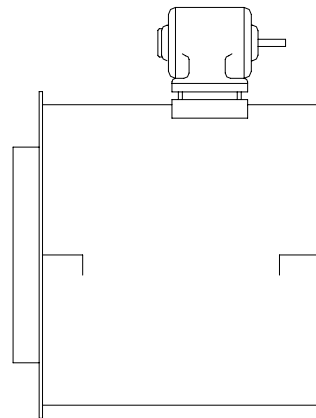
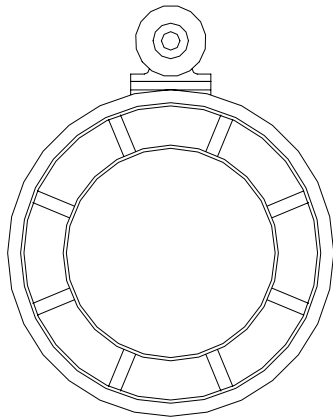


NSGV SERIES "IN-LINE" BLOWER

I, O & M MANUAL

**NSGV CIC In-Line Belt Drive Backward Curve
Class 1 Blower**



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IN-LINE BLOWER

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Receiving & Inspection

Carefully inspect the fan and accessories for any damage and shortage immediately upon receipt of the blower.

- Turn the wheel by hand to ensure it turns freely and does not bind.
- Inspect dampers (if supplied) for free operation of all moving parts.
- Record on the delivery sheet any visible sign of damage.

Handling

Lift the blower by the base or lifting eyes. **NEVER LIFT BY THE SHAFT, MOTOR, WINDBAND, OR HOUSING.**

Storage

If the blower is stored for any length of time prior to installation, completely fill the bearings with grease or moisture-inhibiting oil. Refer to lubricants on page 7. Also, store the blower in its original crate and protect it from dust, debris, and the weather. To maintain good working condition of the blower when it is stored outdoors, or on a construction site, follow the additional steps below.

- Cover the inlet and outlet, and belt tunnel opening to prevent the accumulation of dirt and moisture in the housing.
- Periodically rotate the wheel and operate dampers (if supplied) to keep a coating of grease on all internal parts.
- Periodically inspect the unit to prevent damaging conditions.

NOTE: Disconnect switches are recommended. This should be placed near the blower so that power can be shut off quickly.

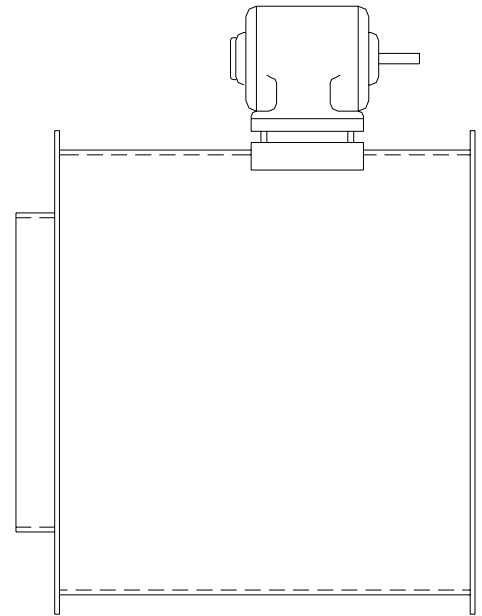
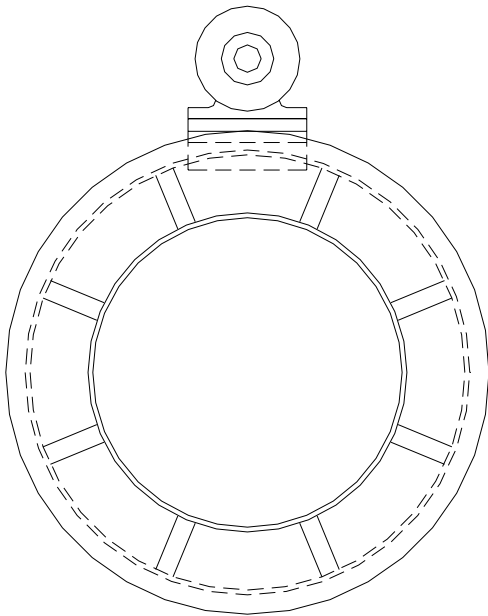
Installation

Most motors are shipped mounted on the fans with belts and drives installed. However, extremely heavy motors and drives are shipped separately, and some motors are shipped separately due to height limitations.

