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INSTALLATION, OPERATION,

& MAINTENANCE

MANUAL

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HARTZELL FAN, INC., PIQUA, OH 45356
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FORM 102-F/FEBRUARY 2001

HARTZELL WARRANTY

LIMITED WARRANTIES

Hartzell represents to Buyer that any goods to be delivered hereunder will be produced in compliance with the requirements of the Fair Labor Standards Act of 1938 as amended.

Hartzell also warrants to Buyer its goods to be free from defects in workmanship and material under normal use and service for one (1) year after tender of delivery by Hartzell. No warranty extends to future performance of goods and any claims for breach of warranty or otherwise accrues upon tender of delivery.

The foregoing constitute Hartzell's sole and exclusive warranties and are in lieu of all other warranties, whether written, oral, express, implied or statutory.

LIMITATION OF LIABILITY FOR BREACH OF WARRANTY

Hartzell's obligation for any breach of warranty is limited to repairing or replacing, at its option, without cost to Buyer at its factory any goods which shall, within such a warranty period, be returned to it with transportation charges prepaid, and which its examination shall disclose to its satisfaction to have been defective. Any request for repair or replacement should be directed to Hartzell Fan, Inc., P.O. Box 919, Piqua, Ohio 45356. Hartzell will not pay for any repairs made outside its factory without its prior written consent. This does not apply to any such Hartzell goods which have failed as a result of faulty installation or abuse, or incorrect electrical connections or alterations, made by others, or use under abnormal operating conditions or misapplication of the goods.

LIMITATION OF LIABILITY

To the extent the above limitation of liability for breach of warranty is not applicable, the liability of Hartzell on any claim of any kind, including negligence, for any loss or damage arising out of or connected with, or resulting from the sale and purchase of the goods or services covered by these Terms and Conditions of Sale or from the performance or breach of any contract pertaining to such sale or purchase or from the design manufacture, sale, delivery, resale, installation, technical direction installation, inspection repair, operation or use of any goods or services covered by these Terms and Conditions shall, in no case exceed the price allocable to the goods or services which gave rise to the claim and shall terminate one year after tender of delivery of said goods or services.

In no event whether as a result of breach of contract, or warranty or alleged negligence, defects, incorrect advice or other causes, shall Hartzell be liable for special or consequential damages, including, but not limited to, loss of profits or revenue, loss of use of the equipment or any associated equipment, cost of substitute equipment, facilities or services, down time costs, or claims of customers of the Buyer for such damages. Hartzell neither assumes nor authorizes any person to assume for it any other liability in connection with the sale of its goods or services.

NO IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS

HARTZELL DOES NOT WARRANT THAT SAID GOODS ARE OF MERCHANTABLE QUALITY OR THAT THEY ARE FIT FOR ANY PARTICULAR PURPOSE. THERE IS NO IMPLIED WARRANTY OF MERCHANTABILITY AND THERE IS NO IMPLIED WARRANTY OF FITNESS.

Safety Accessories, Application and Use Warning

The safe installation and operation of equipment supplied by Hartzell Fan, Inc. is the responsibility of the system designer, installer, maintainer, and user. Since the application and use of its equipment can vary greatly, Hartzell Fan, Inc. offers various product types, optional safety accessories, and sound performance data per laboratory tests. Hartzell Fan, Inc. sells its equipment with and without safety accessories, and accordingly, it can supply such safety accessories only upon receipt of an order. The need for safety accessories will frequently depend upon the type of system, fan location and operating procedures being employed. The proper protective safety accessories to meet company standards, local codes, and the requirements of the Occupational Safety and Health Act must be determined by the user since safety requirements may vary depending on the location and application of the equipment. If applicable local conditions, standard, codes or OSHA rules require the addition of the safety accessories, the user should specify and obtain the required safety accessories from Hartzell Fan, Inc. and should not allow the operation of the equipment without them.
Owners, employers, users, and installers should read "RECOMMENDED SAFETY PRACTICES FOR USERS AND INSTALLERS OF INDUSTRIAL AND COMMERCIAL FANS" published by the Air Movement Control Association, Inc., 30 West University Drive, Arlington Heights, Illinois 60004. A copy of this publication is enclosed with each fan shipped from Hartzell Fan, Inc., and is available upon request at Hartzell's office in Piqua, Ohio 45356 (937-773-7411).

