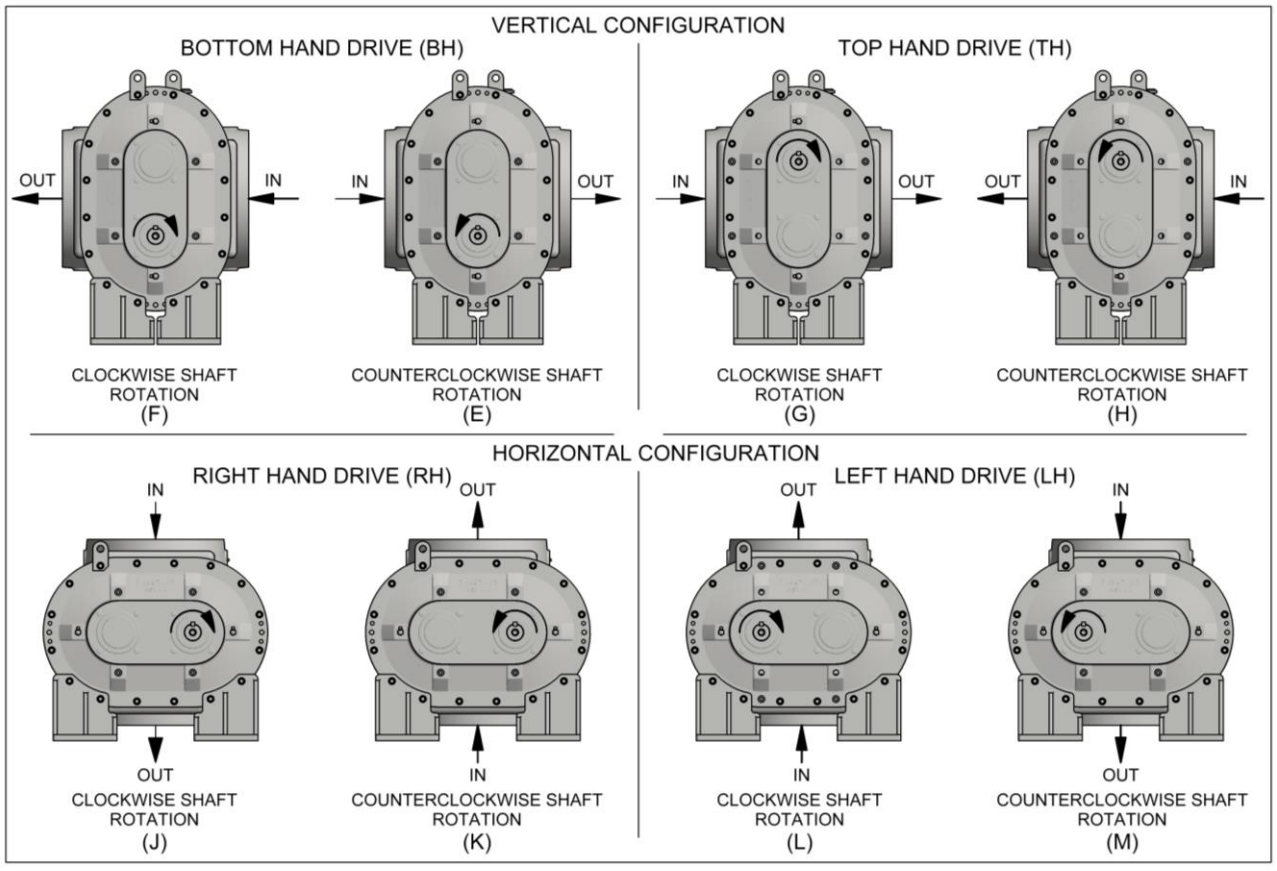

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FIGURE 2-2 BLOWER MOUNTING CONFIGURATIONS

Inlet Filter or Filter-Silencer – For pressure service handling air, the blower inlet must be protected by a filter of suitable size to allow full flow of air to the blower inlet. The filter must be of adequate efficiency to trap any foreign materials which may be in the general area of the air inlet. If noise is a factor, filter-silencers should be used. A differential pressure indicator is recommended to on the filter for measuring filter life.

⚠WARNING

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

In choosing a location for the filter, select a source of cool, clean, and dry air with access for maintenance.

For vacuum service, the type of system used and materials being handled will determine the necessity for an in-line filter.

Couplings – For direct-coupled units, a flexible type coupling, accurately aligned, should be used between the blower and power unit. A grid type coupling is recommended. Misaligned couplings may cause vibration, additional bearing loads and stresses which will affect life of parts involved. **Do not drive the couplings on shaft.** Check shaft and coupling bore for burrs. Polish the shaft and bore if necessary for proper fit. Fit keys to keyways. Check coupling alignment. Exact alignment will vary with the type of couplings; however total indicator reading (TIR) should not exceed 0.003" [75 µm]. With lubricated or special couplings, follow the manufacturer's instructions for installation and maintenance. Do not use couplings that may cause an axial thrust during operation.

DRIVE INSTALLATION

V-Belt Drive – Follow normal specifications recommended by the belt manufacturers for installation of belt drive on blowers. To provide the most compact drive, it is suggested that high capacity V-belt drives be used. Blower shaft and power unit shaft should be parallel, with sheaves aligned on shafts so belts run true. Use only matched belt sets and replace belts in complete sets only. Belt tension should be according to manufacturer's recommendations. Slippage can be detected by belt squeal, overheating or loss of speed. A few hours after initial starting with new belts, it is advisable to recheck belt tension and provide tension adjustment as necessary.

⚠WARNING

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

When selecting a V-belt drive, check to be sure the maximum allowable moment limitation is not exceeded. Refer to Figure 2-3 on next page for V-belt drive overhung load calculations. Figure 2-3 applies to V-belt calculations only. Exceeding overhung load limitations may result in rapid blower failure due to removal of all gear backlash. Premature bearing failure and potential shaft breakage may also result. Increasing sheave diameter and belt speed can reduce belt pull.

NOTICE

When a simple V-belt drive is not available, to stay within the maximum allowable moment, a jackshaft V-belt drive is required.

Belt drives must be carefully aligned. Motor and blower pulleys must be parallel to each other and in the same plane within 1/16 inch [1.6 mm]. Belt tension should be carefully adjusted and belts tightened using a tension meter per belt manufacturer's recommendations.

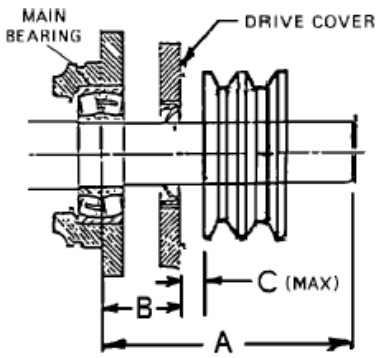
NOTICE

The sheave should be positioned as close as possible to the drive cover. This will reduce the overhung load and extend the bearing life.

Synchronous-Belt Drive – Synchronous belts are not recommended for usage on Gardner Denver positive displacement blowers. Installation of synchronous belts is critical and can result in alignment, tensioning and vibration problems, which contribute to higher than normal loads and stresses on the blowers.

Gear Diameter (inches)	Dimensions - Inches			Maximum Allowable Moment - lbf·in
	A	B	C (Max)	
7	4.50	1.31	.38	3000

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		

$$Z = \frac{(\text{Large Sheave Pitch Diameter} - \text{Small Sheave Pitch Diameter})}{\text{Sheave Center Distance}} \; [Unitless - Use\ inches\ or\ mm]$$

ARC OF CONTACT FACTORS

IMPERIAL CALCULATION (lbf·in):

$$\boldsymbol{Belt\ Pull\ [lbf]} = \left(\frac{2.5 - Ac}{Ac}\right)\left(\frac{125954 \cdot HP \cdot S.F.}{D \cdot RPM}\right)$$

Where,
Belt Pull = Total belt force on blower shaft [lbf]
Ac = Arc of Contact Factor (Refer to Chart above)
HP = Blower shaft power for Operating Conditions [hp]
S.F. = Drive Service Factor (=1.4 for continuous duty applications)
D = Blower Sheave Pitch Diameter [in]
RPM = Blower Sheave Speed [rpm]

$$\boldsymbol{Shaft\ Moment\ [lbf \cdot in]} = \boldsymbol{Belt\ Pull} \cdot \left(B + C + \frac{W}{2}\right)$$

Where,
Shaft Moment = Total moment on blower shaft [lbf·in]
Belt Pull = Total belt force on blower shaft [lbf]
B = Dimension B from model table above [in]
C = Dimension C from model table above [in]
W = Width of Blower Sheave [in]

METRIC CALCULATION (N·m):

$$\boldsymbol{Belt\ Pull\ [N]} = \left(\frac{2.5 - Ac}{Ac}\right)\left(\frac{19083940 \cdot kW \cdot S.F.}{D \cdot RPM}\right)$$

Where,
Belt Pull = Total belt force on blower shaft [N]
Ac = Arc of Contact Factor (Refer to Chart above)
kW = Blower shaft power for Operating Conditions [kW]
S.F. = Drive Service Factor (=1.4 for continuous duty applications)
D = Blower Sheave Pitch Diameter [mm]
RPM = Blower Sheave Speed [rpm]

$$\boldsymbol{Shaft\ Moment\ [N \cdot m]} = \boldsymbol{Belt\ Pull} \cdot \frac{\left(B + C + \frac{W}{2}\right)}{1000}$$

Where,
Shaft Moment = Total moment on blower shaft [N·m]
Belt Pull = Total belt force on blower shaft [N]
B = Dimension B from model table above [mm]
C = Dimension C from model table above [mm]
W = Width of Blower Sheave [mm]

CALCULATION OF SHAFT MOMENT

FIGURE 2-3 V-BELT DRIVE OVERHUNG LOAD CALCULATIONS

SAFETY DEVICES – For all installations the following safety devices are a requirement for safe blower operation.

Check Valve
When the blower is used in a pneumatic conveying system, a check valve must be used to prevent backflow of material into the blower. In any system it is a safety device preventing the downstream pressure from discharging through the blower during shutdown periods and causing reverse rotation of the blower. A check valve must be provided for each blower when several blowers are connected to a common manifold.

Relief Valve
The relief valve must be installed as close to blower ports as possible. There should be no accessories such as valves, check valves, silencers, etc. between the relief valve and blower ports. It should be set a maximum of 2 PSI [140 mbar] above blower process pressure (1" Hg. [34 mbar] below process pressure in vacuum service).

NOTICE
Relief valves should be placed as close as possible to the blower inlet port (vacuum operation) or discharge port (pressure operation).

High Temperature and High Pressure Shutdown – All blower installations should be protected with a high temperature shutdown switch. The controls should be set to stop the blower when the discharge temperature reaches 350°F [177°C]. In some installations, a high pressure shutdown switch may also be advisable. The sensing element of these controls should be installed as close to the blower discharge as possible.

INLET PIPING – During the installation of piping make sure dirt and other foreign materials do not enter blower openings. When inlet piping is used, **IT MUST BE CLEAN, AND FREE OF SCALE AND OTHER FOREIGN MATERIALS WHICH COULD ENTER THE BLOWER**. It is suggested that an expansion joint be installed near blower openings to prevent stressing of the blower housing. Support the pipe to relieve weight on the expansion joint and the blower. Make sure the pipe size is adequate for the rated flow and as straight as possible to prevent pressure drop at the blower inlet. Where bends are necessary use long radius fittings. All connections must be air tight.

For vacuum service, an accurate vacuum gauge must be used near the blower inlet to indicate operating vacuum and a suitable vacuum relief valve must be used. A vacuum blower in pneumatic conveying service requires pre-inlet separation and filtering to prevent material carry-over into the blower.

Estimated inlet pipe size is determined as follows:

0 to 10 feet long [0-3 m], use pipe size equal to blower inlet flange size.

10 to 17 feet long [3-5 m], use pipe size larger than blower inlet.

17 to 33 feet long [5-10 m], two pipe sizes larger than blower inlet.

DISCHARGE PIPING – In general, the type of system used will govern the piping arrangement. However, the following suggestions should be followed for blower protection and efficiency.

An expansion joint should be installed as close to the blower opening as possible to protect the blower housing from stresses. Where a flexible connection is not possible, the weight of the rigid connection and piping must be separately supported, and thermal pipe growth must be accommodated. All pipe connections should be square and even to prevent distortion from misalignment. Piping strain and misalignment stress will distort the blower during operation, resulting in loss of critical internal clearances. Loss of internal clearances will result in serious machine damage and premature, unwarrantable blower failure.

An accurate pressure gauge must be provided near the blower discharge to indicate operation pressure. If noise level is a factor, a discharge silencer should be used. The discharge line should be as straight as possible. Where bends are necessary, use long radius fittings. Provision for condensate drainage at the lowest point in the piping may be required.

SILENCERS – The gear pitch line velocity is typically above the transition speed for inlet and discharge silencers (unless operating near minimum speed). Combination chamber-absorptive silencers are recommended for effective noise attenuation.

VENTILATION – If the blower is to operate in a housing or enclosure, proper ventilation must be provided for adequate blower cooling. Cooling air should be taken from outside the enclosure. The enclosure ambient temperature should be within the limits specified in Figure 2-1.

SECTION 3
MAINTENANCE

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. A maintenance chart listing each blower and scheduling regular maintenance of the unit is valuable. A good program, well carried out, will insure long trouble-free service from the blower. Figure 3-1 shows recommended maintenance schedules for different duty cycles.

	RECOMMENDED FREQUENCY **These intervals are general recommendations and should be adjusted for actual site conditions.**																										
	Daily			**Weekly**			**3 Weeks**			**6 Weeks**			**12 Weeks**			**24 Weeks**			**36 Weeks**			**52 Weeks**					
Duty Cycle: (Note 1)	Light	Standard	Extreme	Light	Standard	Extreme	Light	Standard	Extreme	Light	Standard	Extreme	Light	Standard	Extreme	Light	Standard	Extreme	Light	Standard	Extreme	Light	Standard	Extreme			
Bare Blower																											
Lube level	■	■	■																								
Lube Sample (Note 2)						■				■	■																
Lube change (Note 3)															■					■		■	■				
Lube flush (Note 4)															■			■				■		■			
Lube Temperature	■	■	■																								
Discharge Temperature	■	■	■																								
Discharge Pressure	■	■	■																								
Vibration										■	■	■															
System Components (Note 5)																											
Air filter Inspect				■	■	■																					
Air filter Change (Note 6)												■								■		■					
Expansion Joint Inspect													■	■	■												
Silencer Inspect																		■				■	■				
Check valve inspect																			■	■							
Check valve Test										■	■	■															
PRV inspect																						■	■	■			
PRV Test										■	■	■															

NOTES:

1) Duty Cycle:
Light: 8-10hr day 40hr week
Standard:8-24hr day 40-168hr week
Extreme: 8-24hr day 40-168hr week (Harsh Environments: High/Low Ambient Temperature, High Humidity, Altitude, Contaminates, Cycling Pressure/Flow)

2) Lube Sample: A lube sampling program is the recommended method of determining lubricant life.

