Gardner Denver

PD BLOWERS & VACUUM PUMPS

CYCLOBLOWER H.E. SERIES | SPLASH LUBRICATED

Owner's Manual

CycloBlower H.E. - Dual Splash Lube

37-1-618
Version 03
July 20, 2017

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

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

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

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

1. Trained parts technical representatives to assist you in selecting the correct replacement parts.

2. Complete inventory of new machines and new, genuine factory parts.

3. A full line of factory tested AEON™ PD Series blower lubricants specifically formulated for optimum performance in all blowers.

4. Authorized distributor service technicians are factory-trained and skilled in blower maintenance and repair. They are ready to respond and assist you by providing fast, expert maintenance and repair service.

INSTRUCTIONS FOR DETERMINING BLOWER CONFIGURATION

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

INSTRUCTIONS FOR ORDERING REPAIR PARTS

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

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

To Contact Gardner Denver or locate your local distributor:

Visit: www.contactgd.com/blowers

or

call: (800)372-2222

GARDNER DENVER LUBRICANT ORDER INFORMATION

Re-order Part Numbers for Factory-Recommended Lubricants.

AEON PD Synthetic Lubricant or AEON PD-Food Grade Synthetic Lubricant

AEON PD Synthetic Lubricant

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

AEON PD-Food Grade Synthetic Lubricant

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

AEON PD - XD Synthetic Lubricant

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

Call your local CycloBlower H.E.® Distributor to place your order for Gardner Denver Lubricants. Your Authorized Gardner Denver Distributor is:

FOREWORD

CycloBlower H.E.® 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 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.

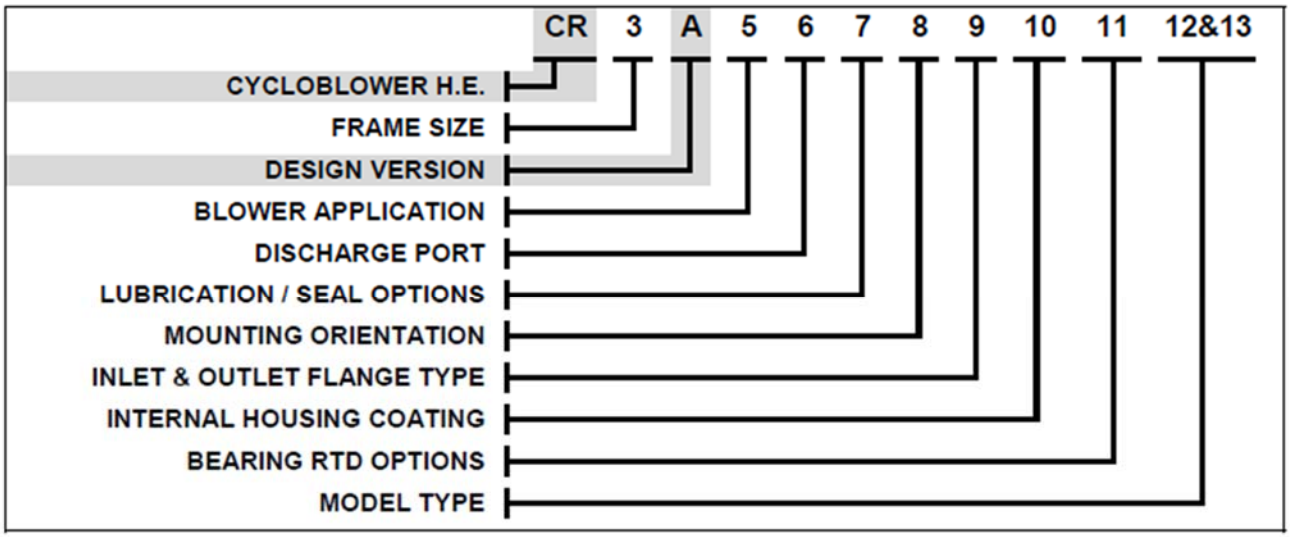
NOTICE
Notice is used to notify people of installation, operation or maintenance information which is important but not hazard-related.

TABLE OF CONTENTS

INDEX

LIST OF ILLUSTRATIONS

MODEL MATRIX



COLUMN 3 - FRAME SIZE	L - 160CDL480 P - 200CDL600 T - 250CDL750
COLUMN 5 - BLOWER APPLICATION	9 - SPECIAL A - AIR SERVICE (INPRO SEALS) B - GAS SERVICE (MECHANICAL SEALS)
COLUMN 6 - DISCHARGE PORT	9 - SPECIAL L - RC1 LOW COMPRESSION M - RC2 MEDIUM COMPRESSION H - RC3 HIGH COMPRESSION*
COLUMN 7 - LUBRICATION / SEAL OPTIONS	9 - SPECIAL A - SPLASH LUBRICATION WITH PISTON RING SEALS B - PRESSURE LUBRICATION WITH PISTON RING SEALS* C - PRESSURE LUBRICATION WITH GRAPHITE RING SEALS*
COLUMN 8 - MOUNTING ORIENTATION	9 - SPECIAL A - BOTTOM DISCHARGE 3 POINT MOUNT B - BOTTOM DISCHARGE 4 POINT MOUNT C - TOP DISCHARGE 4 POINT MOUNTING
COLUMN 9 - INLET & OUTLET FLANGE TYPE	9 - SPECIAL A - ENGLISH ANSI 125 FF B - METRIC ISO 7005 PN10
COLUMN 10 - INTERNAL HOUSING COATING	9 - SPECIAL A - NO COATING B - PTFE COATING
COLUMN 11 - BEARING RTD OPTIONS	9 - SPECIAL A - STANDARD HOUSINGS B - RTD 1/2 BSPP PORTS ADDED C - RTD PORTS AND PROBES INCLUDED
COLUMN 12 & 13 - MODEL TYPE	G - GARDNER DENVER PRODUCTION UNIT GX - GARDNER DENVER REMAN UNIT

* These models covered in different manual

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

Although Gardner Denver blowers are sturdy, precision-engineered machines, there are several relatively simple but basic installation and maintenance procedures that must be observed to assure optimum performance. As there is no guesswork in the manufacture of these highly advanced units, there must be none in preparing them to get the job done in the field.