Arrangements 1 and 9 (FM) are floor-mounted fans. They require a strong, level foundation of reinforced concrete. The foundation's size is determined by blower size, motor size and position, and the specific location of the installation. Use the guidelines below to calculate foundation size.

- The overall dimensions of the foundation should extend at least 6 inches beyond the outline of the blower and its motor.
- The weight of the foundation should be 2 to 3 times the weight of the unit and its motor.

Arrangement 9 (CM) is a ceiling mounted blower. Suspend the blower by steel rods strong enough to support the weight of the blower.



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IN-LINE BLOWER

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Isolation

Floor Mount Spring Isolators

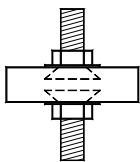
- A. Mount blower and motor on isolation base (if supplied).
- B. Elevate blower (or isolation base) to operating height and insert blocks to hold in position.
- C. Position isolators under the blower and vertically align by inserting leveling bolt through mounting holes in the blower or the base. The isolator must be installed on a level surface.
- D. Adjust the isolators by turning the leveling nut counter clockwise several turns at a time alternately on each isolator until the fan weight is transferred onto the isolators and the blower raises uniformly off the blocks. Then remove the blocks.
- E. Turn lock nut onto leveling bolt and secure firmly in place against the top of the mounting flange or frame.
- F. Secure isolators to mounting surface.

Floor Mounted Rubber-In-Shear (RIS) Isolators

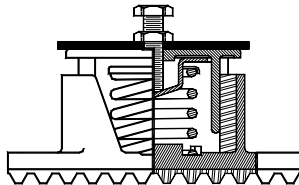
- A. Mount blower and motor on an isolation base (if supplied).
- B. Elevate blower to provide room to insert isolators between the blower and foundation and block in position.
- C. Position isolators under blower and secure bolts.
- D. Remove blocks and allow blower to rest on floor. Isolators must be installed on a level surface.
- E. Secure isolators to mounting surface.

Ceiling Mounted Spring and RIS Isolators

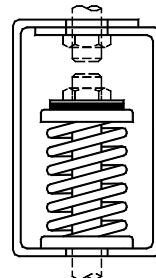
- A. Elevate blower to operating height and brace.
- B. Attach threaded rod to overhead support structure directly above each mounting hole. Rod should extend to within a few feet of blower.
- C. Attach isolator to end of threaded rod using a nut on each side of isolator bracket.
- D. Insert another section of threaded rod through the blower mounting hole and isolator.
- E. Attach two nuts to threaded rod in isolator.
- F. Place adjusting nut and locking nut on threaded rod near blower mounting bracket.
- G. Alternately rotate adjusting nut at each mounting location until the blower weight is uniformly transferred to the isolators. Remove bracing.



Rubber-In-Shear



Spring Isolator



Ceiling Mounted
Spring Isolator

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Duct Installation

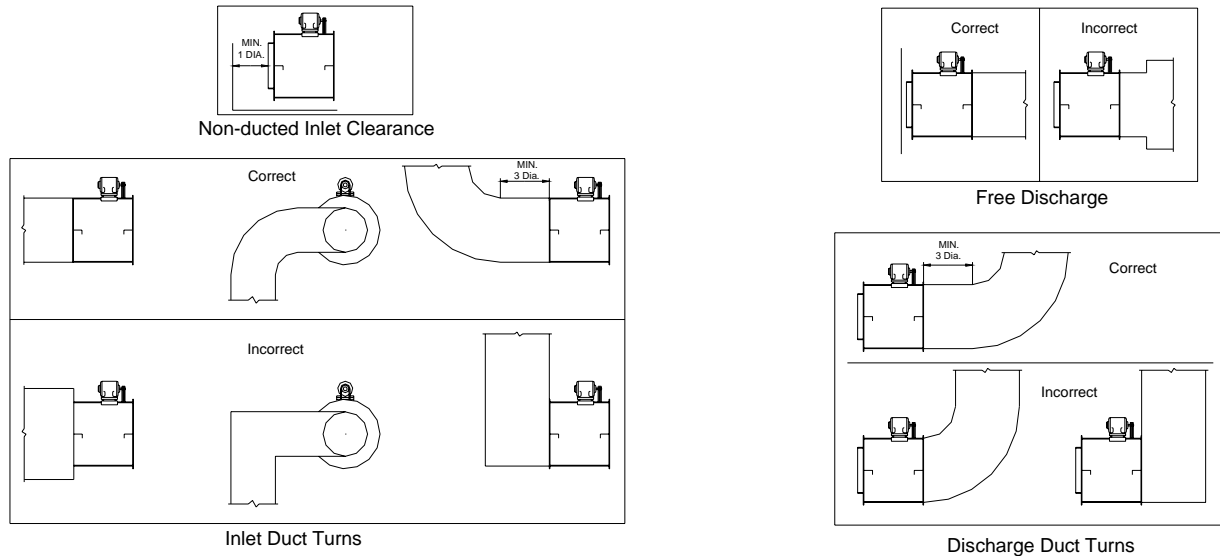
Efficient fan performance relies on the proper installation of inlet and discharge ducts. Be sure your blower conforms to the guidelines below.

