Gardner Denver

PD BLOWERS & VACUUM PUMPS

CYCLOBLOWER H.E. SERIES | FORCED FEED LUBRICATION

Owner's Manual

CycloBlower H.E. - Forced Feed Lube

37-1-619
Version 02
July 1, 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:

Visit: www.contactgd.com/blowers

or

Call: (800) 682-9868

GARDNER DENVER LUBRICANT ORDER INFORMATION

Re-order Part Numbers for Factory-Recommended Lubricants.

AEON 9000TH Synthetic Lubricant or AEON 6000FG-68 Food Grade Synthetic Lubricant

AEON 9000TH Synthetic Lubricant

Description	Part Number
Case of 6 - 1 Gallon Pails	28H335
5 Gallon Pail	28H286
55 Gallon Drum	28H270

AEON 6000FG-68 Food Grade Synthetic Lubricant

Description	Part Number
1 Gallon Pail	28H366
5 Gallon Pail	28H314
55 Gallon Drum	28H315

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.

Safety Labels are used, within this manual and affixed to the appropriate areas of the compressor package, to alert users of the following conditions:

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

Equipment Starts Automatically

Health Hazard – Explosive Release of Pressure

Cutting of Finger or Hand Hazard – Rotating Impeller Blade

High Voltage – Hazard of Shock, Burn, or Death Present until Electrical Power is Removed

Cutting of Finger or Hand Hazard – Rotating Fan Blade

Entanglement of Fingers or Hand/Rotating Shaft

⚠WARNING

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

Asphyxiation Hazard – Poisonous Fumes or Toxic Gases in Compressed Air

⚠CAUTION

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

Burn Hazard – Hot surface

PROHIBITION/MANDATORY ACTION REQUIREMENTS

Do not Operate Compressor with Guard Removed

Lockout Electrical Equipment in De-Energized State

Do Not Lift Equipment with Hook – No Lift Point

Loud Noise Hazard – Wear Ear Protection

Handle Package at Forklift Points Only

Read the Operator's Manual Before Proceeding with Task

NOTICE

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

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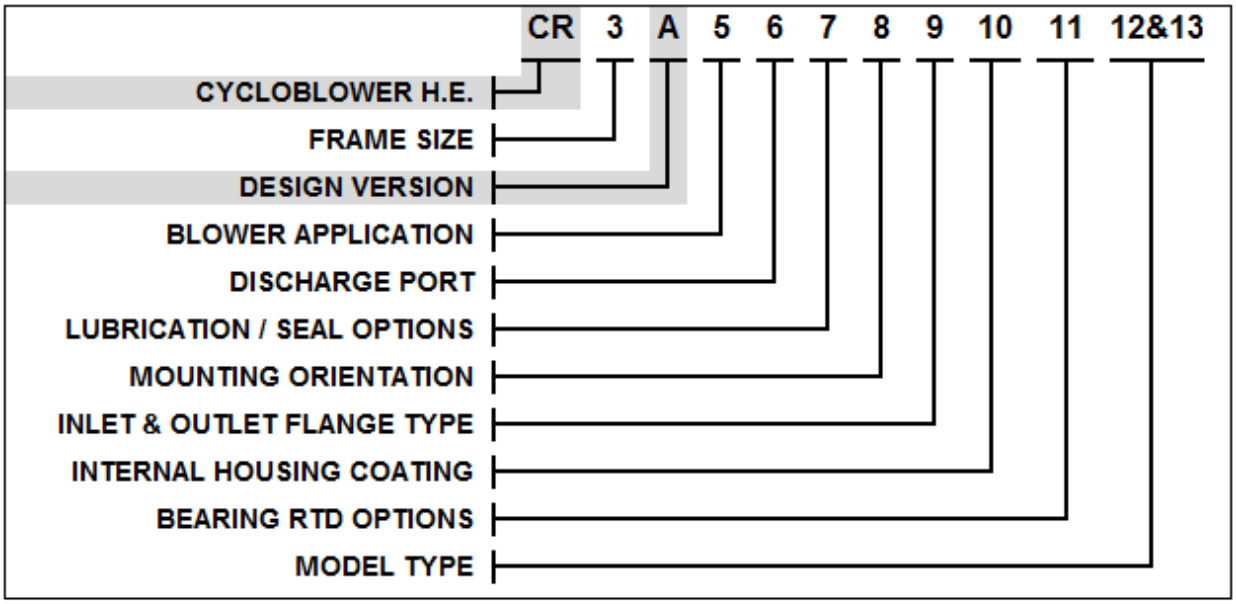

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SAFETY PRECAUTIONS

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

⚠ DANGER

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

- **Keep fingers and clothing away from blower inlet and discharge ports, revolving belts, sheaves, drive coupling, etc.**
- **Do not use the air discharge from this unit for breathing – not suitable for human consumption.**
- **Do not loosen or remove the oil filler plug, drain plugs, covers or break any connections, etc., in the blower air or oil system until the unit is shut down and the air pressure has been relieved.**
- **Electrical shock can and may be fatal.**
- **Blower unit must be grounded in accordance with the National Electrical Code. A ground jumper equal to the size of the equipment ground conductor must be used to connect the blower motor base to the unit base.**
- **Perform all wiring in accordance with the National Electrical Code (NFPA-70) and any applicable local electrical codes. Wiring and electrical service must be performed only by qualified electricians.**
- **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 install the forced feed lubrication system

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 jet lubricated by the forced lubrication system. This system delivers a constant flow rate of cool oil directly to the gears and bearings. FIGURE 2-1 shows a typical bearing lubrication configuration. Oil is injected through a groove in the outer diameter of a housing insert. A small (approx. 0.4 inches [1mm]) hole drilled into the groove directs high velocity oil (blue arrow) into the bearing.

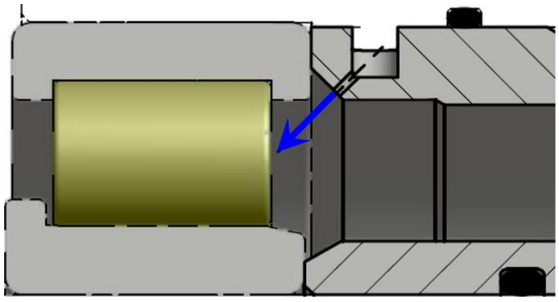


FIGURE 2-1 TYPICAL OIL JET LUBRICATION FOR BEARINGS

The sumps are not vented. The forced lubrication system pulls a small vacuum on the sumps through the drain lines. This causes a small amount of ambient air to flow through the seals and into the sump. This prevents oil mist in the sumps from escaping through the seals.

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 compression chamber seal and the oil sump seal. This vent prevents any compression 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.

LOCATION – Select a clean, dry, well-ventilated area for installing blower and allow ample room for normal maintenance. Ambient air flows into the blower sumps through the seals. If the location is very dusty, measures should be taken to avoid dust ingress. 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	104°F (40°C)
Minimum Inlet Temperature	-20°F (-29°C)
Minimum Ambient Temperature*	32°F (0°C)

*Operation below 50°F [10°C] may require insulating the reservoir walls to keep oil warm.

FIGURE 2-2 ENVIRONMENTAL LIMITS

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.

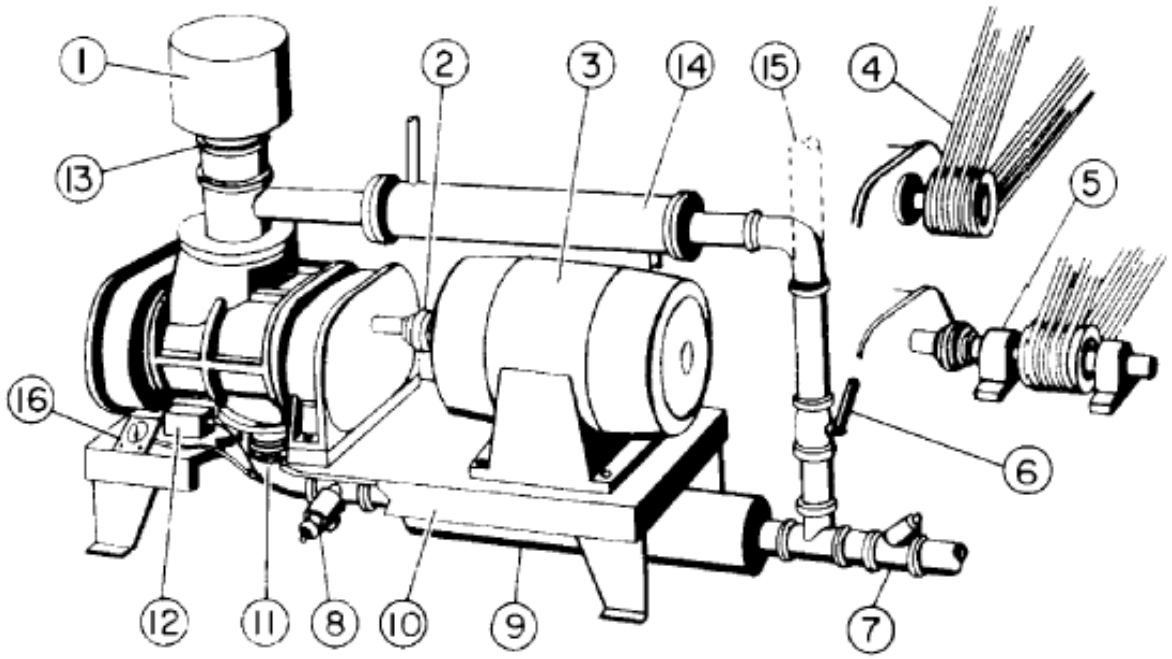


FIGURE 2-3 ACCESSORIES AND SAFETY DEVICES

ACCESSORIES (FIGURE 2-3) – 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

Inl**et 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. 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. A differential pressure indicator is recommended to on the filter for measuring filter life.

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 2-4, page 16, for V-belt drive overhung load calculations. FIGURE 2-4 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

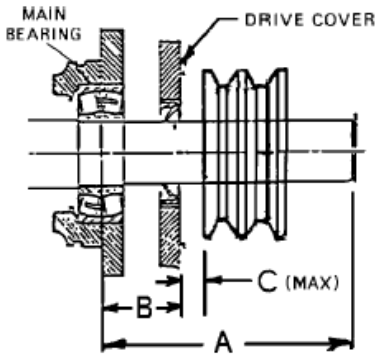
The sheave should be positioned as close as possible to the drive cover. This will reduce the overhung load and extend the bearing life.

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 2-4 V-BELT DRIVE OVERHUNG LOAD CALCULATIONS

Bypass Valve – Installation of a bypass valve at the blower discharge (FIGURE 2-3, page 14) 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 2-3, page 14) 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 2-3, page 14.

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

Check Valve (FIGURE 2-3, page 14) – 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 2-3, page 14) –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 exceeds the values shown in FIGURE 4-1, page 35. 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 2-3, page 14. 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. Discharge silencer construction must be suitable for 450°F [232°C]. High temperature packing material and paint should be used.

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 2-2, page 13.