Please contact Hartzell Fan, Inc. or your local Hartzell representative for more information on product types, safety accessories, and sound performance estimates.

Remember, the selection of safety accessories and the safe installation, application and operation of equipment supplied by Hartzell Fan, Inc. is **your** responsibility. This warning supersedes all previous editions.

INSTALLATION, OPERATION, & MAINTENANCE MANUAL

INTRODUCTION:

The purpose of this manual is to aid in the proper installation and operation of fans manufactured by **HARTZELL FAN, INC.** These instructions are intended to supplement good general practices and are not intended to cover detailed instruction procedures, because of the wide variety and types of fans manufactured by **HARTZELL FAN INC.**

The safe installation and operation of fans is the responsibility of the system designer, installer, maintainer, and user. From the initial system design through the life of the equipment, safety should be a foremost consideration. Some areas, which require some special attention, include system design, layout and construction, fan performance specifications, foundation and installation details, storage procedures, start-up and commissioning procedures, operation, maintenance, and repair.

Handling and installation should always be performed by experienced and trained personnel who are aware of the hazards associated with rotating equipment. Failure to comply with these practices may result in death or serious bodily injury.

Contact your local Hartzell representative for further assistance.

SHIPMENT AND RECEIVING:

All equipment shipped from Hartzell Fan, Inc. is prepared for shipment in accordance with the requirements of the commercial carrier and/or any special considerations required by the nature of the product.
The Bill of Lading or Express Receipt is an acknowledgement by the Transportation Company of the receipt in GOOD CONDITION, meeting the above requirements for the shipment covered by our invoice.

Our responsibility for this shipment has now ceased. We will not be responsible for loss or damage when you give the Transportation Company a clear receipt. (Standard conditions of sale are F.O.B. factory, unless other terms have been quoted and purchased.)

Thoroughly inspect all shipments as soon as received. Keep a record of all equipment received, including inspection details and date of receipt, because of the possibility of partial shipments.

If any of the items called for in this Bill of Lading or Express Receipt are short or damaged, do not accept them until the Freight or Express Agent makes a Damage or Short Shipment Notification on your freight bill or express receipt.

If any concealed loss or damage is discovered, **NOTIFY YOUR FREIGHT OR EXPRESS AGENT AT ONCE** and request an inspection. This is absolutely necessary. Unless you do this, the transportation companies will not entertain any claim for loss or damage. If the agent will not make an inspection, then you should make An Affidavit to the effect that you notified the agent on that particular date and the agent failed to show up. This, with your aforementioned documentation, will properly support your claim.

We will assist you in every possible manner in collecting claims for loss or damage, however this does not make us responsible for collection of claims or replacement of material.

HANDLING:

Handle your equipment with care. Some fans are provided with lifting lugs or holes for easy handling. Others must be handled using nylon straps or well-padded chains and cables, which protect the fan's coating and housing. Spreader bars should be used when lifting large parts.

Axial fans should be lifted by using straps around the fan housing only. **DO NOT LIFT AXIAL FANS BY THE MOTOR, MOTOR BASE, PROP OR FLANGES.**

Centrifugal fans are best lifted using one strap under the fan's scroll and another strap around the bearing base. **DO NOT LIFT CENTRIFUGAL FANS BY THE FAN SHAFT, WHEEL, FLANGES OR INLET SUPPORT.**

Roof ventilators should be lifted by using straps around the fan housing or base only. Spreader bars should also be used to avoid damage to stack caps or hoods. **DO NOT LIFT ROOF VENTILATORS BY THE STACK CAP OR HOOD.**

STORAGE:

If fans are stored for any length of time, they should be stored in a clean, dry location to prevent rust and corrosion. Outdoor storage is not recommended. When outdoor storage is necessary, they should be protected from the elements. Cover the fan inlet and outlet, grease the bearings, and keep motors dry and clean.