It is the purpose of this manual to help you properly install, maintain and service your Gardner Denver blower. It is important that no section be overlooked when preparing to install your blower.

Follow the instructions carefully and you will be rewarded with years of trouble-free operation.

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 to the middle of the sight glass.

⚠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.

SECTION 2
INSTALLATION

GENERAL – The CycloBlower H.E.® is a compact, rotary lobe type axial flow blower. The meshing of two screw type rotors synchronized by timing gears provides controlled compression of the air for maximum efficiency and pulsation free discharge.

OPERATING PRINCIPLE – Compression is achieved by the main (3 lobe) and gate (5 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 five times for each revolution of the shaft and is continuous.

CONSTRUCTION – All models of the CycloBlower H.E.® series of Blowers are of similar design and construction. The housings are a two-piece design with flanged inlet and discharge openings.

The rotors are ductile iron with integral cast shaft. Rotors are dynamically balanced for vibration-free operation. Rotors are coated with food grade PTFE. Helical timing gears are made of alloy steel and are ground for quiet operation.

One 4-point angular-contact ball bearing is used on each rotor shaft at the discharge end as a fixed bearing to maintain rotor axial end clearance. A cylindrical roller bearing is also used on the discharge end to maintain rotor radial clearance.

A deep groove ball bearing is used on each rotor shaft at the inlet end as a floating bearing to maintain rotor radial clearance.

All gears and bearings are oil splash lubricated.

Standard construction is top inlet, bottom discharge, with drive shaft extension from gate rotor at the discharge end. Rotation is clockwise facing the drive shaft. Blowers may be mounted for either V-belt or direct-coupled drive. The main rotor speed is 5/3rd the gate rotor or drive speed.

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. The vent holes are tapped to permit installation of a venting line. Do not plug these vent holes unless a mechanical seal is used.

Each oil sump is vented to atmosphere through a breather. The breather prevents sump pressurization and contamination.

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.

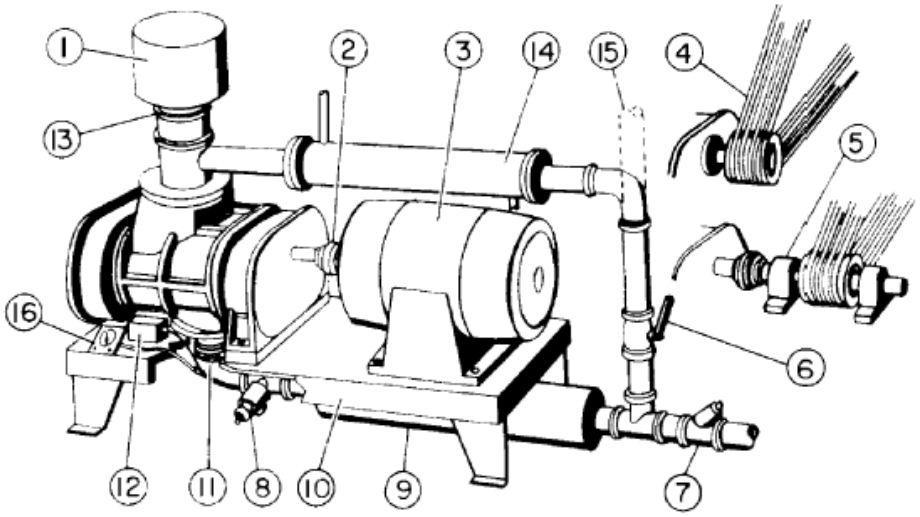


FIGURE 2- 2 – ACCESSORIES AND SAFETY DEVICES

ACCESSORIES (FIGURE 2- 2) – The type of service determines the accessory group required. The typical items are listed as follows:

1. Inlet Filter or Filter-silencer.
2. Flexible Coupling
3. Driver.
4. Simple V-Belt Drive.
5. Jackshaft V-Belt Drive.
6. Bypass Valve.
7. Check Valve.
8. Relief Valve, Vacuum or Pressure.
9. Discharge Silencer.
10. Base Plate.
11. Expansion Joint(s) – Inlet and/or Discharge.
12. Temperature or Pressure Shutdown Switch.
13. Check Valve (Inlet Bypass).
14. Heat Exchanger.
15. Bypass to atmosphere (alternate).
16. Pressure Gauge or Vacuum Gauge

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, page 15) 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.

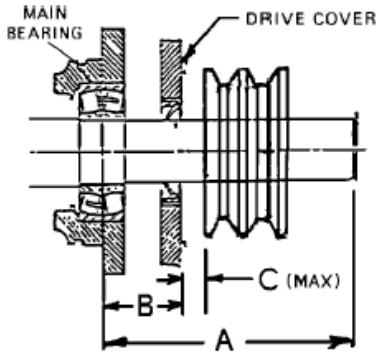
NOTICE
The sheave should be positioned as close as possible to the drive cover. This will reduce the overhung load and extend the bearing life.

