



AIRVAK

**TWIN LOBE ROTARY AIR BLOWERS
(ROOTS BLOWERS)**

**AIR/WATER COOLED TYPE
(HORIZONTAL & VERTICAL FLOW)**

OPERATING MANUAL



Installation Operation Maintenance

WARNING

**Donot Operate Without
Reading Manual**

AIRVAK BLOWERS PVT LTD

Khasra No-14/19, Plot No. Nangli Sakrawati Industrial Area,
Najafgarh, New Delhi-110043, India.

Phone : 011- 65171800

Mob.: +91-9312168073, +91-9971912499

E-mail : info@airvakblower.com • Web : www.airvakblowers.com



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Airvak Twin Lobe Air Compressors/blowers

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CAUTION

AIRVAK BLOWER IS SHIPPED WITH OR WITHOUT OIL.

BEFORE OPERATING, PUT THE REQUIRED AMOUNT OF OIL INTO THE RESERVOIRS AS PER INSTRUCTIONS UNDER LUBRICATION.

DO NOT FILL OIL RESERVOIRS UNTIL BLOWER IS MOUNTED IN ITS OPERATING LOCATION.

NOTICE

AIR BLOWERS ARE MEANT FOR INDOOR INSTALLATION OR SHOULD BE PROTECTED FROM DIRECT RAIN AND SUNLIGHT, IF INSTALLED OUTDOOR.

THANKS...FOR YOUR TRUST ON DEPENDABLE AIRVAK QUALITY.

FAULT CAUSE & REMEDY

SYMPTOM	PROBABLE CAUSE	REMEDY
Vibration	Drive misalignment. Impeller rubbing (Distant knocking sound would be observed). Worn bearings/gears. Loose pulley/coupling.	Check alignment. Check for hot points. Recheck blower alignment and mounting, Recheck impeller timing. Check and replace the bearings/gears. Check if pulley/coupling is loose on shaft. Check key.
Blower jams after running for a short period	Insufficient axial clearances Differential pressures across suction & discharge high, resulting in over heating & subsequent jamming, due to thermal expansion.	Correct clearances. Correct differential pressures.
Blower makes heavy knocking sound on running	Unit out of time. Distortion due to improper mounting or pipe strains. Differential pressure across the suction and discharge openings too high. Worn bearings/gears.	Retime impellers. Check mounting alignment and relieve pipe strains. Check gauge readings across the suction and discharge ends. Check and replace the bearings/gears.
Oil leaking out of oil fill hole	Excessive oil level. Oil seal leakage.	Correct oil level. Check and replace gear end oil seals.
Traces of oil in blower casing	Oil seal leakage.	Check and replace oil seals.

FAULT CAUSE & REMEDY

SYMPTOM	PROBABLE CAUSE	REMEDY
No air flow	Speed too low. Wrong direction of rotation. Obstruction in piping.	Check speed and verify as per recommendations. Check for correct direction of rotation. Check suction and discharge line for any obstruction.
Low capacity	Speed too low. Excessive pressure. Discharge line leaks.	Check speed, belt drive slippage. Check the line pressure. Check up for open flow path.
Excessive power consumption of blower	Speed too high. Differential pressure across the suction and discharge openings too high. Impellers rubbing.	Correct the speed. Check line pressure with rated pressure. Check & clean filter and silencer. Check for any obstruction in the suction and discharge line. Check the impellers for any hot spots/rubbing marks. If observed, reset impeller timing. This operation requires skill and patience. If in doubt, contact "AIRVAK".
Overheating of bearings and gears / blower	Inadequate lubrication. Differential pressure across the suction and discharge openings too high. Coupling misalignment. Belt slippage/Over tightened belts. Too much oil in gear case. Worn impeller, clearances too high. Internal contact.	Check for oil level and replace dirty oil. Check line pressure with rated pressure. Check & clean filter and silencer. Check for any obstruction in the suction and discharge line. Check alignment and realign. Adjust belt tension. Correct oil level. Replace impellers. Reset clearances.



