



Kice PD Blower Operators Manual

1. INTRODUCTION

When you purchased your Kice Air Power Unit, you bought an air cleaning device that has proven its reliability based on hundreds of installations and years of dependable service.

We are proud of our products and the people at Kice Industries who build them. The results of our development work have resulted in the present design of the Kice Air Power Units.

This owner's manual is intended as a guide for proper installation, operation and maintenance to keep your Kice Air Power Unit operating safely and efficiently on the job. Service and spare parts information is also included for your benefit.

Sincerely,

Drew Kice,
President
Kice Industries, Inc.

WARRANTY

The Company warrants the equipment manufactured by the Company to be free of defects in material and workmanship for a period of one (1) year from the date of shipment. Kice agrees to repair or replace, at its option, any parts found to be defective in the opinion of the Company. Kice is not liable for any costs in connection with the removal, shipment or reinstallation of said parts. This warranty does not apply to abrasion, corrosion, erosion, abuse or misuse of the product. Assistance by Kice in system layout or selecting equipment does not imply Kice's responsibility.

Buyer agrees to look to the warranty, if any, of the manufacturer or supplier of equipment manufactured by others and supplied by Kice for any alleged defects in such equipment and for any damages or injuries caused thereby or as a result thereof. Where work is made to measurements or specifications furnished by the Buyer, Kice does not assume any responsibility for the accuracy of Buyer's specifications. Kice will not assume responsibility for alteration or repairs unless the same are made with the written consent and approval of Kice.

PURCHASER SHALL BE RESPONSIBLE FOR COMPLIANCE WITH ELECTRICAL MANUFACTURER'S
RECOMMENDATIONS, UNDERWRITERS CODE AND ALL SAFETY PRECAUTIONS.

Kice extends no other warranty for any of its products other than the above express warranty, and there are no other warranties, express or implied, including warranties of merchantability, fitness for a particular purpose, or otherwise which extend beyond the above limited express warranty. Kice and its dealers shall not in any event be liable for consequential or incidental damages, and the terms and conditions stated herein provides Buyer's sole and exclusive remedy. Any actions for breach of this agreement or warranty must be commenced within one year after the cause of action has occurred.

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IMPORTANT:

Write down the MODEL and SERIAL NUMBER of the Kice Air Power Unit, along with the same information for the auxiliary equipment (i.e., airlock valve, fan, gearmotor, motor, sheave sizes and type, and any special modifications to standard).

For additional information, application assistance or special service, you should contact the factory. We will need to know the MODEL and SERIAL NUMBER of your Kice Air Power Unit. For ready reference, please record this information and the date of delivery or installation on the lines below. See the General Information section for the location of the model and serial number.

Model _____

Serial Number _____

Date of delivery or installation..... _____ / _____ / _____

2. GENERAL INFORMATION

TO THE NEW OWNER

The purpose of this manual is to assist owners and operators in maintaining and operating the Kice Air Power Unit. Please read it carefully; the information and instructions furnished can help you achieve years of dependable performance. Separate manuals are included for auxiliary equipment that make up an air system, such as airlock valves, cyclones and fans. They contain additional information that may not be repeated in this manual. You are urged to read all manuals before attempting any operation or repair of the equipment in the system. If these manuals are not included in your owner's packet, contact our customer service department.

USING THIS MANUAL

General operation, adjustment and maintenance guidelines are outlined for owners and operators of the Kice Air Power Unit. Operating conditions vary considerably and cannot be addressed individually. Through experience, however, operators should have no difficulty in developing good operating, safety and monitoring skills.

The term "disconnect and lockout" as used in this manual means that power to the equipment has been disconnected through the use of a pad lockable, manual power cutoff, or power lockout switch.

Directions used in this manual, for example RIGHT or LEFT, CLOCKWISE or COUNTERCLOCKWISE, refer to directions when facing the door of the Air Power Unit located under the reverse jet cleaning mechanism. The metal identification plate containing the model, serial number and date of manufacture is attached to the housing, next to the Air Power Unit door.

Photographs and illustrations were current at the time of printing, but subsequent production changes may cause your Kice Air Power Unit to vary slightly in detail. Kice Industries, Inc., reserves the right to redesign and change the equipment as deemed necessary, without notification. If a change has been made to your Kice Air Power Unit that is not reflected in this owner's manual or the illustrated parts lists, write or call Kice Industries, Inc., for current information and parts.

MODEL AND SERIAL NUMBER

The model of the Air Power Unit, serial number and date of manufacture can be found stamped on the metal identification plate located on the housing, next to the access door.



Identification Plate Examples

2. GENERAL INFORMATION CONTINUED

Use original Kice Air Power Unit replacement parts only. These parts are available from Kice Industries, Inc. To obtain prompt, efficient service, always provide the following information when ordering parts:

1. Correct part description and number, as given in the Illustrated Parts Lists section of this manual
2. Correct model number
3. Correct serial number

For assistance in service or ordering parts, contact the customer service department:

Kice Industries, Inc.
5500 Mill Heights Dr.
Wichita, KS 67219-2358

Phone: 316-744-7151 Fax: 316-744-7355

IMPORTANT: Any unauthorized modification, alteration, or use of non-approved attachments or drive units voids the warranty and releases Kice Industries, Inc., from any liability arising from subsequent use of this equipment. Each type of Air Power Unit is designed to be used in a specific type of system. Using the Kice Air Power Unit for a purpose other than that for which it was designed could result in personal injury, as well as, product or property damage.

Purchased items (such as speed reducers and motors) are covered by the manufacturer's warranty. If there is a problem with a purchased item, check with the local supplier or service representative.

Kice equipment is designed and built to provide years of operation. As with any equipment, the following rules are essential for trouble-free operation:

- Proper installation
- Regular maintenance
- Correct operation within original design parameters
- Proper application within a process

Failure to properly install, maintain or operate Kice equipment can result in a variety of problems, including, but not limited to: poor equipment performance, decreased equipment life, equipment failure, or dangerous operating conditions.

The Kice Industries product line includes a variety of equipment, all of which can be custom-made to suit your application. Your Kice equipment was chose based on your specification of process, product and your application requirements for capacity, operating conditions, operating parameters, etc. It is essential that your Kice equipment be installed, maintained and operated under the conditions for which it was originally designed and specified. Should your process needs change, please consult with Kice Industries prior to utilizing the equipment under different conditions.

3. SAFETY PRECAUTIONS



Figure 2

This safety alert symbol is used on equipment, safety decals and in manuals to call your attention to an important safety message warning you of possible danger to your personal safety. When you see this symbol (Figure 2), be alert; your personal safety or the safety of other persons is involved. Follow the instructions in the safety message.

HAZARD LEVELS



DANGER (RED) – Danger is used to indicate the presence of a hazard that **WILL** cause **SEVERE** personal injury, death, or substantial property damage if the warning is ignored.



WARNING (ORANGE) – Warning is used to indicate the presence of a hazard that **CAN** cause **SEVERE** personal injury, death, or substantial property damage if the warning is ignored.



CAUTION (YELLOW) – Caution is used to indicate the presence of a hazard that **WILL** or **CAN** cause **MINOR** personal injury or property damage if the warning is ignored.



NOTICE (BLUE) – Notice is used to indicate installation, operation, or maintenance information that is important, but not hazard-related. Hazard warnings should never be included under the Notice signal word.



WARNING: All owners and operators should read this manual, or be instructed in safe operating and maintenance procedures, before attempting to uncrate, install, operate, adjust, or service this equipment.