On direct drive blowers, align the couplings so that the offset and angular misalignment does not exceed 0.003” [75 µm] total indicator reading (TIR). Lubricate coupling according to manufacturer’s specification. 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.

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.

Frame Size	Dimensions - Inches [mm]			Maximum Allowable Moment - lbf·in [N·m]
	A	B	C (Max)	
160CDL480	11.78 [299]	6.16 [156]	0.5 [13]	16,280 [1,840]
200CDL600	14.7 [373]	7.65 [194]	0.5 [13]	30,260 [3,420]
250CDL750	19.1 [485]	9.30 [236]	0.5 [13]	41,300 [4,670]

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):

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

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]

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

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):

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

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]

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

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

Bypass Valve – Installation of a bypass valve at the blower discharge (FIGURE 2- 2, page 12) will allow the blower to be started under no-load. Bypass line may be discharged at atmosphere or to blower inlet depending on local requirements or material being handled.

Heat Exchanger – When the bypass line discharges to blower inlet, a heat exchanger must be included in the line between blower discharge and blower inlet, to remove the heat of compression before the gas is reintroduced into the blower inlet. A check valve (FIGURE 2- 2, page 12) should also be placed in the inlet line between the bypass line and the inlet filter or silencer, to prevent discharging backwards through the filter or silencer.

SAFETY DEVICES – For all installations the following safety devices are a requirement for safe blower operation. Numbers shown are reference numbers used in (FIGURE 2- 2, page 12).

7. Check Valve, Blower Discharge Line
8. Relief Valve, Vacuum or Pressure
12. High Discharge Air Temperature Switch

Check Valve (FIGURE 2- 2, page12) – 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 (FIGURE 2- 2, page12) –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. See (FIGURE 2- 2, page 12). On remote or unattended installations these controls are normally mandatory.

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.

MOUNTING CONFIGURATIONS – The blower is configured for top or bottom discharge at the factory. Changing the discharge orientation requires rebuild by trained personnel.