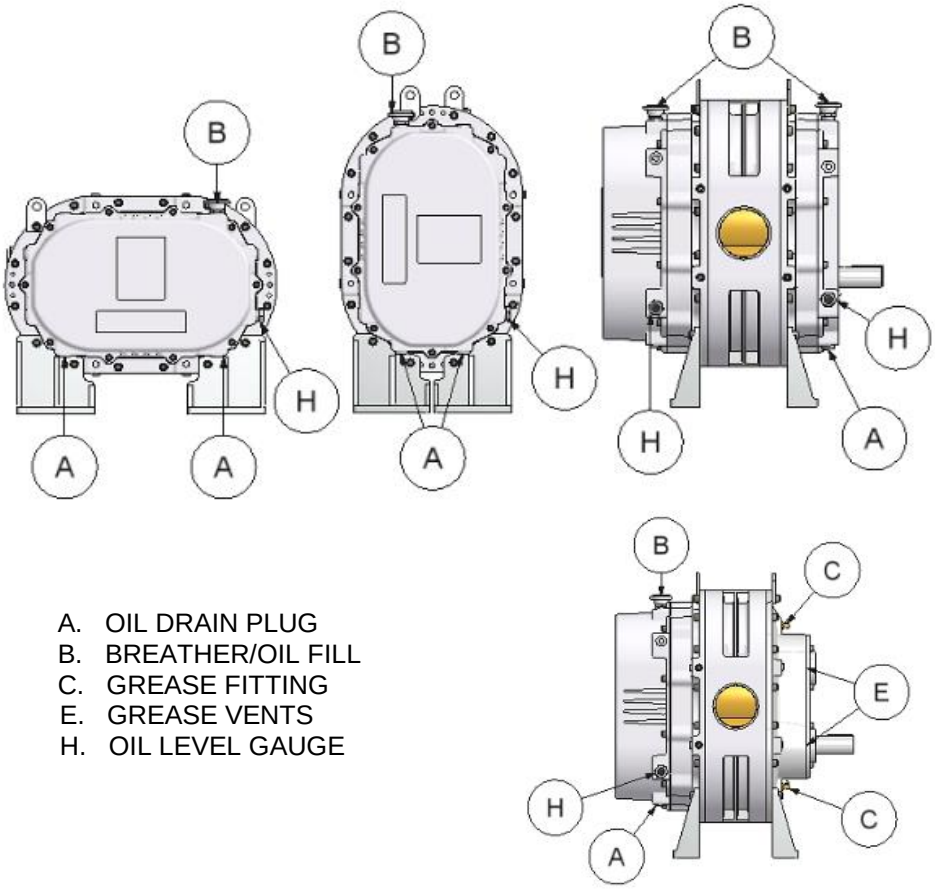
3) Lube Change: The lube change intervals are based on Aeon PD lubricants.
Minimum 52 week oil change frequency may vary dependent upon process or environmental conditions and lube sample results
Duty Cycle may not accrue 6000hrs at 52 weeks. Extreme Duty may require increased frequency dependent upon lube sample results

4) Lube Flush: Periodic cleaning of lube sumps is required to remove accumulated contaminates
Extreme Duty may require increased frequency dependent upon Lube Sample results

5) System Components: System components are not typically supplied by Gardner Denver.
Contact the system component provider or packager for appropriate service intervals.

6) Air Filter Change: The air filter change interval is dependent upon environmental conditions and contamination.
Extreme Duty may require increased frequency dependent upon filter element differential pressure

FIGURE 3-1 RECOMMENDED MAINTENANCE SCHEDULE



A. OIL DRAIN PLUG
B. BREATHER/OIL FILL
C. GREASE FITTING
E. GREASE VENTS
H. OIL LEVEL GAUGE

FIGURE 3-2 LUBRICATION

DRIVE END LUBRICATION (For Grease, Splash Lube Blowers)

Drive end bearings are grease lubricated at the factory with Lithium Complex based grease. **For re-lubrication, use Gardner Denver AEON PD Grease, Part Number 28H283.** AEON PD Grease is a high temperature, high performance grease that is formulated with anti-wear additives to provide superior service under the severe operating conditions of positive displacement blowers. It contains rust inhibitors which provide excellent protection against rust and corrosion.
If you choose not to use AEON PD Grease, select compatible base grease. The grease should be NLGI Grade 2 EP, contain rust inhibitors, and be suitable for blower discharge temperatures up to 350°F (177°C). Completely clean or purge the factory-filled grease from the blower. **Do not mix different types of grease as they may not be compatible. Substitutions may cause early bearing failure.**

Re-grease bearings every 500 hours of operation. Lubricate each bearing through the grease fittings located at C in Figure 3-2 (2 places). When re-greasing, the old grease will be forced out of the vents (E in Figure 3-2). To prevent damage to seals, these vents must be open at all times.

⚠WARNING
Do not over-grease bearings as this could cause premature bearing failure.

Legend "R" Series, Grease-Splash Lube Blower Oil Capacities

Approximate Sump capacity in pints or ounces							
		Vertical Configuration			Horizontal Configuration		
Series	Gear Diameter	Gear End	Drive End	Total	Gear End	Drive End	Total
7	7"	1.66 PT (26.5 oz.)	Grease	1.66 PT (26.5 oz.)	3.5 PT (56 oz.)	Grease	3.5 PT (56 oz.)

Note: Quantities are for purchase estimates only.

FIGURE 3-3 APPROXIMATE OIL CAPACITIES

GEAR END LUBRICATION (For Grease, Splash Lube)
At the gear end, the timing gear teeth are lubricated by being partially submerged in oil. The gear teeth serve as oil slingers for gear end bearings.

Approximate oil sump capacities are listed in Figure 3-3.

⚠WARNING

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

NOTICE

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

LUBRICATION INSTRUCTIONS

Filling procedure - Refer to Figure 3-2, page 20. Remove the breather (B) from the gear cover. Add oil to the gear case until oil reaches the center of the oil level gauge (H). Secure breather (B) in the gear cover.

Add fresh oil as required to maintain proper level. The oil level should be at the middle of the sight glass when the machine is not operating. Refer to Figure 3-3, page 21, for approximate oil capacities.

RECOMMENDED LUBRICANT

AEON PD Synthetic Blower Lubricant is recommended. Refer to Figure 3-4 for AEON PD, AEON PD-FG (Food Grade) and AEON PD-XD (Extreme Duty) part numbers. Order AEON PD from your Gardner Denver Distributor or call Gardner Denver directly.

Convenient Package Sizes	AEON PD Part No.	AEON PD-FG Part No.	AEON PD-XD Part No.
1 quart	28G23	28H97	28G46
Case 12 quarts	28G24	28H98	28G47
1 gallon	28G40	28H333	28G42
Case 6 gallons	28G41	28H334	28G43
5 gallon pail	28G25	28H99	28G44
55 gallon drum	28G28	28H100	28G45

FIGURE 3-4 AEON PD SYNTHETIC LUBRICANT

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

		Ambient Temperatures			
		Less than 10° F	10°F to 32°F	32°F to 90°F	Greater than 90°F
Blower Discharge Temperature	Less than 32°F	AEON PD AEON PD-FG	AEON PD AEON PD-FG		
	32° F to 100° F	AEON PD AEON PD-FG	AEON PD AEON PD-FG	AEON PD AEON PD-FG	
	100° F to 225°F	AEON PD AEON PD-FG	AEON PD AEON PD-FG	AEON PD AEON PD-FG	AEON PD AEON PD-FG
	225° F to 300° F	AEON PD AEON PD-FG	AEON PD AEON PD-FG	AEON PD AEON PD-FG	AEON PD XD
	Greater than 300°F			AEON PD XD	AEON PD XD

FIGURE 3-5 SYNTHETIC LUBRICANT CHART

AEON PD Synthetic Lubricant should be drained after 6000 hours of operation. Re-fill with fresh AEON PD oil. If mineral oil is used, perform the above oil change maintenance every 1500 hours. Recommended service intervals are for normal blower operating conditions. Severe operating conditions may warrant more frequent oil changes. Laboratory analysis of lubricant should be used to help determine the optimum oil change interval.

For best performance and equipment protection, use AEON PD Synthetic Lubricant, which has been specifically formulated for positive displacement blowers. If you choose not to use AEON PD Synthetic Blower Lubricant, select an oil with rust and oxidation inhibitors, anti-foam additives, and the viscosities listed in Figure 3-6. Do not use an oil that contains EP additives.

NOTICE
Flush the oil whenever a change is made from one type of oil to another.

Drain the current lubricant as thoroughly as possible. Refill with the new lubricant. Fill to normal level of the blower, which is at the middle of the sight glass when the machine is not operating. Run the blower for one hour. Shut off the blower and drain the lubricant completely. Refill the blower again with the new lubricant.

Blower Discharge Temperature	**Ambient Temperature**			
	Less than 10°F*	**10°F to 32°F****	**32°F to 90°F**	**Greater than 90°F**
Less than 32°F (0°C)	ISO 100	ISO 100		
32°F to 100°F (0°C to 38°C)	ISO 100	ISO 100	ISO 150	
100°F to 225°F (38°C to 105°C)	ISO 100	ISO 100	ISO 150	ISO 220
225°F to 300°F (105°C to 149°C)	ISO 150	ISO 150	ISO 220	ISO 220
Greater than 300°F (149°C)			***	***

***** For ambient temperatures less than 10°F, but not less than –20°F, the use of oil sump heaters, heated enclosures or synthetic lubricant is required.

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

******* The lubricant viscosity must be 70 SUS minimum at the lubricant operating temperature.

The pour point of the lubricant should be at least 5° to 10°F below the minimum expected ambient temperature.

For continuous operation, where the lubricant temperature exceeds 200°F, synthetic lubricant is recommended.

FIGURE 3-6 LUBRICATION RECOMMENDATION

MAINTENANCE

Air Filter and Filter-Silencer – When the outside surface of the element appears to be evenly coated with dirt, it should be replaced. A differential pressure indicator can be used to determine filter status as well.

DISCHARGE SILENCER – A drain may be provided in the silencer at the lowest point for draining condensate. Draining intervals will depend upon humidity conditions and must be established by the user.

SEALS

PERIODIC INSPECTIONS – A well-organized maintenance program will provide for periodic inspection of the blower, drive and components. These inspections may prevent major repair and downtime.

1. Observe the blower for vibration, heating, noise, oil seal leaks, and excessive shaft air leaks.
2. Check for proper operation of the filters, coupling, drive, power unit, relief and check valves, gauges and other controls.
3. Disconnect the drive and turn the blower by hand to check for drag, tight spots, bearing wear (radial and axial) and gear backlash. Rotation should be free with no indication of drag or metallic interference.
4. Inspect the interior through the inlet or discharge port for cleanliness, corrosion or parts contact.

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

5. Check tightness of all screws and bolts.

VIBRATION MONITORING – All Sutorbilt® Models are vibration tested at the factory to ensure blower quality. The total vibration measured at the factory may be different from the site installation. Vibration is dependent on many factors including foundation construction, shaft alignment, piping configuration, drive type, and operating conditions. High vibration at commissioning may indicate an installation issue or system resonance. Increasing vibration levels over time typically indicate the onset of a failure mode. Periodic or continuous vibration readings can be used to detect problems early.

SOME COMMON CAUSES OF BLOWER FAILURE

1. Poor air filter maintenance or incorrect selection.
2. Inadequate lubrication (wrong, dirty or low oil).
3. Backflow of materials into the blower.
4. Discharge pressure or inlet vacuum above blower rating.
5. Blower speed below minimum rating.
6. Blower speed too low for discharge pressure or inlet vacuum.

TROUBLESHOOTING - shows possible causes and solutions for problems that may be encountered during operation.

Problem	Possible Causes	Solution
Excessive Discharge Temperature	Restricted inlet flow	Clean air filter. Correct any restrictions.
	Excessive discharge pressure	Reduce discharge pressure. Correct any restrictions.
	Operation below allowable speed (pressure dependent)	Increase speed. Reduce pressure or vacuum.
	Worn clearances	Rebuild by factory trained personnel.
Excessive Oil Sump Temperature or Bearing Temperature	Incorrect oil level	Restore oil level to recommended level.
	Excessive bearing load	Reduce belt tension. Check shaft coupling alignment.
	Worn bearings	Rebuild by factory trained personnel.
Low Air Flow	Restricted inlet flow	Clean air filter. Correct any restrictions.
	Slipping Belts	Tighten Belts
	Low speed	Check speed with tachometer or strobe.
	Excessive discharge pressure	Reduce discharge pressure. Correct any restrictions.
	Worn clearances	Rebuild by factory trained personnel.
No Air Flow	Wrong rotation direction	Correct rotation direction.
Oil Leak	Plugged breathers	Clean sump breathers
	Too much oil in sump	Reduce oil level to recommended level.
	Worn oil seal	Rebuild by factory trained personnel.
Knocking, Rotor Tip Drag, Contact	Housing distortion	Properly shim feet to foundation. Correct piping induced strains.
	Excessive pressure or vacuum	Reduce operating pressure or vacuum. Check relief valve.
	Excessive discharge temperature	Remove cause.
	Bearing failure	Rebuild by factory trained personnel.
	Incorrect timing	Rebuild by factory trained personnel.
Excessive Power Consumption	Speed high	Reduce speed
	Pressure or vacuum high	Remove cause
	Knocking, Rotor Tip Drag, Contact	Remove cause
	Worn clearances	Rebuild by factory trained personnel.
Excessive Vibration	Misalignment	Align couplings and belt drives
	Knocking, Rotor Tip Drag, Contact	Remove cause
	Unbalanced Rotors	Make sure rotors are free of scale and process material.
	Loose Blower or Driver Bolts	Check all mounting bolts and tighten as necessary.
	Piping resonance.	Correct piping configuration
	Foundation resonance	Increase rigidity and mass of foundation.
	Worn bearings or gears	Rebuild by factory trained personnel.

FIGURE 3-7 TROUBLESHOOTING TABLE

SECTION 4
OPERATION

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

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

Each blower has limits on pressure differential, running speed, and discharge temperature which must not be exceeded. These limits are shown in the following tables and text in section 4.

GENERAL – A new blower from the factory must be checked and serviced before operation. The blower must be lubricated and operated according to the following instructions. Blower failure can be caused by operation at above rated pressure or below rated minimum speed. Both cause excessive discharge temperature and seizure of rotating parts.

STARTING BLOWER – Start at reduced speed and no-load if possible. If speed is fixed, start without load by bleeding discharge to atmosphere. Starting should be smooth and free of vibrations. After initial no-load start, and operation is satisfactory, apply load gradually until maximum operating conditions are attained. **BE SURE OPERATING CONDITIONS ARE WITHIN BLOWER RATINGS**. Maintain a close check for severe vibrations, unusual noise, leaks and undue heating. The blower will gradually heat up due to compression, but after a reasonable length of time, temperature will stabilize. With very cold ambient conditions, warm up blower at no-load before going into full load service.

If the blower is used as part of a specific system, check the system's manual for any procedures that may be necessary when starting the blower.

PRESTART CHECK (For New or Overhauled Blower), see "Blower Startup Checklist" on page 30.

ROTATION – Rotation is clockwise when facing the drive shaft. An arrow indicating rotation is cast on the blower end cover near the drive shaft.

DAILY CHECK

1. Air filter tight, clean and serviced.
2. Proper oil level in oil sumps.
3. Observe pressure.
4. Relief valve functions.
5. Blower turns freely.