SAFETY DECALS

The safety decals on the Air Power Unit should not be removed, covered over, painted, or otherwise become illegible. If this occurs, the decals should be replaced immediately. Contact our customer service department for replacements.

SAFETY PRECAUTIONS CONTINUED

- Do not attempt to install, connect power to, operate or service your new Air Power Unit without proper instruction and until you have been thoroughly trained in its use by your employer.
- The unit must be lifted by a means with sufficient lifting capacity.
- Never stand under any kind of hoist or lifting mechanism, whether or not it is loaded or in operation. Never stand under or near a component when it is being lifted.
- Qualified personnel, before each use, must carefully inspect all lifting devices. Never use a lifting device to transport equipment. Never use a lifting device that is damaged, deteriorated, or in any way in need of repair.
- Operate safely at all times. Use personal protective equipment when and where appropriate, such as hard hats, helmets, gloves, earplugs, dust masks and eye protection devices. Especially when working inside the Air Power Unit. Keep personal protective equipment in good repair and convenient to the operator.
- The Air Power Unit is fully encapsulated if properly connected during installation and should only be operated after all pipes and hoses, including upstream and downstream components, have been completely connected to the piping system. This will prevent human access while the machine is running.
- The Air Power Unit may also have factory supplied guards for rotating components. Do not connect power to or operate the Air Power Unit unless all moving parts are completely enclosed and all guards, grates and maintenance panels are in place and securely fastened.
- All protective covers, guards, grates, maintenance panels, switches and warning decals must be kept in place and in good repair. Any equipment with a damaged malfunctioning, defective, or missing protective device must be taken out of service until the protective device can be repaired or replaced.
- Do not abuse, overload, mistreat or misuse the Air Power Unit or attempt to operate the Air Power Unit if it is in need of service, lubrication, maintenance or repair.
- The Air Power Unit may be installed and programmed to start automatically or be controlled from a remote location. Keep clear of all moving parts on industrial equipment and on the Air Power Unit at all times, until the POWER IS TURNED OFF AND LOCKED OUT.
- Do not attempt to work on, clean or service the Air Power Unit, open or remove any protective cover, guard, grate, connection or maintenance panel until the POWER IS TURNED OFF AND LOCKED OUT. A main disconnect device must be installed to achieve this.
- During installation, the motor and frame of each piece of equipment including the Air Power Unit, must be effectively and separately grounded in accordance with OSHA safety and health standards, the National Electrical Code, local codes and DIN EN 60204-1 or DIN EN 60439-1 as required for the classified area.
- High voltage and rotating electrical equipment can cause serious or fatal injury. Only qualified, trained and experienced personnel should perform installation, operation and maintenance of electrical machinery.
- If the Air Power Unit is equipped with a maintenance panel or access door incorporating a Protective Interlocking Limit Switch (PLS), the PLS must be interlocked with all electrical controls. This is to prevent all motors or powered devices associated with the unit from being energized if any protective cover, guard, grate or maintenance panel is open or removed. The interlock function of the PLS must be tested and logged daily by supervisory personnel.
- Air Power Units must be equipped with a properly functioning Protective Interlocking Electrical Control Switch (PCS), a Pad-lockable Manual Power Lockout Switch, along with the other basic safety equipment listed above. On-Off, interlock and padlock functions of the PCS must be tested and logged periodically by supervisory personnel.
- Never attempt to manually override or electrically bypass a safety device.
- It is the owner's and the employer's responsibility to adequately train the employee-operator in the proper and safe use of the equipment. Written safety programs and formal instruction are essential. All new employees must be made aware of company policies and operating rules, especially the established safety and health procedures. Refresher training of experienced employees in the potential hazards of the job is important. Up-to-date training records must be maintained at the job site.
- Special attention must be devoted to outside contractors engaged to enter and perform work on equipment or in the workplace. Special care must be exercised to insure all such personnel are fully informed of the potential hazards and follow plant rules – with special emphasis on explosion proof electrical tools and cutting or welding in unsafe environments.
- Keep the workplace cleaned up and free of dirt and dust at all times. Do not attempt to work on slippery or unsafe ladders or work platforms when maintenance or repair work is being performed on the Air Power Unit.
- Do not climb on ladders or work on platforms unless maximum load rating is posted. Do not exceed maximum load ratings when installing or servicing equipment.
- The operator must ensure that adequate lighting conditions are provided at the location of equipment operation.
- Never allow any kind of metal or other foreign objects to enter a Air Power Unit while in operation.
- Free outlet of product must be guaranteed at all times. Otherwise, blockage and severe damage may result, or a dangerous situation may occur.
- Drive components must be inspected and adjusted after transportation and periodically as required by operating conditions. Check sprocket, sheave and coupling alignment and spacing, drive belt tension, setscrews, keys, fasteners, bearings, shafts, and motors as appropriate to job conditions.
- Any device powered by air or hydraulic pressure must be equipped with a properly functioning Pad-lockable Manual Pressure lockout and Internal Pressure Relief Valve (PRV).
- Any equipment that is used in the processing of explosive materials in hazardous environments requires an evaluation on the part of the user and operator of proper and adequate monitoring equipment, dust control, explosion relief venting, and electrical equipment enclosures. Do not use your equipment in hazardous environments unless it has been properly equipped for the hazard.
- It is ultimately the operator's responsibility to implement the above listed precautions and insure proper equipment use, maintenance and lubrication. Keep these instructions and list of warnings with your machine at all times.
- It cannot be assumed that every acceptable safety procedure is contained herein or that abnormal or unusual circumstances may not warrant or require future or additional procedures.

WORK SAFELY AT ALL TIMES!!!

4. GENERAL RECEIVING, HANDLING & INSTALLATION

RECEIVING AND INSPECTION

Kice Industries, Inc., has prepared your new Air Power Unit for shipment in accordance with the Uniform Freight Classification. It has been thoroughly inspected at the factory and, barring damage in transit, should be in excellent condition upon arrival.

The Air Power Unit and accessories should be inspected upon receipt for any shipping damage. If dampers or shutters are provided, check these accessories for free operation of all moving parts.

When a carrier signs the Kice Industries, Inc., bill of lading, the carrier accepts the responsibility for any subsequent shortages or damage, evident or concealed, and any claim must be made against the carrier by the purchaser. Evident shortage or damage should be noted on the carrier's delivery document before signature of acceptance. Inspection by the carrier of damage, evident or concealed, must be requested. After inspection, issue a purchase order for necessary parts or arrange for return of the equipment to Kice Industries, Inc., for repair.

HANDLING AND STORAGE

Kice Air Power Units are shipped in many different configurations. Some units are completely assembled and skidded when size permits. These units may be handled and moved using good rigging techniques, being careful to avoid concentrated stresses that will distort any of the parts. Items or parts of the Air Power Unit that are shipped knocked down will be clearly labeled for reassemble.

If the Air Power Unit is not to be installed promptly, store it in a clean, dry location to prevent rust and corrosion of steel components. If outdoor storage is necessary, protection should be provided. Cover any openings to prevent the accumulation of dirt and moisture inside the housing. Cover motors with waterproof material. Refer to the motor maintenance information for further storage instructions.



Caution: Use proper equipment when lifting or moving the Air Power Unit. Make sure all persons and obstructions are clear from path and installation area.

INSTALLATION

1. Move the Air Power Unit to the installation area using proper equipment.
2. Tighten all fasteners securely. To insure proper operation, the Air Power Unit must be adequately supported and properly installed. All duct work or stacks should be independently supported as excess weight may distort the Air Power Unit housing and cause contact between moving parts.