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

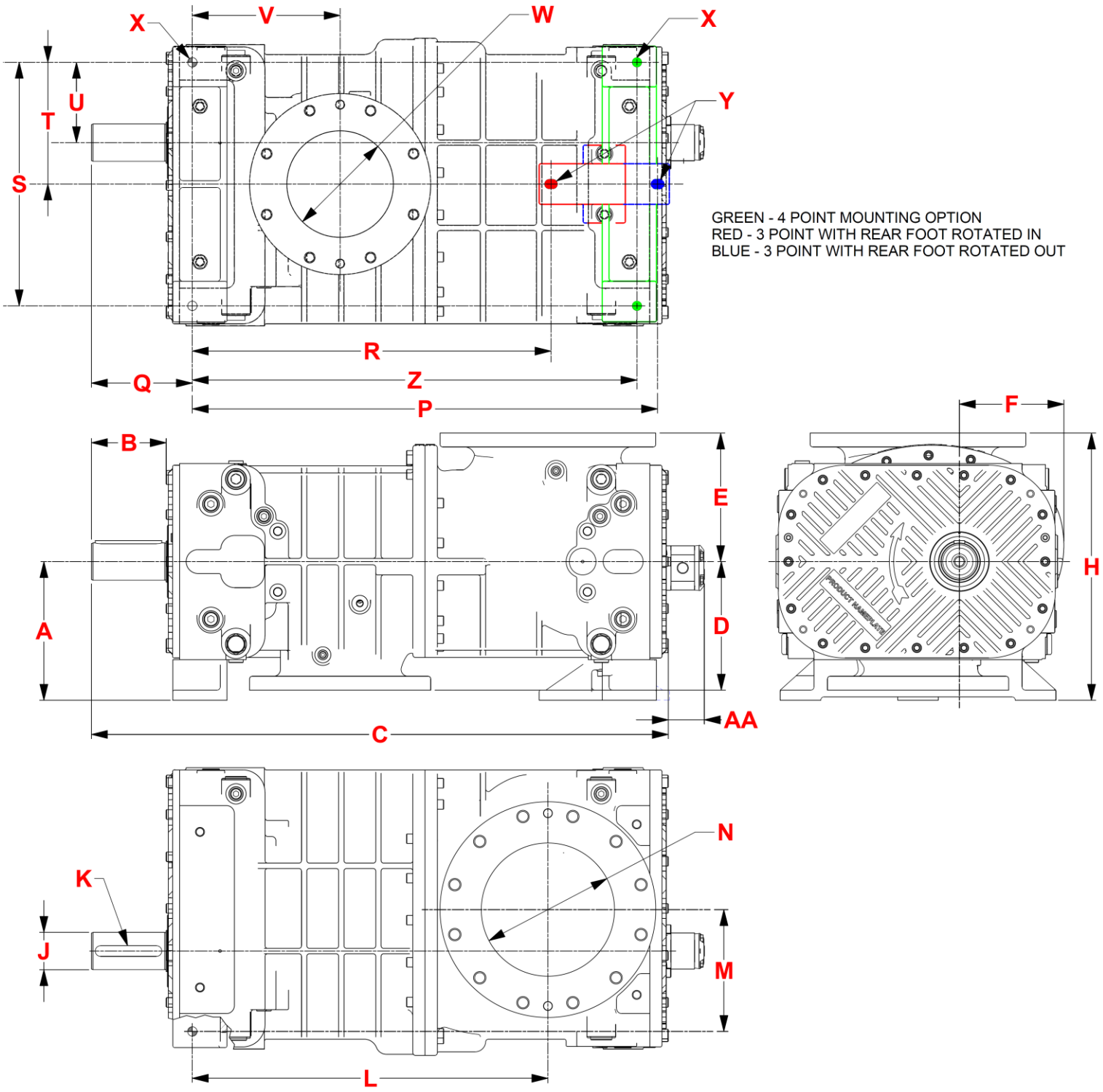


FIGURE 2-5 BOTTOM DISCHARGE OUTLINE DIMENSIONS

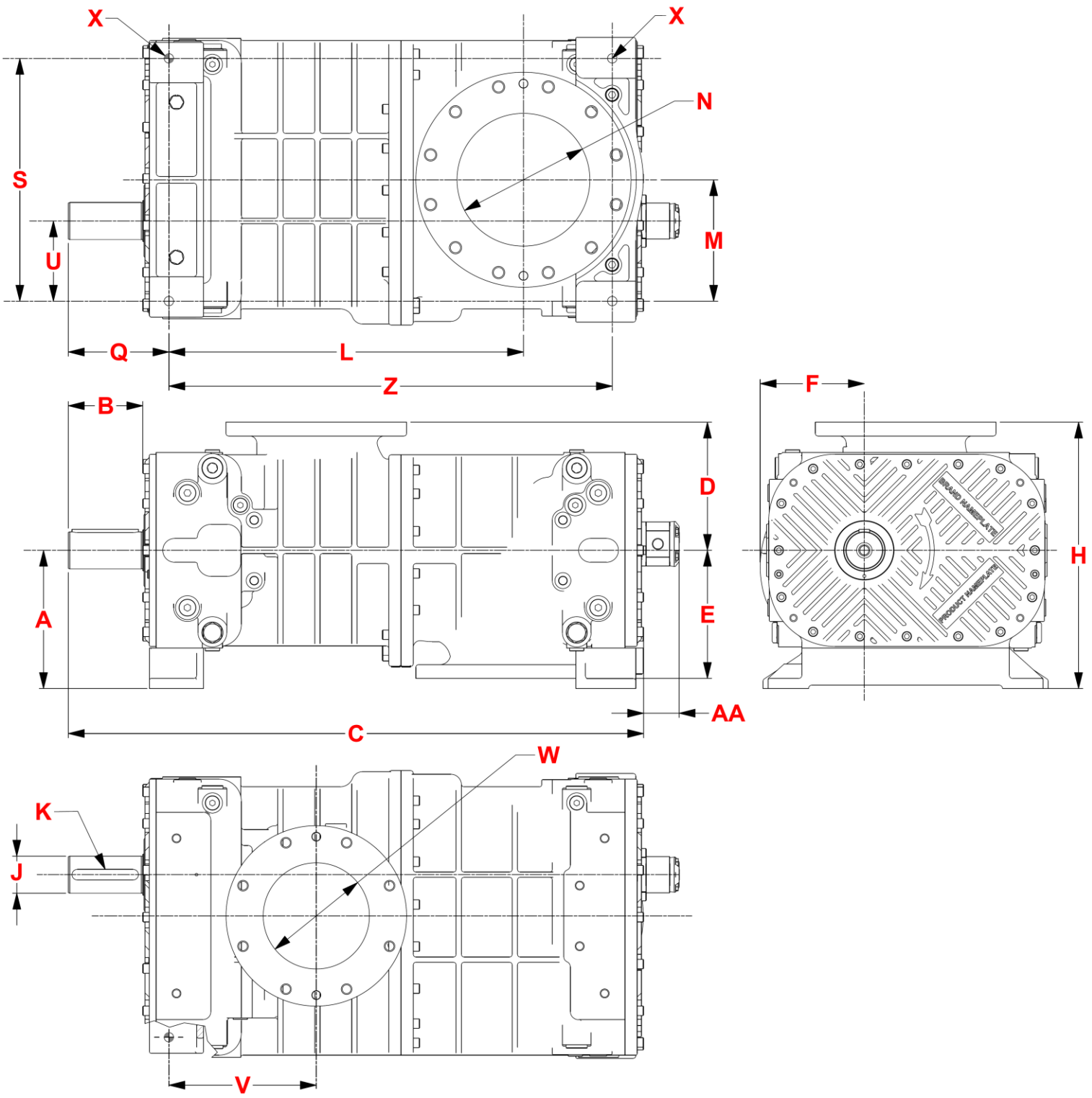


FIGURE 2-6 TOP DISCHARGE OUTLINE DIMENSIONS

	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 2-7 OUTLINE DIMENSIONS (TOP AND BOTTOM DISCHARGE)

SECTION 3
FORCED LUBRICATION SYSTEM INSTALLATION

FORCED FEED LUBRICATION SYSTEM – The forced feed lubrication system is required for running CycloBlower H.E. models at relatively high pressures/vacuums. It can also be used to extend blower life for low pressure/vacuum applications. It provides ideal lubrication for bearings and gears. Figure 3-1 shows the main components of the lubrication system.

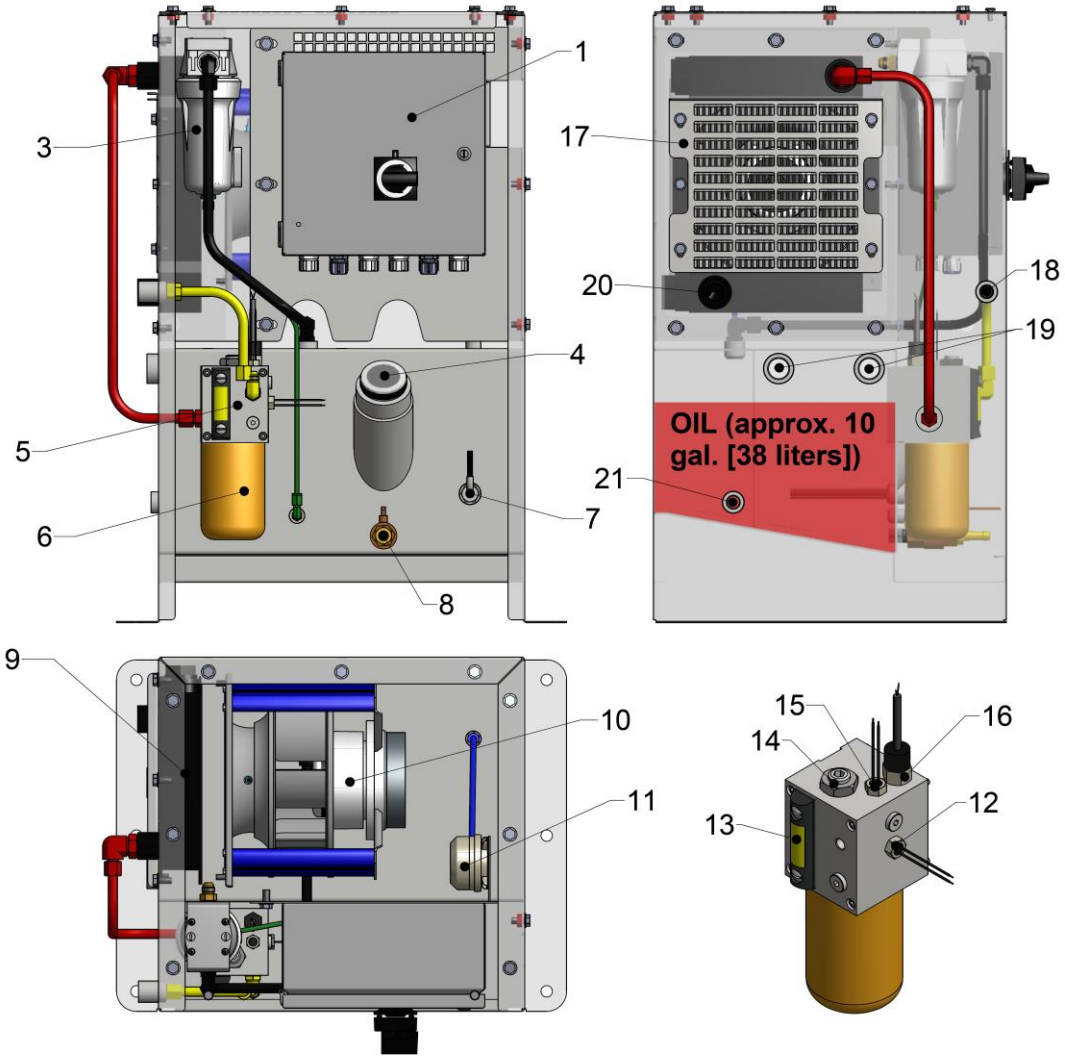


FIGURE 3-1 MAIN LUBRICATION SYSTEM COMPONENTS

COMPONENT DESCRIPTIONS:

1. Control Box
2. Manual System Control Switch
3. Coalescing Filter for Oil Mist Removal
4. Oil Fill Cap
5. Oil Control Block Assembly
6. Oil Filter
7. Oil Heater with Internal Thermostat
8. Oil Drain Valve
9. Heat Exchanger w/ Internal Thermal Bypass
10. Backwards Curved Centrifugal Fan
11. Low Reservoir Vacuum Switch
12. Low Oil Temperature Fault Switch
13. Oil Level Sight Glass
14. Oil Pressure Regulation Valve
15. High Oil Temperature Fault Switch
16. Low Oil Pressure Fault Switch
17. Adjustable Louver for Air Pressure Regulation

18 Blower Oil Injection Connection (1/2” BSPP)
19 Blower Drain Line Connections (1” BSPP)
20 Oil Pump Outlet Connection (1/2” BSPP)
21 Oil Pump Inlet Connection (1/2” BSPP)

CONTROL BOX – The control box provides connections for the electrical supply, fault contacts, and remote control contact. Refer to FIGURE 3-9, page 29 and FIGURE 3-10, page 30 for wiring diagrams.

Electrical Requirements – The forced lubrication system requires a 220V/240V, 50Hz/60Hz single-phase electric supply.

Electrical shock can cause injury or death. Open main disconnect switch, lockout and tagout before working on control box.

Electrical Wire Sizing – A certified electrician familiar with National Electric Codes and applicable local codes shall size the electrical power wires serving the lubrication system. Refer to FIGURE 3-2 for electrical requirements.

Input Voltage	Frequency	Phase	Maximum Operating Current
220-240	50/60 Hz	1	3A

FIGURE 3-2 LUBRICATION SYSTEM ELECTRICAL REQUIREMENTS

Electrical Wire Routing – 3 x ½" trade size (0.875 in. [22.2mm] actual) conduit holes are provided on the side of the lubrication system closest to the control box for power and control wiring.