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 must 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 below,

MAXIMUM / MINIMUM OPERATING LIMITATIONS							
SIZE	**RPM**	**MIN RPM VERT**	**MIN RPM HORIZ.**	**MAX PRESSURE PSI.**	**MAX VAC IN HG**	**MAX. TEMPERATURE RISE °F**	**MAX. DISCHARGE TEMPERATURE °F**
7L	2050	764	546	6	12	160	260
7M	2050	764	546	10	16	225	325
7H	2050	764	546	15	16	240	340

DO NOT EXCEED THESE LIMITS

NOTICE
Blower speed, line losses, elevation, and increased inlet temperatures will affect the maximum operating limitations. The minimum RPM for the blowers is based on lubrication only. The blowers may only be operated down to the minimum RPM, when the temperature rise and discharge temperature are below the maximum limitations as shown.

FIGURE 4-1 OPERATING LIMITATIONS

TYPE OF SERVICE – The blower can be operated in either pressure or vacuum service.

Pressure – Never operate the blower above the maximum pressure shown in Figure 4-1. Excessive pressure may cause overheating and blower failure, it is therefore most important to have an accurate pressure gauge in the discharge line as close to the blower discharge as possible. Reduced speeds have a direct effect on allowable pressure (Figure 4-2, page 28). A bypass valve to bleed air from the discharge to atmosphere may be used to control the pressure. **NEVER** reduce the blower speed to maintain a certain pressure before it is determined if the reduced speed is adequate for that pressure. An accurate pressure gauge must be maintained

Vacuum – Do not operate the blower above the maximum vacuums shown in Figure 4-1, or below the minimum speed shown in Figure 4-3, page 28. All vacuum ratings are based on standard atmospheric discharge. An accurate vacuum gauge and vacuum relief valve must be used as close to the blower inlet as possible.

ALTITUDE – Maximum discharge pressure ratings and inlet vacuum ratings, shown in Figure 4-1, are decreased with operation at higher altitudes, see Figure 4-2. Above 5000 feet [1525 m], consult the nearest Gardner Denver Office.

Altitude (Feet Above Mean Sea Level)	Allowable Pressure or Vacuum (% of Rating)
0 [0 m]	100.0%
1000 [305 m]	96.6%
2000 [610 m]	93.2%
3000 [915 m]	89.8%
4000 [1220 m]	86.4%
5000 [1525 m]	83.0%

FIGURE 4-2 ALTITUDE, PRESSURE/VACUUM RATING

Example 1: 7L, Altitude 4000 ft. [1220 m].
Maximum pressure rating is 6 psig [414 mbar] at sea level from Figure 4-1, page 27.
Allowable pressure at 4000 ft. is 86.4% of rating: 0.864 * 6 = 5.18 psig [357 mbar].

Example 2: 7H, Altitude 5000 ft. [1525 m].
Maximum vacuum rating is 16 inches of mercury [540 mbar] at sea level from Figure 4-1, page 27.
Allowable vacuum at 4000 ft. is 83.0% of rating: 0.83 * 16 = 13.28 inches of mercury [450 mbar]

SPEED – Refer to Figure 4-1, page 27, for maximum and minimum speeds. Never operate the blower below the minimum or above the maximum speed shown. There is a definite relationship between blower speed, discharge pressure and/or inlet vacuum, and the resulting discharge air temperature. Reduced speed at high pressure or vacuum can cause excessive heating which may result in rapid blower failure. For engine-driven units provide an accurate speed indicator.

Examples of minimum allowable speed at given pressures or vacuums for vertical units are listed in Figure 4-3, as speed is reduced, pressure or vacuum must also be reduced.

EXAMPLE: Using a 7M blower, operating against 15 PSIG [1034 mbar], minimum allowable speed is 1108 RPM.

Model	Minimum Speed (RPM), Pressure		
	Up to 7 PSIG [483 mbar]	14 PSIG [965 mbar]	15 PSIG [1034 mbar]
7L	764	-	-
7M	764	764	-
7H	764	764	1108

Model	Minimum Speed (RPM), Vacuum	
	Up to 12” Hg. [406 mbar]	16” Hg. [542 mbar]
7L	764	-
7M	764	1194
7H	764	1280

FIGURE 4-3 MINIMUM SPEED, BASED ON PRESSURE OR VACUUM

NOTICE

Blower speed, line losses, elevation, and increased inlet temperatures will affect the maximum operating limitations.

Do not continue to run a blower that is overheating. Check the blower for damage before restarting.

Lubricating oil temperature will increase with increasing discharge air temperature. Oil temperature in the discharge end sump will exceed that in the inlet end sump. Oil sump temperatures at the discharge end in the 200-250°F [93-121°C] range are not uncommon.

STOPPING BLOWER – Where possible, reduce the system pressure to zero gauge before stopping the blower. To prevent backflow of foreign material into the blower on shutdown, provide a check valve in the discharge line.

On engine-driven units, idle the engine for a few minutes prior to shutdown

EMERGENCIES – In event of system failures, shutdown the blower immediately. Inspect the blower for foreign material backflow. If materials are found inside the blower housing, a thorough cleaning is necessary before restarting.

Do not operate a blower which is noisy, vibrating, or heating excessively.

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 cause skin burns on contact.

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.

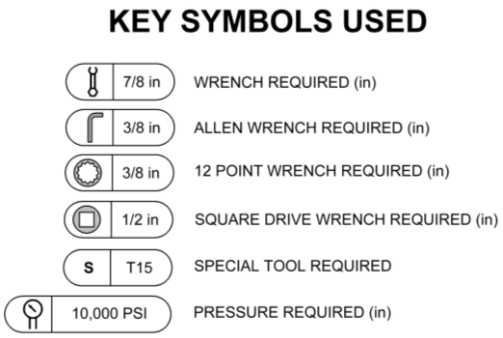
- ☐ 1. Check the unit and all piping for foreign material and clean if required.
- ☐ 2. Check the flatness of the feet and the alignment of the drive. Feet that are bolted down in a bind can cause housing distortion and internal rubbing. Misaligned V-drives can cause the rotors to rub against the head 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 can remove gear backlash and cause blower destruction. They also create heavy bearing/shaft 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.
- ☐ 6. 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. Start the unit and operate 15 minutes at no load. During this time, check for hot spots and other indications of interference.
- ☐ 9. Apply the load and observe the operation of the unit for one hour. Check frequently during the first day of operation.
- ☐ 10. If malfunctions occur, do not continue to operate. Problems such as knocking rotors can cause serious damage if the unit is operated without correction.

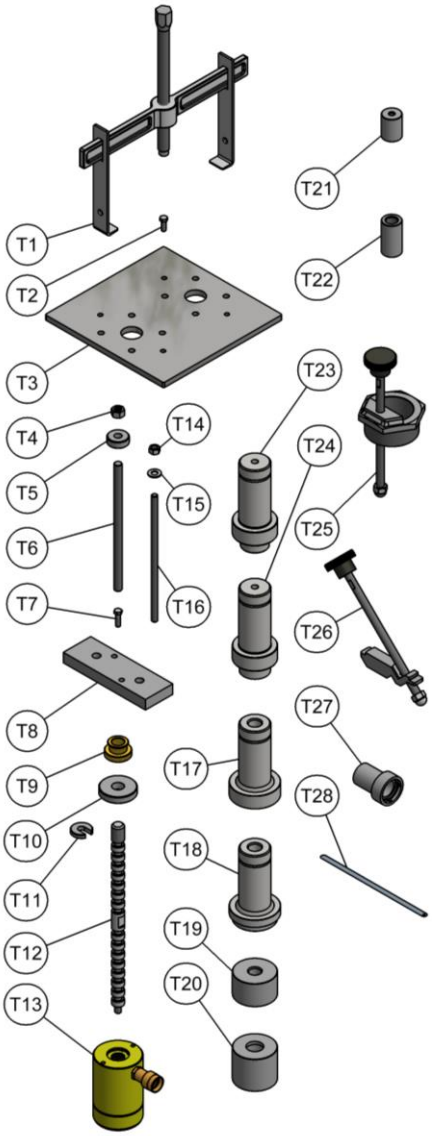
SECTION 5
DISASSEMBLY / ASSEMBLY INSTRUCTIONS

TOOLS

	Grease or Light Oil	
	Loctite 243 (Thread Sealant)	
T1	Two Jaw Puller	
T2	(4) Screws (for Puller Plate mounting)	GD P/N: 655ED040
T3	Puller Plate	GD P/N: 313GAG074
T4	Nut (for gear removal)	GD P/N: 50C7
T5	Thick washer	GD P/N: 325GAG074
T6	Threaded rod	GD P/N: TST000644
T7	Screw (for securing hydraulic ram)	GD P/N: 655ED050
T8	Tool, gear puller bar	GD P/N: 326GAG074
T9	Cap	GD P/N: 307GAE074
T10	Driver, Bearing washer	GD P/N: 315GAG074
T11	"C" Washer	GD P/N: 306GAE074
T12	Push/Pull Rod	GD P/N: 337GAF074
T13+	Hollow Hydraulic Ram	
	with Pressure Gauge	GD P/N: TEN001154
T14	Nut (for seal driver)	GD P/N: 50AQ5
T15	Washer (for seal driver)	GD P/N: 95W49
T16	Threaded Rod	GD P/N: 79L231
T17	Bearing Driver (Gear End)	GD P/N: 314GAG074
T18	Bearing Driver (Drive End)	GD P/N: 301GAG074
T19	Driver, Gear	GD P/N: 324GAG074
T20	Driver, Gear Pusher	GD P/N: 323GAG074
T21	Coupling, Pull Rod to Rotor Shaft	GD P/N: 328GAG074
T22	Coupling, Pull Rod to Rotor Shaft	GD P/N: 322GAG074
T23	Driver, Lip Seal	GD P/N: 305GAG074
T24	Driver, Mechanical Seal	GD P/N: 321GAG074
T25	Rotor Lock Tool (7H)	GD P/N: 312GAG074
T26	Rotor Lock Tool (7M & 7L)	GD P/N: 311GAG074
T27	Bearing Lock Nut Tool	GD P/N: TEN021042
T28	Feeler Gauges (1/2" x 12") 0.004" Thickness	
	Feeler Gauges (1/2" x 12") 0.009" Thickness	
	Feeler Gauges (1/2" x 12") 0.012" Thickness	
	Feeler Gauges (1/2" x 12") 0.016" Thickness	
	Feeler Gauges (1/2" x 12") 0.019" Thickness	
T29	Nylon Wedge	
T30	Center Punch	
T31	Punch	
T32	Ball Peen Hammer	
T33	Ratchet	
T34	Torque Wrench	
T35	Hex Key Socket Set, 3/8" Drive (SAE)	
T36	Hydraulic Press with Pressure Gauge	
T37	Depth Micrometer	
T38	Pliers or Hook Tool	
T39	(2) Blocks of Wood (Approx. 3-1/2" x 3-1/2" x 24")	

+ Enerpac hydraulic tool T20 sold separately.
Must be used with a hand pump or electric pump.





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DISASSEMBLY INSTRUCTIONS

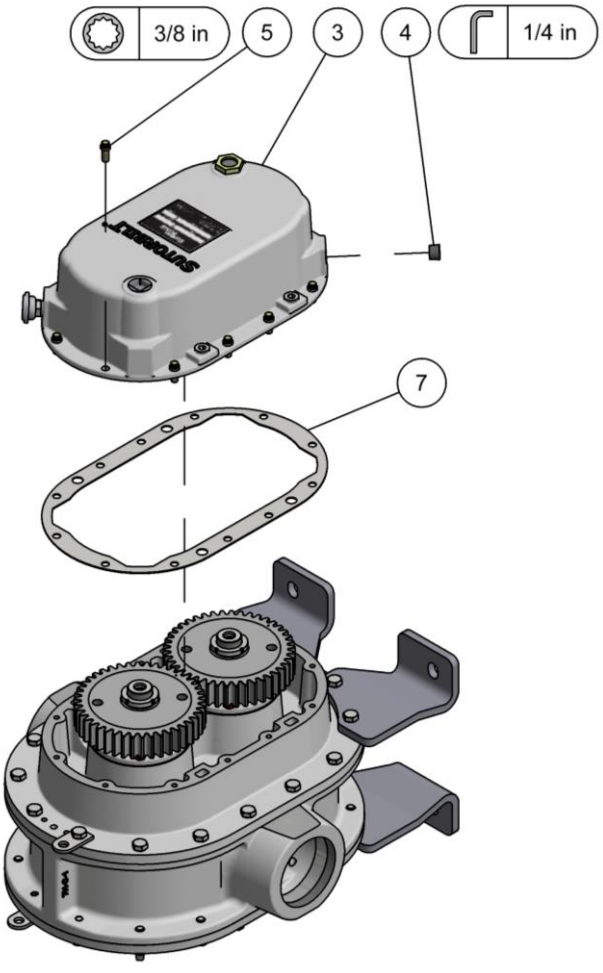
NOTICE
Numbers in parentheses ( ) refer to key numbers in assembly drawing on page 52.

IMPORTANT: MARK ALL PARTS WITH A CENTER PUNCH SO THEY CAN BE REASSEMBLED IN THE SAME POSITION (IMPELLERS, HEADPLATES, AND GEARS)

NOTICE
The cover and gear headplate gasket tends to bond tightly to both surfaces. After socket head bolt removal, it is sometimes necessary to take a ball peen hammer and a blunt chisel and drive off the cover.

5-1 Gear Cover Removal

- Drain oil by removing plug (4) from gear end cover (3).
- Remove gear cover (3) by removing screws (5).
- Remove gasket (7).



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5-2 Check Gear Backlash (Undamaged Gears Only)

- If the timing gears appear undamaged, the gear backlash must be checked to see if the gears can be salvaged.
- Mount a magnetic base dial indicator on gear headplate (see Figure 5-1).
- Lock one Impeller stationary by wedging a feeler gauge between the impeller and the headplate.
- Place the tip of the indicator at the center of the contact surface on a tooth of the gear on the free shaft.
- Rock the impeller back and forth by hand and read the total rotational movement to the nearest 0.0005 inches. Do this at four gear mesh positions 90 degrees apart.
- Permissible gear backlash 0.002/0.003 inches.

NOTICE
If backlash is above the specified limit, the gears are not necessarily unusable. Excessive play could be caused by worn bearings.