WARNING: High voltage and rotating parts can cause serious or fatal injury. Only qualified personnel should perform installation, operation and maintenance of electrical machinery. Make sure that any electric motor and the frame of the Air Power Unit is effectively grounded in accordance with OSHA standards, the National Electrical Code and local codes.

3. The Air Power Unit controller can be mounted in any convenient location. Orientation of the controller does not affect its performance.
4. Test run the Air Power Unit. If any unusual noises occur, disconnect and lock out the power.
5. Reassemble any doors or covers removed during installation.

SLAB MOUNTED UNITS

A correctly designed and level concrete foundation provides the best means of installing a Air Power Unit outdoors. The slab should be extended to support accessory equipment, such as a floor-mounted fan. The

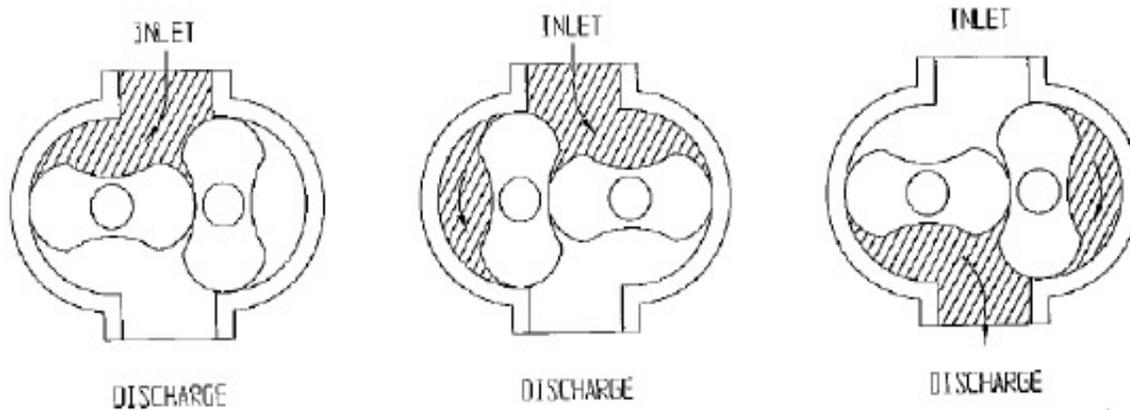
GENERAL RECEIVING, HANDLING & INSTALLATION CONTINUED

mass of the base must maintain the fan/driver alignment, absorb normal vibration, and resist lateral loads. The overall dimensions of the concrete base should extend at least six to twelve inches beyond the outline of the Air Power Unit base and other equipment. The weight of the slab in the area where high speed rotating equipment is located should be two to three times the weight of the rotating assembly including the motor. The foundation requires firmly anchored fasteners, such as anchor bolts.

5. OPERATING CHARACTERISTICS

The Kice rotary lobe blower is a positive displacement type unit whose pumping capacity is determined by size, operating speed, and pressure conditions. It employs dual lobe rotors rotating in opposite directions within a housing enclosed on both ends by end plates.

Effective sealing of the blower inlet from the blower discharge is accomplished by use of very close operating clearances. The resulting absence of moving contact eliminates the need for any internal lubrication in the air chamber. Clearances between the rotors during rotation are maintained by a pair of accurately machined helical timing gears mounted on the two shafts extending outside the air chamber. The two inter meshing rotary lobes are designed to rotate and trap air or gas between each rotor and the housing. As each rotor lobe rotates past the edge of the inlet, the trapped air or gas is essentially at inlet pressure and temperature. Since the blower is a constant volume device, the trapped air remains at inlet pressure until the rotor lobe opens into the discharge port. Immediately, the high pressure air in the discharge line compresses the low pressure air to discharge pressure. The rotors continue to rotate and force the air from the blower into the discharge line.



It can be seen by the illustrations that the air moves, not between the rotors, but between the rotors and the sides of the housing. Also, the direction of rotation of the blower can make either side the inlet or discharge.

No attempt should ever be made to control capacity by means of a throttle valve in the intake or discharge piping. This will increase the power load on the drive system, increase the operating temperatures, and can overload and/or seriously damage the blower. Likewise, if a possibility exists that flow to the blower inlet could be cut off during normal operation of a process, then an adequate vacuum relief valve must be installed near the blower inlet. A pressure type relief valve in the discharge line near the blower is also strongly recommended for protection against cutoff or blocking in this line. A check valve should also be used near the discharge of every blower. This is for both safety and operating conditions.

A V-belt drive is normally employed to obtain the correct blower speed. If conditions change from the design criteria, field changes can be made to the drive by changing the diameter of one or both sheaves to obtain the desired capacity and speed. To protect the blower from back flushing of material, a check valve should be installed in the discharge piping of the blower on all applications.

Consult your Kice sales representative if questions arise.

6. OPERATING LIMITATIONS

To ensure continued satisfactory performance, a blower must be operated within certain approved limitations. The manufacturer's warranty is, of course, also contingent on such operation. Maximum limits for pressure, temperature, horsepower and speed are specified here for the various Kice PD blower sizes when operating at standard atmospheric conditions. Do not exceed any one of these limits.

Blower Model Number	Maximum Pressure/ Vacuum	Maximum Discharge Temperature	Maximum Break Horsepower	Maximum Blower Speed
PD-2000	15 psig/15" h.g. 1 bar/0.5 bar	280° F 128° C	10 hp 7.5 kW	3600 RPM
PD-2500	15 psig/15" h.g. 1 bar/0.5 bar	280° F 128° C	20 hp 15 kW	3600 RPM
PD-3000	15 psig/15" h.g. 1 bar/0.5 bar	320° F 160° C	40 hp 30 kW	3600 RPM
PD-4000	15 psig/15" h.g. 1 bar/0.5 bar	320° F 160° C	65 hp 48.5 kW	3000 RPM
PD-5000	15 psig/15" h.g. 1 bar/0.5 bar	280° F 138° C	80 hp 59.7 kW	3000 RPM
PD-6000	15 psig/15" h.g. 1 bar/0.5 bar	280° F 138° C	120 hp 89.5 kW	3000 RPM

Example: The listed maximum allowable temperature limit (which is a function of the inlet air temperature, as well as, the temperature rise of the air at the discharge) for any particular blower may occur well before the maximum speed or maximum pressure rating is reached. Temperature rise, then, becomes the limiting condition. In other words, the operating limit is always to be determined by the maximum rating reached first, and it can be any one of the four:

1. PRESSURE DIFFERENTIAL
2. DISCHARGE TEMPERATURE
3. BLOWER SPEED
4. BRAKE HORSEPOWER

Kice PD blowers are designed for pressure and/or vacuum service, and have been selected to provide the proper air volume within the pressure, temperature and horsepower range of the blower so as to perform as required.

7. FLOW DIRECTION BY ROTATION

The standard configuration of the Kice PD blower is top inlet, bottom discharge, left hand shaft location, and counterclockwise rotation (see Figure 1).



Figure 1

8. INSTALLATION

Figure 2 shows a typical complete Kice Air Power Unit installation (note the absence of throttle or shut-off valves in either the inlet or the outlet line).