EXTENDED STORAGE:

Fans are to be stored in their original containers or equivalent protection and should be kept in a clean, dry, protected warehouse where exercised control over temperature, dust, dew point, shock, and vibration is reasonably maintained.

A) Temperatures: Between 50 degrees F and 120 degrees F.

B) Maximum relative humidity of 60%

C) Shock or vibration: 2 mils maximum to prevent bearings from brinelling.
Exceeding this limit will require vibration-dampening material under the units.

Motor bearings (and fan bearings on belt drive units) are to be greased at the time of going into extended storage. Motor shaft (and fan shaft on belt drive units) are to be manually rotated every month and additional grease added, purging some of that in the bearing cavity every six (6) months. ***Grease in bearings is to be purged at time of removal from storage, making sure that an ample supply of fresh grease is in each grease cavity. Grease used must be compatible with that already in motor and fan bearings.*** ***(See Page 14)***
All motors with space heaters are to have the heaters connected if storage conditions exceed 60% relative humidity and/or if temperatures are below 50 degrees F.

Motor windings should be meggered at the time the equipment is put in storage. At the time of removal from storage, the resistance reading must not have dropped more than 50% from the initial reading. Contact Hartzell Fan, Inc., Warranty and Service Department, if the motor resistance is less than 50% of the initial reading. **NOTE:** ***Motors in storage may absorb moisture in their windings resulting in a significant loss of insulation resistance.*** **THE APPLICATION OF POWER TO A MOTOR WITH INSUFFICIENT INSULATION RESISTANCE MAY RESULT IN DAMAGE TO THE MOTOR OR OTHER EQUIPMENT.**

Storage records complying with the above requirements should be maintained.

If an extended warranty is desired, contact your local sales representative for charges and details.

INSTALLATION:

Centrifugal Fans should always be mounted to a flat, level, and rigid structure. The fan base should be shimmed and leveled. Gaps between the foundation and fan base should be grouted. This will ensure permanent alignment and a smooth-running, vibration-free fan, as well as minimize maintenance costs. Failure to properly install the fan base can contribute to excessive vibration.

Poured concrete foundations are recommended, wherever practical, for floor mounted fans. If vibration isolators are required, they should be installed between the fan and the foundation. Tighten all mounting bolts securely with lock washers and lock nuts.

Fans mounted off ground level should be rigidly mounted to a structural platform and be placed as near as possible to or over, a solid wall or column. Supports for suspended fans must be crossbraced for live load support to prevent side sway.

For roof mounted fans, place the fan curb panel on the roof curb, level, and then anchor the unit to the curb using lag screws, neoprene washers, and flat washers. ***It is recommended that stacks be independently mounted to the roof and use guy wires to prevent side sway.*** **AVOID SUPPORTING A STACK DIRECTLY ON THE FAN FLANGE.**

In both axial and centrifugal fans, inlet and outlet ducts should be independently supported, and never supported by the fan flanges. Flexible duct connections are recommended. These connections will also minimize noise.
The independent mounting of stacks and ducts to the fan flanges will assure that the fan will not be subjected to external forces which may twist or deform fan housing. This also will ensure that the impeller will not strike the housing or cause misalignment of the sheaves and bearings.

It is recommended that access doors be placed in ductwork just ahead of the fan inlet and just behind the fan outlet for ease of inspection and maintenance. Access doors in a duct system should never be opened with the fan running, to avoid possible equipment damage and personal injury.

No turns in duct should be closer than two and one half fan diameters away from the inlet or outlet of a fan. Walls or flat surfaces should also not be closer than one fan diameter from the inlet side.