- If timing gears appear to be reusable, match mark timing gear tooth mesh by making small punch marks on the ends of meshing gear teeth with a pin punch and hammer (see Figure 5-2). The impeller tip to valley (throat) blower reassembly

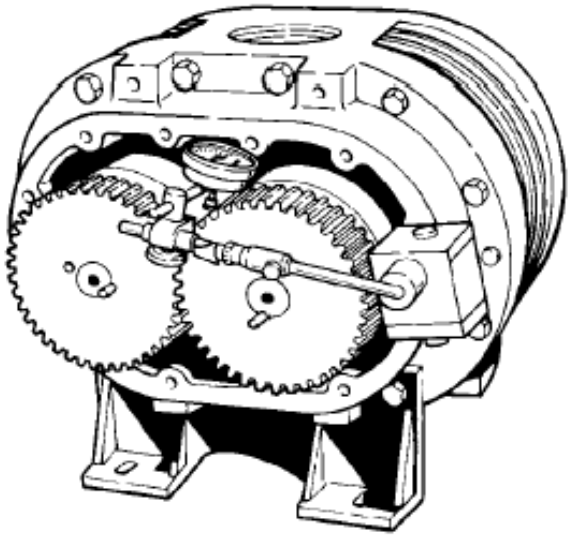


FIGURE 5-1

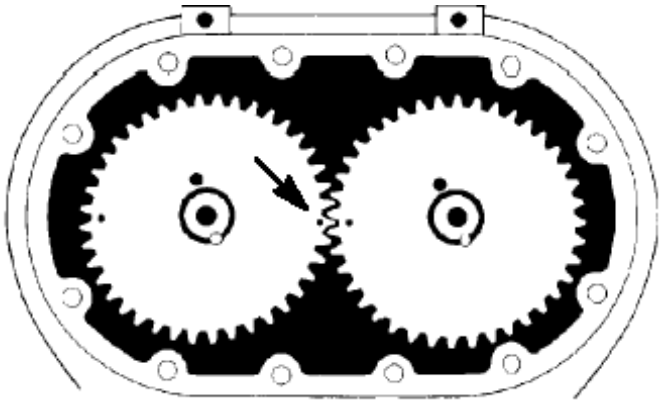
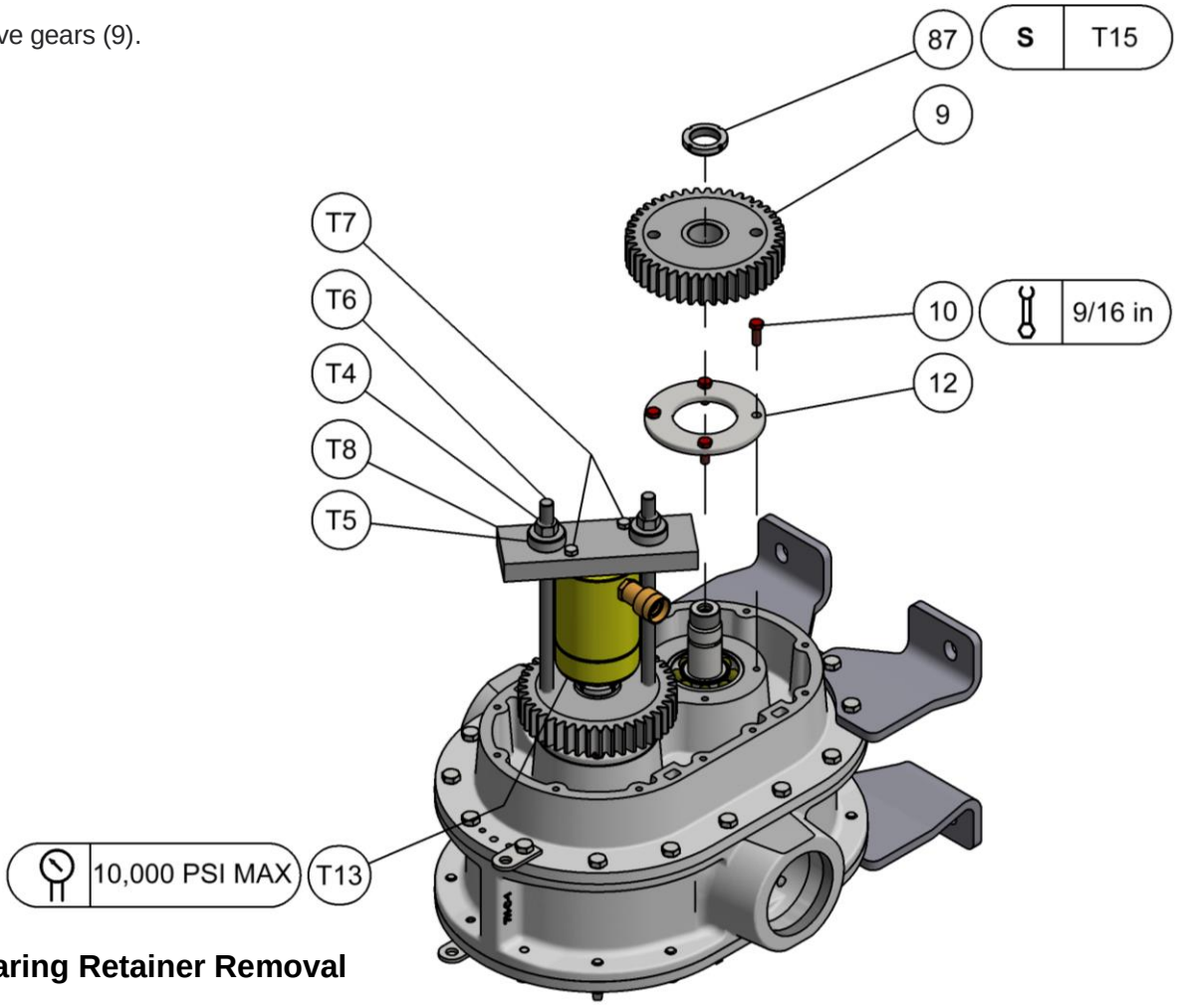


FIGURE 5-2

5-3 Gear Removal

- Loosen lock nuts (87) with spanner tool (T27) so that they are flush with end of shaft by placing a nylon wedge (T29) or shop rag between gears to stop rotation while loosening lock nuts.
- Assemble gear puller bar (T8) to end of hydraulic ram (T13), then run threaded rods (T6) through the large holes on the puller bar into the threaded holes on the gear. Place washers (T5) over the threaded rods (T6), then thread nuts (T4) on the ends of the threaded rods (T6).
- Loosen gear (9) by applying hydraulic pressure to hydraulic ram that will push against shaft. **(DO NOT EXCEED 10,000 PSI ON HYDRAULIC RAM).**
- Repeat for other gear.
- Remove lock nuts (87) by placing a nylon wedge (T29) or shop rag between gears to stop rotation while removing lock nuts.
- Remove gears (9).



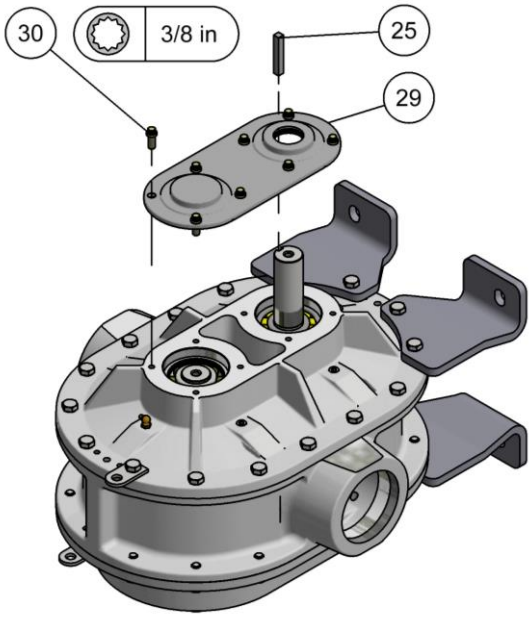
GAG797_R_03 / 00

5-4 Bearing Retainer Removal

- Remove 8 bearing retainer screws (10).
- Remove 2 bearing retainers (12).

5-5 Drive Cover Removal (GRS-SPL UNITS ONLY)

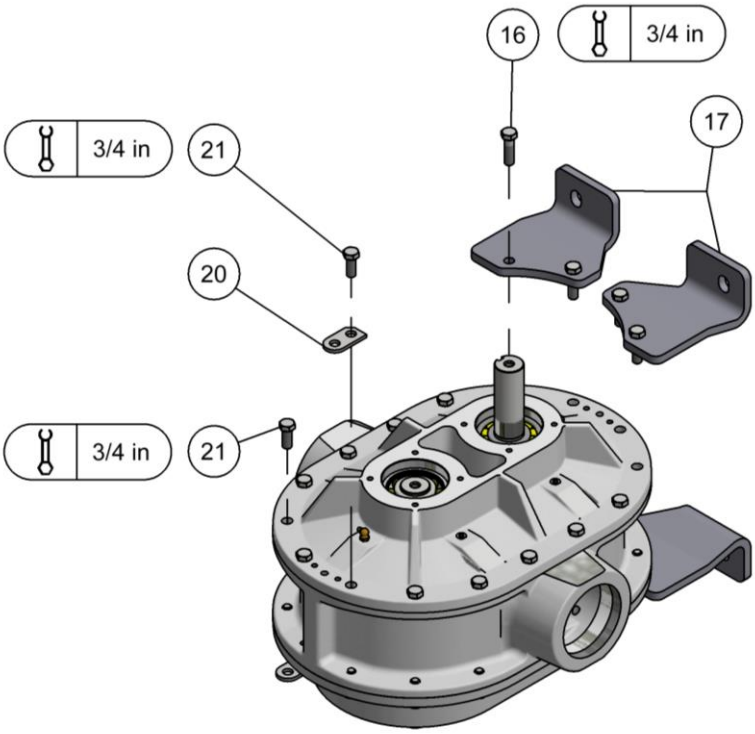
- Remove key (25).
- Remove drive cover (29) by removing 8 screws (30).



GAG797_R_04 / 00

5-6 Foot and Lifting Lug Removal

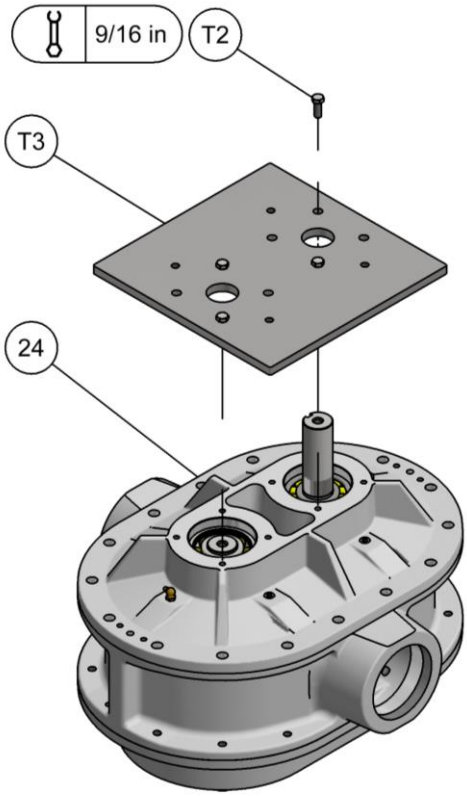
- Remove 2 lifting lugs (20) by removing 2 screws (21).
- Remove 4 feet (17) by removing 8 screws (16).
- Remove remaining headplate screws (21).



GAG797_R_05 / 00

5-7 Puller Plate Installation (DRIVE END)

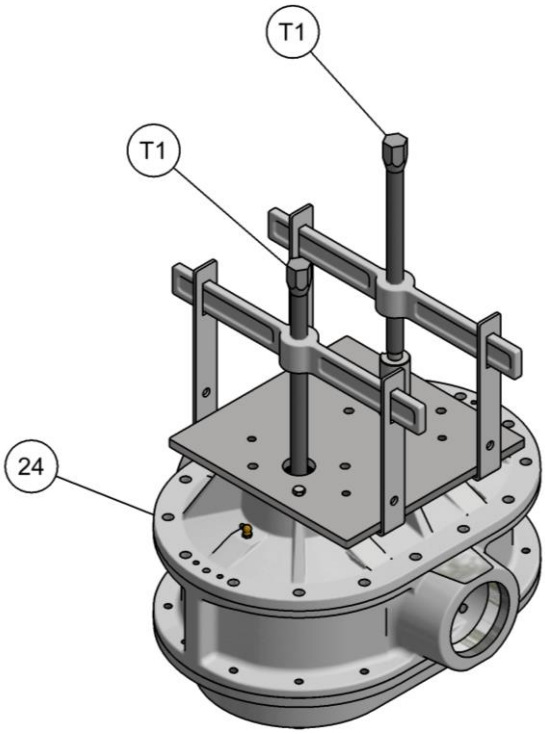
- Install puller plate (T3) with 4 screws (T2) to drive end headplate (24).



GAG797_R_06 / 00

5-8 Headplate Removal (DRIVE END)

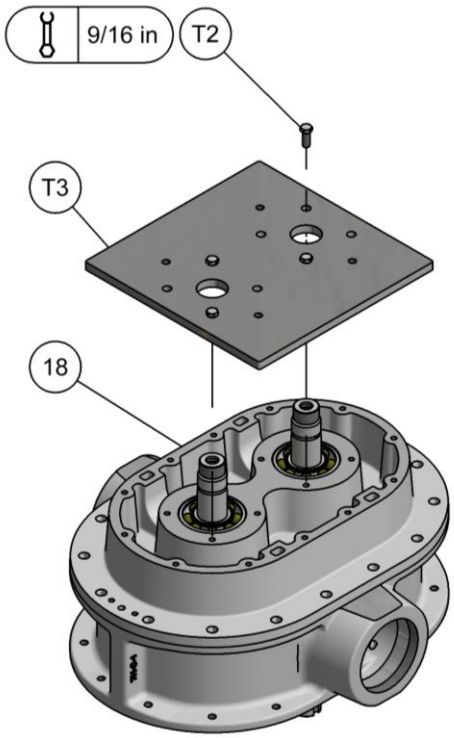
- Install 2 (two jaw) pullers (T1) as shown.
- Tighten each puller forcing screw to extract headplate (24) keeping each side advancing evenly by switching back and forth between each puller only rotating each forcing screw 1/2 turn at a time.
- Remove headplate (24).



GAG797_R_07 / 00

5-9 Puller Plate Installation (GEAR END)

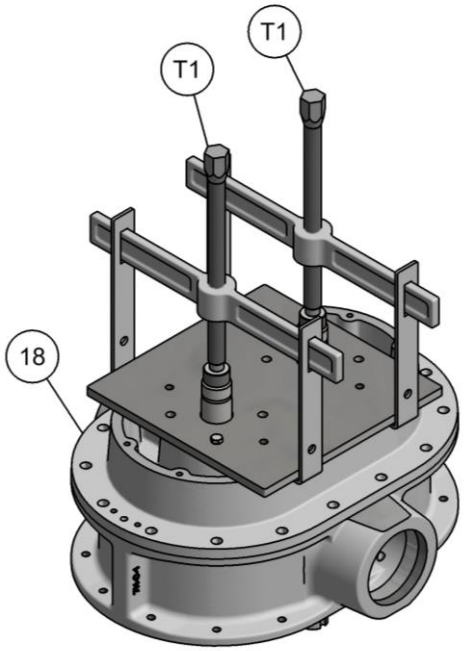
- Install puller plate (T3) with 4 screws (T2) to drive end headplate (18).



GAG797_R_08 / 00

5-10 Headplate Removal (GEAR END)

- Install 2 (two jaw) pullers (T1) as shown.
- Tighten each puller forcing screw to extract headplate (18) keeping each side advancing evenly by switching back and forth between each puller only rotating each forcing screw 1/2 turn at a time.
- Remove headplate (18).