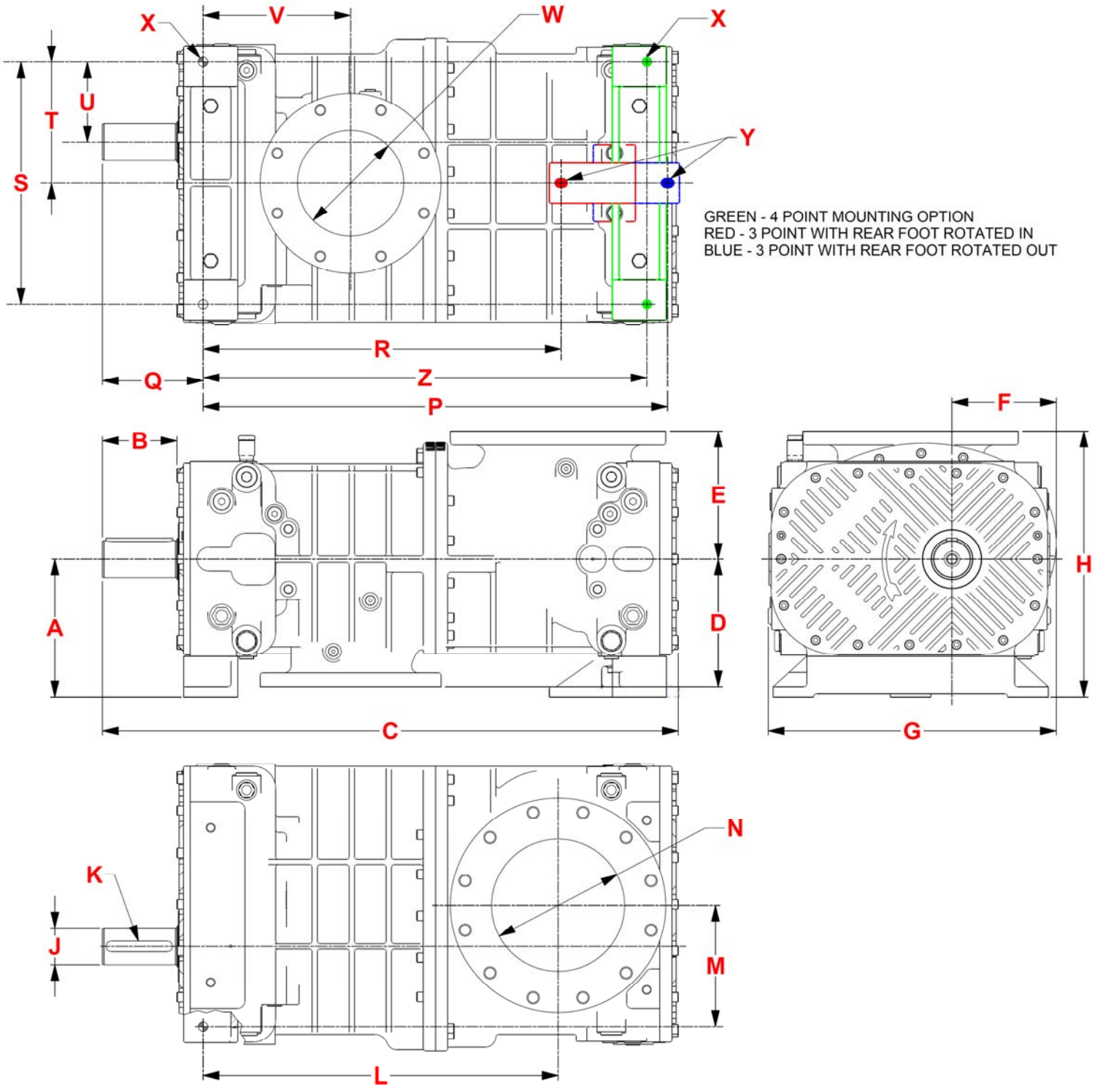


FIGURE 2- 4 – BOTTOM DISCHARGE OUTLINE DIMENSIONS

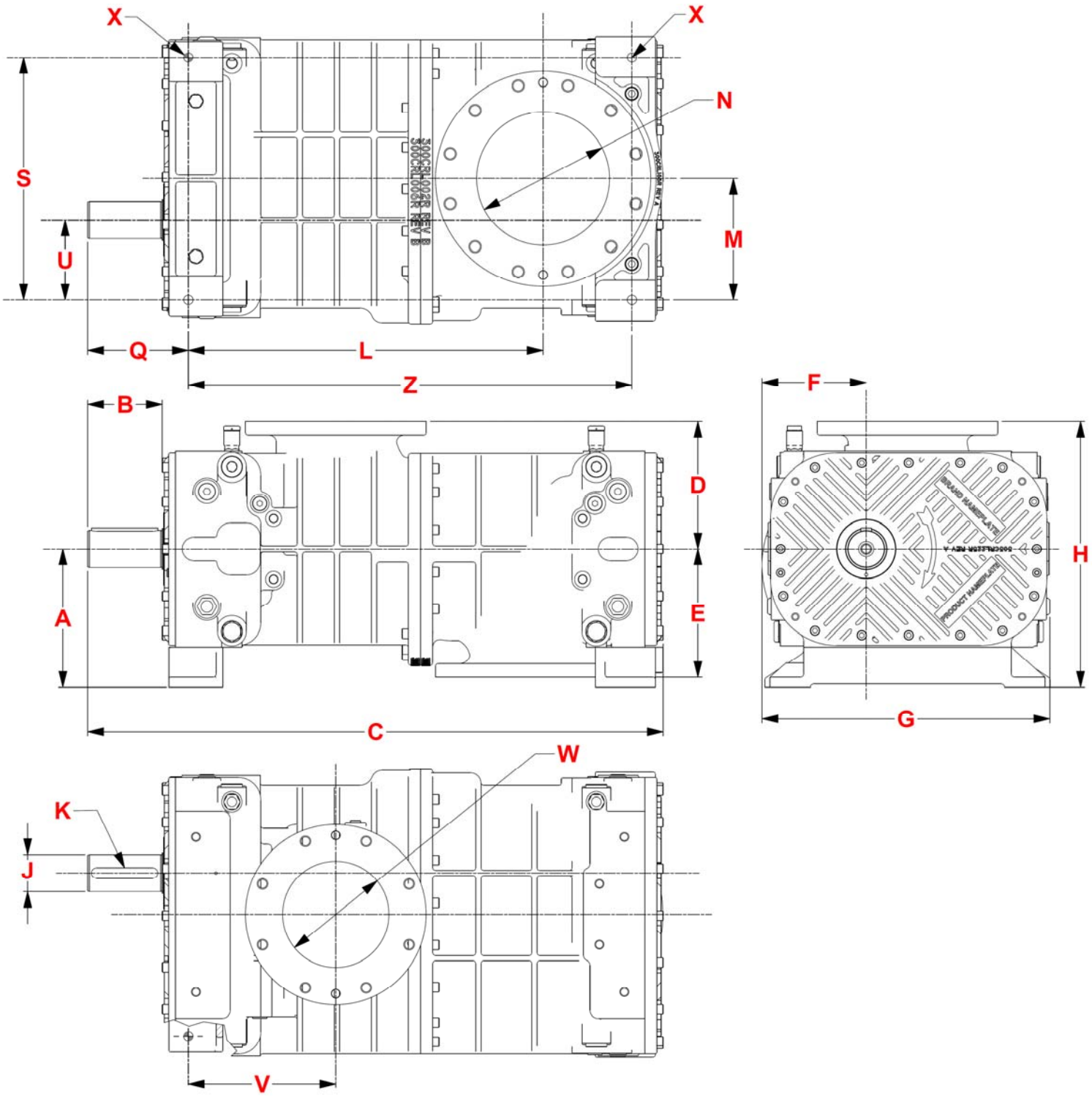


FIGURE 2- 5 – TOP DISCHARGE OUTLINE DIMENSIONS

	160CDL480	200CDL600	250CDL750
Approximate Weight	1150 lbf [520 kg]	1940 lbf [880 kg]	3500 lbf [1560 kg]
Outline Drawings	300CRL800 (Bottom Disch.) 301CRL800 (Top Disch.)	300CRP800 (Bottom Disch.) 301CRP800 (Top Disch.)	300CRT800 (Bottom Disch.) 301CRT800 (Top Disch.)
A	10.25 in. [260.4 mm]	12 in. [304.8 mm]	15.88 in. [403.2 mm]
B	5.52 in. [140.3 mm]	7.05 in. [179 mm]	8.42 in. [214 mm]
C	42.63 in. [1082.8 mm]	51.59 in. [1310.4 mm]	63.65 in. [1616.6 mm]
D	9.50 in. [241.3 mm]	11 in. [279.4 mm]	13 in. [330.2 mm]
E	9.50 in. [241.3 mm]	11 in. [279.4 mm]	13 in. [330.2 mm]
F	7.72 in. [196 mm]	9.52 in. [241.7 mm]	10.55 in. [268 mm]
G	21.32 in. [541.5 mm]	26.21 in. [665.7 mm]	31.18 in. [792 mm]
H	19.75 in. [501.7 mm]	23 in. [584.2 mm]	28.88 in. [733.4 mm]
J	2.76 in. [70 mm]	3.54 in. [90 mm]	3.94 in. [100 mm]
K	12mmX20mmX125mm	14mmX25mmX140mm	16mmX28mmX180mm
L	26.28 in. [667.4 mm]	33.04 in. [839.2 mm]	38.47 in. [977.2 mm]
M	9.00 in. [228.7 mm]	11.75 in. [298.5 mm]	13.75 in. [349.2 mm]
N	10" ANSI125FF or 250mm ISO 7005 (PN10)	12" ANSI125FF or 300mm ISO 7005 (PN10)	14" ANSI125FF or 350mm ISO 7005 (PN10)
P	34.38 in. [873.3 mm]	42.16 in. [1070.9 mm]	48 in. [1219.2 mm]
Q	7.46 in. [189.4 mm]	8.39 in. [213.1 mm]	10.94 in. [278 mm]
R	26.51 in. [673.2 mm]	34.29 in. [870.8 mm]	N/A (Symmetric Foot)
S	18.00 in. [457.2 mm]	23.5 in. [596.9 mm]	27.5 in. [698.5 mm]
T	9.00 in. [228.7 mm]	11.75 in. [298.5 mm]	13.75 in. [349.2 mm]
U	5.94 in. [151 mm]	7.75 in. [196.9 mm]	8.5 in. [215.9 mm]
V	10.92 in. [277.4 mm]	13.23 in. [336.2 mm]	18 in. [457.2 mm]
W	8" ANSI125FF or 200mm ISO 7005 (PN10)	10" ANSI125FF or 250mm ISO 7005 (PN10)	12" ANSI125FF or 300mm ISO 7005 (PN10)
X	0.69 in. [17.5 mm]	0.81 in. [20.6 mm]	0.88 in. [22.2 mm]
Y	0.69x0.94 in. [17.5x23.8 mm]	0.69x0.94 in. [17.5x23.8 mm]	0.88x1.75 in. [22.3x44.5 mm]
Z	32.86 in. [834.5 mm]	41.82 in. [1062.3 mm]	49.57 in. [1259.2 mm]

FIGURE 2- 6– OUTLINE DIMENSIONS (TOP AND BOTTOM DISCHARGE)

SECTION 3
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 3.