Grounding – The lubrication system must be properly grounded in accordance with the National Electrical Code and/or applicable local codes.

Failure to properly ground the lubrication system can result in injury or death. Install ground wiring in accordance with the National Electric Code and any applicable local codes.

Fault Contacts – Two fault contacts (one normally open, one normally closed) are provided to indicate a lubrication system fault. At least one fault contact must be used to disable the main blower motor. Running the blower with the lubrication system in a fault condition will result in blower failure. Fault contacts are rated 6A/240VAC.

Faults– Figure 3-3, shows lubrication system control faults. Any fault will cause the fan to turn off and the fault contacts to change state.

Fault	Fault Level	Typical Operating Range	Comments
Oil Pressure	11 PSI [0.76 bar]	15-36 PSI [1-2.5 bar]	Low oil flow rate and velocity can cause bearing and gear failure.
Low Oil Temperature	50°F [10°C]	70°F [21°C]	Prevents oil seal leaks. Thick (cold) oil doesn't drain from sumps.
High Oil Temperature	210°F [99°C]	180°F [82°C]	High oil temperature indicates blower/system issue.
Low Reservoir Vacuum	1.2 in. H2O [300 pa]	1.6-2.5 in. H2O [400-620 pa]	Prevents seal leaks. Low reservoir vacuum allows oil mist to exit through seals. Vacuum also assists sump drainage.
Fan Fault	-	-	Fan has integrated variable speed drive and controller. Various fault conditions (thermal, overload, power) may cause fan fault.

FIGURE 3-3 LUBRICATION SYSTEM FAULTS

Time Delay Relay - A time delay relay in the control box bypasses the fault switches at startup until the reservoir vacuum and oil pressure stabilize. The time delay relay is set at 60 seconds from the factory. Reservoir vacuum is typically stable after 30 seconds. Oil pressure is stable once the blower reaches full speed. If a VFD is used with a slow acceleration time, the time delay could need to be increased. However, under no circumstances should it be set to more than 120 seconds.

Manual System Control Switch – This switch is used to control the fan and time delay relay. **It does not switch power to the oil heater and is not a system lockout disconnect**. When the switch is turned ON, the fan is energized and the time delay relay closes for the specified duration. When the time delay relay opens, the fan will continue to run only if no faults are present. Turning the switch OFF and back ON restarts the fan and time delay relay. It should be left in the ON position if the remote control contact is used.

Remote Control Contact - A remote RUN/RESET contact is also available. It has similar functionality to the manual system control switch. The system is shipped with the contact bypassed by a jumper. The jumper must be removed if remote control is used. With the manual system control switch in the ON position, a closure between the remote run contact energizes the fan and activates the time delay relay. After the time delay relay opens, the fan will continue to run if no faults are present. The remote control contact must be opened and then closed to restart the time delay relay. The contact switches 0.2A at 220-240VAC. Make sure all devices used for the remote control interface are rated accordingly.

The control voltage is 220-240VAC. Electrical shock can cause injury or death. Open main disconnect switch, lockout and tagout before working on control box.

Devices and wiring used for remote control interface must be rated for 240VAC.

COALESCING FILTER – The high velocity oil injection creates an oil/air mist in the blower sumps. This mist is pulled through the drain lines and into the reservoir. The coalescing filter removes oil particles in the air before the air is ejected through the heat exchanger fan. (Replacement Element P/N FIL14BE)

OIL RESERVOIR– The reservoir volume is approximately 10 gallons [38 liters]. The reservoir should be filled oil to the middle of the sight glass. The oil fill neck is positioned to prevent overfilling. Overfilling can prevent proper oil mist elimination and cause seal leaks. Low oil levels can increase oil temperature and decrease oil life. The hoses will fill with oil during the initial run and the oil level may need to be adjusted. Turn the system off before adjusting oil level. Removing the oil fill cap while the system is operating will cause loss of reservoir vacuum and the system will fault off. Refer to SECTION 5 for oil recommendations.

OIL HEATER – The lubrication system has a small (125W) immersion heater. The heater maintains the oil at approximately 70°F [21°C] even when the blower is not operational. If the lubrication system power is disconnected in a cold environment and the oil is allowed to become cold, the heater may need a day to heat the oil once power is restored. The low oil temperature switch will prevent operation until the oil is hot enough.

FAN – A backwards curved centrifugal fan is used to pull cooling air through the heat exchanger and exhaust through the top of the enclosure. The fan also pulls a small amount of oil/air mist through the coalescing filter. The filtered air is exhausted with the cooling air.

PUMP – A gear pump is mounted to the non-drive end sump cover. The pump shaft is directly coupled to the female (drive) rotor shaft. The pump can be mounted in multiple orientations. The inlet and outlet ports must be determined by an arrow on the pump housing.

HEAT EXCHANGER – The heat exchanger cools the oil before it is injected into the blower. It contains an internal thermal bypass valve to prevent over-cooling the oil.

OIL CONTROL BLOCK - A pressure regulating valve on the control block is used to set the oil injection pressure and allow excess oil to return to the reservoir. The injection pressure is set by loosening the jamb nut and adjusting the internal hex bolt. Screw the bolt in to increase pressure. Screw the bolt out to lower injection pressure. Tighten jamb nut when adjustments are complete. FIGURE 3-4 shows the oil pressure regulator.

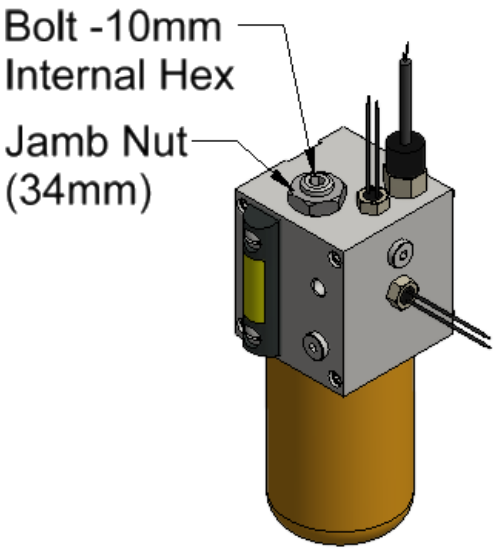


FIGURE 3-4 OIL PRESSURE ADJUSTMENT

If a variable speed drive is used with the blower, it is necessary to verify that the oil injection pressure is acceptable at minimum and maximum operating speed.

ADJUSTABLE LOUVER – An adjustable louver panel in front of the heat exchanger allows the reservoir vacuum to be adjusted. The louver should be set for maximum cooling (down) unless adequate reservoir vacuum cannot be reached. Refer to FIGURE 3-5.

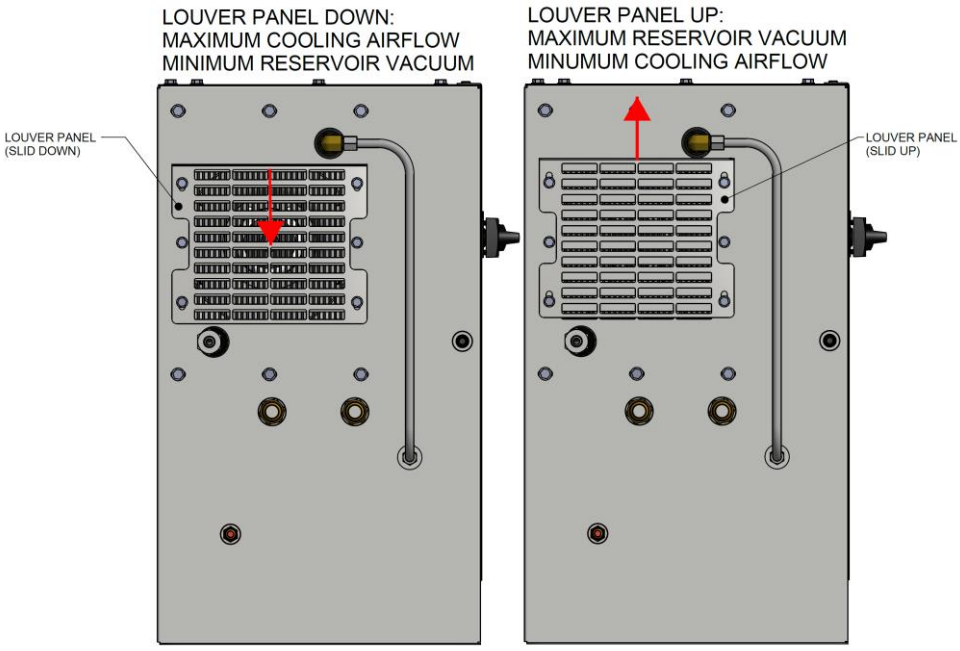


FIGURE 3-5 RESERVOIR VACUUM ADJUSTMENT

TYPICAL LUBRICATION SYSTEM PLACEMENT: Refer to FIGURE 3-12, page 32, FIGURE 3-13, page 32, and FIGURE 3-14, page 33, for recommended placement of the lubrication system for both top and bottom discharge configurations. The Lubrication system should be placed on the non-drive side (male rotor side) of the blower.

Other configurations may be possible, but verification testing should be done to ensure that reservoir vacuum can be maintained and that the seals do not leak.

LUBRICATION SYSTEM PLUMBING AND CONNECTIONS:

Oil under pressure will cause severe personal injury or death. Shut down blower, relieve system of all pressure, disconnect, lockout and tagout the power supply before removing valves, caps, plugs, fittings, bolts and filters

FIGURE 3-6 shows forced lubrication system hydraulic connections to the blower. Warm oil (orange) is pulled from the reservoir by a pump driven by the female (drive) rotor. It then flows back to a heat exchanger on the unit for cooling. An internal thermal bypass valve in the heat exchanger core prevents over-cooling the oil. The cool oil flows into a control block where it is filtered and pressure regulated. Excess oil returns to the reservoir. The remaining cool oil (blue) flows to each end of the blower. The oil absorbs heat from the gears, bearings, and housings, and drains (red) back to the reservoir. Air containing oil mist is also pulled through the drain lines into the reservoir. The oil mist is then pulled from the reservoir, through a coalescing filter, and the clean air is exhausted to ambient by the heat exchanger fan. The coalesced oil returns to the reservoir through a drain line at the bottom of coalescing filter.

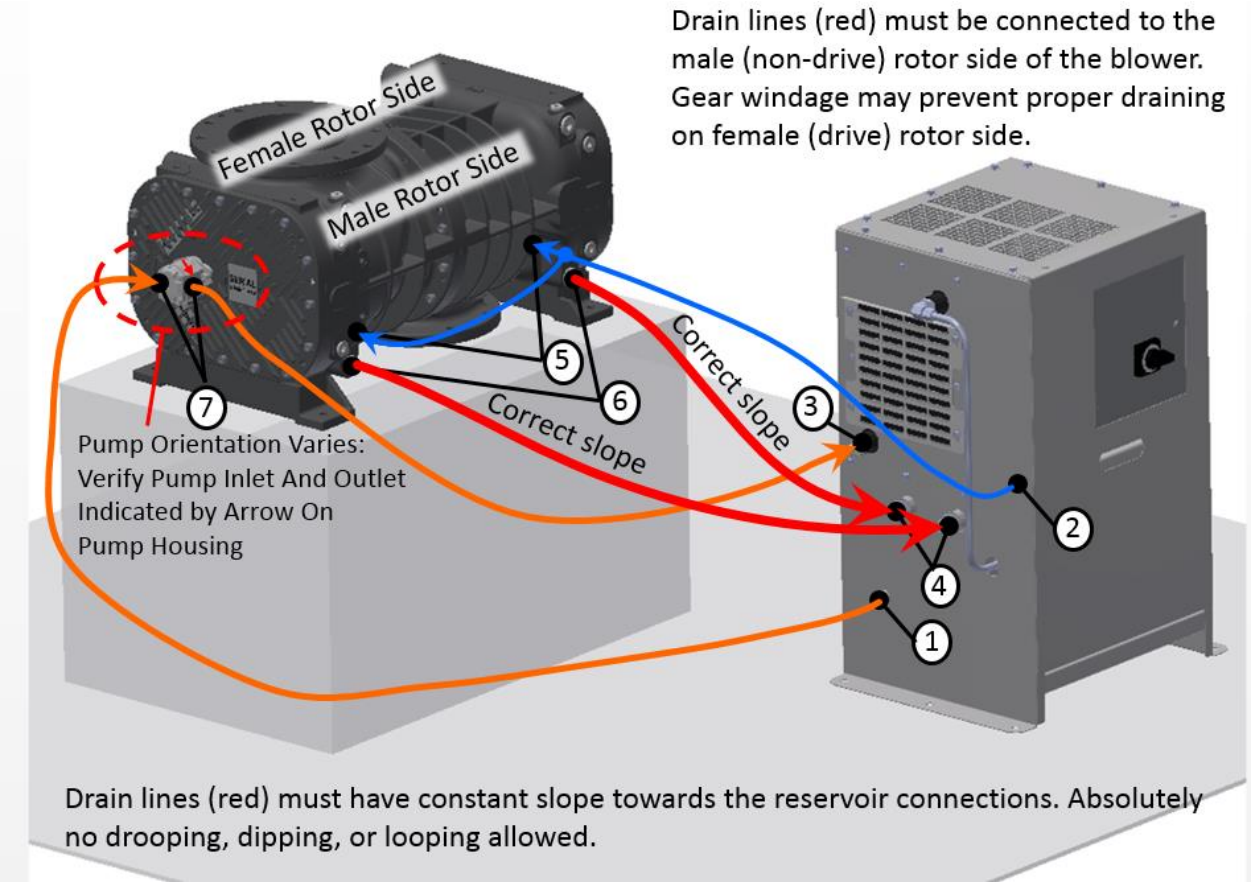


FIGURE 3-6 LUBRICATION SYSTEM HYDRAULIC CONNECTIONS

⚠WARNING

Installing shutoff valves in any of the hydraulic lines can cause blower failure.