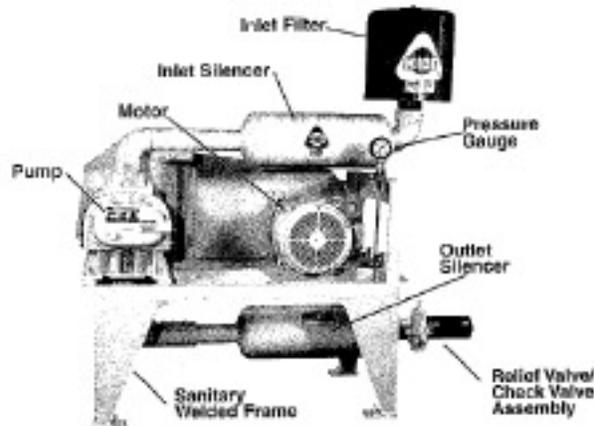


Figure 2

The Kice Air Power Unit should be installed in a protected indoor location, if possible. However, an unprotected outdoor installation will be satisfactory if correct lubrication for expected ambient temperatures is used (see Lubrication section of this manual). Before starting the installation, remove the shipping plugs or covers from the inlet and discharge connections. Inspect the interior of any tubing or piping to which the Air Power Unit will be connected for dirt or foreign objects. Install the inlet filter and turn the blower by hand to insure it rotates freely. Before connecting the Air Power Unit to the conveying line, bump the motor and check for proper rotation. For best results and long life, run the motor and blower for 10 to 20 minutes with no load as a break-in period.

The blower has been factory mounted on the base, and the base should be leveled to insure proper lubrication and even weight distribution. The floor may be uneven; therefore, shims may be needed to prevent twisting the base which, in turn, may cause the blower to be twisted. If the blower is twisted or cramped, the lobes may contact the end plates or the housing. Rotating the shaft by hand will confirm

whether or not this has happened.

To insure proper operation, the unit must be adequately supported and properly installed. All tubing or piping should be independently supported, as excess weight may distort the blower housing and cause contact between moving parts. When vibration isolation pads are used, consult Kice Industries, Inc., for proper location of pads.

SLAB MOUNTED UNITS

A correctly designed and level concrete foundation provides the best means of installing a floor mounted Air Power Unit. The mass of the base must maintain the Air Power Unit/driver alignment, absorb normal vibration, and resist lateral loads. The overall dimensions of the concrete base should extend at least six inches beyond the outline of the Air Power Unit base. The weight of the slab should be two to three times the weight of the rotating assembly, including the motor. The foundation requires firmly anchored fasteners, such as the anchor bolts shown in Figure 3. Hammer drilled expansion fasteners can be used in less demanding applications.

Move the Air Power Unit to the mounting location and lower it over the anchor bolts, leveling the Air Power Unit with shims around the bolts. Fasten the Air Power Unit securely. If grouting is used, shim the Air Power Unit at least $\frac{3}{4}$ inch from the concrete base (see Figure 3). When vibration isolation pads are used, check the Kice drawing for installation instructions.

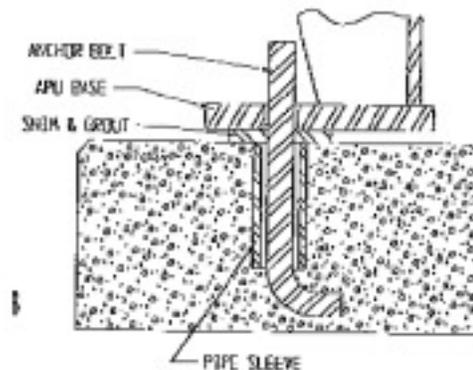


Figure 3

STRUCTURAL STEEL MOUNTED UNITS

When an elevated or suspended structural steel platform is used, it must have sufficient bracing to support the unit load and prevent side sway. The platform should be of welded construction to maintain permanent alignment of all members.

V-BELT DRIVE

The V-belt drive is normally factory installed. In some cases, the drive is removed to facilitate the installation of the Air Power Unit or the customer provides the drive. The following procedure should be used to mount the V-belt drive.

1. Remove all foreign material from the blower and motor shafts. Coat both shafts with machine oil for easier mounting. Mount the belt guard back plate at this time if it is not already in place.
2. Mount the sheaves onto the shafts, checking the sheave bores and bushings for nicks and burrs. Avoid using force. If resistance is encountered, lightly polish the shaft with crocus cloth until the sheave slides

INSTALLATION CONTINUED

on freely. Tighten the tapered bushing bolts sequentially so that equal torque is applied to each.

3. Adjust the motor on its base to a position closest to the blower shaft. Install the drive belts by working each one over the sheave grooves until all are in position. Never pry the belts into place. On Kice Air Power Units, sufficient motor adjustment is provided for easy installation of the proper size belts.
4. Adjust the sheaves and the motor shaft angle so that the sheave faces are in the same plane. Check this by placing a straightedge across the faces of the sheaves. Any gap between the straightedge and the sheave faces indicates misalignment. Important: This method is only valid when the width of the surface between the belt edge and the sheave face is the same for both sheaves. When they are not equal, or when using adjustable pitch sheaves, adjust so that all belts have approximately equal tension. Both shafts should be at right angles to the center belt.

BELT TENSIONING

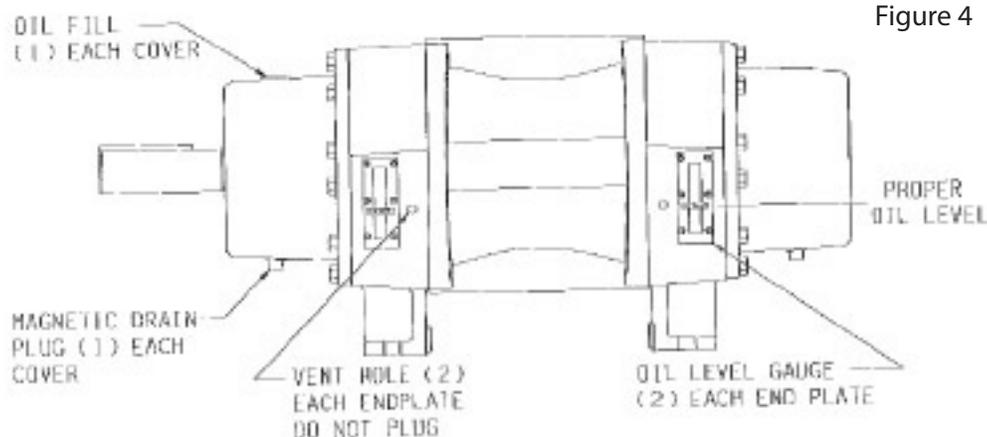
1. Check belt tension with a tensioning gauge and adjust the tension using the motor rail adjustment screws. Excess tension shortens bearing life while insufficient tension shortens belt life, can have adverse effects on blower performance, and may cause vibration. The lowest allowable tension is that which prevents slippage under full load. Belts may slip during start-up, but slippage should stop as soon as the blower reaches full speed. For more precise tensioning methods, consult the drive manufacturer's literature.
2. Recheck setscrews, rotate the drive by hand and check for rubbing, and reattach the belt guard.
3. Belts tend to stretch somewhat after installation. Recheck tension after several days of operation. Check sheave alignment, as well as, setscrew and/or bushing bolt tightness.

LUBRICATION

Every Kice PD blower is factory tested, drained of its oil, and shipped dry to its installation point. Both independent oil reservoirs (one on each end of the blower) must be filled to the proper level before operation.