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," page 25.

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.

⚠WARNING

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

Model	Drive Shaft Speed RPM	Discharge Pressure* Sea Level PSIG [mbar]	Dry Vacuum* Inches Hg [mbar]	Temperature Rise °F [°C]	Discharge Temperature °F [°C]
160CDL480 RC1	3600	18 [1240]	16 [540]	250 [139]	350 [177]
160CDL480 RC2	3600	20 [1380]	18 [610]	250 [139]	350 [177]
200CDL600 RC1	2800	18 [1240]	16 [540]	250 [139]	350 [177]
200CDL600 RC2	2800	20 [1380]	18 [610]	250 [139]	350 [177]
250CDL750 RC1	2200	18 [1240]	16 [540]	250 [139]	350 [177]
250CDL750 RC2	2200	20 [1380]	18 [610]	250 [139]	350 [177]

* Pressures or vacuums are gauged at immediate blower discharge or inlet. For maximum ratings at reduced speeds, See (FIGURE 3- 3, page 23).

FIGURE 3- 1 – MAXIMUM RATINGS

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 3- 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 3- 3, page 23). A bypass valve to bleed air from the discharge to atmosphere (FIGURE 2- 2, page 12) 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 3- 1, or below the minimum speed shown in FIGURE 3- 3, page 23. 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 3- 1 are decreased with operation at higher altitudes. See FIGURE 3- 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 3- 2– ALTITUDE – PRESSURE/VACUUM RATING

Example 1: 160CDL480 RC2, Altitude 4000 ft [1220 m].
Maximum pressure rating is 20 psig [1380 mbar] at sea level from FIGURE 3- 1.
Allowable pressure at 4000 ft. is 86.4% of rating: 0.864 * 20 = 17.28 psig [1191 mbar].

Example 2: 160CDL480 RC1, Altitude 5000 ft. [1525 m].
Maximum vacuum rating is 16 inches of mercury [540 mbar] at sea level from FIGURE 3- 1.
Allowable vacuum at 4000 ft. is 83.0% of rating: 0.83 * 16 = 13.28 inches of mercury [450 mbar]

SPEED – Refer to FIGURE 3- 1, page 22, for maximum and FIGURE 3- 3 for 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 are listed in FIGURE 3- 3, as speed is reduced, pressure or vacuum must also be reduced.

EXAMPLE: Using a 160CDL480 RC2 blower, operating against 18 PSIG [1240 mbar], minimum allowable speed is 1100 RPM.