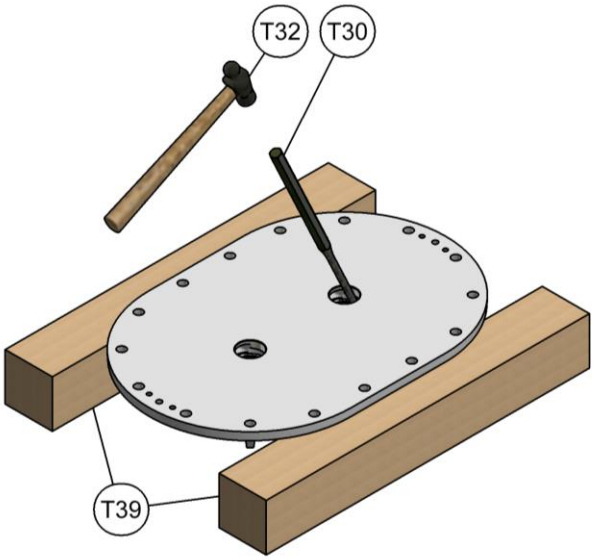
GAG797_R_09 / 00

5-11 Bearing Removal

- **NOTE:** Bearing should be replaced during overhaul.
- Bearings are a slip fit in housings and should be removed by hand.
- Remove bearing from headplate.

5-12 Seal Removal

- **NOTE:** Seals should be replaced during overhaul.
- Place headplate between 2 blocks of wood (T39) as shown.
- Using hammer (T32) and punch (T30) remove oil seals from headplates.

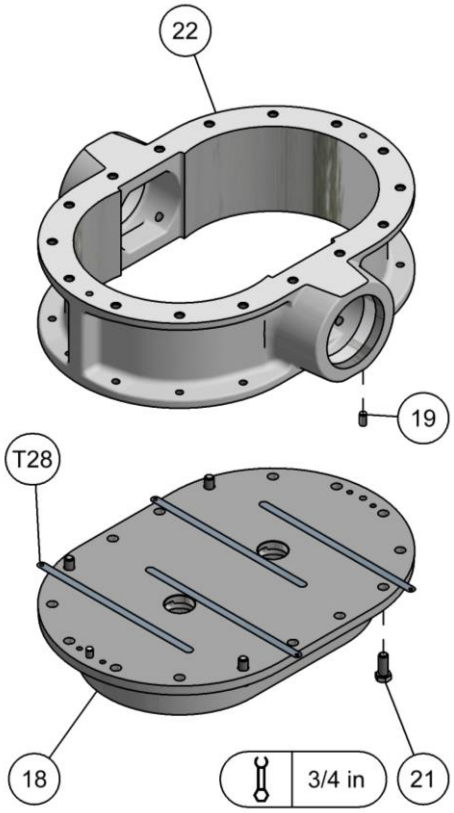


GAG797_R_27 / 00

ASSEMBLY INSTRUCTIONS

5-13 Cylinder Installation

- Inspect Dowel Pins (19) for damage and make sure they are installed in cylinder.
- Position four 0.004” feeler gauges (T28) on headplate (18) as shown.
- **NOTE:** Feeler gauges are to be used to set rotor end clearance. Ensure enough of the gauge is extended and accessible for removal.
- Mount cylinder (22) ensuring dowel pins (19) are aligned.
- Install four screws (21) to temporarily secure cylinder (22) to headplate (18).



GAG797_R_10 / 00

5-14 Rotor Installation

- **NOTE:** For “Q” cylinder models, ensure drive rotor position and rotation match configuration. Failure to do so will result in greatly reduced performance.
- Insert rotors (23) into cylinder (22) as shown.

5-15 Clearances Limits

- **NOTE:** Before installing drive end headplate, position blower so that impellers are vertical, with the drive end on top. It will be necessary to use blocks in order for the unit to set level. Measure the total end clearance using a depth micrometer (see Figure 5-3).
- If total clearance is not within the limits specified in Figure 5-4, it may be necessary to shim the case to obtain the proper total end clearance. Paper shim should be placed between the drive headplate and impeller case.

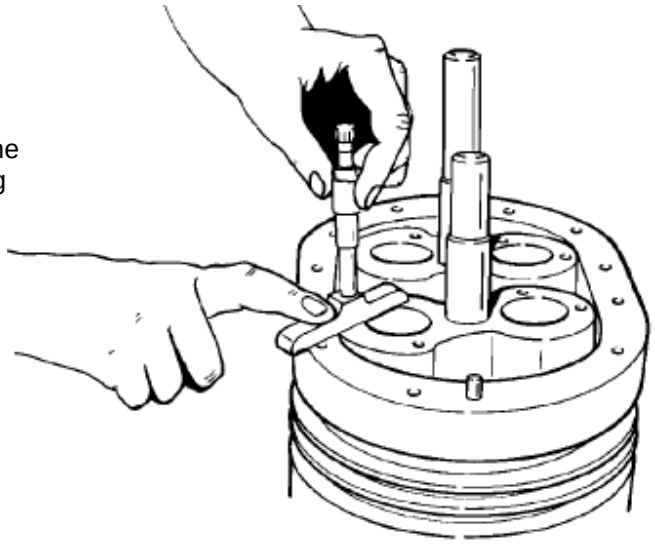
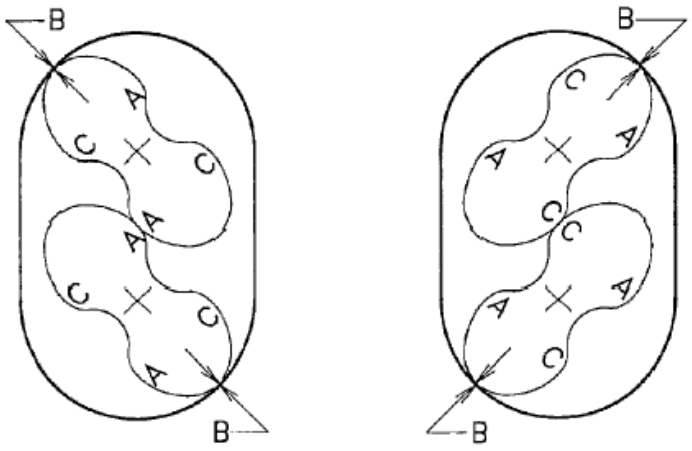


FIGURE 5-3

NOTICE
If more than .007" shim is required, put .007" on the drive end and the remaining on the gear end.

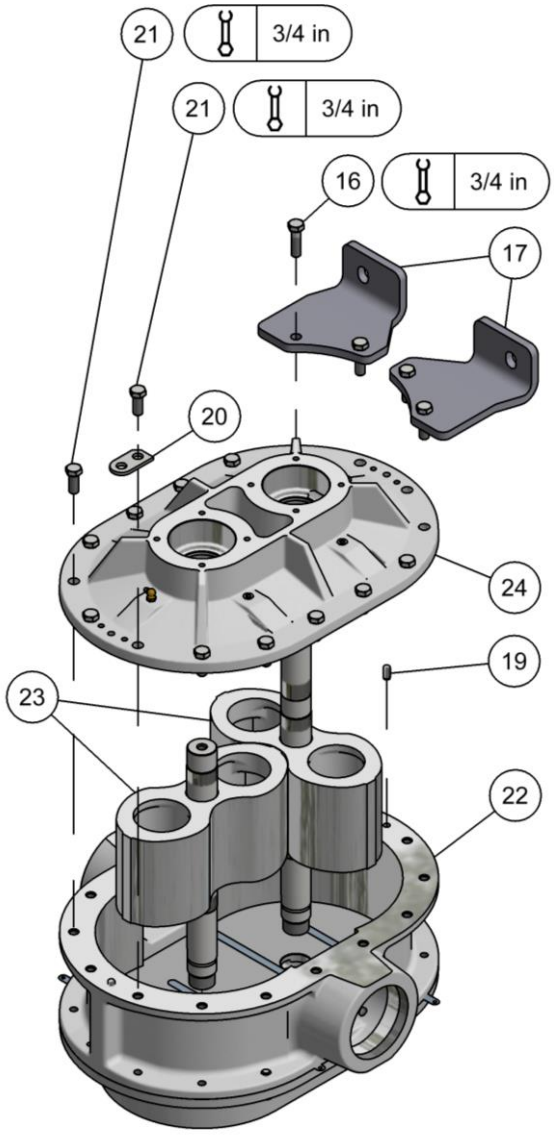


	7H	7M	7L
TOTAL END CLEARANCE	.008 - .012		
IMPELLER TO GEAR HEADPLATE	.004 - .005		
IMPELLER TIMING (A – A) (C – C)	.009 - .011		
TIP TO CASE CLEARANCE (B – B)	.006 - .009		

FIGURE 5-4

5-16 Headplate Installation (DRIVE END)

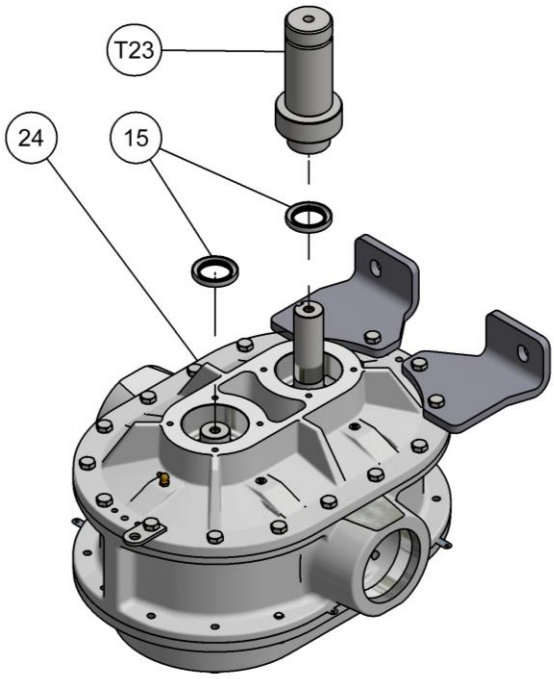
- **NOTE:** Before installing drive end headplate use a depth micrometer to measure expansion clearance between rotors and machined cylinder face. Paper shims may be required to achieve proper clearance. (Refer to page 40)
- Proper expansion clearance to be 0.009/0.014 inches.
- Using a hammer, install 2 dowel pins (19) into cylinder.
- Mount headplate (24) onto cylinder (22) ensuring dowel pins (19) are aligned.
- **NOTE: CHECK ORIENTATION OF UNIT BEFORE INSTALLING LUGS AND FEET.**
- Install lifting lug (20) by using screw (21) to secure to headplate (24) and cylinder (22).
- Install 4 feet (17) by using 8 screws (16) to secure to headplate (24).
- Install 11 screws (21) to secure cylinder (22) to headplate (24).
- Torque to specification all screws (16) and (21).



GAG797_R_11 / 00

5-17 Lip Seal Installation (DRIVE END GRS-SPL UNITS ONLY)

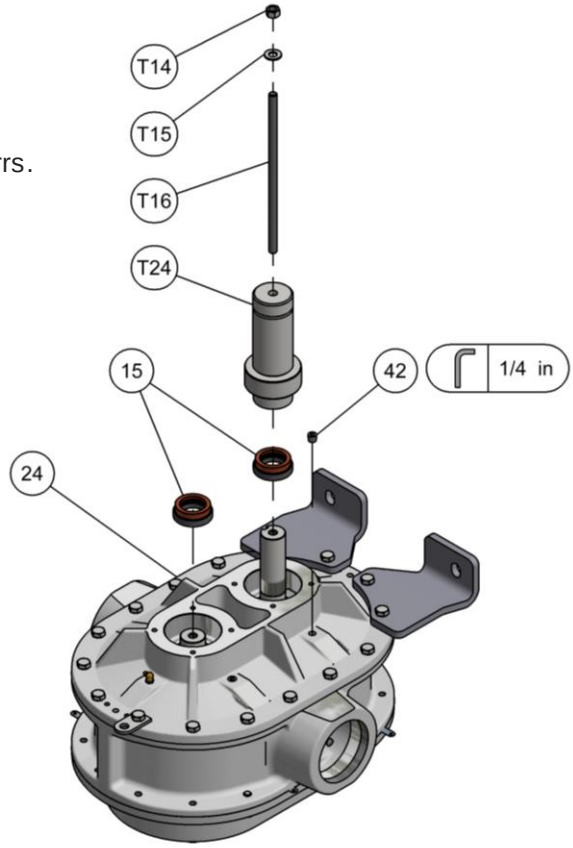
- Ensure headplate (24) is clean and free of any nicks and burrs.
- Apply grease or light oil to the inner and outer diameter of each shaft seal (15).
- Using a hammer and seal driver (T23), carefully install each seal until seated.



GAG797_R_12 / 00

5-18 Mechanical Seal Installation (DRIVE END GRS-SPL UNITS ONLY)

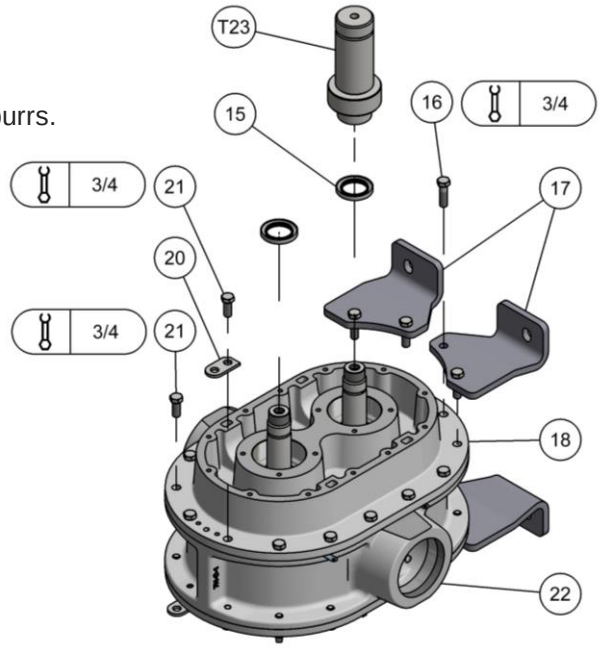
- Ensure headplate (24) is clean and free of any nicks and burrs.
- Apply grease or light oil to the inner and outer diameter of each shaft seal (15).
- Assemble threaded rod (T16) onto end of shaft.
- Slide seal driver (T24) over rod.
- Slide washer (T15) over rod.
- Carefully tighten nut (T14) on rod (T16) to install seal until seated in housing.
- Repeat seal installation of other shaft.
- Apply thread sealant to 4 plugs (42).
- Install 4 plugs (42) into headplate (24).
- Torque to specification all plugs (42).