Non-Duct Inlet Clearance If your blower has an open inlet (no duct work), the blower must be placed 1 fan wheel diameter away from walls and bulkheads.

Free Discharge Avoid a free discharge into the plenum. This will result in lost efficiency because it doesn't allow for a static regain.

Inlet Duct Turns For ducted inlets, allow at least 3 fan wheel diameters between duct turns or elbows and the blower inlet.

Discharge Duct Turns Where possible, allow 3 duct diameters between duct turns or elbows and the blower outlet.



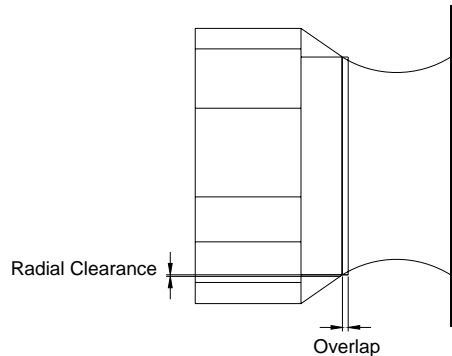
Wheel-To-Inlet Clearance

The correct wheel-to-inlet clearance is critical to proper fan performance. This clearance should be verified before initial start-up since rough handling during shipment could cause a shift in blower components. Refer to wheel/inlet drawing for correct overlap.

Adjust the overlap by loosening the wheel hub and moving the wheel along the shaft to obtain the correct value.

A uniform radial gap between the edge of the cone and the edge of the inlet is obtained by loosening the inlet cone bolts and repositioning the inlet cone.

The overlap should be 5/8 inch for blower sizes #100, #120, #135, #150, #165, #180, #195, and #210.



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Belt and Pulley Installation

Belt tension is determined by the sound the belts make when the blower is first started. Belts will produce a loud squeal which dissipates after the blower is operating at full capacity. If the belt tension is too tight or too loose, lost efficiency and possible damage can occur.

Do not change the pulley pitch diameter to change tension. This will result in a different fan speed than desired.

- A. Loosen motor plate adjustment nuts and move motor plate in order that the belts can easily slip into the grooves on the pulleys. Never pry, roll, or force the belts over the rim of the pulley.
- B. Adjust the motor plate until the proper tension is reached. For proper tension, a deflection of approximately 1/4" per foot of center distance should be obtained by firmly pressing the belt. See Figure 3.
- C. Lock the motor plate adjustment nuts in place.
- D. Ensure pulleys are properly aligned. See Figure 4.