Model	Minimum Speed (RPM) – Pressure		
	Up to 15 PSIG [1035 mbar]	18 PSIG [1240 mbar]	20 PSIG [1380 mbar]
160CDL480 RC1	800	1600	-
160CDL480 RC2	800	1100	1500
200CDL600 RC1	800	900	-
200CDL600 RC2	800	800	800
250CDL750 RC1	500	850	-
250CDL750 RC2	500	500	700

Model	Minimum Speed (RPM) - Vacuum	
	Up to 16” Hg. [540 mbar]	18” Hg. [610 mbar]
160CDL480 RC1	800	-
160CDL480 RC2	800	1300
200CDL600 RC1	800	-
200CDL600 RC2	800	800
250CDL750 RC1	500	-
250CDL750 RC2	500	500

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

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

OPERATING TEMPERATURE – Blower air discharge temperature will increase with higher operating pressures or vacuums. Maximum allowable discharge is 350°F [177°C]. If the discharge temperature continues to exceed 350°F [177°C], stop the blower at once and correct the trouble.

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.

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 4
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 4- 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 4- 1– RECOMMENDED MAINTENANCE SCHEDULE

LUBRICATION – Gears and bearings are splash lubricated. Approximate oil volumes are shown in FIGURE 4- 2, page 27. Filling with this amount of oil will bring the oil level to about the middle of the sight gauge. Add more oil if necessary to bring the level to the middle. DO NOT OPERATE THE BLOWER UNLESS OIL LEVEL IS AT THE MIDDLE OF THE SIGHT GAUGE. Do not overfill. Oil is added through the oil fill hole at the top of each bearing carrier. Check oil level only when machine is not operating and maintain at middle of each sight glass.

	Approximate Oil Volume - quarts [liters]		
	160CDL480	200CDL600	250CDL750
Drive End Sump	3.2 [3]	7.75 [7.3]	14.0 [13.2]
Non-Drive End Sump	2.5 [2.4]	5.5 [5.2]	9.1 [8.6]

FIGURE 4- 2 – APPROXIMATE OIL VOLUMES

Check the oil level at both ends of the blower daily. The oil change period is governed by operating conditions, such as load, temperature, dirt, humidity, fumes and the quality of oil used. Under severe operating conditions, the oil should be changed every 1000 hours or more often. Under ideal operating conditions oil may extend the change interval up to 6000 hours based on good oil analysis program. Good practice is to change the oil often enough that it appears clean and clear when drained from the sump. Oil sump should be flushed with a clean solvent every forth oil change. Always use clean containers for oil and cleaning solvents.

RECOMMENDED LUBRICANT

AEON PD Synthetic Blower Lubricant is recommended.
AEON PD – FG (Food Grade) and AEON PD – XD (Extreme Duty) part numbers.

AEON PD is formulated especially for positive displacement blower service to provide maximum blower protection at most temperatures. Refer to FIGURE 4- 3 for part numbers. One filling of AEON PD will last a minimum of 4 times longer than a premium mineral oil, depending on actual operating conditions. 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	25H97	28G46
Case: 12 quarts	28G24	28H98	28G47
1 gallon	28G40	28H333	28G42
Case: 6 gallons	28G41	28H334	28G43
5 gallon pail	28G25	38H99	28G44
55 gallon drum	28G28	28H100	28G45

FIGURE 4- 3 – AEON PD SYNTHETIC LUBRICANT

		Ambient Temperatures				
		-10°F 10° F* (-23°C to -12°C)	**10°F to 32° F** (-12°C to 0°C)**	**32°F to 60° F (0°C to 16°C)**	**60°F to 90° F (16°C to 32°C)**	**Greater than 90° F (32°C)**
Blower Discharge Temperature	Less than 32°F (0°C)	AEON PD AEON PD FG	AEON PD AEON PD FG			
	32°F to 100° F (0°C to 38°C)	AEON PD AEON PD FG	AEON PD AEON PD FG	AEON PD AEON PD FG	AEON PD AEON PD FG	
	100°F to 225° F (38°C to 105°C)	AEON PD AEON PD FG	AEON PD AEON PD FG	AEON PD AEON PD FG	AEON PD XD	AEON PD XD
	225°F to 300° F (105°C to 149°C)	AEON PD AEON PD FG	AEON PD AEON PD FG	AEON PD AEON PD FG	AEON PD XD	AEON PD XD
	Greater than 300° F (149°C)			AEON PD XD	AEON PD XD	AEON PD XD

FIGURE 4- 4 – LUBRICANT CHART

If not using AEON PD synthetic blower lubricant, contact the factory for recommendations.

* For ambient temperatures less than 10° F [-12°C], but not less than -10° F [-23°C], the use of sump heaters, heated enclosures and synthetic lubricant is required.

** For ambient temperatures 10° F to 32° F [-12 to 0°C], the use of oil sump heaters, heated enclosures, and synthetic lubricant is recommended.

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.

ROTOR SHAFT SEALS – Rotors have a labyrinth type shaft air seal to minimize air leakage along the shaft from the compression chamber. More air will leak through the seals at the discharge end since they are under higher air pressure. Excessive air leakage indicates shaft seal failure. Seal replacement must be done by factory trained personnel.

BEARING OIL SEALS – Oil leakage along each shaft from the oil sumps is prevented by an Inpro ® Bearing Isolator or mechanical seal. Seal replacement must be done by factory trained personnel.

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 Cycloblower H.E.® 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 4- 5 – TROUBLESHOOTING TABLE

BLOWER OVERHAUL – Blower overhaul must be done by factory trained personnel.