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TO GET MAXIMUM FROM YOUR "AIRVAK" BLOWERS

- **Make sure proper oil levels 3/4 of Glass Indicator are maintained in the gear end and grease/oil in the bearing end.**
- **Check oil level and grease every 100 hours of operation. Loss of oil or grease should be replenished.**
- **First oil change should be done within the first 200 operating hours and thereafter every 1000 hours or more often, if oil gets dirty.**
- **Check belt tension every fortnight. Too tight belts would cause premature bearing failure while too loose belts would cause overheating of belts and pulleys.**
- **Check regularly for any knocking or abnormal sound. High frequency sound indicates bearing trouble. Knocking sound indicates rotor timing upset. Contact "AIRVAK" for necessary adjustments.**
- **Clean air filter every fortnight by reverse airflow. Choked filter would result in excessive power consumption and overheating of blower. Replace filter every three months or earlier.**
- **Check and clean silencer in every Two month.**

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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 safety hazards and be cautious. Some general safety precautions are given below.

DANGER

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

- Keep fingers and clothing away from blower inlet and discharge ports, revolving belts, pulleys, 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.
- Electric shock can and may be fatal.
- Open main, disconnect switch, tag and lockout before working on the control.
- Disconnect the Blower unit from its power source, tag and lockout before working on the unit.

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BLOWER STARTUP CHECKLIST

- Check the unit and all piping for foreign materials and clean if required.
- Check the flatness of the feet and alignment of the drive. Feet that are bolted down in a bind can cause distortion of the casing, disturbing the internal clearances.
- If blowers are V belts driven, check the belt tension and alignment. Over-tensioned belts create heavy bearing loads, which leads to premature failure. Mis-aligned V belts can cause the impellers to rub against the side plates, resulting in overheating and jamming on operation. Misaligned couplings can cause premature bearings/shaft failures.
- Be sure adequate drive guards are in place to protect the operator from severe personal injury from incidental contact.
- Check the unit for proper lubrication. Proper oil level cannot be overemphasized. Too little oil will ruin bearings and gears. Too much oil will cause overheating and can ruin gears and cause other damage. Ensure drive end bearings are greased.
- With motor locked out, turn the drive shaft by hand to be certain the impellers do not bind.
- "Jog" the unit with the motor a few times to check direction of rotation and to be certain it turns freely and smoothly.
- Start the unit and operate for 15 minutes at no load. During this time check for abnormal noise and other indications of interference.
- Apply the load and observe the unit for one hour. Check frequently for abnormal noise / over heating / overloading during the first day of operation. If malfunctions occur, do not continue to operate. Problems such as knocking impellers can cause serious damage if the unit is operated without correction

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Whenever the equipment needs attention, the operator or repairman should locate the cause and correct the trouble quickly. The trouble-shooting "Fault Chart" is provided to assist the mechanic in those respects.

Contact factory for any information or assistance giving blower Model No., Serial No., capacity and pressure details, marked on the nameplate on the Blower.

CONTACT INFORMATION

AIRVAK BLOWERS PVT LTD

Khasra No-14/19, Plot No. Nangli Sakrawati Industrial Area,
Najafgarh, New Delhi-110043, India.

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Recommended Oil :

CASTROL HYPOY B90,
SERVO GEAR SUPER 90,
HP GEAR OIL X-P90,
BP SPIROL SUPER 90EP

Recommended Grease :

CASTROL AP-2/AP-3,
LITHIUM BASE GREASE
WITH HIGH TEMPERATURE
STABILITY

BLOWER DETAIL :
BLOWER MODEL :
BLOWER SERIAL NO :
CAPACITY :
PRESSURE :
RECOMMENDED MOTOR :
V BELT :
BLOWER PULLEY :
MOTOR PULLEY :
ACCESSORIES :



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WARNING

Failure to observe these notices could result in damage to equipment.

- Stop the unit if any repairs or adjustments on or around the Blower are required.
- Disconnect the Blower unit from its power source, tag and lockout before working on the unit.
- Do not operate unit if safety devices are not operating properly. Check periodically. Avoid bypassing safety devices

Working Principles

Airvak Twin Lobe Rotary Blowers are positive displacement units, whose pumping capacity is determined by size, operating speed and pressure conditions. It employs two double lobe Impellers mounted on parallel shafts, rotating in opposite direction within a casing closed at the ends by side plates. As the impellers rotate, air is drawn into one side of the casing and forced out the opposite side against the existing pressures. The differential pressure developed, therefore, depends upon the resistance of the connected system. The Blowers, being Positive Displacement Type, do not develop pressure within the casing but the discharge pressure depends upon the system resistance / back pressure. Effective sealing of the compressor inlet area from the discharge area is accomplished by use of very small operation clearance, eliminating the need of any internal lubrication of the lobes. A pair of accurately machined alloy steel, hardened and ground timing gears maintain clearances between the impellers, during rotation. The air, thus, delivered is **100% OIL FREE**

The pumping capacity of a lobe compressor, operating at constant speed remains relatively independent of inlet and discharge pressure variations. These Blowers are constant volume machines, which deliver a fixed discharge against the system back pressure. It is, therefore essential to ensure that minimum pipeline restrictions, at the inlet and discharge, are imposed.