HYDRAULIC CONNECTIONS - Figure 3-7 shows the type of connection at each location and the minimum allowable internal hose diameter. All fittings and adapters used must be selected for minimum flow restriction. The type of connection provided on the lubrication system is determined by the type of blower flange selected in the configurator. The “ENGLISH_STD” selection comes with the BSPP to JIC adapters shown below.

Connection # (Figure 3-6)	Description	Metric Connection	English/Standard Adapter (P/N)	Min Internal Hose Diameter in. [mm]
1	Pump Suction Connection at Lube System	½” BSPP	½” JIC (86H299)	0.5” [12.7mm]
2	Oil Injection Connection at Lube System	½” BSPP	½” JIC (86H299)	0.5” [12.7mm]
3	Heat Exchanger Inlet on Lube System	¾” BSPP	½” JIC (86H316)	0.5” [12.7mm]
4	Drain Connections on Lube System	1 ” BSPP	1 ” JIC (86H192)	1” [25.4mm]
5	Oil Injection Connections on Blower	½” BSPP	½” JIC (86H299)	0.5” [12.7mm]
6	Drain Connections on Blower	1 ” BSPP	1 ” JIC (86H192)	1” [25.4mm]
7	Pump Inlet and Outlet Ports (Always Verify Pump Orientation)	½” BSPP	½” JIC (86H299)	0.5” [12.7mm]

FIGURE 3-7 CONNECTION TYPES

HOSE ROUTING - Proper hose routing is extremely important for proper lubrication system operation. The drain lines must have a constant slope towards the blower. See Figure 3-8. Any dipping, drooping, looping etc. will prevent proper oil mist elimination and will cause seal leaks. The drain lines must be connected on the male (non-drive) rotor side of the blower. Gear windage may prevent proper drainage on the female (drive) rotor side of the blower. All hoses should be neatly routed and their lengths minimized. **Do not install shutoff valves in any of the hydraulic lines**. Restricting proper oil flow can cause blower failure. The cooling system should be installed as close to the blower as possible.

⚠WARNING

Do not use Teflon tape or thread sealant on any fittings.
Teflon tape and thread sealant can clog the small oil injection holes and cause blower failure.
JIC and BSPP fittings used do not require Teflon tape or thread sealant.
Ensure that all hoses are free of dirt and debris before installation

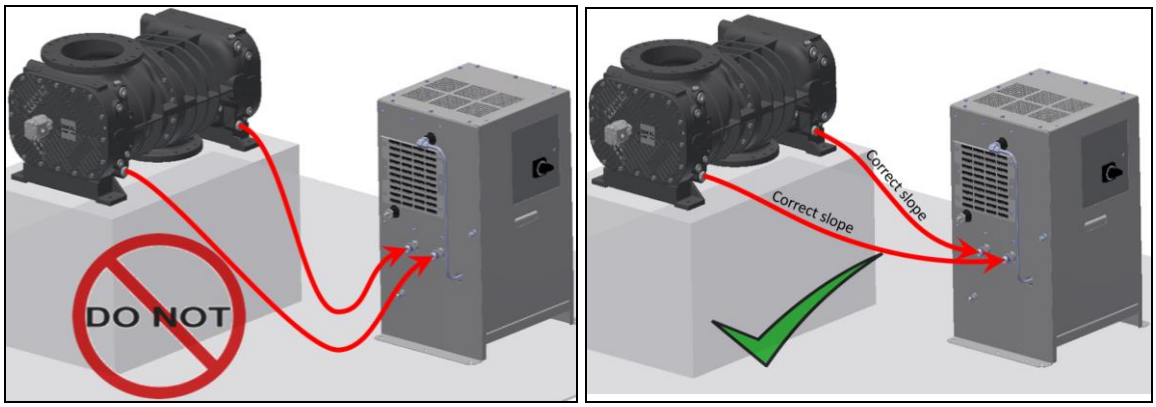
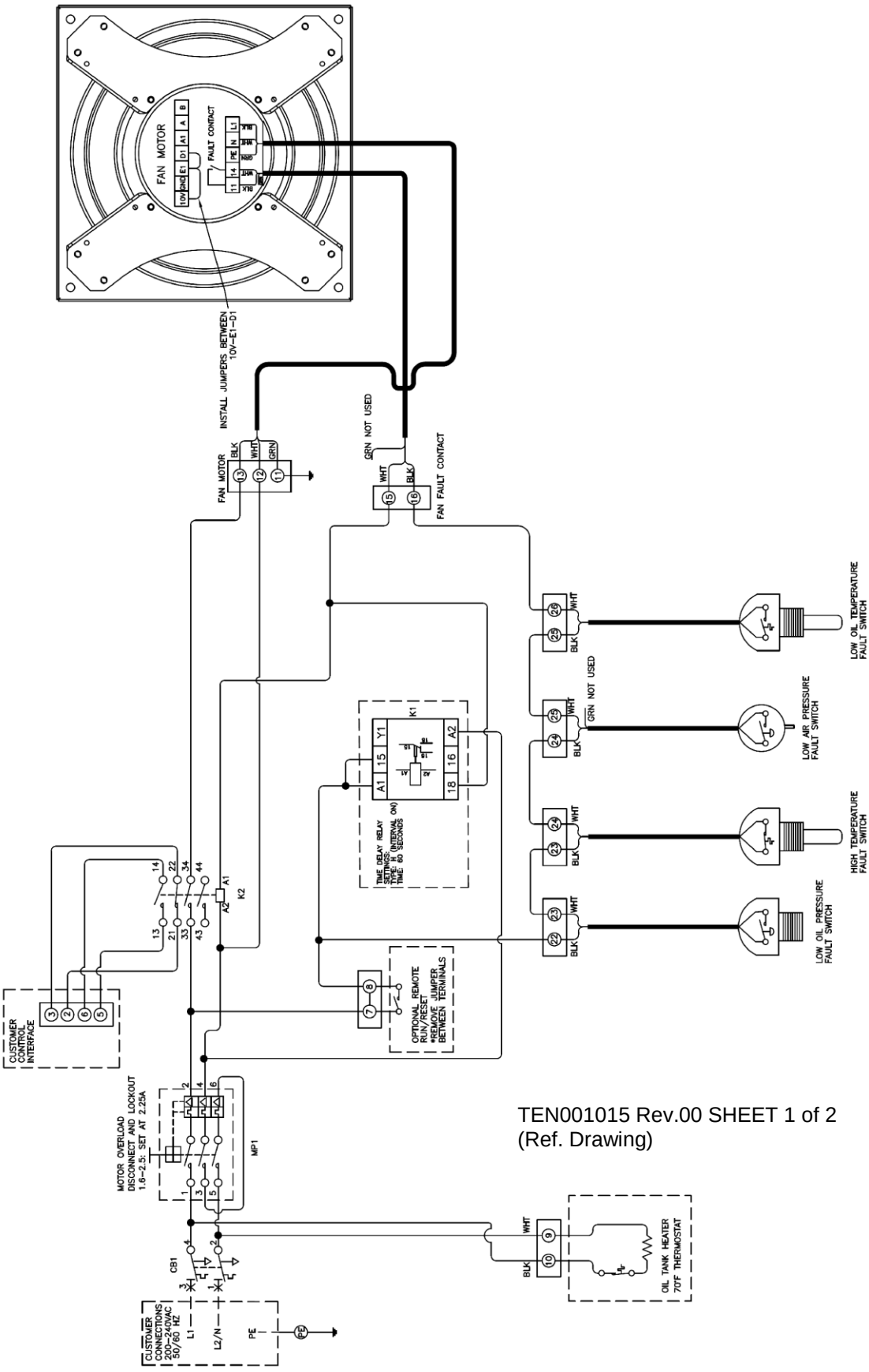


FIGURE 3-8 PROPER DRAIN SLOPE

HOSES - Hoses materials need to be compatible with the lubricant used. Material compatibility data sheets for Aeon lubricants can be obtained from Gardner Denver. Hoses should be rated for temperature of at least 212°F [100°C] and pressure of at least 50 PSI [3.4 bar].



TEN001015 Rev.00 SHEET 1 of 2
(Ref. Drawing)

FIGURE 3-9 LUBRICATION SYSTEM WIRING DIAGRAM SHEET 1

TEN001015 Rev.00 SHEET 2 of 2
(Ref. Drawing)