Branch entries into the main duct should be spaced such that they do not enter directly opposite each other. A maximum of 45 degree angle between main branch and entering branch should be used as a guideline. ***Avoid sudden changes in duct size.*** Use a 14 degree included angle, or less, in reducing a duct to a fan, and not more than 30 degrees included angle to the discharge. Elbow turns should be kept to a centerline radius of at least one and one-half diameters of the duct.

Electrical connections for the fan motor must be connected by a qualified electrician, conforming to the National Electrical code and local codes and practices. When making electrical connections, the motor must be connected following electrical characteristics as indicated by the motor nameplate, and adhere to the wiring diagram on the motor nameplate or in the motor terminal box. ***Motors may fail immediately if improperly connected.*** It is also recommended that an overload device to protect the motor be installed between the current supply and the motor. Recommended tolerances for overload devices should be plus 10 % of the motor full load amperage rating, including the allowance for the motor service factor.

NOTE: ***It is common for motors to draw several times full load amperage during startup, for approximately fifteen seconds. Larger sized fans may require twenty seconds or longer.***

STARTUP:

Lock out the primary and all secondary power sources.

A complete inspection should be made of all ductwork and the fan interior. Make certain there is no foreign material, which can be drawn into or blown through the fan or ductwork. Appropriate protective measures and safety practices should be observed when entering or working within these areas. These measures may include the use of goggles, respirators, or other personal protective devices.

Make sure the foundation or mounting arrangement and the duct connections are adequately designed and installed per drawings and in accordance with recognized acceptable engineering practices.

Check and tighten all bolts, fasteners, and set screws as necessary. **NOTE:** ***Forces encountered during shipment, handling and rigging can disturb factory settings.***

Check the fan assembly and bearings for proper grounding to prevent static electrical discharge. **NOTE:** ***Especially important when using FRP fans.***

Ensure power and drive components such as motor starter, variable frequency drive, or hydraulic power unit are properly sized, matched, and connected to the fan.

Check bearings for recommended lubricant and lubrication amount.

Clearance should be checked between the impeller and fan housing. Spin the impeller to determine whether it rotates freely, without hitting anything, and is not grossly out of balance. **NOTE:** ***Prior to shipment, all fans have been thoroughly inspected and have passed stringent operation and balance test.***

Inspect impeller for proper rotation for fan design. Arrows to show direction of rotation and airflow are attached to the fan housings.

Check alignment of drives and all other components.

Check the belt drive for proper sheave selection and installation and make sure the sheaves are not reversed (excessive speeds could develop).

Check for recommended belt tension.

Properly secure all safety guards.

Assure that all appropriate warnings have been put in place.

Secure all access doors to the fan and ductwork.

Restore power and momentarily energize the fan to check the direction of rotation. Listen as the fan coasts to a stop for any unusual noise, identify the source, and take corrective action as necessary.

Switch on the electrical supply and allow the fan to reach full speed. Check carefully for: (1) Excessive vibration (2) Unusual noise (3) Proper belt alignment and tension (4) Proper lubrication (5) Proper amperage, voltage, or power values. If any problem is indicated, **SWITCH OFF IMMEDIATELY.**
Lock out power supply. Secure the fan impeller if there is a potential for windmilling. Check carefully for cause of the trouble, correct as necessary, and repeat check list procedure. (Ref. Page 15 Trouble shooting chart)

NOTE: ***The fan should not need balancing, as it was balanced at the factory to be within stringent vibration levels before shipment. However, there are several things that may cause vibration, such as rough handling in shipment and erection, weak foundations, and alignments. It is recommended that the vibration levels be checked with a vibration analyzer to verify that the vibration is within levels recommended later in this manual. (See Page 13, Table 1.)***

Even if the fan appears to be operating satisfactorily, shut it down after a brief period, lock out the power supply, and recheck startup proceedures, as the initial start-up may have loosened the bolts, fasteners, and set screws.

