



OPERATIONS MANUAL

ROTARY POSITIVE DISPLACEMENT BLOWER PACKAGES

SAFETY FIRST!

Safety Valves:

Safety relief valves for pressure or vacuum should be sized and purchased with a setting to protect blowers or motors as appropriate. Do not change the relief setting without considering the effect on each component

Check Valves:

One way check valves are required on positive blower applications to prevent a suck back of foreign materials into the blower or to eliminate blower rotation when multiple packages are manifolded together.

Guards:

Blower drive groups are hazardous and require guarding. Guarding should follow OSHA guidelines.

Guards must be fastened in place before starting the package and never removed before stopping rotation and locking out the main power supply.

Electrical:

The installation, electric motor, wiring and all electrical controls must be in accordance with ANSI National Electrical Code, state and local codes. All electrical work should be performed by a qualified electrician. Failure to abide by the national, state and local codes may result in physical harm, death or property damage. The electrical supply should be checked for adequate wire size and transformer capacity. During installation a suitably fused or circuit breaker disconnect switch should be provided. Where a 3-phase motor is used to drive the unit any voltage unbalance between the legs should be eliminated and any low voltage corrected to prevent excessive current draw.

Warning, be sure the skid is adequately grounded.

Warnings:

Warning signs and labels should be provided after installation. Do not remove any warnings, caution or instructional material.



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WARNING - UNITS START AUTOMATICALLY!

Preparing for Maintenance or Service:

NEVER ASSUME THE PACKAGE IS READY FOR MAINTENANCE SERVICE BECAUSE IT IS STOPPED.

The following procedure should be followed to maximize safety when preparing for maintenance service:

1. Disconnect and lock-out the main power switch using the approved procedure for your facility.
2. If the unit is inside of an accoustical enclosure, the enclosure should remain open and well ventilated during servicing.
3. Close shutoff valves ahead of the inlet and after the outlet to prevent flow and eliminate pressure build-up in the unit. Never depend upon a check valve to isolate the system.
4. Lock open any manual vent valves and verify that pressure in the system is at atmospheric pressure before servicing. **DO NOT** close manual vent valves at any time while servicing.
5. Shut off water and depressurize water lines if unit is water cooled.

Service Safety:

Always follow your plant safety procedures while servicing a vacuum pump or blower package. Listed below are some guidelines:

1. Wait for the unit to cool before starting service.
2. Loosen, but do not remove, flange or component bolting to be sure there is no residual pressure before removing the bolting.
3. Never attempt to add or drain oil from a running unit.
4. Clean up oil spills immediately.
5. Never use a flammable solvent for cleaning air filters or unit parts.
6. Tighten bolts and screws properly after servicing.

START-UP PROCEDURE

Pre-Start Checks:

1. Lock-out package and remove drive guard. Inspect package for any loose bolts, wires or tubing.



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2. For V-Belt drive, check for proper belt tension and sheave alignment per V-Belt drive instructions. Belts should be rechecked after the first 24 hours of run in. For coupling drive units, check final alignment conformance to coupling manufacturer's recommendations.

WARNING: BLOWER PACKAGES ARE SHIPPED WITHOUT OIL.

3. If splash lubricated, check the oil level on each end of the blower. Fill to proper level as indicated on sight gauge using oil viscosity in blower manufacturer instruction manual. **DO NOT OVERFILL.**

If pressure lubricated, the oil reservoir must be filled to proper level prior to starting.

4. The blower housing must be free from any pipe stress.
5. Rotate blower by hand and check for any obstruction or unusual noise.
6. Make sure motor is wired properly.
7. Be sure pressure is off of system downstream and upstream of the blower. Make sure all blind flanges are removed from piping and there are no restrictions to flow.
8. Make sure electrical overload devices are installed in the motor control center. Check all shutdown circuitry for proper wiring logic. Check all shutdown and alarm switches for proper set points.
9. Check inlet filter for any dirt or obstructions.
10. Open drains in silencers and coolers. Replace plugs after draining.
11. **REPLACE DRIVE GUARD BEFORE STARTING!**
12. "Jog- start" motor to check for proper rotation.

Start-Up:

1. Start cooling water flow, for pressure lubricated units, if supplied with water cooled oil cooler, be sure all valves in water system are open and confirm flow through the cooler. Start the electric oil-driven pump motor. Check pump rotation. Before starting the blower adjust the oil pressure