GAG797_R_13 / 00

5-19 Lip Seal Installation (GEAR END)

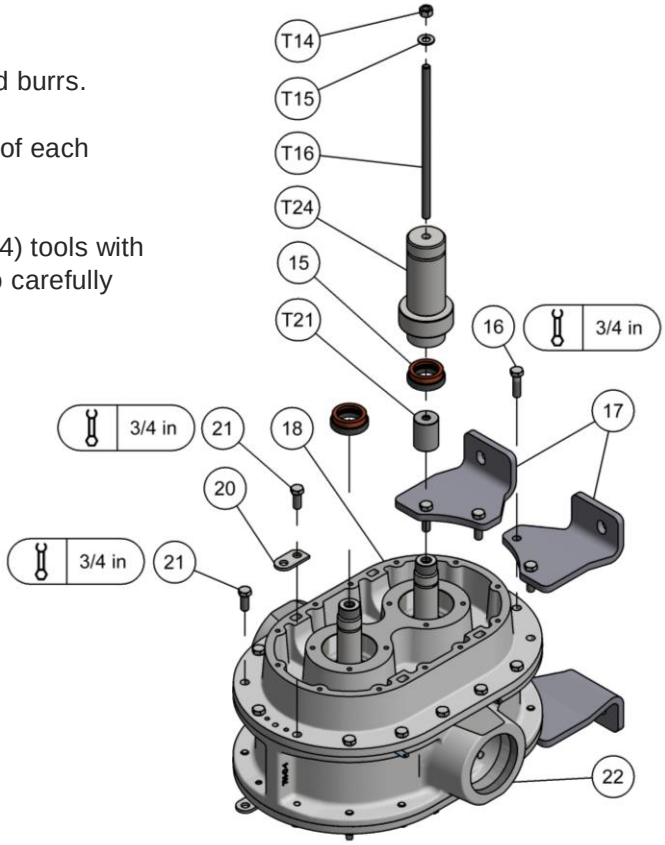
- Ensure headplate (18) is clean and free of any nicks and burrs.
- Apply grease or light oil to the inner and outer diameter of each shaft seal (15).
- Using a seal driver (T23), carefully install each seal until seated.
- **<u>NOTE:</u> CHECK ORIENTATION OF UNIT BEFORE INSTALLING LUGS AND FEET.**
- Install lifting lug (20) by using screw (21) to secure to headplate (18).
- Install feet (17) by using 8 screws (16) to secure to headplate (18) and cylinder (22).
- Install 11 screws (21) to secure headplate (18) to cylinder (22).



GAG797_R_15 / 00

5-20 Mechanical Seal Installation (GEAR END)

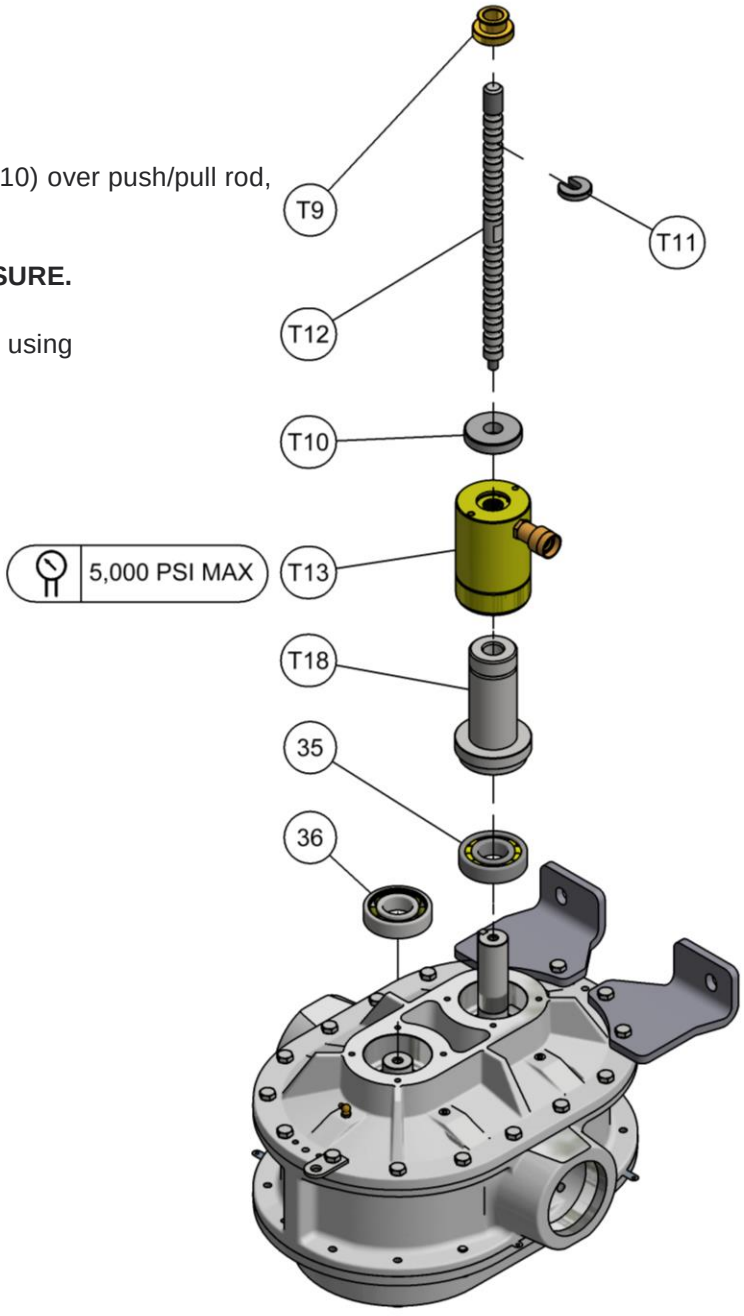
- Ensure headplate (18) is clean and free of any nicks and burrs.
- Apply grease or light oil to the inner and outer diameter of each shaft seal (15).
- Using the threaded rod (T16), washer (T15) and nut (T14) tools with seal (15) and seal driver tool (T24), turn the nut (T14) to carefully install each seal until seated.
- **<u>NOTE:</u> CHECK ORIENTATION OF UNIT BEFORE INSTALLING LUGS AND FEET.**
- Install lifting lug (20) by using screw (21) to secure to headplate (18).
- Install feet (17) by using 8 screws (16) to secure to headplate (18) and cylinder (22).
- Install 11 screws (21) to secure headplate (18) to cylinder (22).
- Torque to specification all screws (16) and (21).



GAG797_R_16 / 00

5-21 Bearing Installation (DRIVE END GRS-SPL UNITS ONLY)

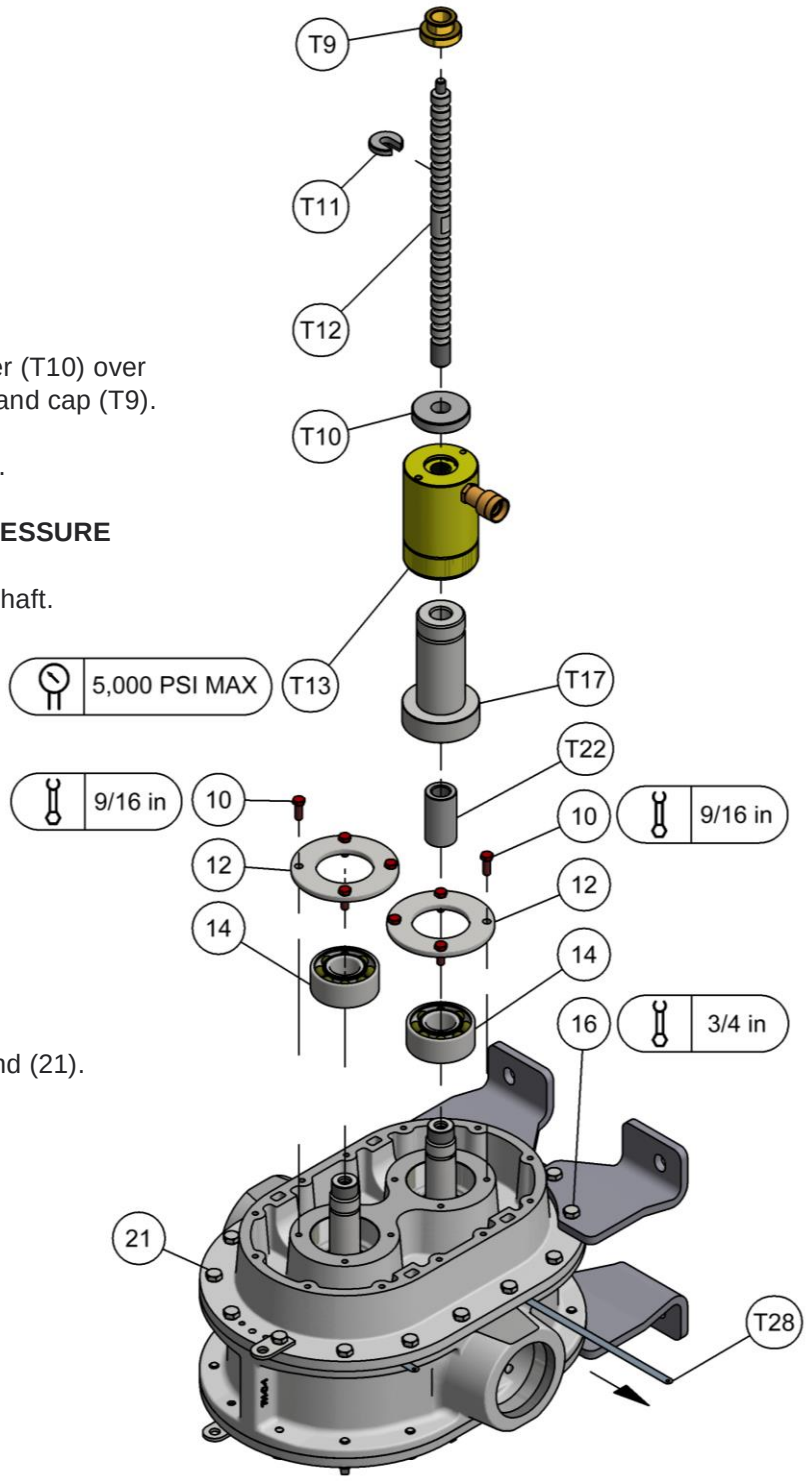
- Place bearing (35) over long shaft.
- Assemble rod (T12) onto end of shaft.
- Slide bearing driver (T18) over rod.
- Slide hydraulic ram (T13) & driver washer (T10) over push/pull rod, then install washer 'C' (T11) and cap (T9).
- **<u>NOTE:</u> DO NOT EXCEED 5,000 PSI PRESSURE.**
- Repeat bearing installation of the other shaft using bearing (36) on short shaft.



GAG797_R_14 / 00

5-22 Bearing Installation (GEAR END)

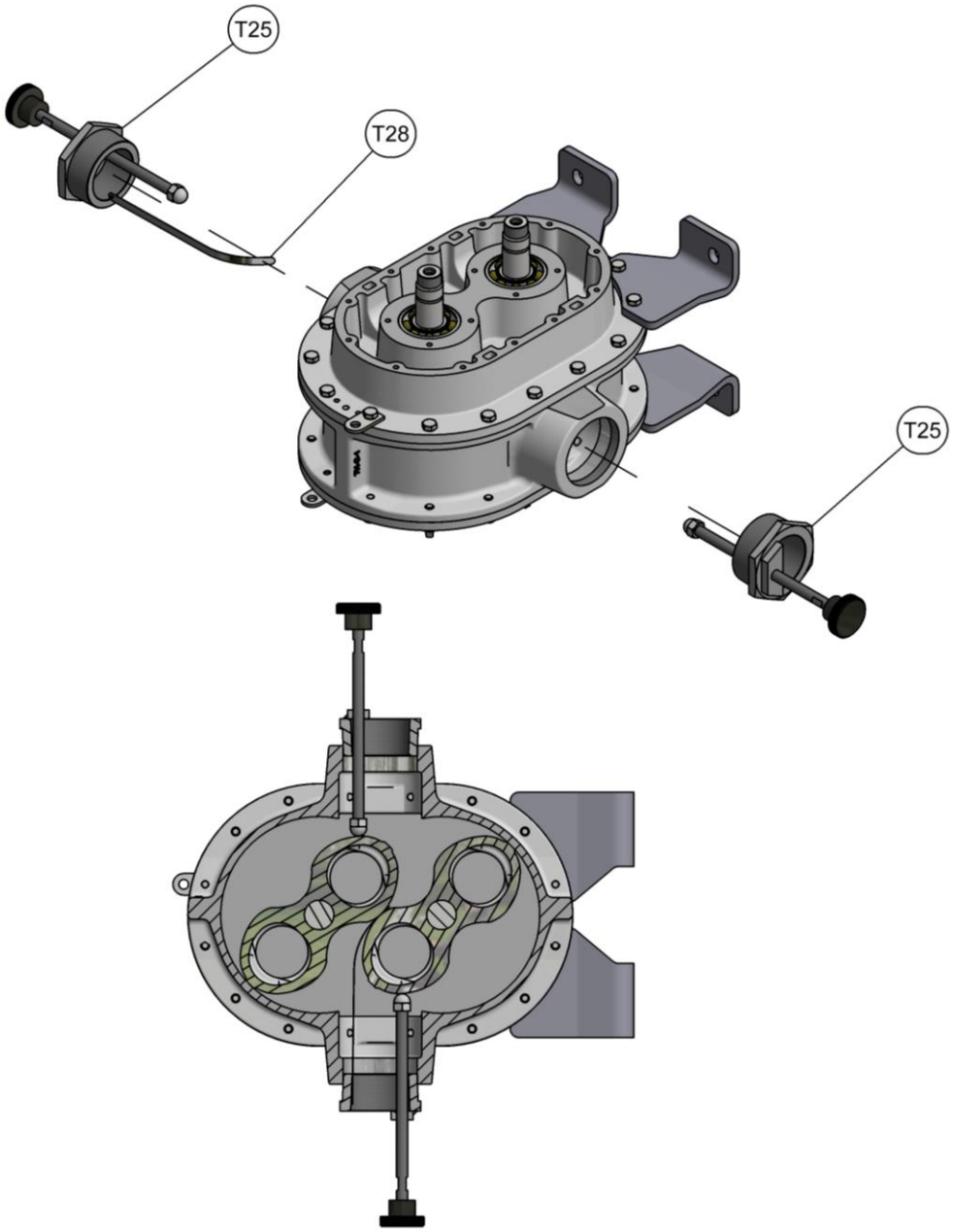
- Place a bearing (14) over end of shaft.
- Assemble rod coupling (T22) and Push/pull rod (T12) onto end of shaft.
- Slide driver (T17) over rod.
- Slide hydraulic ram (T13) & driver washer (T10) over puller rod, then install “C” washer (T11) and cap (T9).
- Install bearing using hydraulic ram (T13).
- **<u>NOTE:</u> DO NOT EXCEED 5,000 PSI PRESSURE**
- Repeat bearing installation of the other shaft.
- Install 2 bearing retainers (12) using 8 screws (10).
- Loosen gear end headplate screws (16) and (21). Remove all 4 feeler gauges (T28).
- **<u>NOTE:</u>** Pliers (T38) may be required to remove feeler gauges.
- Tighten headplate screws (16) and (21).
- Torque to specification all screws (16) and (21).