STARTUP CONT:
The fan may now be put into operation, however during the first eight hours of operation, it should be closely observed and checked for excessive vibration and noise. At this time checks should be made of motor input current and motor and bearing temperatures to ensure that they do not exceed manufacture's recommendations.

After eight hours of operation, the fan should be shut down and the power locked out. Recheck startup proceedures and adjust, as necessary.

After twenty-four hours of satisfactory operation, the fan should be shut down (locked out) and the drive belt tension should be readjusted to recommended tension. (See Page 12) **NOTE:** (***It is normal for belt drive fans to squeal briefly during startup.)***

MAINTENANCE:

Periodic inspection of all the fan parts is the key to good maintenance and trouble-free fan operation. Frequency of inspection must be determined by the user and is dependent upon the severity of the application. Prepare a maintenance schedule and make sure it is strictly adhered to.

NEVER SERVICE OR ADJUST ROTATING EQUIPMENT WHILE IT IS IN OPERATION. LOCK OUT THE POWER SOURCE BEFORE PERFORMING MAINTENANCE.

Regular fan maintenance should include the following:

1) Check the fan impeller for any buildup of foreign material or wear from abrasion. Both can cause excessive vibration which will lead to damage of the impeller and other fan components. Replace the impeller if excessive wear is noticed. Carefully clean the impeller of any foreign material.

2) Check V-belt drives for proper alignment, tension, and excessive wear.

3) Lubricate the fan and motor bearings.

4) Consult the trouble shooting guide for excessive vibration or noise, insufficient performance, or when the fan does not operate. (See Page 15 Trouble shooting chart)

5) Tighten all bolts and setscrews.

BEARINGS AND LUBRICATION:

All Hartzell belt drive fan bearings are heavy duty; self-aligning ball or roller type, depending on the fan size, motor horsepower, and performance, and are relubricable for continuous service.

Selection of the correct bearing grease and greasing intervals depends on several things. Extreme high or low temperatures, dirty or damp surroundings, and excessive vibration exceeding the "fair" levels in Table 1 are all things that will require more frequent greasing or special greases. (Refer to Page 14 for recommended greases and greasing intervals.)

The motor bearings and the fan bearings on the belt drive fans should be greased at regular intervals. Motor manufacturers' greasing instructions and recommendations should be followed closely. Avoid the use of a pressure greasing system which tends to fill the bearing chamber completely. Do not overgrease. Use only 1 or 2 shots with a hand gun in most cases. Maximum hand gun rating 40 P.S.I. Rotate bearings during lubrication where good safety practice permits. NOTE: On motors with non-regreasable sealed bearings, no lubrication is required for the life of the bearings.

The most frequent cause of bearing failure is not greasing often enough, using incompatible greases or excessive belt tension. Excessive vibration, especially if the bearing is not rotating, will also cause bearings to fail. Bearings must also be protected from water and moisture to avoid internal corrosion.

NOTE: ***It is typical for some anti friction bearings to exhibit a running surface temperature in excess of 140 deg. F. This surface will be too hot to touch, but is not cause for alarm.***

BEARING REPLACEMENT:

Fan bearings on belt drive fans should not need to be replaced for many years if the above recommendations are strictly adhered to. However, use the following procedure when bearing replacement is necessary.