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- on the relief valve near the oil filter to maintain pressure.
2. If water cooled intercooler or after cooler are part of the package, start cooling water flow. Be sure all valves in water system are open and confirm flow through the cooler.
 3. Open by pass, if provided, to allow unloaded start-up of the blower.
 4. Start blower, accelerate to full speed, then shut down. Listen for knocking sounds, both with power on and as it slows down.
 5. If no problems have occurred, restart unit. Operate for several minutes under minimal load condition. Check motor amperage draw with an ammeter to insure that no overload is occurring. Check the housing surfaces to locate any hot spots indicating impeller contact. Listen for noises and watch for changes in vibration.
 6. Check switches by reducing pressure and temperature settings until they trip out. Then reset to recommended settings.
 7. Increase pressure gradually and observe pressures and temperatures for any usual readings. Run the unit for at least one (1) hour, at stable conditions.
 8. Check relief valve for proper relief point.
 9. For V-Belt drive units, check belt tension during the first twenty-four (24) hours. Belts have a break-in period during which they may stretch. For coupling drive units, re-check alignment after running unit at full load design conditions for one (1) hour.
 10. After initial commissioning:
 - Check inlet and/or discharge filter elements. Replace if necessary.
 - Check oil and replace if necessary.
 - If pressure lubricated, change oil filter.
 11. Record pressures and temperatures for first week of operation at regular intervals.

PREVENTATIVE MAINTENANCE

A. Daily

1. Record the following during initial commissioning:
Blower inlet temperature.



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Blower inlet pressure/vacuum.
Blower discharge temperature.
Blower discharge pressure or differential pressure.

Motor amperage.
Motor voltage, if available.
Motor stator temperature, if available.
Motor bearing temperature, if available.

Lube oil pressure (pressure lube units only).
Lube oil temperature (pressure lube units only)

2. Observe any abnormalities, such as unusual noises, vibration, strange odors or oil leaks.
3. Keep a log to determine if there are any changes from previous readings. Look for which might indicate pending problems.
4. Check oil levels.

B. Monthly

1. Check protective switches and relief valves for proper operation and setpoints.
2. Record motor and blower bearing housing vibration levels at each bearing in the horizontal, vertical and axial planes. Note any changes from previous readings and take a complete vibration signature (amplitude vs frequency) if any trends are noted.
3. Sample lube oil. Change oil if the following values are exceeded:
 - a. Water 2 - 3% Max.
 - b. Metals 50 - 75 PPM Max.
 - c. Acid 5.0 - 7.5 Mg/KOH/g Max.

Increase frequency of sampling if any of the above show more than 15% increase over previous sample.

When changing oil for reassured lubricated blowers, clean oil pump suction strainer, flush all oil reservoirs and replace oil filter element before filling with clean oil

4. Check inlet air filter elements and clean or replace as required. A differential pressure gauge may be installed to allow for a visual indication of a dirty element.



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C. Annually

1. Remove an inlet or discharge expansion joint or spool piece, inspect impellers, and record all impeller clearances.
2. Check coupling for alignment and wear. Repack with fresh grease as necessary.
3. Inspect V-Belts and V-Belt sheaves. Check sheave alignment and tension V-Belts.

D. Every Three Years

1. Remove gearbox housing and thrust end bearing covers.
2. Inspect gear tooth wear pattern.
3. Measure gear backlash at four points spaced 90 degrees.
4. Check bearing clearance by indicating shaft vertical movement adjacent to the bearing.

E. A PREVENTATIVE MAINTENANCE SCHEDULE SHOULD BE ESTABLISHED FOR DRIVER AND ACCESSORIES IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS..



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TROUBLESHOOTING CHECK LIST

<u>TROUBLE</u>	<u>POSSIBLE CAUSE</u>	<u>SOLUTION</u>
No Flow	Wrong Rotation Speed Too Low Obstruction in Piping	Compare actual rotation blower rotation arrows. Check by tachometer and compare with specified speed. Check piping, valves and silencer to assure open flow path.
Low Flow	Speed Too Low Excessive Pressure Rise Obstruction in Piping Excessive Slip	If belt drive, check for slippage and readjust tension. Check inlet vacuum and discharge pressure and compare these figures with specified operating conditions. Check piping, valves and silencer to assure open flow path. Check inside of casing for worn or eroded surfaces.
Excessive Power	Speed Too High Excessive Pressure Rise Impellers Rubbing	Check by tachometer and compare with specified speed. Check piping, valves and silencer to assure open flow path. Inspect outside of cylinder for high temperature areas, then check for impeller contact at these points. Check blower mounting and drive alignment.
Vibration	Misalignment Impellers Rubbing Worn Bearing/Gears Unbalances or Rubbing Impellers Driver or Blower Loose Piping Resonances	Check carefully. Realign if questionable. Check oil sump levels in gearhouse and drive end covers. Check gear and condition of bearings and replace as indicated. Remove build-up of scale or process material to restore original clearances and impeller balance. Tighten mounting bolts. Determine if standing wave pressure pulsations are present in the piping.
Overheating of Bearings or Gears	Inadequate Lubrication Excessive Lubrication Excessive Pressure Rise Coupling Misalignment Excessive Belt Tension	Check oil sump levels in gearhouse and drive end covers. Check oil levels. Drain and refill with oil of recommended grade. Check inlet vacuum and discharge pressure and compare these figures. Check carefully. Realign if questionable. Readjust for correct tension.