Shaft bearings at the gear end of the blower are splash lubricated by one or both gears dipping into the oil reservoir formed by the end plate and cover. A slinger assembly (which dips into the oil reservoir) lubricates shaft bearings at the free end of the blower. Before starting the blower, fill the oil sumps as instructed below:

1. Remove the fill plugs from the gear end and the free end covers.
2. Slowly pour oil through each fill hole until the oil appears in the oil sight glass. Slowly bring the oil up to the proper level (see Figure 4).
3. Reinstall the fill plugs in both end covers.



INSTALLATION CONTINUED

KICE recommends the use of synthetic lubricants. Recommended oil viscosity is as follows:

Ambient Temperature		Blower Discharge Pressure (Indoor Installation)	
30°F/0°C and under	Mobil SHC 627	0 - 5 PSIG/0.0 - .34 bar	Mobil SHC 627
30°F - 90°F/0°C - 30°C	Mobil SHC 629	6 - 10 PSIG/0.41 - .69 bar	Mobil SHC 627
ABOVE 90°F/30°C	Mobil SHC 629	11 - 15 PSIG/.076 - 1 bar	Mobil SHC 629

Lubrication should be checked regularly during operation. Though the time lapse between oil changes will need to be determined for each individual installation, the normal time lapse will be between 800-1200 operating hours.



WARNING: Never attempt to change or add oil while the blower is running. Failure to heed this warning could result in damage to the equipment or personal injury.

Approximate Oil Capacities - Total Per Unit			
Model	Capacity	Model	Capacity
PD-2000	3/4 Qt.	PD-2500	3/4 Qt.
PD-3000	1-3/4 Qt.	PD-4000	1-3/4 Qt.
PD-5000	2-3/4 Qt.	PD-6000	2-3/4 Qt.

10. OPERATION & START-UP

Before starting the blower for the first time under power, recheck the installation thoroughly to reduce the possibility of problems. Use the following checklist as a guide, but also consider any other special conditions in your installation.

1. Be certain no bolts, rags or dirt have been left in the blower.
2. Be certain that the inlet piping is free of debris. The inlet of the blower must be protected by an inlet filter.
3. Check the blower leveling, drive alignment, belt tension, and tightness of all mounting bolts.
4. Be certain that the oil is at the proper level in both ends of the blower.
5. Be certain that the electrical motor is properly lubricated, and that the starter is set for the proper amperage and voltage.
6. Rotate the blower shaft several times by hand to make sure the blower is rotating freely. Unevenness or tight spots are an indication of a problem.
7. Check the motor rotation by momentarily pushing (“bumping”) the start button and checking the flow direction of the blower. Reverse the motor connections if the airflow is in the wrong direction.

Initial operation should be carried out under “no load” conditions by not starting the airlock valves that feed material into the conveying line, or by disconnecting the discharge of the blower from the conveying line and venting the discharge to atmosphere. Start the motor briefly, listen for unusual noises, and check that the blower coasts freely to a stop. If any questions exist, investigate before proceeding further.

Assuming all tests are satisfactory, the blower will now be ready for continuous full load operation. During the first several days, make periodic checks to determine that all conditions remain acceptable and steady. These checks may be particularly important if the blower is part of a process system where conditions will vary. At the first opportunity, stop the blower and clean the inlet filter. Also, recheck leveling, drive alignment, belt tension, and mounting bolts for tightness.

11. LONG TERM STORAGE

1. Spray the interior of the blower (lobes, housing and end plates) with a rust preventative.
2. Completely fill both end reservoirs with oil.
3. Securely attach a very prominent tag stating that the end reservoirs are completely filled with oil and must be drained and refilled to proper levels prior to start-up.
4. Apply rust preventative grease to the drive shaft.
5. Attach a desiccant bag to the inner surface of either the inlet or the discharge dust cover to prevent condensation from occurring inside the blower. Make sure the desiccant bag is attached securely to the cover so that it will be removed when the dust cover is removed. It is imperative that the desiccant bag be removed before start-up of the blower.
6. Store the blower in an air-conditioned and heated building if at all possible. At least insure as dry conditions as possible.
7. The blower should be stored with the shaft accessible, so that it can be rotated once or twice every two or three weeks.

12. MAINTENANCE & REPLACEMENTS

Regular inspection of the blower and its installation, along with complete checks on operating conditions, will pay dividends in added life and usefulness. Particular attention should be paid to lubrication of the timing gears and bearings in accordance with comments under the Lubrication section of this manual (Section 9). Also, service the motor per the manufacturer's instructions and check drive belt tension. By use of a thermometer and a gauge, make sure the blower operating temperature and pressure remain within allowed limits.

When a blower is taken out of service, it may require internal protection against rusting or corrosion. The need for such protection must be a matter of judgment based on existing conditions, as well as, length of down time. Under atmospheric conditions producing rapid corrosion, the blower should be protected immediately.

Should adjustments or replacements eventually be needed, these can often be performed locally as described in this manual after obtaining the required parts. Personnel should have a good background of mechanical experience and be thoroughly familiar with these instructions. Major repairs not covered in this manual should be referred to the nearest Kice service representative.

When ordering parts, provide all of the blower nameplate information, plus the item number and description as taken from the appropriate Itemized Parts List in this manual. Numbers shown in parentheses () in sections 18, 19 and 21 correspond to item numbers in the Itemized Parts Lists.

13. SERVICE

Kice offers 2 to 3 business day service on all repair parts shipments. If any trouble occurs to a unit within the warranty period, we suggest you immediately contact the factory for assistance. When returning units under warranty to the factory, transportation charges must be prepaid.

14. REPAIR PARTS

When ordering repair parts or a replacement blower, please provide the following information:

1. Model Number and Serial Number of the blower.
2. Item number and description of the part as shown on the Itemized Parts List.

15. REPAIR KITS

Repair kits are available for all blower models. They include the following parts:

ITEM No.	Qty	Description
9	2	Gear End Bearing
10	2	Free End Bearing
13	1	Drive Shaft Seal
24	2	Key
50	1	Drive Shaft Bearing
58	16	Seal Ring

16. TROUBLESHOOTING BLOWERS

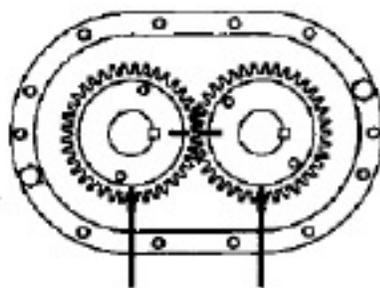
Trouble	Cause	Reasons
Lack of performance	Reduced blower speed Restricted blower inlet Excessive slip through blower Leaking pressure relief valve	Worn or loose V-Belts Dirty or clogged inlet filter Rotor tips worn Worn seats or incorrect setting
Unusual noises	Rotors making contact with case end plates or each other	Excessive operating pressure Failing bearings and seals
Leaking oil	Seals failing Oil foaming Overfilling	Excessive operating pressure and/or temperature Incorrect lubricant or overfilling Seal vent holes plugged
Overheating	Reduced blower speed Restricted blower inlet Excessive slip through blower Overpressure	Worn or loose V-belts Dirty or clogged inlet filter Rotor tips worn Pressure relief valve setting incorrect
Failing bearings and/or gears	Using incorrect lubricant Oil levels too low or high Oil temperature too high Infrequent oil changes	See instructions on page 13 or consult factory Inattention or overfilling Excessive operating pressure and/or speed See instructions on page 13