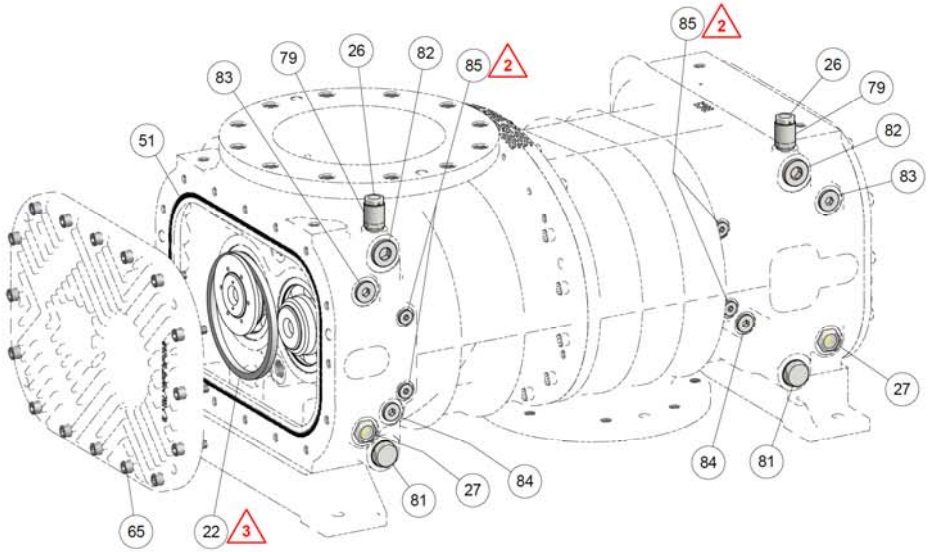
REPAIR PARTS – When ordering parts, specify Blower Model, Size and Serial Number.

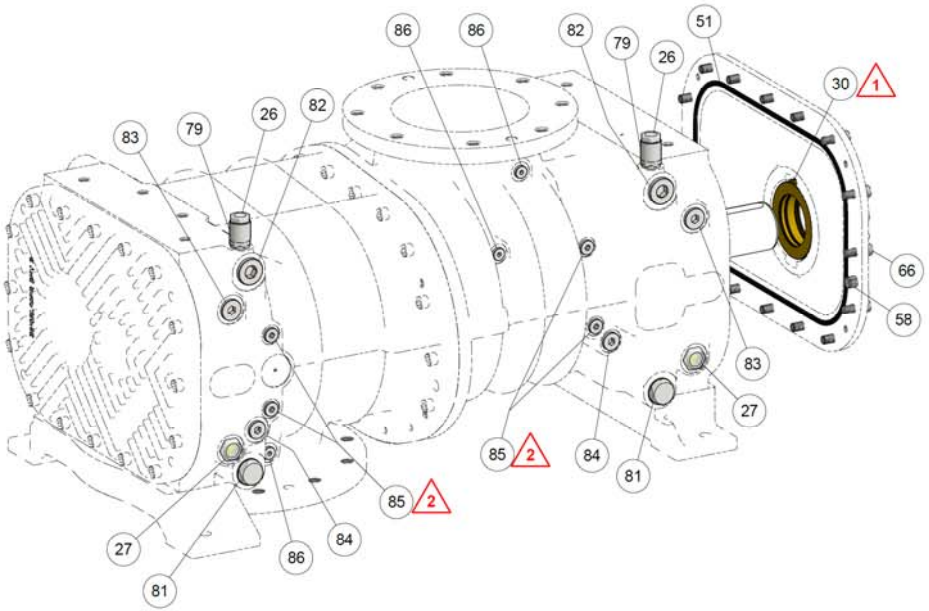
Reference numbers shown in the left hand column of the parts list are used to help locate parts shown on the drawing and sectional view. DO NOT ORDER BY REFERENCE NUMBERS.

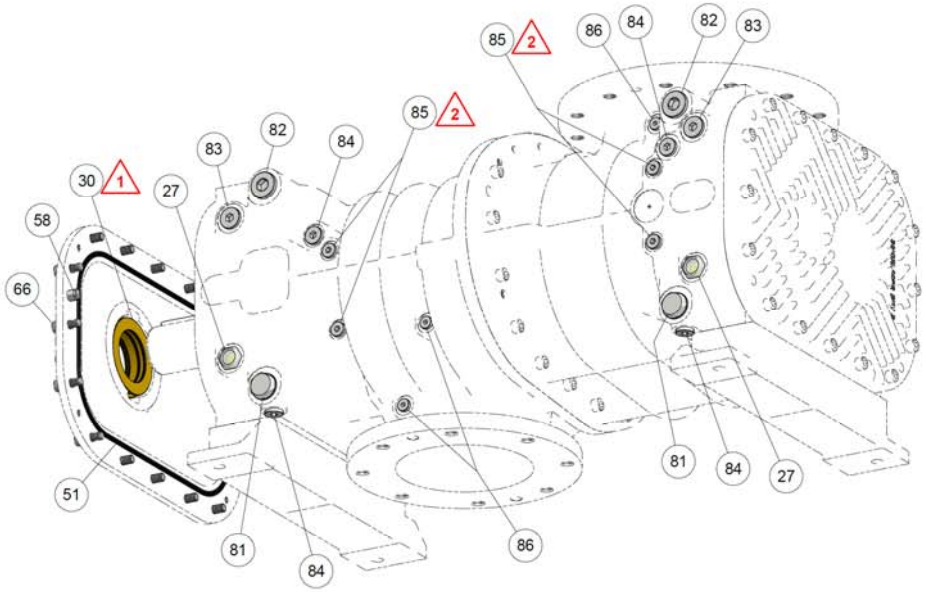
After locating the reference number, the part number may be found for your particular blower under the correct Model Number Column.