1. Lock out power source.
2. Gain access to the fan bearings. On duct, ductaxial, and vaneaxial fans, the fan probably will have to be removed from the duct system. Remove the bearing cover, if any.
3. Loosen the belts by shifting the motor.
4. Remove the impeller and disconnect the lube tubes.
5. Remove the shaft and bearing assembly. Note the position of the bearings' shims.
6. Measure the location of the bearing to the impeller end of the shaft and the bearing spacing.
7. Loosen all bearing/shaft setscrews or other locking device.
8. Remove bearings (may have to be pressed off the shaft).
9. Polish the shaft with fine emery paper (240 Grit or finer) and file the setscrew dimples smooth.
10. Install new bearings on the shaft, making sure that the collars are together, (i.e., facing each other on the shaft) and set screws are in line with each other. Lightly seat one setscrew on each bearing to hold in the approximate position from #5) above.
11. Mount the shaft/bearing assembly in the fan, on shims, with bolts. Do not tighten yet. Just snug up. Loosen setscrews.
12. Center the shaft in the housing (both ends) as closely as possible and shim where necessary. The fan impeller may need to be temporarily installed to get its clearances equal.
13. Tighten the bearing mounting bolts.
14. With a soft-faced mallet, tap the shaft between the bearings while turning the shaft by hand to seat the bearing races. The shaft must turn freely. Tighten all bearing setscrews. Spin the shaft again. Is it free?
15. Reinstall the lube tubes.
16. While rotating shaft purge bearings with fresh grease (Ref. Page 14).
17. Install bearing cover, impeller, and belts, and adjust the motor to get proper belt tension. Also, make sure that the sheaves are properly aligned. (See V-belt drives , Page 10 & 11).
18. If a new shaft is supplied, then ignore items #6 through #8.

Carefully following this procedure will ensure trouble-free service.

V-BELTS DRIVES:

V-belts on Hartzell belt drive fans are oil, heat, and static resistant type, and oversized for continuous duty. With proper installation and maintenance, years of operating efficiency can be added to the life span of the V-belt drive.

V-belt drives should be completely guarded.

A noisy V-belt indicates the need for attention. V-belt noise can be caused by the slapping of the belts against the drive guard or other obstruction. Check for an improperly installed guard, loose belts, buildup of foreign material in the sheave grooves, or excessive vibration. The cause of excessive vibration should be determined and corrected. **NOTE:** ***It is normal for belts to squeal briefly at startup.***

Check belt tension often. Ideal tension is the tension at which the belt will not slip under peak load conditions. Over-tensioning shortens belt and bearing life. Keep belts free from foreign material which may cause slipping. The use of belt dressing is not recommended. (See Page 12 for recommended tensioning.)

Inspect sheaves often. Keep all sheaves' grooves smooth and uniform. Burrs and rough spots along the sheave rim can damage belts. Dust, oil, and other foreign matter can lead to pitting and rust, and should be avoided as much as possible. Badly worn grooves or a shiny groove bottom indicates that either the sheave, the belt, or both are badly worn. Replace either or both belts and worn sheaves.

Check sheave alignment. Sheaves that are not aligned properly cause excessive belt wear and sheave wear.

V-BELT DRIVE REPLACEMENT:

Whether you are just installing new belts or a completely new drive, worn bearings, bent shafts, or other components that might cause future problems should be replaced at this time. If installing belts only, check existing sheaves carefully for worn grooves or other damage.

Although alignment is not as critical in V-belt drives as in others, proper alignment is essential to long belt and sheave life. **NOTE:** ***Loose belts or misalignment can cause fan vibration.***

First, make sure that drive shafts are parallel. ***The most common causes of misalignment are nonparallel shafts and improperly located sheaves.*** Where shafts are not parallel, belts on one side are drawn tighter and pull more than their share of the load. As a result, these belts wear out faster, requiring the entire set to be replaced before it has given maximum service. If misalignment is in the sheave, belts will enter and leave the grooves at an angle, causing excessive belt and sheave wear. (See Page 11, Figure 1).

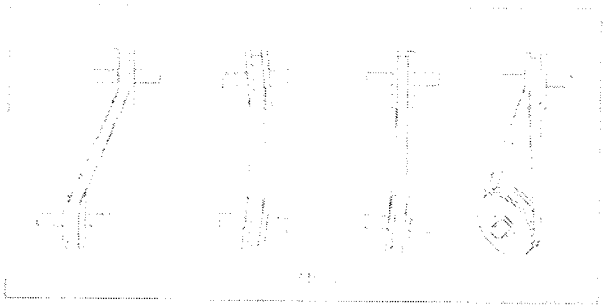
Shaft alignment can be checked by measuring the distance between the shafts at three or more locations. If the distances are equal, then the shafts will be parallel.