Adequate size piping and large radius bends ensure minimum line losses resulting in higher efficiency and low power consumption. Sudden change in pipeline cross section should also be avoided.

To change capacity, it is necessary either to change speed (energy saving) or vent some of the air into atmosphere (not energy saving). The air must not be re-circulated from the discharge to suction as it may result in over-heating. No attempt should ever be made to control the capacity of compressor by means of throttle valves in the intake or discharge piping. This increases the power load on the motor and may seriously damage the compressor. There is an increase in the discharge air temperature due to heat of compression. As a thumb rule the discharge air temperature increases 12°C for every 0.1 Kg/cm^2 of ΔP above the inlet temperature.

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Nominal heating based on discharge pressure is normal and no cause of alarm.

NOTE ON INPUT POWER

The input power to the blower motor is proportional to the blower speed and system back pressure. When operating at the rated speed, too high or too low power intake indicates change in differential pressure across the blower inlet and discharge port. During installation ensure the differential pressure does not exceed the rated pressure as increase in differential pressures would result in overheating / overloading of the blower. It is advised that when process has attained equilibrium the input power to the blower (or input current) may be recorded and change in this reading would indicate change in load conditions. Increase in power intake would result for

1. Suction filter getting choked
2. Suction / Discharge silencer getting choked
3. Suction / Discharge line valve, if any, not functioning
4. Change in system parameters.

It is strongly recommended that the cause of overloading must be rectified so as to prevent overloading and overheating of the blower.

STARTING UP

After the final check-up the blower is ready for trouble free service.

TROUBLE SHOOTING

Even though AIRVAK Blowers are well designed and manufactured, there may be times when servicing will be required due to normal wear, the need for adjustment, or various external causes. In general, major repairs are to be considered beyond the scope of maintenance work and should be performed at the factory or by factory trained people.

The design of the blower is basically simple and many repair operations are straightforward but the work should be done by personnel with good mechanical experience. Some operations involve extra care, patience and a degree of precision work. Well-qualified personnel, only, should only undertake adjustment and setting of internal clearances, as improper setting may cause serious damage to the blower.

WARNING

ENSURE LUBRICATION OF BEARINGS AND GEARS IS REGULARLY MAINTAINED. THIS AVOIDS PREMATURE FAILURE OF BLOWER. PROVIDE SUITABLE PROTECTION/COVER TO PREVENT LUBRICANT GETTING CONTAMINATED BY DUST, DIRT AND WATER AS THESE RENDER IT INEFFECTIVE.

CHECK BEFORE STARTING OF BLOWERS

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 a new location. It is suggested that the steps be followed in sequence and checked off in the boxes provided.

- ☞ Check the unit and all piping for foreign materials and clean if required.
- ☞ Check the flatness of the feet and alignment of the drive. Feet that are bolted down in a bind can cause distortion of the casing, disturbing the internal clearances.
- ☞ If blowers are V belts driven, check the belt tension and alignment. Over-tensioned belts create heavy bearing loads, which leads to premature failure. Mis-aligned V belts can cause the impellers to rub against the side plates, resulting in overheating and jamming on operation. Misaligned couplings can cause premature bearings/shaft failures.
- ☞ Check the unit for proper lubrication. Proper oil level cannot be overemphasized. Too little oil will ruin bearings and gears. Too much oil will cause overheating and can ruin gears and cause other damage. Ensure drive end bearings are greased.
- ☞ Start the unit and operate for 15 minutes at no load. During this time check for abnormal noise and other indications of interference.
- ☞ Apply the load and observe the unit for one hour. Check frequently for abnormal noise / over heating / overloading during the first day of operation. If malfunctions occur, do not continue to operate. Problems such as knocking impellers can cause serious damage if the unit is operated without correction.