GAG797_R_17 / 00

5-23 Setting Interlobe Clearance

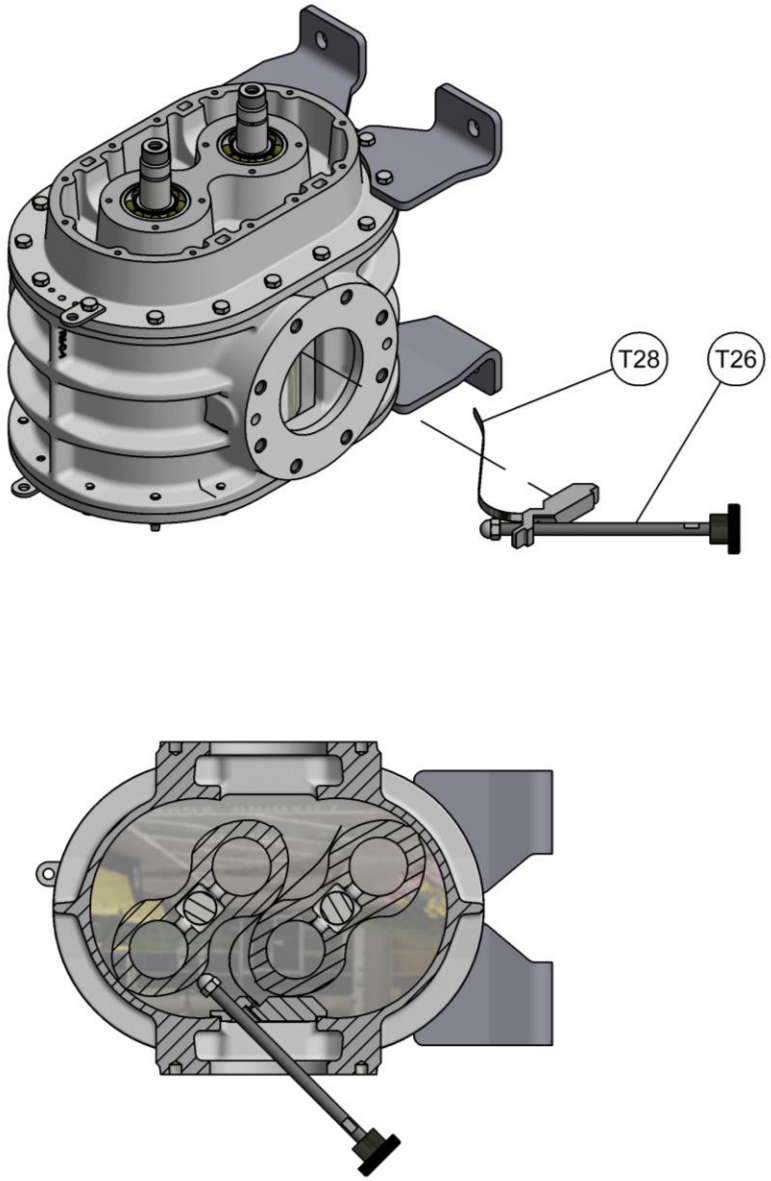
- Install rotor lock tool (T25) into port while positioning .012 feeler gauge (T28) in between the rotors as shown.
- Tighten adjusting knob until locked firmly against impeller body.
- Ensure tolerance is achieved as indicated in table. (See Figure 5-4, page 40).



GAG797_T_18 / 00

5-24 Setting Interlobe Clearance

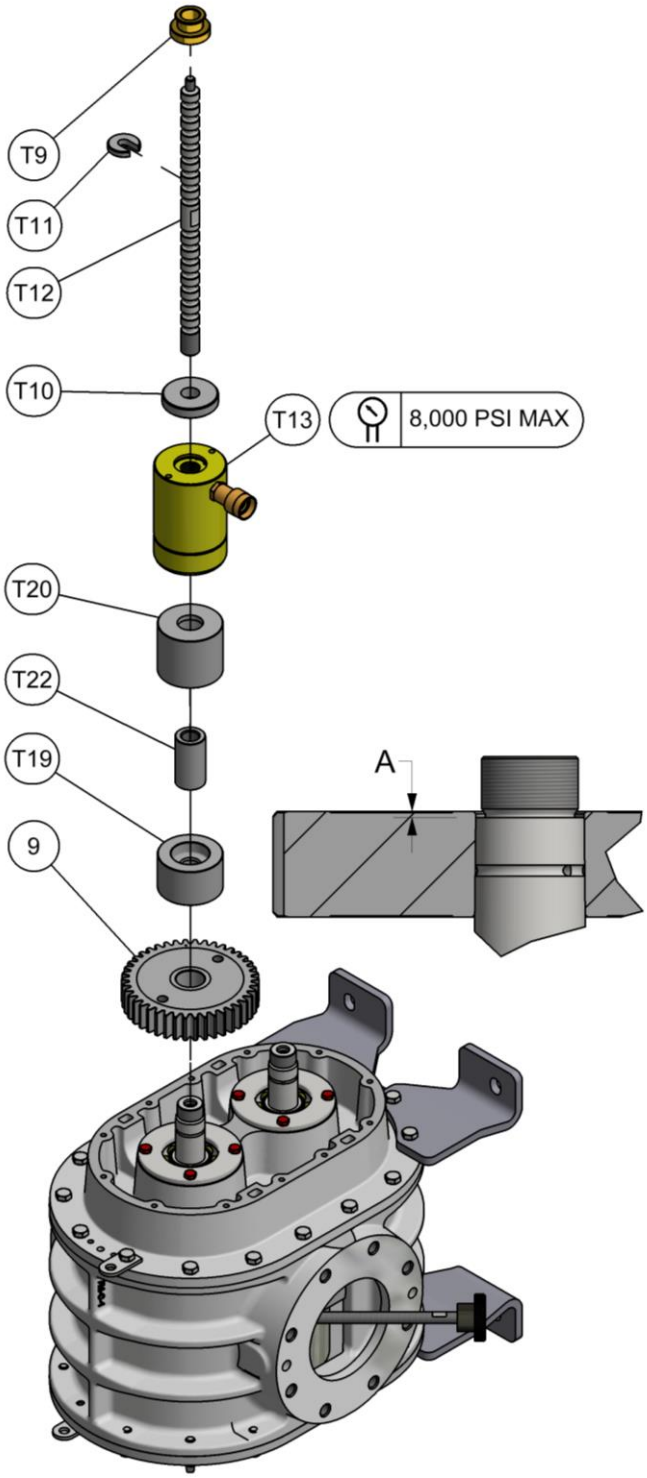
- Install rotor lock tool (T26) into port while positioning .012 feeler gauge (T12) in between the rotors as shown.
- Tighten adjusting knob until locked firmly against impeller body.
- Ensure tolerance is achieved as indicated in table. (See Figure 5-4, page 40).



GAG797_T_19 / 00

5-25 Idler Gear Installation

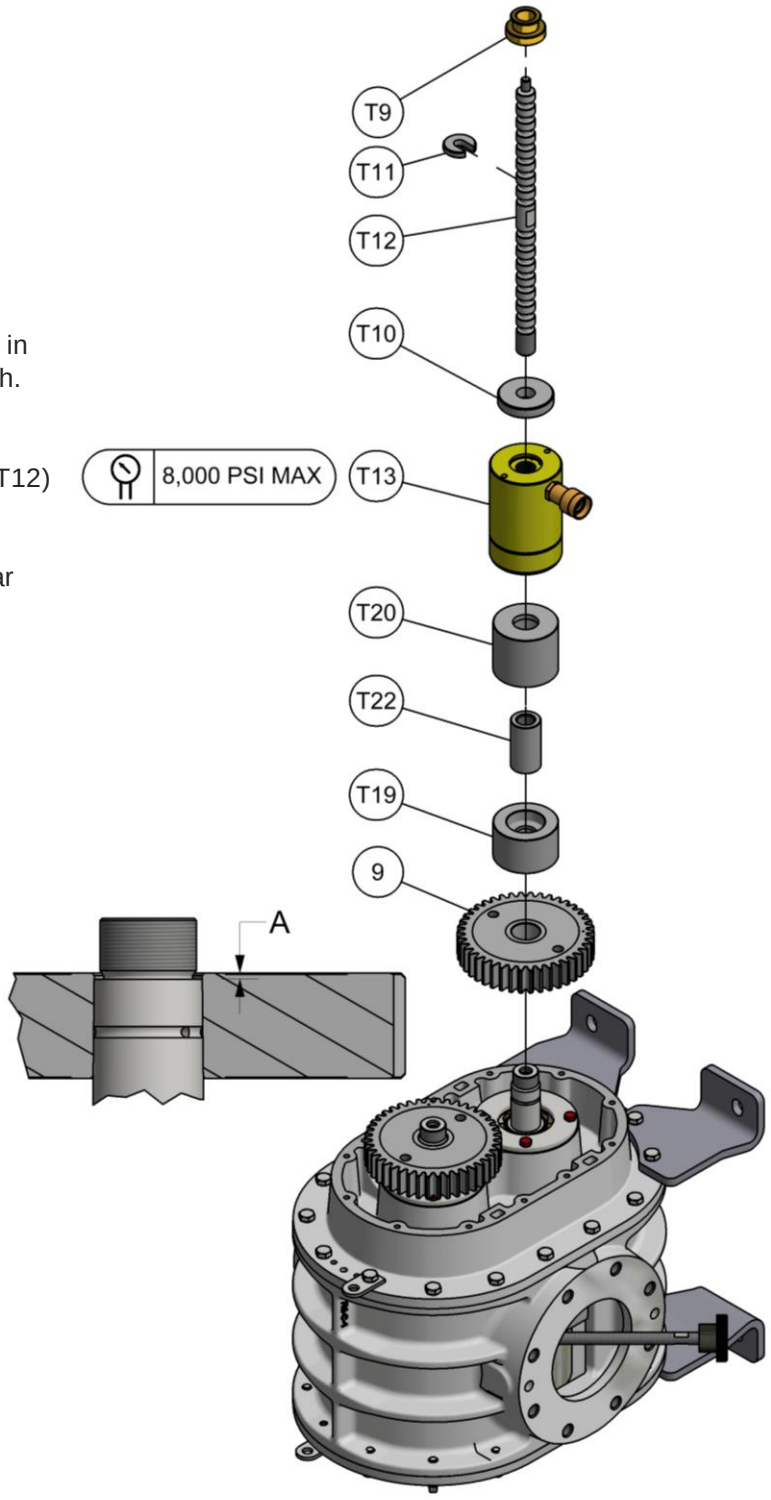
- Place gear (9) on idler shaft.
- Using a depth micrometer, measure dimension “A” as shown in illustration. Ensure a minimum of .140 inch is achieved as indicated in table. (See Figure 5-4, page 40)
- Place gear driver tool (T19) on rotor shaft, then assemble rod coupling (T22) and push/pull rod (T12) onto end of shaft.
- **NOTE:** If minimum backlash is not achieved, gear and/or shaft may need to be replaced.
- Slide driver (T20) over rod.
- Slide hydraulic ram (T13) over push/pull rod (T12), install “C” washer (T11) and cap (T9).
- Install gear using hydraulic ram (T13).
- **NOTE:** Driver (T19) is designed to not travel beyond shoulder on shaft, allowing gear face to be flush with shoulder.
- **DO NOT EXCEED 8,000 PSI OF PRESS FORCE OR DAMAGE MAY OCCUR TO SHAFT.**



GAG797_R_22 / 00

5-26 Drive Gear Installation

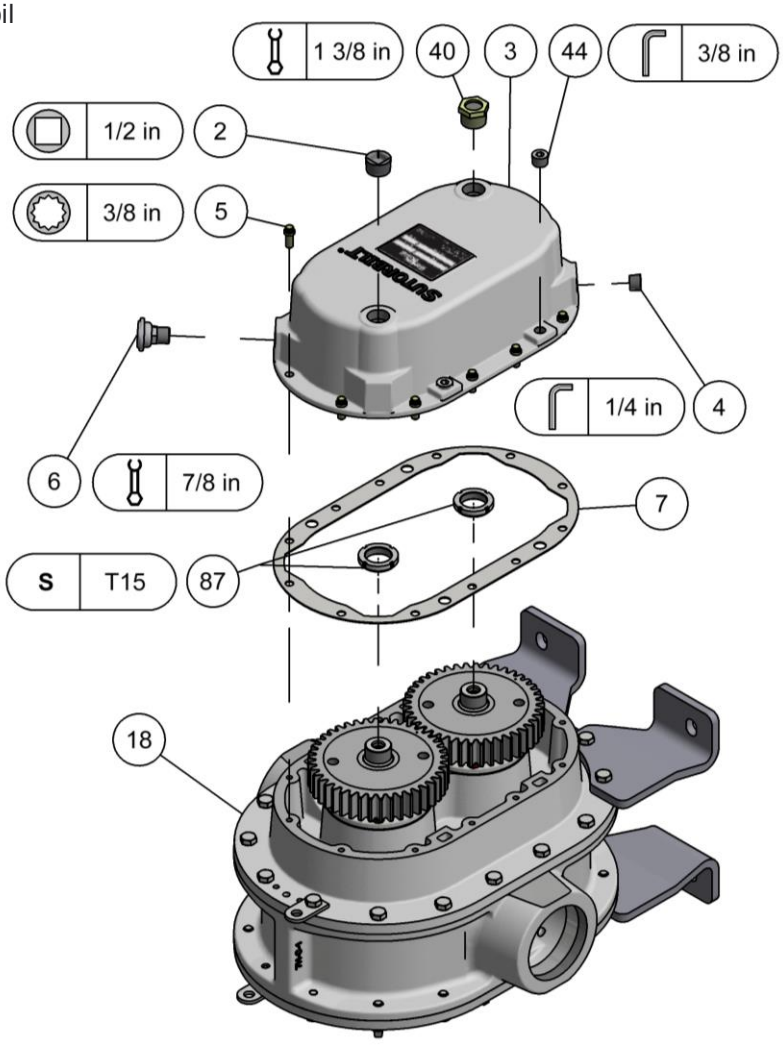
- Place gear (9) on idler shaft.
- Using a depth micrometer, measure dimension “A” as shown in illustration. Ensure a minimum of .140 inch is achieved as indicated in table. (See Figure 5-4, page 40)
- Rotate and hold gear in mesh against other gear in direction of operating rotation to remove backlash.
- Place gear driver tool (T19) on rotor shaft, then assemble rod coupling (T22) and push/pull rod (T12) onto end of shaft.
- **NOTE:** If minimum backlash is not achieved, gear and/or shaft may need to be replaced.
- Slide driver (T20) over rod.
- Slide hydraulic ram (T13) over push/pull rod (T12), install “C” washer (T11) and cap (T9).
- Install gear using hydraulic ram (T13).
- **NOTE:** Driver (T19) is designed to not travel beyond shoulder on shaft, allowing gear face to be flush with shoulder.
- **DO NOT EXCEED 8,000 PSI OF PRESS FORCE OR DAMAGE MAY OCCUR TO SHAFT.**



GAG797_R_23 / 00

5-27 Gear Nut and Gear Cover Installation

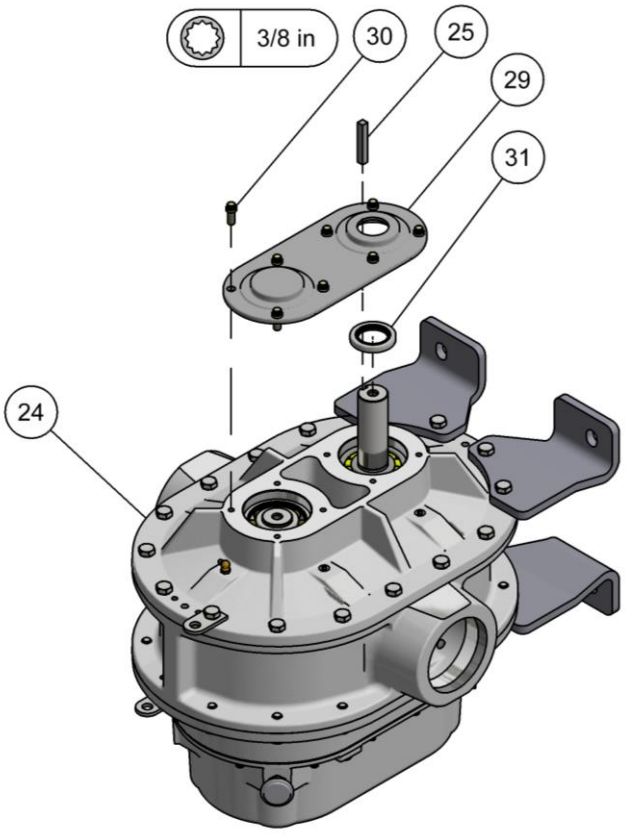
- Apply Loctite 243 to threads of lock nuts (87).
- Tighten lock nuts (87).
- Torque to specification for the lock nuts (87).
- Install gasket (7) onto headplate (18).
- Install cover (3) onto headplate (18) using 12 screws (5).
- **<u>NOTE:</u> CHECK ORIENTATION OF UNIT BEFORE INSTALLING PLUGS, OIL LEVEL GAUGE AND BREATHER.**
- Apply thread sealant to 2 plugs (2) & (4), oil level gauge (40) and breather (6).
- Install plugs (2) & (4), oil level gauge (40) and breather (6) according to unit configuration.
- Torque to specification all screws (5).
- Torque to specification all plugs (2) & (4).
- Torque to specification oil level gauge (40).
- Torque to specification breather (6).
- Apply thread sealant to 4 plugs (44). **NOTE FOR MECHANICAL SEAL UNITS ONLY.**
- Torque to specification all plugs (44). **NOTE FOR MECHANICAL SEAL UNITS ONLY.**



GAG797_R_24 / 00

5-28 Drive Cover Installation (GRS-SPL UNITS ONLY)

- Install drive shaft seal (31) into cover (29).
- Install cover (29) onto headplate (24) using 8 screws (30).
- Install drive shaft key (25) into to drive shaft keyway.
- Torque to specification all screws (30).