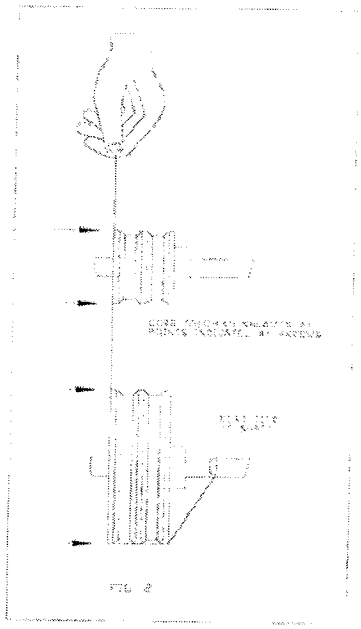
To check the location of the sheaves on the shaft, a straightedge or a piece of string can be used. If the sheaves are properly lined up, the string will touch them at the points indicated by the arrows (See Page 11, Figure 2). Rotating each sheave a half revolution will determine whether the sheave is wobbly or the shaft is bent. Correct any misalignment.

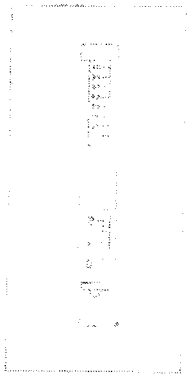
Always use matched belts and never mix new and used belts on a drive. Always replace belts with the right type of V-belt. Install belts correctly. When belts are forced into the sheave with a screwdriver or other wedge, the outer fabric is often ruptured and cords broken. It is well worth the time to move the driver unit closer so the V-belts can be slipped easily into the sheave groove without damage. Shorten the center distance between the driven and driver sheave so the belts can be put on without the use of force. While the belts are still loose on the drive, rotate the drive until all the slack is on one side. Then increase the center distance until the belts are snug. The drive is now ready for tensioning. Tension the belts as indicated on Page 12. **NOTE:** ***Never "roll" or "pry" the belts into the sheave grooves.*** This can damage the belt cords and lead to belt turnover, short life, or actual breakage. Moreover, it is both difficult and unsafe to install belts this way. Keep take-up rails, motor base, or other means of center distance adjustment free of dirt, rust, and grit. Lubricate adjusting screws and slide rails from time to time.

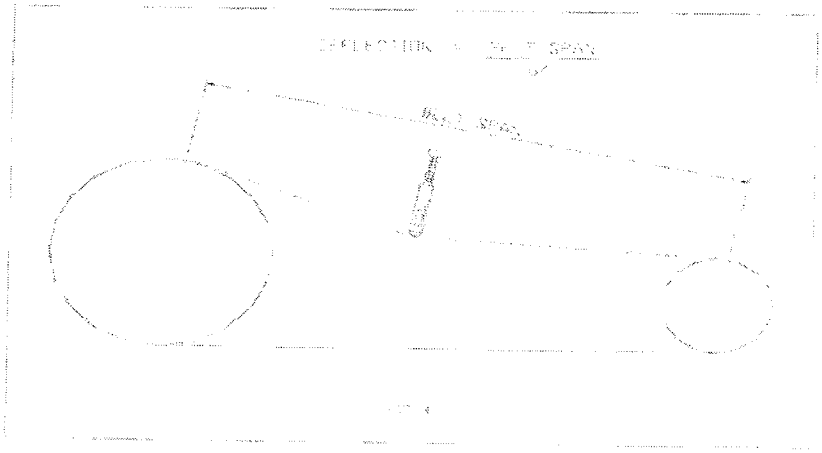
Tighten all sheave bolts and setscrews before reconnecting the power. **NOTE:** ***All sheave bolts, setscrews, and belts should be checked and tightened if necessary after two days of initial operation.***

IMPORTANT: DO NOT INCREASE THE FAN SPEED BEFORE FIRST CONTACTING THE HARTZELL FACTORY. ARBITRARILY SPEEDING UP THE FAN CAN CAUSE MOTOR OVERLOAD, FAILURE, AND POTENTIAL IMPELLER FAILURE.