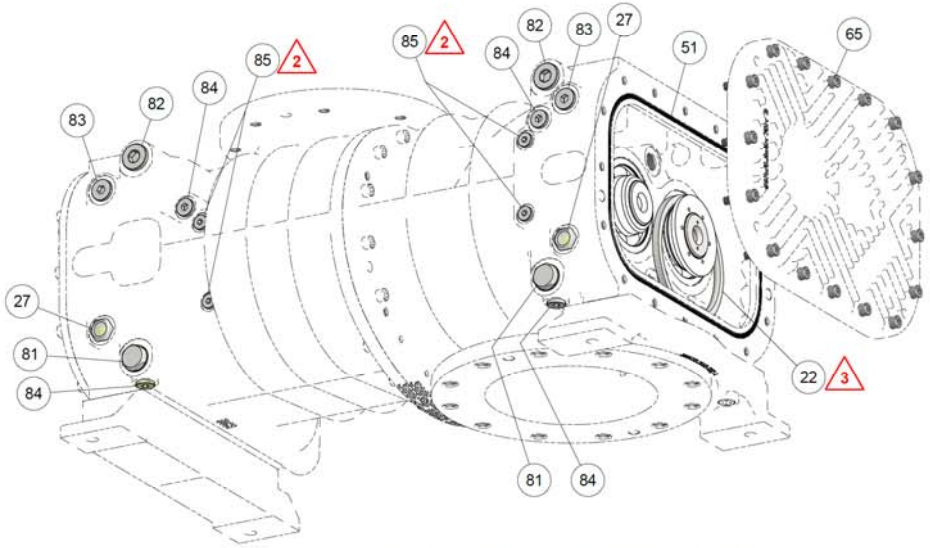
Specify exactly the number of parts required (see column “Qty.”). DO NOT ORDER BY SETS.

THIS PAGE WAS LEFT BLANK INTENTIONALLY.









FOR BOTTOM DISCHARGE UNITS

FOR TOP DISCHARGE UNITS

1 FOR INPRO SEALS, ORIENTATION OF SEAL DRAIN SLOT MUST BE LOCATED AT BOTTOM

2 FOR GAS APPLICATIONS, (8) PLUGS MUST BE INSTALLED

3 FOR SPLASH LUBE, ORIENTATION OF OUTTER SPLASH RING MUST REST ON TOP OF INNER RING GROOVE

BASIC REPLACEMENT COMPONENTS, SPLASH LUBRICATION

REF. No	Name of Part	160CDL480		200CDL600		250CDL750	
		Qty.	Part No.	Qty.	Part No.	Qty.	Part No.
22	SLINGER (OUTER RING)	1	RB3285570109	1	300CRP173	1	300CRT173
26	BREATHER	2	RB2033750901	2	RB2033750901	2	RB2033750901
27	SIGHT GAUGE (OIL LEVEL)	4	RB1519301006	4	RB1519301006	4	RB1519301006
30	SEAL-OIL (DRIVE SHAFT)	1	303CRL199	1	302CRP199	1	302CRT199
51	O-RING (COVER)	2	25BC951	2	25BC962	2	25BC847
58	DOWEL PIN	2	62M177	2	62M177	2	62M177
65	SCREW (INLET COVER)	16	665SMCA120400	20	665SMCA120400	18	665SMCA120500
66	SCREW (DISCHARGE COVER)	16	665SMCA120300	20	665SMCA120400	18	665SMCA120500
79	EXTENSION (BREATHER)	2	RB2085430901	2	RB2085430901	2	RB2085430901
81	PLUG (MAGNETIC DRAIN)	4	VP1142628	4	VP1142628	4	VP1142628
82	PIPE PLUG	4	A93060500	4	A93060500	4	A93060500
83	PIPE PLUG	4	A93060490	4	A93060490	4	A93060490
84	PIPE PLUG	6	A93060480	6	A93060480	10	A93060480
86	PIPE PLUG	3	A93060460	3	A93060460	3	A93060460
85*	PIPE PLUG (*MECHANICAL SEALS OPTION ONLY)	8	A93060470	8	A93060470	8	A93060470

GENERAL PROVISIONS AND LIMITATIONS

Gardner Denver (the "Company") warrants to each original retail purchaser ("Purchaser") of its new 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 normal practice and 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

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 with the applicable Warranty Period as follows,

BARE BLOWERS

Basic bare blowers, consisting of all parts within, are warranted for 12 months from date of initial use or 18 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.

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.

All costs of transportation of product, labor or parts claimed not to be as warranted and, of repaired or replacement parts to or from such service facilities shall be borne by the Purchaser. The Company may require the return of any part claimed not to be as warranted to one of its facilities as designated by Company, transportation prepaid by Purchaser, to establish a claim under this 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's rate schedule amounts or labor provided by unauthorized service personnel is not provided for by this warranty.

Replacement parts provided under the terms of the warranty are warranted for the reminder 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 MERCHANTABLILITY.

THE REMEDY PROVIDED UNDER THIS WARRANTY SHALL BE THE SOLE, EXCLUSIVE AND ONLY REMEDY AVAILABLE TO 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 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 with 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 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.

NOTES:

Gardner Denver®

Gardner Denver, Inc.

1800 Gardner Expressway
Quincy, IL 62305

Customer Service Department
Telephone: (800) 682-9868
pd.blowers@gardnerdenver.com

www.gardnerdenverproducts.com