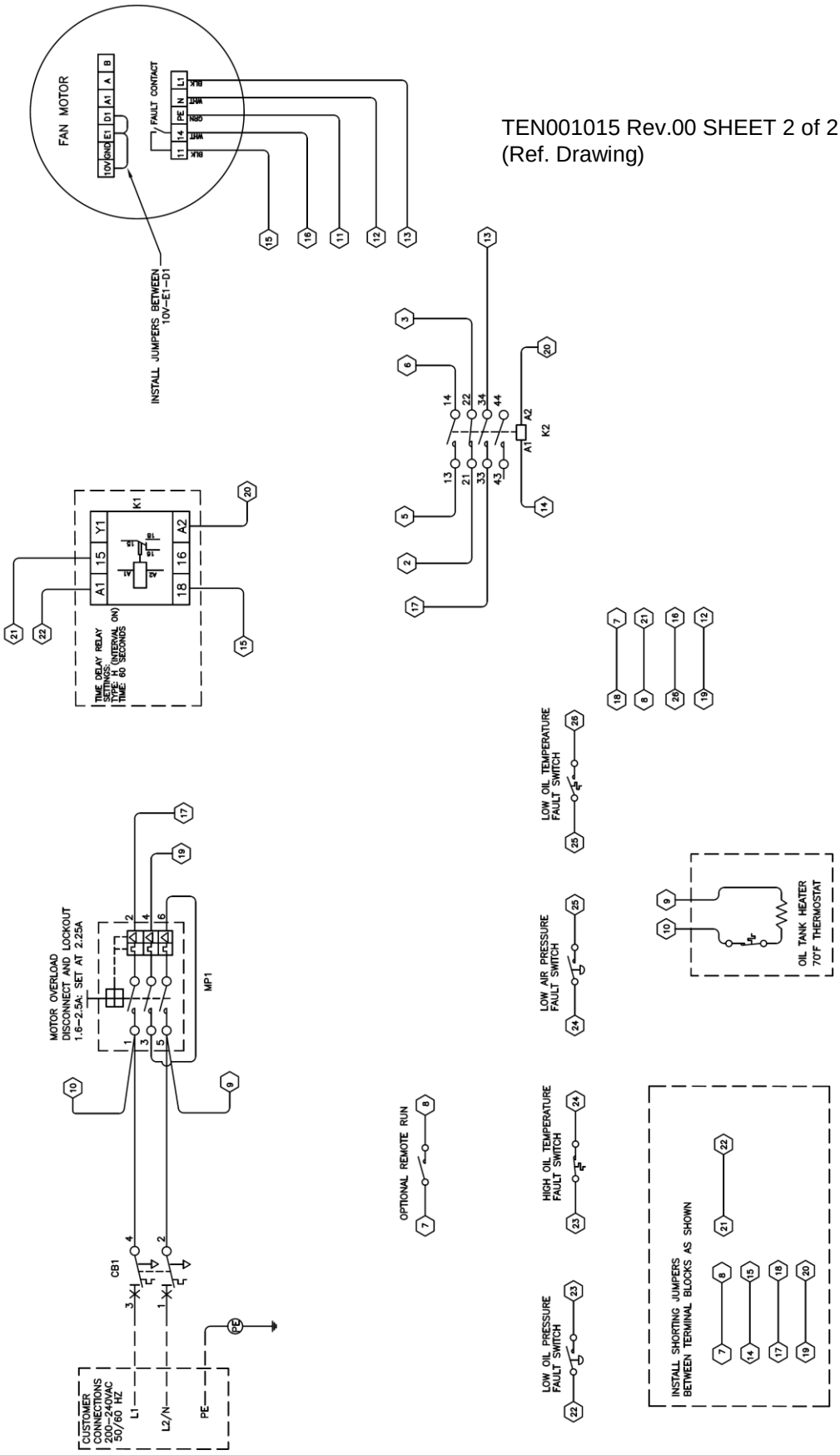


FIGURE 3-10 LUBRICATION SYSTEM WIRING DIAGRAM SHEET 2

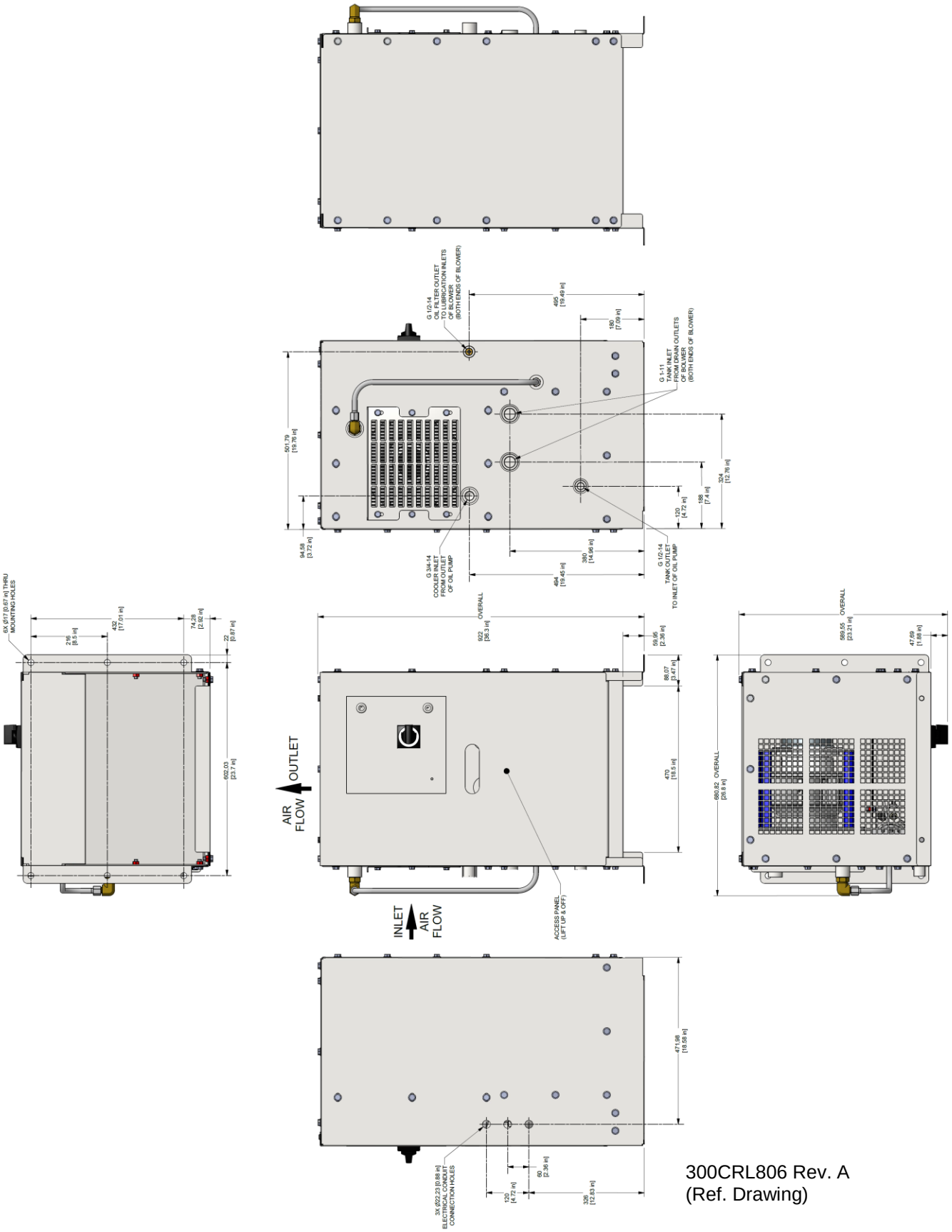
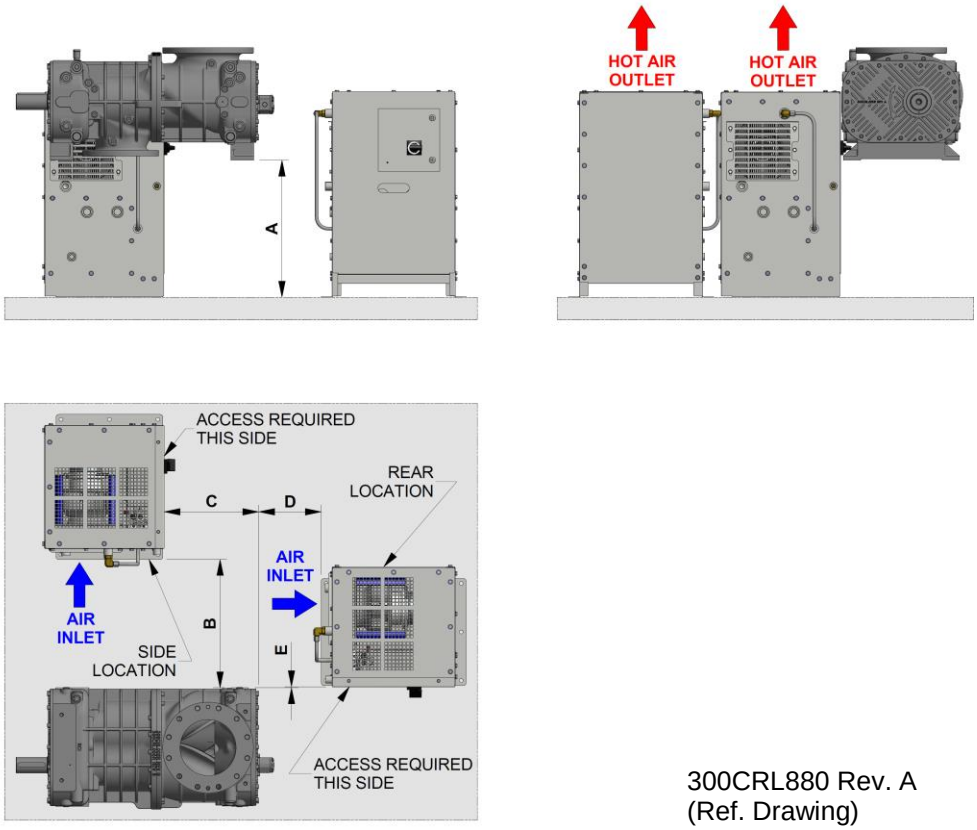
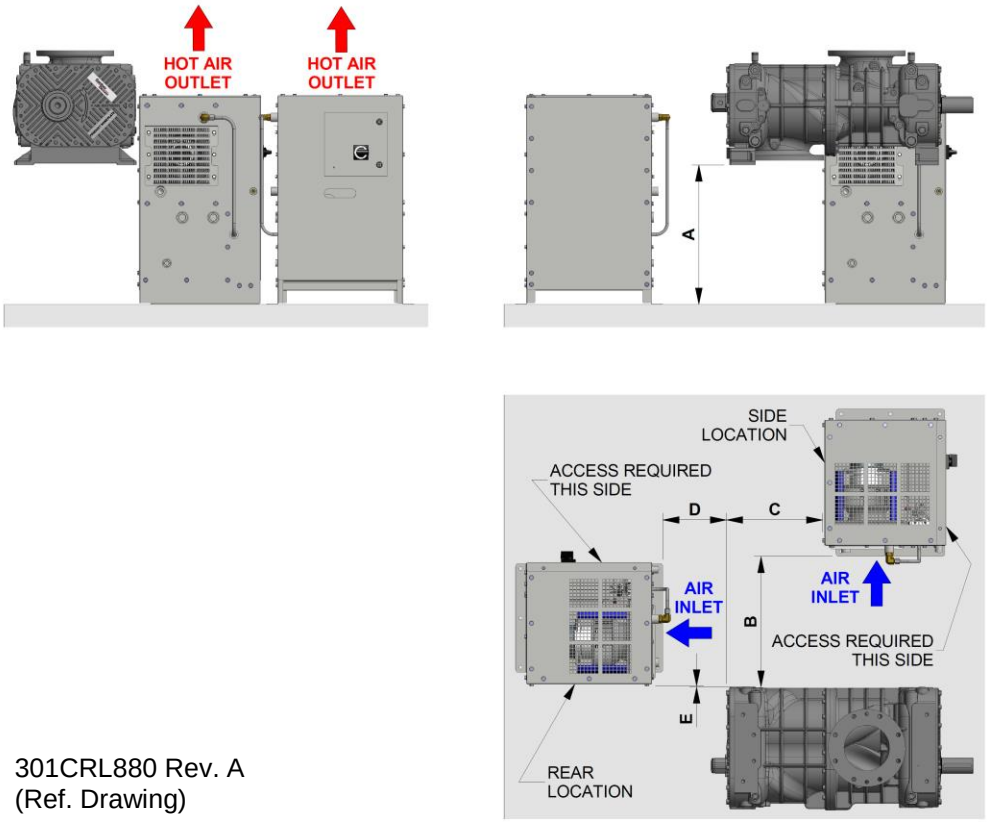


FIGURE 3-11 LUBRICATION SYSTEM OUTLINE DRAWING



300CRL880 Rev. A
(Ref. Drawing)

FIGURE 3-12 TYPICAL BOTTOM DISCHARGE LAYOUT



301CRL880 Rev. A
(Ref. Drawing)

FIGURE 3-13 TYPICAL TOP DISCHARGE LAYOUT

Dimension	Typical Layout	Recommended Minimum	Recommended Maximum
A	24 in. [610mm]	20 in. [508mm]	48 in. [1219mm]
B	22 in. [559mm]	20 in. [508mm]	48 in. [1219mm]
C	17 in. [432mm]	0 in. [0mm]	36 in. [914mm]
D	11 in. [279mm]	6 in. [152mm]	24 in. [610mm]
E	0.5 in. [13mm]	0 in. [0mm]	24 in. [610mm]

FIGURE 3-14 LAYOUT DIMENSIONS FOR TOP AND BOTTOM DISCHARGE

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 – Turn on the forced lubrication system with the manual control switch or remote control contact. This will start the time delay (fault bypass) relay. The blower needs to be started within approximately 60 seconds to build oil pressure or the lubrication system will fault off and will need to be reset. Start the blower at reduced speed and no-load if possible. Check the oil injection pressure and verify it is within the operating range shown in FIGURE 3-3, page 24. 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 lubrication system continues to fault off after the time delay relay opens, refer to Figure 3-3, page 24, for possible causes and resolve the issue.

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 38.

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 the reservoir tank
3. Observe pressure.
4. Relief valve functions.
5. Blower turns freely.
6. Oil cooler heat exchanger is clean and airflow is unobstructed.

⚠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 FFL	3600	18 [1240]	16 [540]	250 [139]	350 [177]
160CDL480 RC2 FFL	3600	30 [2068]	20 [677]	350 [177]	450 [232]
160CDL480 RC3 FFL	3600	36 [2500]	22 [745]	350 [177]	450 [232]
200CDL600 RC1 FFL	2800	18 [1240]	16 [540]	250 [139]	350 [177]
200CDL600 RC2 FFL	2800	30 [2068]	20 [677]	350 [177]	450 [232]
200CDL600 RC2 FFL	2800	36 [2500]	22 [745]	350 [177]	450 [232]
250CDL750 RC1 FFL	2200	18 [1240]	16 [540]	250 [139]	350 [177]
250CDL750 RC2 FFL	2200	30 [2068]	20 [677]	350 [177]	450 [232]
250CDL750 RC3 FFL	2200	36 [2500]	22 [745]	350 [177]	450 [232]

* Pressures or vacuums are gauged at immediate blower discharge or inlet. For maximum ratings at reduced speeds, see (FIGURE 4-3, page 36).