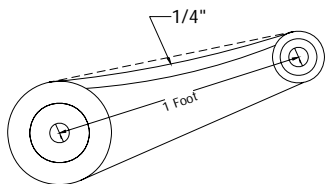


Figure 3

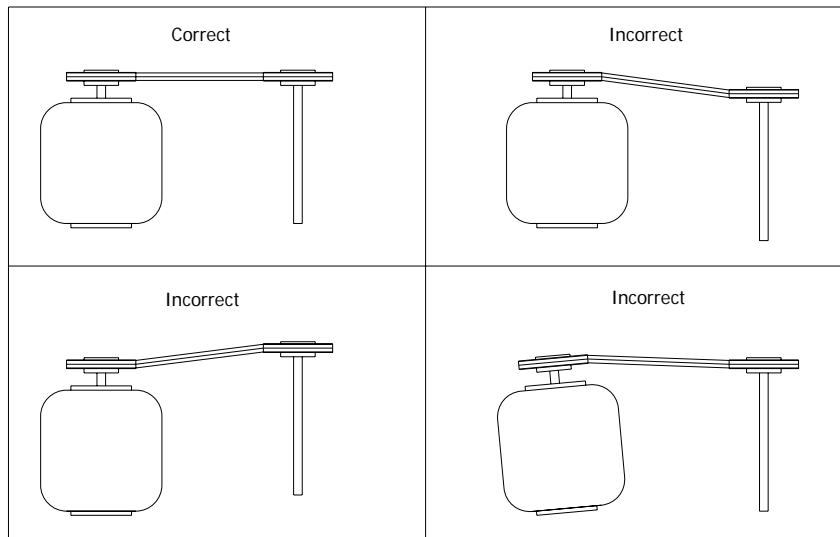


Figure 4

Pulley Alignment

Pulley alignment is adjusted by loosening the motor pulley setscrew and by moving the motor pulley on the motor shaft or by moving the entire motor mounting bracket. Figure 4 illustrates correct and incorrect pulley alignment. A recommended method of inspecting the pulley alignment is using a carpenter's square and putting the shorter leg along the case of the motor and adjusting the pulley until the other leg of the square is parallel to the belt.

Wiring Installation

All wiring should be in accordance with local ordinances and the National Electric Code, NFPA 70. Ensure the power supply (voltage, frequency, and current carrying capacity of wires) is in accordance with the motor nameplate.

WARNING: Lock off all power sources before unit is wired to power source.

Leave enough slack in the wiring to allow for motor movement when adjusting belt tension. Some fractional motors have to be removed in order to make the connection with the terminal box at the end of the motor. To remove the motor, remove bolts securing motor base to power assembly. **Do not remove motor mounting belts.**

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Wheel Rotation

Test the blower to ensure the rotation of the wheel is counter clockwise as viewed from the drive side of the wheel.

115 and 230 - Single Phase Motors Fan rotation is set correctly at the factory. Changing the rotation of this type of motor should only be done by a qualified electrician.

208, 230, and 460 - 3 Phase Motors These motors are electrically reversible by switching two of the supply leads. For this reason, the rotation of the blower cannot be restricted to one direction at the factory. Consult factory for reversing information.

NOTE: Do not allow the blower to run in the wrong direction. This will overheat the motor and cause serious damage. For 3-Phase motors, if the fan is running in the wrong direction, check the control switch. It is possible to interchange two leads at this location so that the blower is operating in the correct direction.

Final Installation Steps

A. Inspect fasteners and setscrews, particularly blower mounting and bearing fasteners, and tighten according to the recommended torque shown in the table.

B. Inspect for correct voltage with voltmeter.

C. Ensure all accessories are installed.

Setscrews				Hold Down Bolts	
Size	Key Hex Across Flats	Recommended Torque		Size	Wrench Torque
		Min.	Max.		
No. 10	3/32"	28	33	3/8" - 16	240
1/4"	1/8"	66	80	1/2" - 13	600
5/16"	5/32"	126	156	5/8" - 11	1200
3/8"	3/16"	228	275	3/4" - 10	2100
7/16"	7/32"	29	348	7/8" - 9	2040
1/2"	1/4"	42	504		
5/8"	5/16"	92	1104		
3/4"	3/8"	120	1440		

Operation

Pre-Start Checks

- A. Lock out all the primary and secondary power sources.
- B. Ensure fasteners and setscrews, particularly those used for mounting the blower, are tightened.
- C. Inspect belt tension and pulley alignment.
- D. Inspect motor wiring.
- E. Ensure belt touches only the pulley.
- F. Ensure blower and ductwork are clean and free of debris.
- G. Inspect wheel-to inlet clearance. The correct wheel-to-inlet clearance is critical to proper blower performance.
- H. Close and secure any access doors.
- I. Restore power to the blower.

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Start Up

Turn the fan on. In variable speed units, set the blower to its lowest speed and inspect the following:

- Direction of rotation.
- Excessive vibration.
- Unusual noise.
- Bearing noise.
- Improper belt alignment or tension (listen for squealing).
- Improper motor amperage or voltage.

If a problem is discovered, immediately shut the blower off. Lock out all electrical power and check for the cause of the trouble. See troubleshooting.

Inspection

Inspection of the blower should be conducted at the first **30 minute, 8 hour, and 24 hour** intervals of satisfactory operation. During the inspections, stop the blower and inspect as per the conditions chart.