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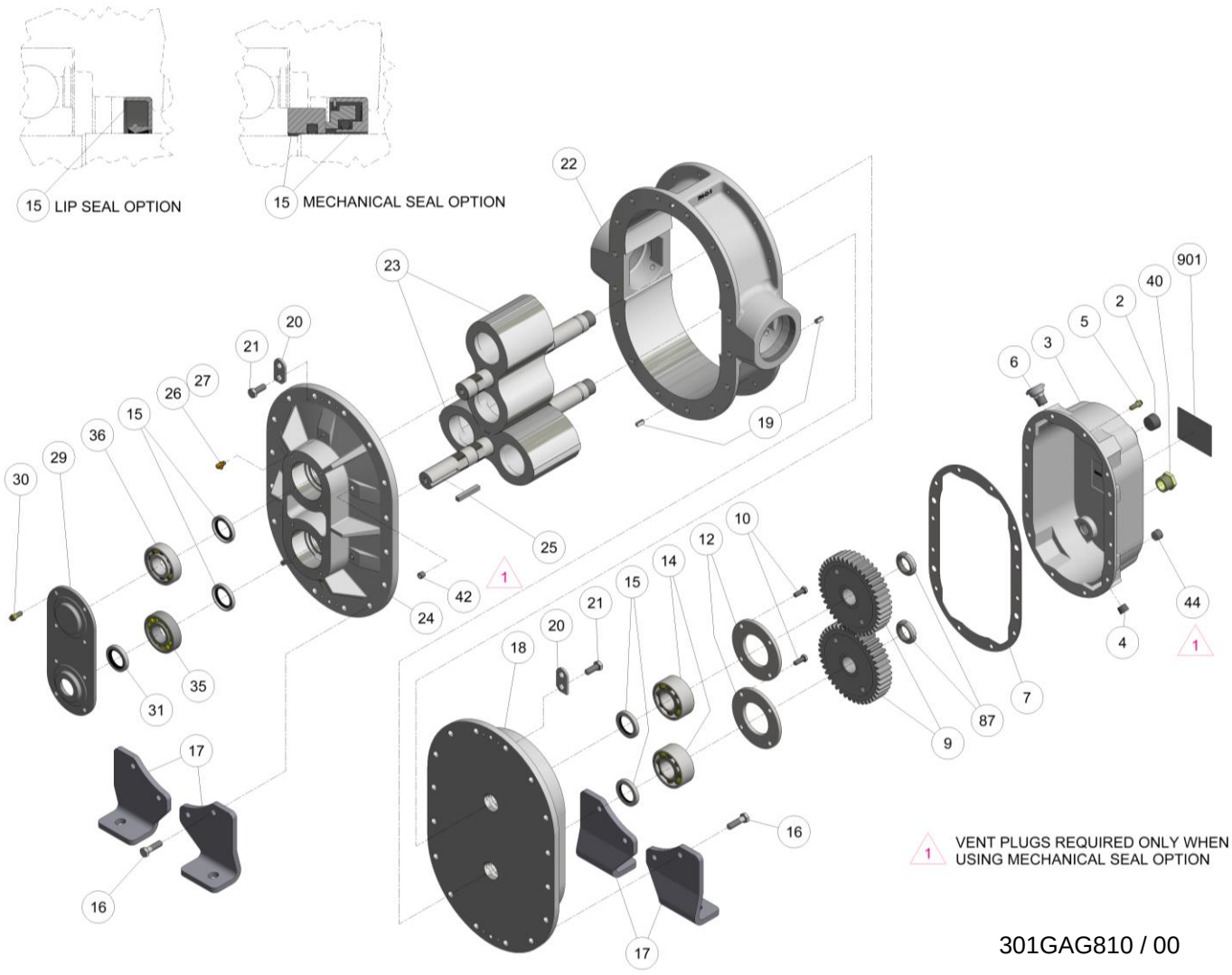
GRS-SPL (GREASE / SPLASH LUBE)



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GRS-SPL (GREASE / SPLASH LUBE)

ITEM	DESCRIPTION	QTY	7H LIP SEAL (VERTICAL)	7M LIP SEAL (VERTICAL)	7L LIP SEAL (VERTICAL)	7H LIP SEAL (HORIZONTAL)	7M LIP SEAL (HORIZONTAL)	7L LIP SEAL (HORIZONTAL)	ITEM
2	PLUG	1	64B4	64B4	64B4	64B4	64B4	64B4	2
3	GEAR CASE	1	900893071701	900893071701	900893071701	900893071701	900893071701	900893071701	3
4	PLUG	1	64B2	64B2	64B2	64B2	64B2	64B2	4
5	SCREW	12	75LM122	75LM122	75LM122	75LM122	75LM122	75LM122	5
6	BREATHER	1	5L223	5L223	5L223	5L223	5L223	5L223	6
*7	GASKET	1	200GAG715	200GAG715	200GAG715	200GAG715	200GAG715	200GAG715	*7
9	GEAR KIT	1	300GAG6008	300GAG6008	300GAG6008	300GAG6008	300GAG6008	300GAG6008	9
*10	SCREW	8	655ED04N	655ED04N	655ED04N	655ED04N	655ED04N	655ED04N	*10
12	BEARING RETAINER	2	900893070401	900893070401	900893070401	900893070401	900893070401	900893070401	12
*14	BEARING	2	DF138116	DF138116	DF138116	DF138116	DF138116	DF138116	*14
*15	SEAL (INTERNAL)	4	TST000544	TST000544	TST000544	TST000544	TST000544	TST000544	*15
16	SCREW	8	655EE070	655EE070	655EE070	655EE070	655EE070	655EE070	16
17	FOOT GROUP	1	GAG81958	GAG81958	GAG81958	GAG81959	GAG81959	GAG81959	17
18	BEARING HOUSING	1	303GAG006	303GAG006	303GAG006	303GAG006	303GAG006	303GAG006	18
19	DOWEL PIN	4	62M48	62M48	62M48	62M48	62M48	62M48	19
20	LIFTING LUG	2	200GAF451	200GAF451	200GAF451	200GAF451	200GAF451	200GAF451	20
21	SCREW	24	655EE050	655EE050	655EE050	655EE050	655EE050	655EE050	21
22	CYLINDER	1	900893070101	900893070201	900893070301	900893070101	900893070201	900893070301	22
23	ROTOR GROUP	1	300GAGH4028	300GAGM4028	300GAGL4028	300GAGH4028	300GAGM4028	300GAGL4028	23
24	BEARING HOUSING	1	302GAG006	302GAG006	302GAG006	302GAG006	302GAG006	302GAG006	24
25	KEY	1	900639910407	900639910407	900639910407	900639910407	900639910407	900639910407	25
26	PIPE FITTING	2	40E9	40E9	40E9	40E9	40E9	40E9	26
27	CAP	2	40P58	40P58	40P58	40P58	40P58	40P58	27
29	DRIVE COVER	1	900883073701	900883073701	900883073701	900883073701	900883073701	900883073701	29
30	SCREW	8	75LM122	75LM122	75LM122	75LM122	75LM122	75LM122	30
*31	DRIVE SEAL	1	60DD727	60DD727	60DD727	60DD727	60DD727	60DD727	*31
*35	BEARING	1	12BA213	12BA213	12BA213	12BA213	12BA213	12BA213	*35
*36	BEARING	1	BB1177709	BB1177709	BB1177709	BB1177709	BB1177709	BB1177709	*36
40	OIL LEVEL GAUGE	1	VP1004935	VP1004935	VP1004935	VP1004935	VP1004935	VP1004935	40
42	PLUG	-	-	-	-	-	-	-	42
44	PLUG	-	-	-	-	-	-	-	44
*54	SHIM (0.003” THICK)	1	200GAG732	200GAG732	200GAG732	200GAG732	200GAG732	200GAG732	*54
55	SHIM (0.010” THICK)	1	201GAG732	201GAG732	201GAG732	201GAG732	201GAG732	201GAG732	55
*56	SHIM (0.0015/0.002” THICK)	1	202GAG732	202GAG732	202GAG732	202GAG732	202GAG732	202GAG732	*56
87	NUT (GEAR RETAINER)	2	50Z7	50Z7	50Z7	50Z7	50Z7	50Z7	87
**105	OVERHAUL KIT	1	300GAG6010	300GAG6010	300GAG6010	300GAG6010	300GAG6010	300GAG6010	**105
**900	IDENT & INSTRUCTION GROUP	1	301GAG4011	301GAG4011	301GAG4011	301GAG4011	301GAG4011	301GAG4011	**900

* INCLUDED IN OVERHAUL KIT

** NOT SHOWN ON ILLUSTRATION

ASSEMBLY TORQUE SPECIFICATIONS

Hex Head Cap Screws

Tightening Torque Values In Foot Pounds										
Size	Bolt Dia	Grade 2			Grade 5			Grade 8		
		Clamp Load	Tightening Torque		Clamp Load	Tightening Torque		Clamp Load	Tightening Torque	
			K=.20 Dry	K=.15 Lub.		K=.20 Dry	K=.15 Lub.		K=.20 Dry	K=.15 Lub.
1/4-20	.2500	1320	5	4	2020	8	6	2860	12	9
1/4-28	.2500	1500	6	5	2320	10	7	3280	14	10
5/16-18	.3125	2160	11	8	3340	17	13	4720	25	18
5/16-24	.3125	2400	12	9	3700	19	14	5220	25	20
3/8-16	.3750	3200	20	15	4940	30	23	7000	45	35
3/8-24	.3750	3620	23	17	5600	35	25	7900	50	35
7/16-14	.4375	4380	30	24	6800	50	35	9550	70	55
7/16-20	.4375	4900	35	25	7550	55	40	10700	80	60
1/2-13	.5000	5840	50	35	9050	75	55	12750	110	80
1/2-20	.5000	6600	55	40	10700	90	65	14400	120	90

Socket Head Cap Screws

Tightening Torque Values in Foot Pounds				
Socket Head Cap Screw		ASTM A574		
Thread Size & Pitch	Screw Diameter	Clamp Load Pounds	Tightening Torque	
			K= .20 Dry	K= .15 Lub.
1/4-20	.2500	3338	14	10
1/4-28	.2500	3825	16	12
5/16-18	.3125	5505	29	22
5/16-24	.3125	6090	32	24
3/8-16	.3750	8100	51	38
3/8-24	.3750	9225	58	43
7/16-14	.4375	11175	81	61
7/16-20	.4375	12450	91	68
1/2-13	.5000	14925	124	93
1/2-20	.5000	16800	140	105

Miscellaneous Items

Item	Description	Thread Size
2	1” Plug	1 – 11 1/2 NPT
4	1/2” Plug	1/2 – 14 NPT
6	Breather	1/2 – 14 NPT
26	Grease Fitting	1/8 – 27 NPT
40	Oil Level Gauge	1 – 11 1/2 NPT
42	Plug	1/4 – 18 NPT
44	Plug	3/8 – 18 NPT

Normal Torque Tolerance is -0% / +10%

Gardner Denver

WARRANTY
SUTORBILT BLOWERS
Legend SERIES

GENERAL PROVISIONS AND LIMITATIONS

Gardner Denver (the "Com pany") warrants to each original retai l 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 repai red 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 negligenc e, accident, improper storage, or improper installation or application.
3. Any product which has not been operated or maintained in a ccordance with the recommendati ons of the Company.
4. Components or accessories manufactured, warranted and s erviced by others.
5. Any reconditioned or prior ow ned 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 n ormal business hours at an authorized s ervice facility of the Company, any part which in its judgment proved not to be as warranted within the appl icable Warranty Period as fol lows.

BARE BLOWERS

Basic grease lubricated bare blowers, consisting of all parts within, are warranted for 1 8 months from date of initial use or 24 months from date of shipment to the first purchaser, whichever occurs first. Basic dual splash lubricated bare blow ers, 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" blow er per Com pany instructions, will be cause for denial of w arranty.

OTHER COMPONENTS

All other components are warranted for 12 months from date of initial use or 18 months from date of shipment to first purchaser, whichever comes first. The Company reserves the right to withdraw the Warranty where evidenc e indicates application outside the stated performance area, or where there is evidence of abuse

LABOR TRANSPORTATION AND INSPECTION

The Company will provide labor, b y Company repres entative or authorized service personnel, for repair or replac ement of any product or part thereof w hich 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 ina ccessibility of equipment, or labor provided by unauthorized s ervice personnel is not provided by thi s warranty.

All costs of transportation of product, labor or parts claimed not to be as warranted and, of repaired or r eplacement parts to or from such service facilities shall be borne by the Purchaser. The Company may require the return o f any part claimed not to be as warranted to one of its facilities as designated by the Company, transportation prepaid by Purc haser, to establish a claim under this warranty. Replac ement 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 c omponents.

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.

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, repres entation, agreement, or unders tanding, oral or written, made by any a gent, distributor, repres entative, or employee of the Company which is not contain ed in this Warranty will be binding upon the Co mpany unless made in writing and ex ecuted by an of ficer 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 produ ct is claimed not to have been as w arranted. Any action for breach of this warranty must be commenced within one y ear 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 produ ct was not as warranted.

SB-7-638VER00

Gardner Denver®

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For additional information, contact your local representative or visit:
www.gardnerdenver.com/en-us/gdproducts/products/blowers

Please recycle after use.