FIGURE 4-1 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 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 4-3, page 36). A bypass valve to bleed air from the discharge to atmosphere (FIGURE 2-3, page14) 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 36. 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: 160CDL480 RC2 FFL, Altitude 4000 ft. [1220 m].
Maximum pressure rating is 30 psig [2068 mbar] at sea level from FIGURE 4-1.
Allowable pressure at 4000 ft. is 86.4% of rating: 0.864 * 30 = 25.92 psig [1787 mbar].

Example 2: 160CDL480 RC3, Altitude 5000 ft. [1525 m].
Maximum vacuum rating is 22 inches of mercury [745 mbar] at sea level from Allowable vacuum at 4000 ft. is 83.0% of rating: 0.83 * 22 = 18.26 inches of mercury [618 mbar]

SPEED – Refer to (FIGURE 4-1, page 35) for maximum and (FIGURE 4-3, page 36) 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 4-3. As speed is reduced, pressure or vacuum must also be reduced.

EXAMPLE: Using a 160CDL480 RC2 FFL blower, operating against 25 PSIG [1724 mbar], minimum allowable speed is 1200 RPM.

Model	Minimum Speed (RPM) – Pressure					
	Up to 15 PSIG [1035 mbar]	18 PSIG [1240 mbar]	20 PSIG [1380 mbar]	25 PSIG [1724 mbar]	30 PSIG [2068 mbar]	36 PSIG [2500 mbar]
160CDL480 RC1 FFL	800	1600	-	-	-	-
160CDL480 RC2 FFL	800	1100	1500	1200	1950	-
160CDL480 RC3 FFL	800	800	800	1050	1500	2200
200CDL600 RC1 FFL	800	900	-	-	-	-
200CDL600 RC2 FFL	800	800	800	800	1600	-
200CDL600 RC3 FFL	800	800	800	800	900	1450
250CDL750 RC1 FFL	500	850	-	-	-	-
250CDL750 RC2 FFL	500	500	500	650	1100	-
250CDL750 RC3 FFL	500	500	500	600	900	1300

Model	Minimum Speed (RPM) - Vacuum				
	Up to 16” Hg. [540 mbar]	18” Hg. [610 mbar]	20” Hg. [677 mbar]	21” Hg. [711 mbar]	22” Hg. [745 mbar]
160CDL480 RC1 FFL	800	-	-	-	-
160CDL480 RC2 FFL	800	800	1100	-	-
160CDL480 RC3 FFL	800	800	800	1250	1900
200CDL600 RC1 FFL	800	-	-	-	-
200CDL600 RC2 FFL	800	800	800	-	-
200CDL600 RC3 FFL	800	800	800	800	800
250CDL750 RC1 FFL	500	-	-	-	-
250CDL750 RC2 FFL	500	500	600	-	-
250CDL750 RC3 FFL	500	500	500	600	1100

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.

OPERATING TEMPERATURE – Blower air discharge temperature will increase with higher operating pressures or vacuums, and lower operating speeds. If the discharge temperature or temperature rise exceeds the limits shown in (FIGURE 4-1, page 35) stop the blower at once and correct the trouble.

⚠WARNING

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

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

Turn off the lubrication system with the manual control switch or the remote control contact.

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.

⚠WARNING

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. Ensure forced lubrication system is properly installed and the lubrication system fault contacts are used to disable the blower motor. Check lubrication level in the reservoir.
- ☐ 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
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 5-1 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																								
Discharge Temperature	■	■	■																					
Discharge Pressure	■	■	■																					
Vibration										■	■	■												
Lubrication System																								
Oil Level	■	■	■																					
Oil Pressure	■	■	■																					
Oil Temperature	■	■	■												■									
Oil Sample (Note 2)																				■		■		
Change Oil (Note 3)																					■	■	■	
Oil Flush (Note 4)																								■
Clean Heat Exchanger												■					■		■					
Change Oil Filter																					■	■	■	
Change Coalescing Element																						■	■	■
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) Oil Sample: A lube sampling program is the recommended method of determining lubricant life.

3) Oil Change: The lube change intervals are based on Aeon 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 oil reservoir is required to remove accumulated contaminates.
Recommend reservoir flush every fourth oil change.
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 5-1 RECOMMENDED MAINTENANCE SCHEDULE

LUBRICATION – Gears and bearings are oil jet lubricated. It is essential that the forced lubrication system be well maintained to prevent blower failure. The forced lubrication system fault contacts must be used to disable the main blower motor. Running the blower without the forced lubrication system operational will result in blower failure.

Hot oil can cause severe burns. Allow oil to cool below 120°F [49°C] before servicing.

Check the oil level in the reservoir weekly. 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 more frequently. 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 reservoir should be flushed with a clean solvent every forth oil change. Always use clean containers for oil and cleaning solvents.

NOTICE

Used oil must be disposed of in accordance with local regulations.

RECOMMENDED LUBRICANT

AEON 9000TH Synthetic Lubricant is recommended.
AEON 6000FG-68 (Food Grade)

Refer to FIGURE 5-2 for Aeon lubricant part numbers. One filling of AEON 9000TH will last a minimum of 4 times longer than a premium mineral oil, depending on actual operating conditions. Order AEON 9000TH from your Gardner Denver distributor or call Gardner Denver directly. If not using AEON 9000TH or AEON 6000FG-68 synthetic lubricant, contact the factory for recommendations

Convenient Package Sizes	AEON 6000FG-68	AEON 9000TH
1 gallon	28H366	-
Case: 6 gallons	-	28H335
5 gallon pail	28H314	28H286
55 gallon drum	28H315	28H270

FIGURE 5-2 AEON SYNTHETIC LUBRICANT

OIL FILTER – The oil filter (GD P/N RB2079640000) must be changed with every oil change.

1. Disconnect, lockout and tagout power supply to blower and lubrication system. Allow oil to cool.
2. Remove the spin-on filter element.
3. Clean the gasket face of the filter body.
4. Coat the new element gasket with clean lubricant used in the unit.
5. Screw the new element on the filter body and tighten by hand. Tighten 1/2 turn more after gasket makes contact. **DO NOT OVERTIGHTEN ELEMENT**.
6. Run the unit and check for leaks.

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.

HEAT EXCHANGER – Regularly inspect the heat exchanger for debris. The heat exchanger fins can be cleaned with a compressed air jet. Use caution not to damage the fins.

⚠ WARNING

The compressed air jet can damage the heat exchanger fins if held too close.

⚠ DANGER

Compressed air can cause severe personal injury. Use appropriate personal protective equipment.

ROTOR SHAFT SEALS – Rotors have a labyrinth type shaft air seal to reduce 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. The graphite ring seals have more internal clearance and air leakage than the piston ring seals. While noticeable, the leakage is negligible compared to total flow. An increase in air leakage may indicate 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, and oil seal 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.

⚠ WARNING

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 pressure).
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 Temperature or Bearing Temperature	Dirty heat exchanger	Clean Heat Exchanger on Lubrication System
	Excessive bearing load	Reduce belt tension. Check shaft coupling alignment.
	Worn bearings/gears	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	Low reservoir vacuum	Adjust reservoir vacuum with louver
	Too much oil in reservoir	Reduce oil level to recommended level.
	Faulty 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.
Lubrication System Fault (Motor Shuts Off Soon After Starting)	Reservoir Vacuum Too Low	Increase vacuum with adjustable louver. Tighten oil fill cap.
	Oil Injection Pressure Too Low	Restrictive plumbing, Increase injection pressure. Prime pump lines. Change oil filter.
	Oil Temperature Too High	Clean heat exchanger, Check blower
	Oil Temperature Too Low	Wait for oil heater to heat reservoir. Insulate reservoir walls from airflow.
	Fan Motor Fault	Remove cause
	Remote Run/Reset Signal Failure	Check signal or bypass with jumper if not used.

FIGURE 5-3 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**.

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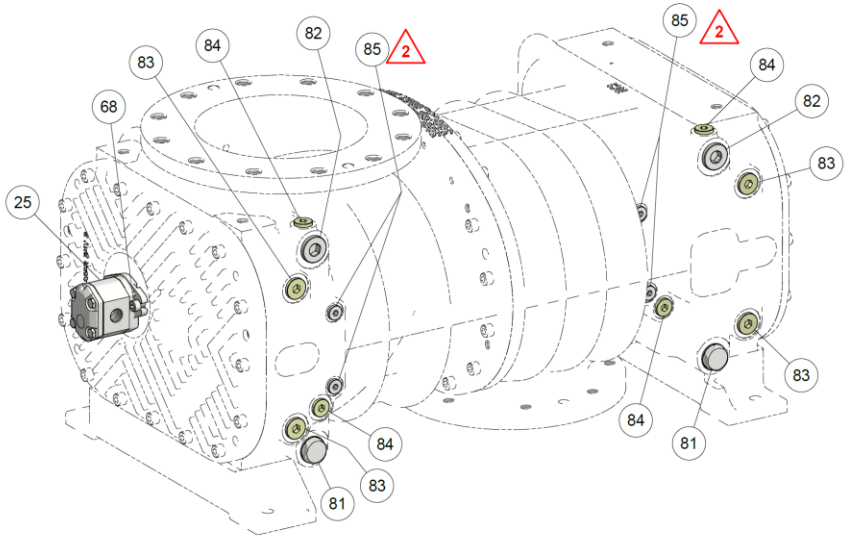
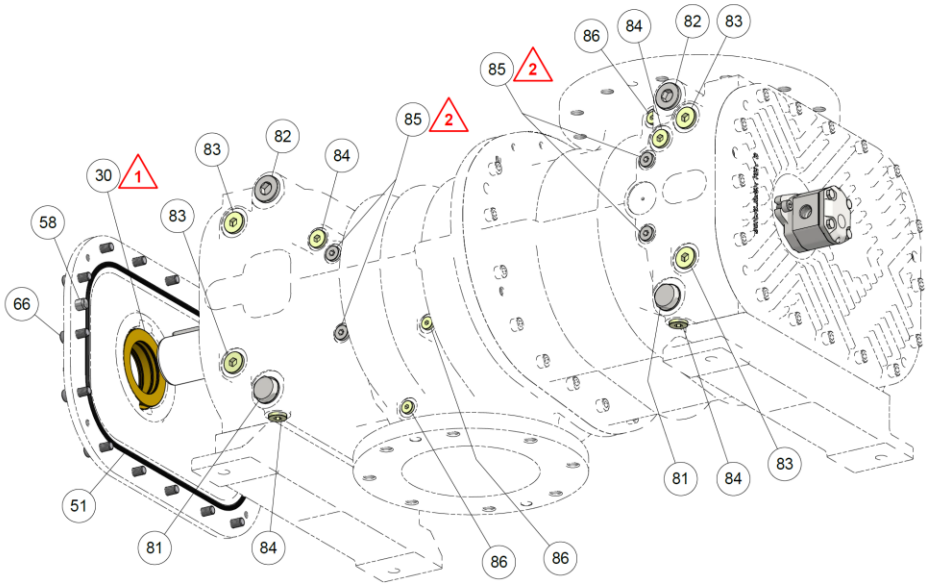
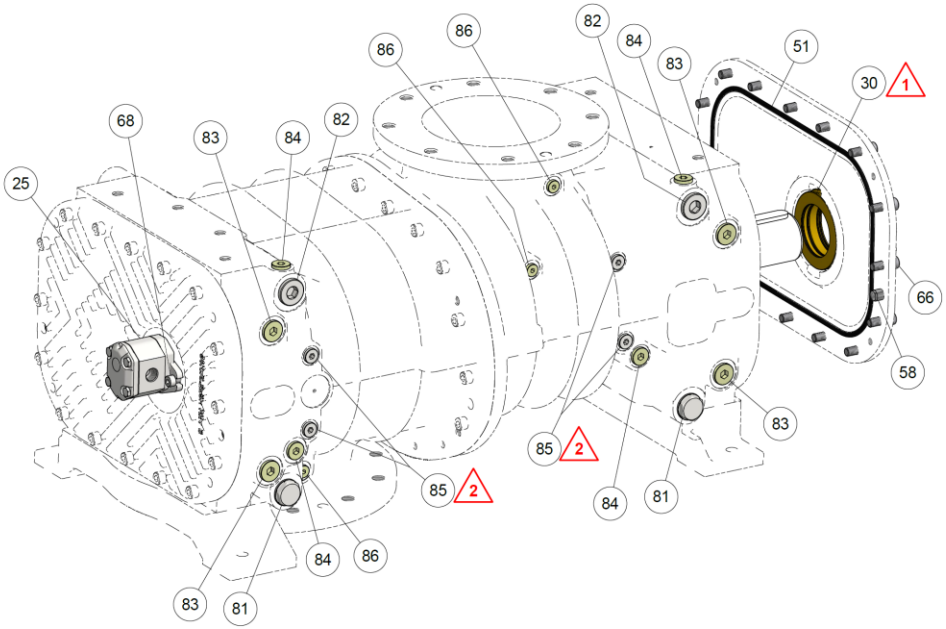
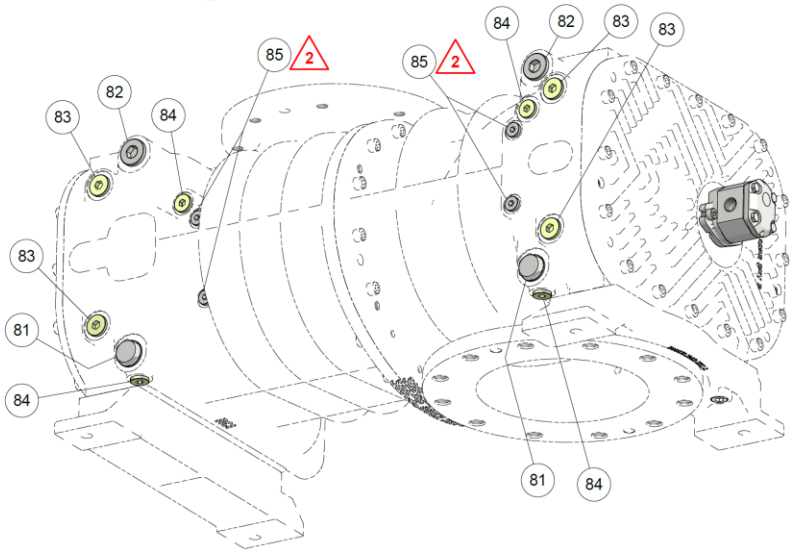