17. TROUBLESHOOTING V-BELT DRIVES

Trouble	Cause	Reasons
Belt slip	Not enough tension (sidewalls glazed)	Replace belts and apply proper tension
Drive squeals	Shock load Heavy starting load	Apply proper belt tension Increase belt tension
Belt turned over	Broken cord caused by prying on sheave Impulse loads Misalignment of sheave and shaft Worn sheave grooves Excessive belt vibration	Replace belts as a set only Replace sheaves Realign drive
Belt breaks	Shock loads Heavy starting loads Belt pried over sheaves Foreign objects in drive	Apply proper belt tension; recheck drive Use compensatory starting Replace belts correctly Install belt guard
Belt wears rapidly	Sheave grooves worn Mismatched belts Belt slips Sheaves not aligned Oil or heat condition	Replace sheaves Replace belts as a set only Apply proper belt tension Realign sheaves Eliminate oil, ventilate drive

18. DISASSEMBLY OF BLOWER

1. Remove the blower from the Air Power Unit and drain the lubricant from both ends by removing the magnetic drain plugs (31). Mark the end plates, covers, and housing so they can be reassembled in their original position.
2. Remove the cap screws (26) from the drive end cover (6). Using a beveled chisel and a hammer, remove the cover.
3. Remove the retaining ring (47) from the drive shaft.
4. Using gear pullers, remove the drive shaft bearing (50).
5. Remove the drive shaft bolts (66). A chisel can be used to bend back the locking tab (65).
6. Remove the drive shaft (45).
7. Remove the gear cap screws (29) and washers (25).
8. Align the timing marks on the timing gears (8) – see Figure 5A.



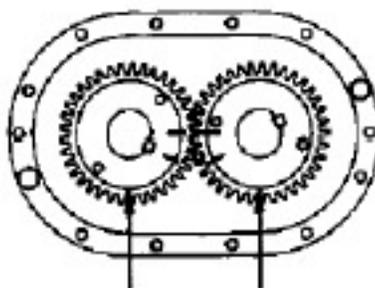
DRIVE GEAR DRIVEN GEAR

Figure 5A

KEYWAYS IN LINE AND TIMING MARKS MATCHED

Figure 5A

9. Rotate the drive gear clockwise three teeth off the timing mark and mark this location (see Figure 5B). This gear position is necessary so the rotors will clear and not jam. Do not allow the reference marks to change location while the driven gear is being removed.



DRIVE GEAR DRIVEN GEAR

Figure 5B

TIMING MARKS ADVANCED 3 TEETH.
(REFERENCE MARKS ALIGNED)

Figure 5B

10. Using gear pullers, pull the driven gear first.
11. After removal of the driven gear, pull the drive gear.
12. Remove the gear end bearing retainer cap screws (62) and the retainer plate (14), exposing the bearings.
13. Remove the cap screws (26) from the free end cover (7). Using a beveled chisel and a hammer, remove the cover, exposing the oil slinger assembly (20).
14. Remove the flat head socket screws (29* or 69 & 307**), washer(s) (25* or 281**), spacer (57), and oil singer (20).

DISASSEMBLY OF BLOWER CONTINUED

15. Use bar pullers (see Figure 6) and attach to the free end plate bores. Pull the free end plate (4) from the rotor shafts. (Note: two bar pullers are suggested.)

* - PD-2000/2500, ** - PD-3000/4000/5000/6000

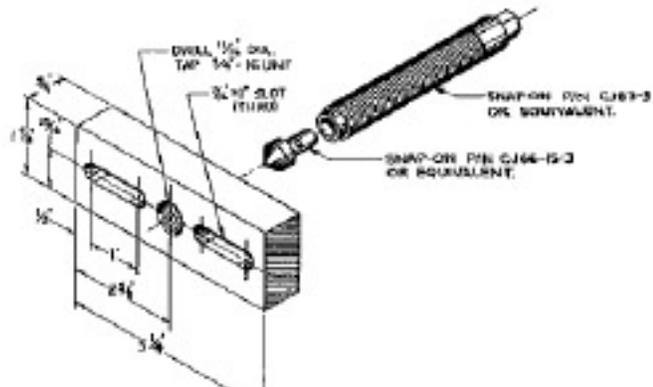


Figure 6 - Illustration of Bar Puller

16. Attach the bar puller to the gear end plate bore and push out the rotors (1), one at a time.
17. Using a rubber mallet, tap the end plate from the housing (3).
18. Using a soft metal punch and a mallet, tap out the bearings from the end plate bores.
19. Remove the seal rings (58) from the piston ring carriers (239).
20. Inspect all parts for wear and serviceability.

19. ASSEMBLY OF BLOWER

The assembly procedure is generally the same for all blower models.

Dowel pins are used to locate the end plates, housing, and end covers in their proper location relative to each other. Be sure they are in place.

It is recommended that the gear end rotor shaft bearings be purchased from Kice, as they are specially ground to locate the rotors with correct end clearance relative to the gear end plate.

Make sure all parts are clean and free of any nicks or burrs caused by disassembly. Refer to pages 30 and 31 for pressing tools.

It is suggested that long (12") feeler gauges be used to check the interlobe timing – preferably two .006", one .005", one .004", and one .003". This will give you all the combinations from .003" to .024".



Caution: All Hex head cap screws used on Kice PD blowers are metric. The use of anything other than metric cap screws will result in thread damage. All pipe plug holes are American Standard Pipe Thread.

PREPARATION OF END PLATE AND ROTORS FOR ASSEMBLY

1. If the piston ring carriers (239) are being replaced, lubricate the shaft and press on the new sleeves with the inside chamfer facing the lobes using the tools shown on pages 30 and 31.
2. Install the seal rings (58) into the grooves of the piston ring carriers on the gear end only and lock in place by compressing the rings. Center the rings on the sleeves. The seal rings for the free end of the shafts will be installed later in the assembly.

ASSEMBLY OF BLOWER CONTINUED

ATTENTION: All piston ring carriers or seal journals MUST be polished to remove any scratches or nicks. Failure to polish seal journals could result in seal leakage.

GEAR END ASSEMBLY

1. Stand the rotors on the press with the drive rotor (1) on the left, making sure the keyways are properly positioned as shown in Figure 7. You may use the drive end plates as a temporary fixture to support the rotor lobes while pressing on the bearings and gears.

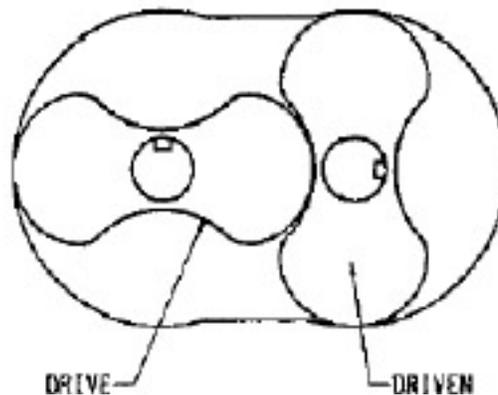


Figure 7

2. Install the gear end plate (4) over the rotor shafts. The seal rings should glide into their respective bores with ease.
3. Lubricate the shafts and press the double row ball bearings (9) onto the shafts and into the end plate bores. Use the bearing pressing tools shown on page 30 and 31.



Caution: These bearings have flush ground faces. Look for a black dot (acid mark) on the inner race. Install with the dot up. Do not use bearings that have not been flush ground within a .001" tolerance.