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INTRODUCTION : YOUR KEY TO TROUBLE FREE SERVICE

Thank you for investing in AIRVAK quality. Your Airvak Blower is a precision-engineered blower that has been carefully manufactured and thoroughly tested at the state-of-the-art AIRVAK Blowers factory as per BS1571 Part II.

As with other precision machinery, there are several relatively simple installation, operation and maintenance procedures that you must observe to optimum blower performance. There is no guesswork in the manufacture of your highly advanced Airvak Blower and there must be none in preparing the Blower to get the job done in the field.

The purpose of this manual is to help you properly install, operate and maintain your Airvak Blower. It is essential that you review all sections of this manual in preparation for installing your blower. Follow the instructions carefully and you will be rewarded with trouble free Airvak service.....year in and year out.

AIRVAK BLOWER ASSISTANCE: For prompt professional

AIRVAK service always contact at following address.

AIRVAK BLOWERS PVT LTD

Khasra No-14/19, Plot No. Nangli Sakrawati Industrial Area,
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EQUIPMENT CHECK & STORAGE

EQUIPMENT CHECK: On 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, unpack 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 Airvak Blower was packed at the factory with adequate protection to permit normal storage for upto Two (2) months.

If the unit is to be stored under adverse conditions or for extended period of time, the following additional measures should be taken to prevent damage.

1. Store the Blower in a clean, dry 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.

CAPACITY CONTROL: The capacity of the blower can be varied by changing the blower speed, however, confirmation to the input power and maximum speed must be made prior to doing so. No valves should be put in to the suction/discharge line to regulate the air capacity. One may, however, vary the discharge air capacity by venting out some of the air into atmosphere.

LUBRICATION:

Correct lubrication is probably the most important requirement, other than operating the blower within its specific rating limits. In a blower there are no moving contacts between the two impellers or between impellers and the body or side plates. The wear is then, confined to the timing gears, the bearings and the shaft seals. All are lubricated and wear should be nominal if clean oil of proper grade is always supplied.

Timing gears wear should be negligible over the normal period of service. Gear teeth are hardened and ground to super finish. A reasonable degree of tooth wears, which normally can be accommodated without permitting contact between lobes.

However high oil level in the gearbox would cause churning and excessive oil heating usually indicated by high temperature at the bottom of the sump. If operation is continued under this condition, gear will wear and tooth clearance will be lost. Rapid wear of teeth then will probably develop, which will eventually produce impeller knocking. From this point serious damage will be unavoidable if operations are continued. Tooth fracture, brought on by sustained overloading and shock loads would produce similar results suddenly. Shaft bearings are critical in the service life of the Blower. Gradual wear may allow shaft position to change slightly until rubbing develops between impellers and cylinders or plates. Sudden bearing failure is usually more serious. Since the impellers shaft assembly is no longer supported and properly located, extensive damage is likely to occur if operation is continued. It has been observed that main cause of premature sudden bearing failure is either lack of lubrication or contamination. It is, therefore, strongly advised to take all the necessary steps to ensure proper, clean lubrication of gears and bearings.

WARNING

Choking of suction filter leads to increased load on the blower. Replace filter every three months. Servicing the air filters is one of the most important maintenance operations to be performed periodically to ensure long blower life.

PRESSURE RELIEF VALVE: A pressure relief valve is necessary in the discharge pipe to protect against any overloading at the discharge line. The standard relief valve supplied is spring loaded type. It should be mounted in the discharge line. The spring tension on the valve are adjusted to suit the pressure requirement of the system. In case of discharge line pressure exceeding the set limits, the valve cap pops up, discharging air to atmosphere

NOTICE

Relief valves should be placed as close as possible to the Blower discharge. They are not meant to discharge full capacity and therefore cannot be taken as safeguard against total blockage.

NON RETURN VALVE : Non-return valve may be fitted close to the discharge port to prevent the compressor from running in the reverse direction when switched off under load conditions. In multiple blower installations when two or more units discharge into a common header, use of non-return valves is recommended. One non-return valve should be located in each blower discharge line. Properly installed, they will protect against damage from reverse rotation caused by air back flow through an idle blower.

MEASURING AND MONITORING DEVICES: Pressure gauge is supplied along with the supply and is recommended to connect it to the discharge pipe line, close to the blower, to ensure that the system pressure is within the Blower rated pressure. However, U-Tube Mercury manometer may be used for more accurate observations. Special measuring and monitoring systems can be connected as per the individual requirement.

CAUTION

Before running the Blower, drain the oil, if any, and replace to the proper operating level with clean, fresh lubricant.