FOR BOTTOM DISCHARGE UNITS



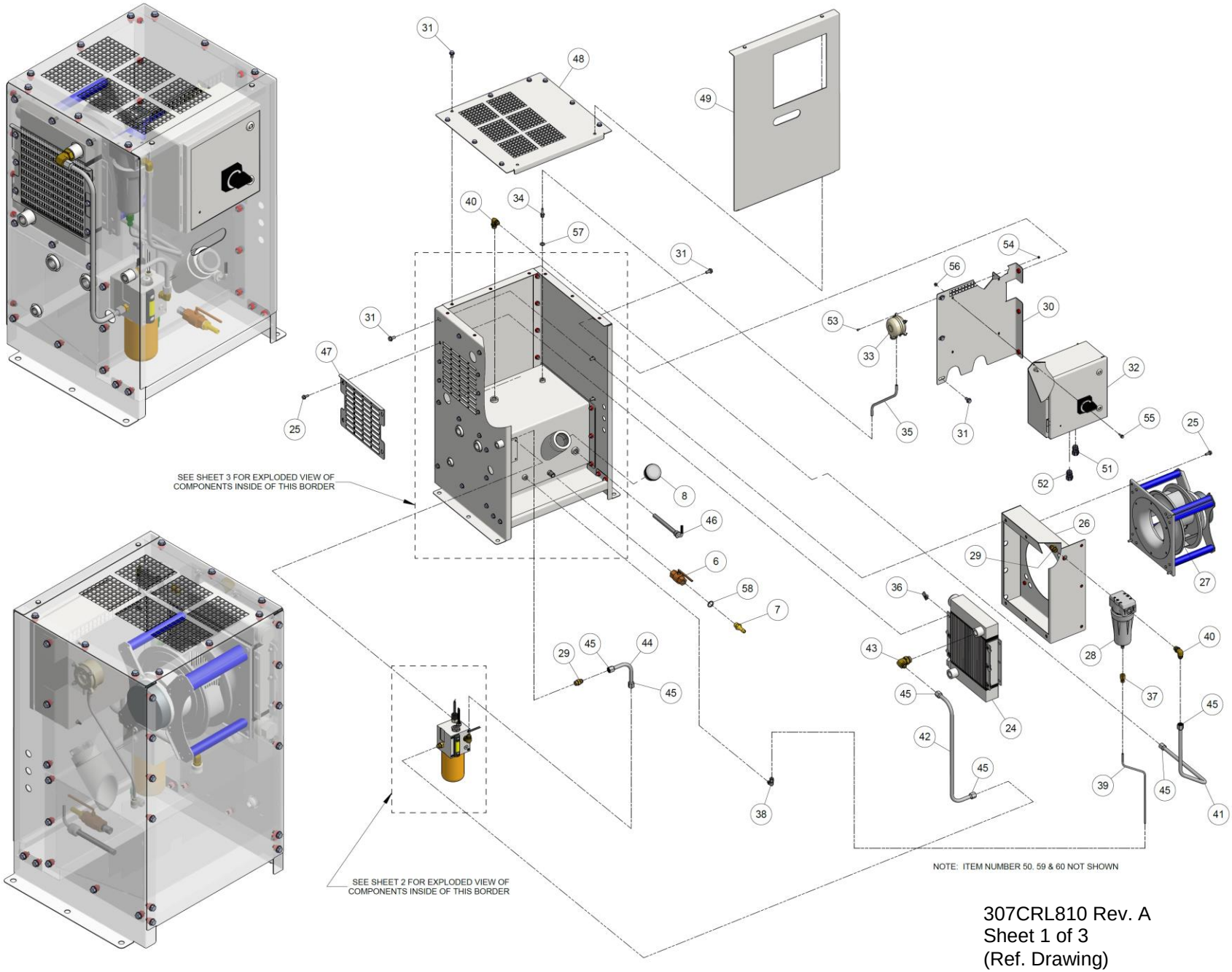


FOR TOP DISCHARGE UNITS

1. FOR INPRO SEALS, ORIENTATION OF SEAL DRAIN SLOT MUST BE LOCATED AT BOTTOM
2. FOR GAS APPLICATIONS, (8) PLUGS MUST BE INSTALLED

BASIC REPLACEMENT COMPONENTS, FORCED LUBRICATION BLOWER

REF. No	Name of Part	160CDL480		200CDL600		250CDL750	
		Qty.	Part No.	Qty.	Part No.	Qty.	Part No.
25	GEAR PUMP	1	VP1139262	1	VP1139262	1	VP1139262
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
66	SCREW (DISCHARGE COVER)	16	665SMCA120300	20	665SMCA120400	18	665SMCA120500
68	SCREW (OIL PUMP)	2	665SMCA100250	2	665SMCA100250	2	665SMCA100250
81	PLUG (MAGNETIC DRAIN)	4	VP1142628	4	VP1142628	4	VP1142628
82	PIPE PLUG	4	A93060500	4	A93060500	4	A93060500
83	PIPE PLUG	8	A93060490	8	A93060490	8	A93060490
84	PIPE PLUG	8	A93060480	8	A93060480	12	A93060480
86	PIPE PLUG	3	A93060460	3	A93060460	3	A93060460
85*	PIPE PLUG (*MECHANICAL SEALS OPTION ONLY)	8	A93060470	8	A93060470	8	A93060470



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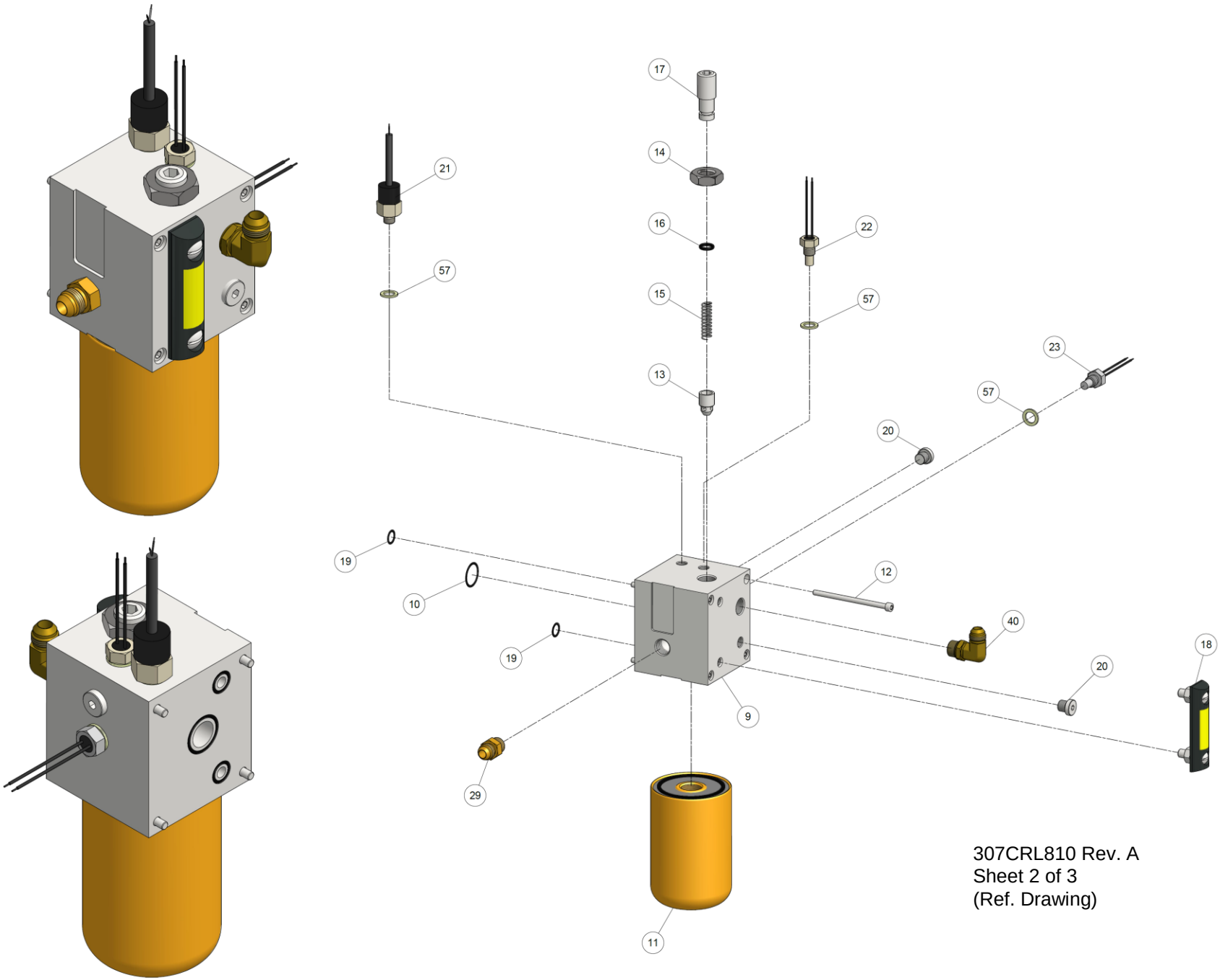
REPLACEMENT COMPONENTS, LUBRICATION SYSTEM (300CRL204)

REF. No	Name of Part	Qty.	Part No.
6	BALL VALVE	1	A10352174
7	HOSE BARB	1	A93613080
8	OIL CAP	1	RB2099370901
24	OIL COOLER	1	TEN003680
25	SCREW	10	75LM307
26	SUPPORT, FAN	1	300CRL165
27	FAN	1	TEN003678
28	FILTER	1	G7426494 (Replacement Element FIL14BE)
29	ADAPTER	3	86H299
30	PARTITION	1	300CRL1293
31	SCREW	47 (total)	75LM297
32	CONTROL BOX	1	300CRL466
33	AIR PRESSURE SWITCH	1	TEN001037
34	HOSE BARB	1	A93614710
35	HOSE	2	R44B
36	U NUT	6	TST000167
37	TUBE FITTING	1	TST000166
38	TUBE FITTING	1	86E289
39	TUBE	1	85G3
40	ADAPTER	3 (total)	86H271
41	TUBE	3	85K6
42	TUBE	3	85K6
43	TUBE FITTING	1	86H316
44	TUBE	1	85K6
45	FITTING	6	VP1155222
46	HEATER	1	TEN003679
47	SHUTTER, AIR INLET	1	300CRL327
48	PANEL, TOP	1	300CRL216
49	PANEL, SIDE ACCESS	1	301CRL216
50	WIRE CABLE	15	97J68
51	FITTING-ELECTRICAL	6	24CA615
52	FITTING-ELECTRICAL	2	24CA2865
53	SCREW	4	75G68
54	NUT	4	VP1029847
55	SCREW	4	RB2050170134
56	NUT	4	VP1036511
58	GASKET	1	25BC874
59	CONNECTOR-SPLICE	1	24CA7540
60	WIRE – FAN JUMPER	0.5	VP1109898