4. Install the bearing retainer plates (14) and secure with cap screws (62). At this time, using feeler gauges, check the clearances between the face of the end plate and the rotor lobes. Refer to the table at the end of this section for minimum/maximum gear end clearances. If the clearances are not within specifications, recheck the parts to find the cause of the incorrect clearances before proceeding.
5. Install the keys (24) in the rotor shaft keyways; a tight fit is required.
6. Lubricate the shafts and keys, and press the drive gear (right hand helix) onto the drive rotor. To install the driven gear, align the reference marks as shown in figure 5B. Tap the gear with a mallet to start, then press the gear until seated.

NOTE: ALL TIMING GEARS MUST BE USED IN SETS AS THEY ARE MATCHED AND SERIALY NUMBERED

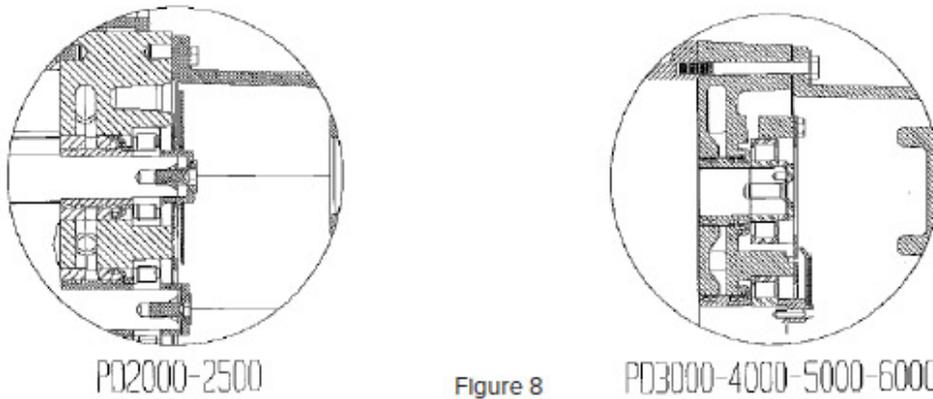
7. Install the gear washers (25) and secure with cap screws (29), using a few drops of Loctite 242 (removable thread locker) on each screw.
8. Remove the assembly from the press and stand it on a worktable with the gears down. Place blocks under the end plate to prevent the assembly from falling over. The drive gear should remain on the left side.
9. Install the rotor housing (3) and secure temporarily with two cap screws evenly spaced.
10. Check the clearances between the end of the lobes and the end of the housing using a flat bar and feeler gauges or a depth micrometer. Refer to the table at the end of this section for minimum/maximum free end clearances.
11. Install the seal rings (58) into the grooves of the piston ring carriers on the free end and lock into place by compressing the rings.

ASSEMBLY OF BLOWER CONTINUED

12. Install the free end plate (4) over the rotor shafts. The seal rings should glide into their respective bores with ease.
13. Lubricate the free end of the rotor shafts.
14. Install the free end roller bearings (10) with the flange or lip side facing away from the blower. Install the spacer (57) and the washer (25* or 281**), and secure with the flat head socket screw (29* or 307**) using a few drops of Loctite 242.

* - PD 2000/2500, ** - PD 3000/4000/5000/6000

NOTE: The inner race of all the roller bearings has a flange on one side only. This flange must face outward (see Figure 8).

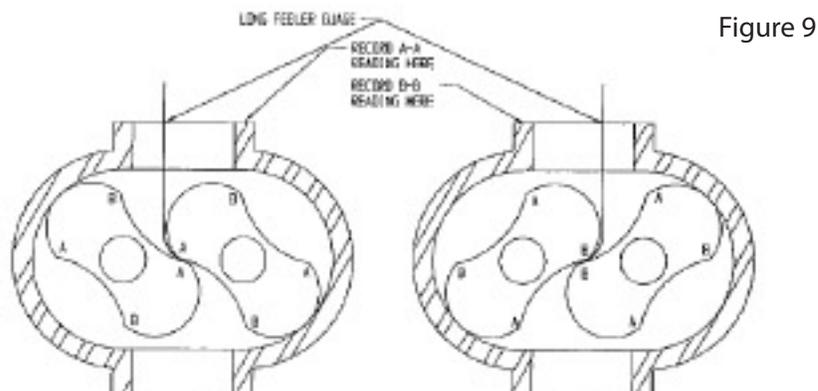


15. Install the spacer (67*) or roll pin (68**), then the oil slinger (20), and secure with the flat head screw (29* or 69**) and washer (25*) using a few drops of Loctite 242.
16. Using silicone sealer, place a bead around the perimeter of the free end plate and install the free end cover (7) with cap screws (26).
17. Lay the assembly down with the drive gear on the left for timing.

* - PD 2000/2500, ** - PD 3000/4000/5000/6000

ADJUSTING ROTOR INTERLOBE CLEARANCE

The driven gear is made of two pieces. The outer gear shell is fastened to the inner hub with four cap screws and located with two dowel pins. A laminated shim, made up of .003" laminations, separates the hub and the shell. Adding or removing shim laminations moves the gear shell axially relative to the inner hub. Being a helical gear, it rotates as it is moved in or out and the driven rotor turns with it, thus changing the clearance between the rotor lobes. Changing the shim thickness .015" on a PD 6000 model will change the interlobe clearance approximately .012". Refer to the table at the end of this section for minimum/maximum interlobe clearances.



ASSEMBLY OF BLOWER CONTINUED

EXAMPLE (Model 6000): Referring to Figure 9, check the clearance at AA (right hand reading) and BB (left hand reading). If AA reading is 0.017" and BB reading is 0.004", by removing .018" of shim, the readings should then be: AA = 0.011" and BB = 0.010". To determine the amount of shim to add or remove, subtract the smaller reading from the larger and multiply the result by:

0.7 (for PD 2000 & 2500 models):

$$0.017" - 0.004" = 0.013"; 0.013" \times 0.7 = 0.0091" \text{ or } .009"$$

1.1 (for PD 3000 & 4000 models):

$$0.017" - 0.004" = 0.013"; 0.013" \times 1.1 = 0.0143" \text{ or } .015"$$

1.3 (for PD 5000 & 6000 models):

$$0.017" - 0.004" = 0.013"; 0.013" \times 1.3 = 0.0169" \text{ or } .018"$$

Round off the amount to the nearest increment of shims available (i.e., .003", .006", .009", .012", etc).

To determine whether to add or remove shim: If the right side reading is higher than the left side, remove this amount. If the right side reading is lower, then add this amount.

When removing the gear shell from the driven gear, it is not necessary to remove the gear lock bolt. After completing the timing of the lobes, bend over the lock tabs on the four gear cap screws.

1. Install the drive shaft (45) along with the oil slinger (310) and secure by the cap screws (66) and lock plates (65**), bending over the tabs. Make sure that the dowel pins (22) are in the gear end plate. ** - PD 3000/4000/5000/6000 only

NOTE: The drive shaft run out, measured at the seal journal, should be within .003" T.I.R.

2. Install the drive shaft bearing (50).
3. Secure the bearing on the drive shaft with the retaining ring (47).
4. Remove the temporary screws and place a bead of silicone sealer around the perimeter of the end plate. Carefully slide the cover over the drive shaft. Make sure the dowel pins (22) are in place. Secure with cap screws (26). (See pages 30 and 31 for tools to hold the bearing square while installing the gear end cover.)