30 Minute Interval: Inspect bolts, setscrews, and motor mounting bolts. Adjust as necessary.

8 Hour Interval: Inspect belt alignment and tension. Adjust and tighten as necessary.

24 Hour Interval: Inspect belt tension, bolts, setscrews, and motor mounting bolts. Adjust and tighten as necessary.

Conditions Chart

RPM	Temperature	Fan Status	Greasing Intervals
100	Up to 120° F	Clean	6 to 12 months
500	Up to 150° F	Clean	2 to 6 months
1000	Up to 210° F	Clean	2 weeks to 2 months
1500	Over 210° F	Clean	Weekly
Any Speed	Up to 150° F	Dirty	1 week to 1 month
Any Speed	Over 150° F	Dirty	Daily to 2 weeks
Any Speed	Any Temperature	Very Dirty	Daily to 2 weeks
Any Speed	Any Temperature	Extreme Conditions	Daily to 2 weeks

Maintenance

Establish a schedule for inspecting all parts of the blower. The frequency of inspection depends on the operating conditions and location of the blower.

Inspect blowers exhausting corrosive or contaminated air within the first month of operation. Blowers exhausting contaminated air (airborne abrasives) should be inspected every three months.

Regular inspections are recommended for blowers exhausting non-contaminated air.

It is recommended the following inspection be conducted twice per year.

- Inspect bolts and setscrews for tightness. Tighten as necessary. Worn setscrews should be replaced immediately.
- Inspect belt wear and alignment. Replace worn belts with new belts and adjust alignment as needed (Page 4).
- Bearings should be inspected as recommended in the *Conditions Chart*.
- Inspect variable inlet vanes for freedom of operation and excessive wear. The vane position should agree with the position of the control arm. As the variable inlet vanes close, the entering air should spin in the same direction as the wheel.

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Maintenance cont.

- Inspect springs and rubber isolators for deterioration and replace as needed.
- Inspect for cleanliness. Clean exterior surfaces only. Removing dust and grease on the motor housing assures proper motor cooling. Removing dirt from the wheel and housing prevent imbalance and damage.

Lubricants

NSGV uses petroleum lubricant in a lithium base. Other types of grease should not be used unless the bearings and lines have been flushed clean. If another type of grease is used, it should be a lithium-based grease conforming to NLGI grade 2 consistency. A NLGI grade 2 grease is a light viscosity, low-torque, rust-inhibiting lubricant that is water resistant. Its temperature range is from -30° F to +200° F and capable of intermittent highs of +250° F.

Motor Bearings

Motor bearings are pre-lubricated and sealed. Under normal conditions they will not require further maintenance for a period of ten years. However, it is advisable to have your maintenance department remove and disassemble the motor, and lubricate the bearings after three years of operation in excessive heat and or in a contaminated air stream consisting of airborne abrasives.

Fan Bearings

In-Line blower bearings are lubricated through a grease fitting on the exterior of the blower housing and should be lubricated by the schedule listed in the *Conditions Chart*. For best results, lubricate the bearing while the blower is in operation. Pump the grease slowly until a slight bead forms around the bearing seals. Excessive grease can burst the seals thus reducing the bearing life.. In the event the bearing cannot be seen, use no more than three injections with a hand-operated grease gun.

Changing Shaft Speed

All belt driven blowers up to and including 5 HP are equipped with variable pitch pulleys. To change the fan speed, perform the following:

- A. Loosen setscrew on driver (motor) pulley and remove key, if equipped.
- B. Turn the pulley rim to open or close the groove facing. If the pulley has multiple grooves, all must be adjusted to the same width.
- C. After adjustment, inspect for proper belt tension.

Speed Reduction

Open the pulley in order that the belt rides deeper in the groove (smaller pitch diameter).

Speed Increase

Close the pulley in order that the belt rides higher in the groove (larger pitch diameter). Ensure that the RPM limits of the blower and the horsepower limit of the motor are maintained.

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Pulley and Belt Replacement

- A. Remove pulleys from their respective shafts.
- B. Clean the motor and blower shafts.
- C. Clean bores of pulleys and coat the bores with heavy oil.
- D. Remove grease, rust, or burrs from the pulleys and shafts. Remove burrs by sanding.
- E. Place blower pulley on the blower shaft and motor pulley on its shaft. Damage to pulleys can occur when excessive force is used in placing the pulleys on their respective shafts.
- F. Tighten in place.
- G. Install belts on pulleys and align described in the *Belt and Pulley Installation* section.

Bearing Replacement

The blower bearings are pillow block ball bearings. Figures 6 and 7 show the components described in the following steps.