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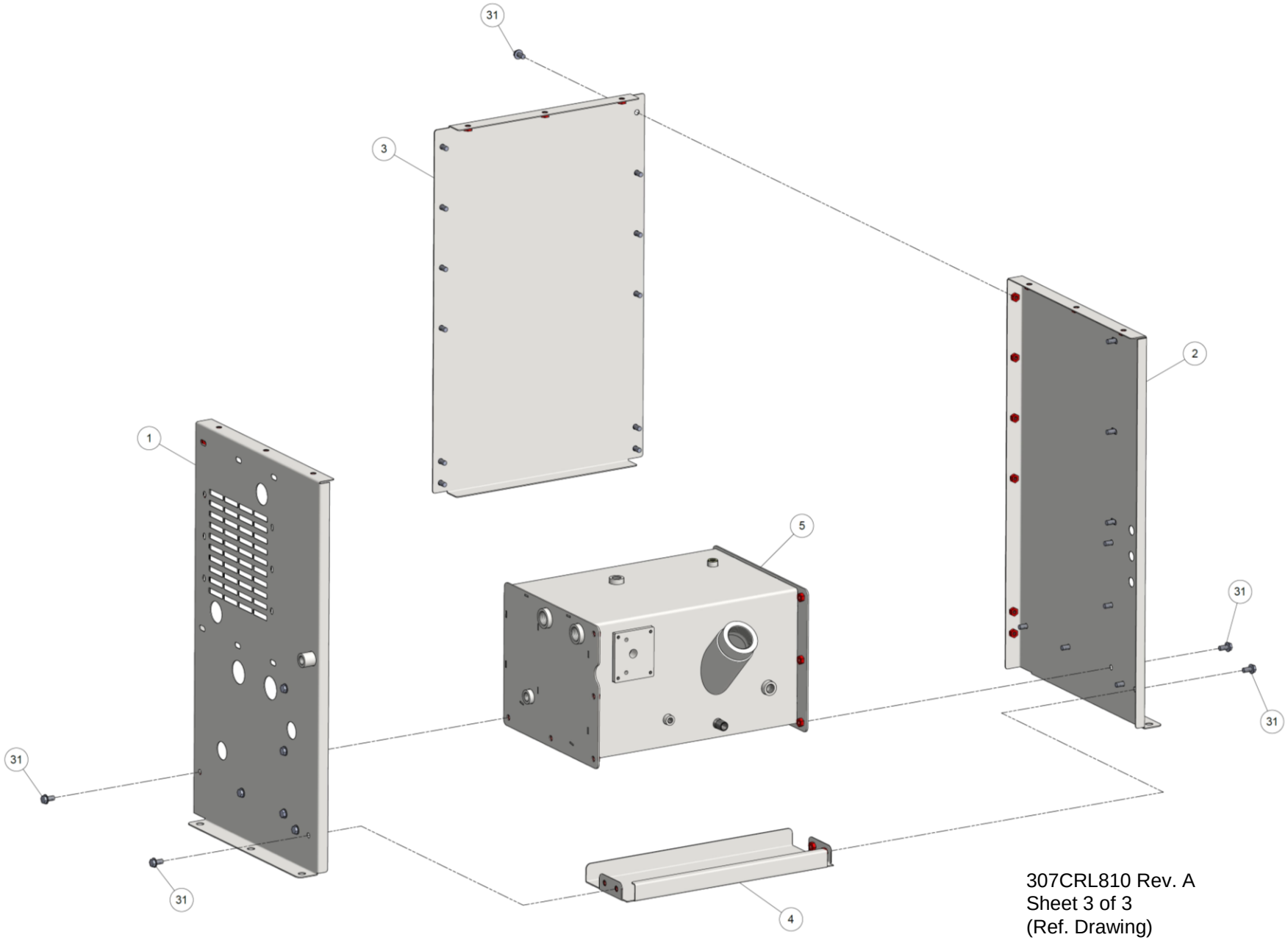
REPLACEMENT COMPONENTS, OIL CONTROL BLOCK

REF. No	Name of Part	Qty.	Part No.
9	HYDRAULIC OIL CONTROL BODY	1	300CRL192
10	O-RING	1	RB2028580954
11	OIL FILTER	1	RB2079640000
12	SCREW	4	RB2080500134
13	MAIN RELIEF CARTRIDGE	1	RB3279960109
14	NUT	1	RB2018780172
15	SPRING	1	RB2079650000
16	O-RING	1	RB2009570954
17	MAIN RELIEF SPOOL	1	RB3279950109
18	LEVEL INDICATOR	1	RB2065130948
19	O-RING	2	RB2088630954
20	PLUG	2	A93060460
21	PRESSURE SWITCH, 11 PSI	1	TEN001034
22	TEMPERATURE SWITCH, 50 DEG F	1	TEN001036
23	TEMPERATURE SWITCH, 210 DEG F	1	TEN003684
29	ADAPTER	3	86H299
40	ADAPTER	3 (total)	86H271
57	GASKET	4	25BC860



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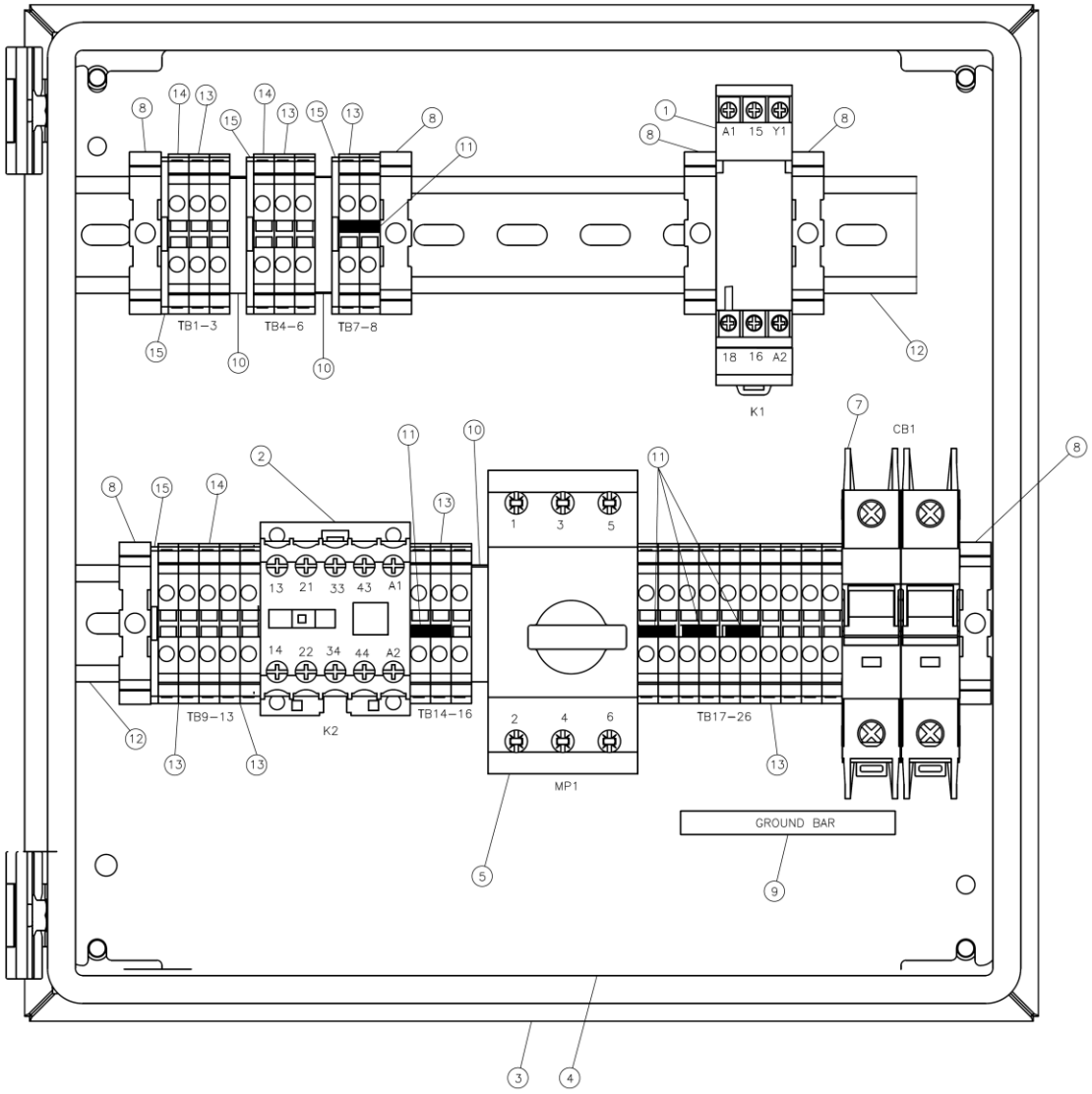
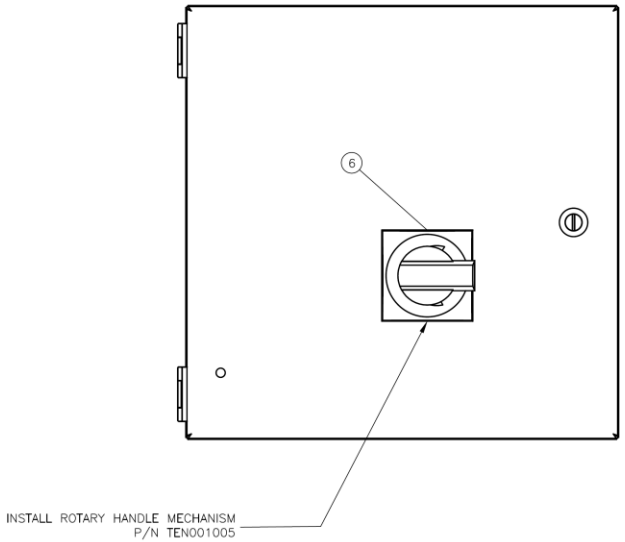
(Ref. Drawing)

REPLACEMENT COMPONENTS, BASIC ENCLOSURE

REF. No	Name of Part	Qty.	Part No.
1	SUPPORT, LEFT SIDE	1	301CRL165
2	SUPPORT, RIGHT SIDE	1	302CRL165
3	PANEL, BACK	1	302CRL216
4	FLOOR, BOTTOM	1	300CRL1228
5	TANK	1	300CRL250
31	SCREW	47 (total)	75LM297





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REPLACEMENT COMPONENTS, LUBRICATION SYSTEM CONTROL

REF. No	Name of Part	Qty.	Part No.
1	RELAY-TIME DELAY	1	009M6011A
2	MINI CONTROL RELAY, 10A 3NO1NC,240V COIL	1	TEN001002
3	BOX-CONTROL,ENCL,12x12x6,UL4,MMP HANDLE	1	TEN001007
4	PANEL, CONTROL BOX, FOR 12x12 BOX	1	TEN001008
5	Manual Motor Protector, 1.6-2.5A, Fr B	1	TEN000366
6	ROTARY HANDLE MECHANISM FOR EATON XT MMP	1	TEN001005
7	CIRCUIT BREAKER - 6A, 2-POLE, UL489	1	TEN000974
8	TERMINAL BLOCK, END STOP	6	24CA5987
9	BAR, GROUNDING, 5 TERMINAL, GBK5	1	24CA7878
10	SPACER FOR DIN RAIL COMPONENTS	3	24CA7526
11	PLUG-IN BRIDGE FOR XBUT4, 2-POSITION, R	5	TEN000361
12	DIN RAIL,35mm x 7.5mm x 2m(SLOTTED)	1	24CA5991
13	TERMINAL BLOCK,SINGLE-LEVEL26-10 AWG,30A	23	24CA5992
14	GROUND BLOCK, DIN MOUNT26-10 AW GREEN/YEL	3	24CA5986
15	TERMINAL BLOCK END PLATE, SINGLE LEVEL	4	24CA5993

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.

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Gardner Denver®

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

 Printed in U.S.A.

ENERGY STAR PARTNER

CERTIFIED QUALITY MANAGEMENT SYSTEM ISO 9001:2008 ANAB DNV

MEMBER OF CAGI Compressed Air & Gas Institute

KNOW PRESSURE COMPRESSED AIR CHALLENGE

Please recycle after use.