7. Rotate the Blower shaft (20 to 25 turns) monthly during storage. Inspect the Blower shaft (near shaft seal area) monthly and spray with rust inhibitor if needed.

Blower inlet & outlet are temporarily capped to keep out dirt and other contaminants during shipment. These covers must be removed before start-up. Keep them intact during the period of storage.

Airvak Blowers are internally and externally treated to protect against normal atmospheric corrosion. Prior to installation remove covers from Blower inlet and discharge openings and inspect internals. If the cleaning is required, clean the internals thoroughly using any commercial safety solvent (e.g. Kerosene). Continue this procedure until the unit is visibly clean. Check the drive shaft by rotating manually to ensure the impellers turn freely at all points. No internal adjustment is generally required.

WARNING

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

INSTALLATION

FOUNDATIONS: For permanent installations we recommend concrete foundations be provided, and the equipment may be grouted to the concrete. Before grouting, equipment must be leveled, free of all strains, and anchored so no movement will occur during setting of grout. After grout has completely hardened, a recheck is necessary to compensate for shrinkage etc. If required add shims under Blower feet after final tightening of foundation bolts to remove strain from the Blower housing. Blower assembly can be mounted on Anti Vibration Pads or directly placed on leveled concrete surface.

LOCATION: If possible, install the Blower in a well & clean, dry place with plenty of room for inspection and maintenance. Protection from direct sunlight and rainwater is required. Effect of location on driver and accessory equipment must also be considered.

CONFIGURATIONS: Airvak Blower is available in both vertical and horizontal flow configurations. In case of vertical flow configurations top port is the suction port and the bottom port is the discharge port with direction of rotation clockwise as viewed from the drive (Pulley) end. In case of horizontal flow configuration (when viewing from drive pulley end) the right side is the suction port and the discharge port is on the Left hand side with direction of rotation clockwise.

DRIVE INSTALLATION

BELT DRIVE: Belt drives must be carefully aligned. Motor and blower pulleys must be parallel to each other and in the same plane. Belt Tension should be carefully adjusted to the belt manufacturer recommendation using a belt tension gauge. Check tension frequently during the first day of operation.

WARNING

Over tightened belts leads to heavy bearing loads and shaft deflections and may result in premature failure of bearings / shafts.

The location of pulley on the Blower shaft greatly affects the stress in the shaft. The optimum blower pulley positioning is as close as possible to the blower drive shaft bearing cover, to minimize overhung loads.

PIPING: Inlet and discharge connections on all blowers are large enough to handle maximum volume with minimum friction loss. Reducing the pipe diameter on either inlet or discharge will only create additional line loss and increase the overall pressure differential and input power.

Pipe threads/flanges (suction and discharge) must meet the compressor connections accurately and squarely. No attempt should be made to correct misalignment of end connections by springing or cramping the pipe or by forcefully connecting the two. This may result in distorting the blower casing and thereby causing serious damage to the Blower. For similar reasons, piping should be supported near the compressor to eliminate dead weight strains on the blower. A flexible pipe bellow is recommended in the discharge pipeline, close to the compressor discharge, so as to isolate compressor and pipeline vibrations.

Avoid sharp bends in the suction and discharge line. Use adequate size pipe with large radius bends. This would keep pipeline pressure losses to bare minimum. As a thumb rule the line size should be such that the air velocity is in the range of 20-25 mts/sec. Gate valves, nozzles etc., should be avoided, since they cause turbulence and have not much utility. If at all they must be used, ensure they are sized adequately.

All system piping must be cleaned internally before connecting to the Blower

AUXILIARY EQUIPMENT

The auxiliary items that might be required under various operating conditions are

SILENCERS: The need for silencer depends on Blower speed and pressure as well as sound level requirements in the general surroundings. The silencers supplied are absorptive type with mineral wool filled internal for noise absorption, and can be mounted in suction or discharge piping, as required. Silencers should be mounted as close to the blower as possible.

SUCTION FILTER: A dry bag type inlet filter is generally recommended, especially in dusty locations, as it safeguards the machine against dirt and dust. The filter should be periodically checked for choking. Choking of filter would result in pressure drop across it thereby increasing the load on the Blower marked by increase in power intake. The filter element should be regularly cleaned by reverse jet of air. The pressure drop across the filter should not exceed 100mm WG. Replace filter every three months.