- A. Loosen and remove belts by lowering motor mounting plate with the four adjusting nuts.
- B. Remove the discharge cover by removing the attaching bolts around the perimeter of the inner drum (discharge end of unit).
Do not remove blower sheave yet.
- C. Remove the discharge cover by removing the attaching bolts around the perimeter of the inlet plate.
- D. Remove inlet cone by removing attaching bolts/nuts around perimeter.
- E. Remove wheel by loosening setscrews and sliding off shaft. A 2-jaw puller may be required.
- F. Record the location of the blower sheave from the end of the shaft, and remove the sheave.
- G. Record the distance from either bearing to the end of the shaft.
- H. Loosen setscrews on bearings and remove shaft.
- I. Mark setscrew location on shaft and smooth down any raised shaft material as required.
- J. Remove bearings from bearing base and replace, noting the exact location of each; **do not fully tighten base bolts.**
- K. Slide shaft through bearings until the shaft protrudes the same amount as measured above. Tapping the inner race of each bearing with a soft driver may be required. **Do not hammer the end of the shaft or bearing housing.**
- L. Return setscrews to same location as marked above and tighten one setscrew on each bearing to half its specified torque.
- M. Rotate the shaft to allow the bearings to align themselves.
- N. Install wheel and inlet cone to their proper location per wheel-to-inlet clearance section on page 3.
- O. Tighten hold-down bolts to proper torque.
- P. Turn the shaft by hand. Resistance should be the same as it was before hold-downs were fully tightened.
- Q. Tighten all setscrews to full specified torque.
- R. Replace the sheave, align with motor sheave, and adjust belt tension.
- S. Test run blower and retighten all setscrews and bolts, and trim balance as necessary (.0785 in/sec max).
- T. Replace discharge cover.

After 24 hours of operation, retighten all setscrews and bolts to the appropriate torque.

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Troubleshooting

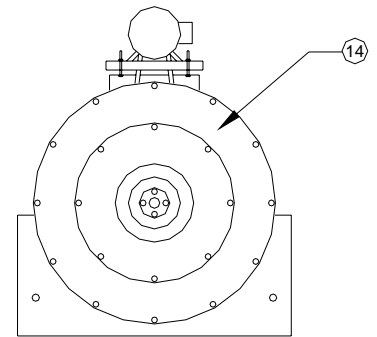
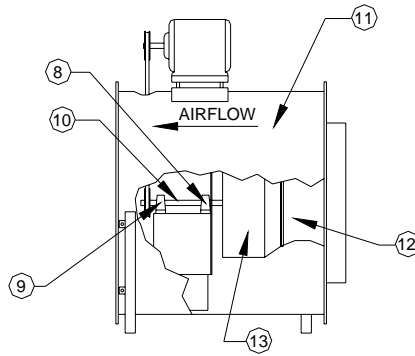
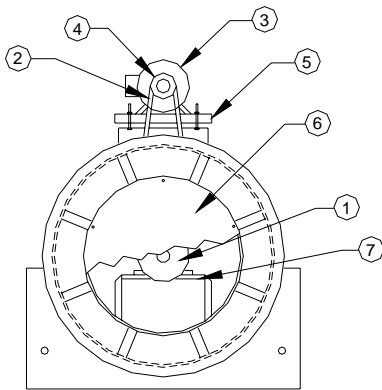
Problem and Potential Cause
Low Capacity or Pressure <ul style="list-style-type: none">- Incorrect direction of rotation. Make sure the blower rotates in the same direction as the arrows on the motor of the belt drive assembly.- Poor blower inlet conditions. There should be a straight clear duct at the inlet.- Improper wheel alignment.
Excessive Vibration and Noise <ul style="list-style-type: none">- Damaged or unbalanced wheel.- Belts too loose; worn or oily belts.- Speed too high.- Incorrect direction of rotation. Make sure the blower rotates in same direction as the arrows on the motor or belt drive assembly.- Bearings need lubrication or replacement.- Fan surge or incorrect inlet outlet conditions.
Overheated Motor <ul style="list-style-type: none">- Motor improperly wired.- Incorrect direction of rotation. Make sure the blower rotates in same direction as the arrows on the motor or belt drive assembly.- Cooling air diverted or blocked.- Improper inlet clearance.- Incorrect blower RPM.- Incorrect voltage.
Overheated Bearings <ul style="list-style-type: none">- Improper bearing lubrication.- Excessive belt tension.

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IN-LINE BLOWER

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Arrangement 9 Vertical/Floor Ceiling Mount Parts List



Item no.	Description
1	Fan Sheave
2	Belt Set
3	Motor
4	Motor Sheave
5	Motor Plate
6	Discharge Cover Plate
7	Bearing Support Assembly
8	Inboard Bearing
9	Outboard Bearing
10	Shaft
11	Housing
12	Inlet Cone
13	Wheel
14	Inlet Plate

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