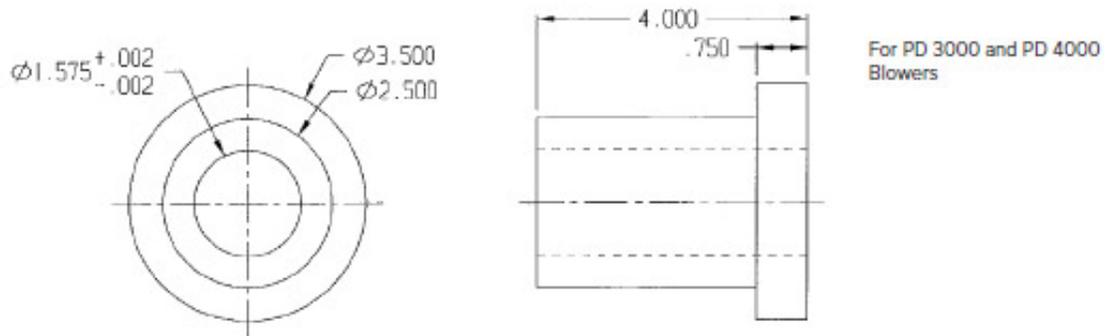
NOTE: Take care as not to damage the seal on the drive shaft.

5. Prior to putting the blower into operation, follow the Installation, Lubrication and Operation & Start-up sections of this manual (Sections 8, 9 and 10). Observe the oil level frequently during the initial hours of operation. A badly installed or damaged oil seal will result in oil loss.

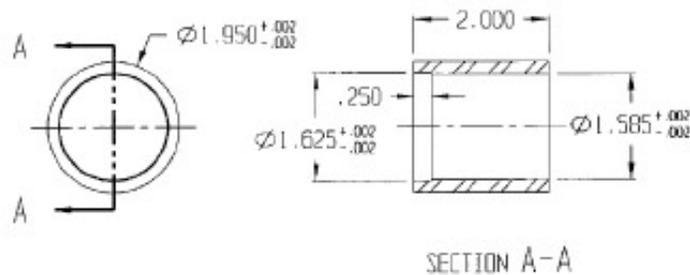
20. RECOMMENDED CLEARANCES FOR KICE PD BLOWERS

	Gear End	Free End	Total End	Tip-Port	Tip-Dowel	Interlobe
	Min/Max	Min/Max	Min/Max	Min/Max	Min/Max	Min/Max
PD-2000	0.003	0.005	0.011	0.003	0.006	0.006
	0.006	0.011	0.014	0.007	0.010	0.010
PD-2500	0.003	0.007	0.013	0.003	0.006	0.006
	0.006	0.013	0.016	0.007	0.010	0.010
PD-3000	0.004	0.005	0.013	0.003	0.007	0.008
	0.008	0.014	0.018	0.009	0.009	0.012
PD-4000	0.004	0.007	0.015	0.003	0.007	0.008
	0.008	0.014	0.018	0.009	0.009	0.012
PD-5000	0.004	0.010	0.018	0.003	0.007	0.010
	0.008	0.017	0.021	0.009	0.009	0.014
PD-6000	0.004	0.011	0.019	0.003	0.007	0.010
	0.008	0.018	0.022	0.009	0.009	0.014

20. SPECIAL TOOLS

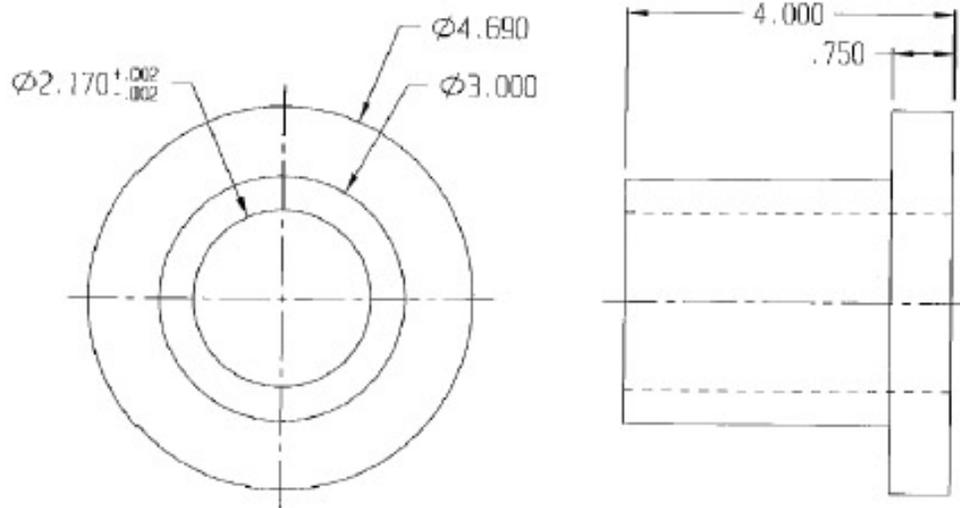


LIP SEAL AND BEARING PRESSING TOOL

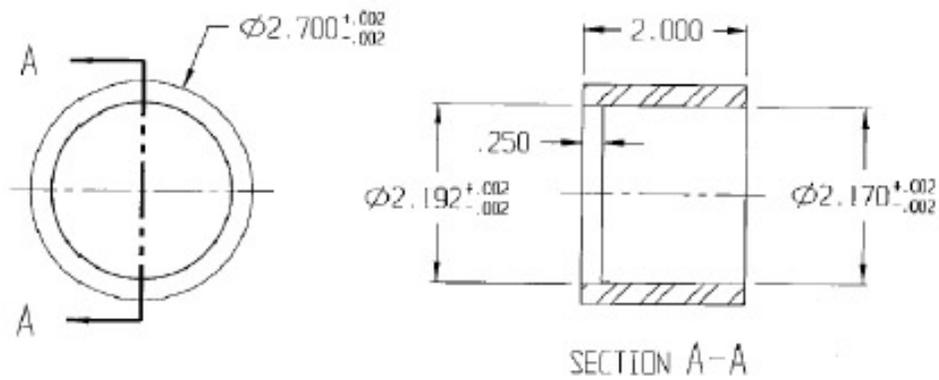


SLEEVE PRESSING TOOL
(USE WITH BEARING PRESSING TOOLS)

For PD 5000 and PD 6000 Blowers



LIP SEAL AND BEARING PRESSING TOOL



SLEEVE PRESSING TOOL
(USE WITH BEARING PRESSING TOOLS)

21. REPLACING THE DRIVE SHAFT LIP SEAL

1. Perform the proper lockout/tagout procedures on the blower motor.
2. Remove the drive guard, drive belts, driven sheave and bushing, drive shaft key (23), and drive guard backplate.
3. Drill two 1/8" diameter holes into the seal case (13) on opposite sides of the drive shaft (45) from one another.
4. Install a screw into each 1/8" diameter hole so that the head of the screw extends out from the seal case.
5. Using two slotted pry bars (one for each of the two screws), slip the beveled nail slot of the pry bar beneath the underside of the head of the screw.
6. Manipulate both of the pry bars at the same time so that the screws pull the lip seal (13) along the drive shaft (45) and out of the bore in the drive cover (6).
7. Remove the lip seal from the drive shaft and discard.
8. Polish the area of the shaft where the new lip seal will be installed with Bear-Tex or steel wool.
9. Coat the drive shaft with grease and install the new Viton lip seal.

NOTE: Take care as not to damage the seal on the drive shaft. A badly installed or damaged oil seal will result in oil loss.

10. Reinstall the drive guard backplate, drive shaft key, driven sheave and bushing, drive belts, and drive guard.
11. Release the blower motor from lockout/tagout.

KICE INDUSTRIES, INC.

5500 N. Mill Heights Dr.

Wichita, KS 67219-2358

(P) 316.744.7151

(F) 316.744.7355

sales@kice.com

kice.com