INSTALLING, TENSIONING AND CHECKING V-DRIVES

GENERAL DRIVE TENSIONING GUIDELINES:

1. IDEAL TENSION IS THE TENSION AT WHICH THE BELT WILL NOT SLIP UNDER PEAK LOAD CONDITIONS.
2. OVER TENSIONING SHORTENS BELT AND BEARING LIFE.
3. KEEP BELTS FREE FROM FOREIGN MATERIAL WHICH MAY CAUSE SLIPPING.
4. MAKE PERIODIC V-DRIVE INSPECTION, TENSION WHEN SLIPPING. THE USE OF BELT DRESSING IS NOT RECOMMENDED.
5. BEFORE INSTALLING A NEW SET OF V-BELTS, CHECK THE CONDITION OF THE SHEAVES. DIRTY OR RUSTY SHEAVES IMPAIR THE DRIVES EFFICIENCY AND ABRADE THE BELTS, RESULTING IN PREMATURE FAILURE. ALSO, WORN SHEAVES CAN SHORTEN THE BELT LIFE BY AS MUCH AS 50%.
6. DO NOT USE A NEW OR USED BELT AS REPLACEMENT FOR A UNITOF A SET. IF A BELT BREAKS A NEW SET OF MATCHED BELTS IS NECESSARY. ALWAYS REPLACE BELTS WITH THE SAME KIND THAT WERE ON THE FAN BEFORE.
7. AFTER PROPERLY TENSIONING THE BELTS, DOUBLE-CHECK TO BE SURE THE SHEAVE GROOVES ARE CORRECTLY ALIGNED, AND THAT ALL SHAFTING IS PARALLEL.

INSTALLATION AND CHECKING METHODS:

I. VISUAL METHOD

1. WHEN INSTALLING BELTS, REDUCE THE CENTER DISTANCE SO THAT THE BELTS MAY BE PLACED IN THE SHEAVE GROOVES WITHOUT FORCING. ARRANGE THE BELTS SO THAT THE TOP AND BOTTOM SPANS HAVE ABOUT THE SAME AMOUNT OF SAG. APPLY TENSION TO THE BELTS BY INCREASING THE CENTER DISTANCE UNTIL BELTS ARE SNUG AND HAVE A LIVE SPRINGING ACTION WHEN STRUCK WITH THE HAND.
2. OPERATE THE DRIVE A FEW MINUTES TO SEAT THE BELTS IN THE SHEAVE GROOVES. OBSERVE THE OPERATION OF THE DRIVE UNDER ITS HIGHEST LOAD CONDITIONS (USUALLY STARTING). A SLIGHT BOWING OF THE SLACK SIDE OF THE DRIVE INDICATES ADEQUATE TENSION. EXCESSIVE BOWING OR SLIPPAGE INDICATES INSUFFICIENT TENSION. IF THE SLACK SIDE REMAINS TAUT DURING THE PEAK LOAD, THE DRIVE IS TOO TIGHT.
3. NEW DRIVE TENSION SHOULD BE CHECKED SEVERAL TIMES DURING THE FIRST 24 HOURS OF OPERATION, BY OBSERVING THE SLACK SIDE SPAN.

II. TENSIONING GAGE METHOD

WHEN A TENSION GAGE IS AVAILABLE AND THE CENTER OF THE BELT SPAN IS ACCESSIBLE, THE FOLLOWING METHOD MAY BE USED. TO DETERMINE THE POUNDS FORCE REQUIRED TO TENSION A DRIVE WITH A BELT TENSIONER, PROCEED AS FOLLOWS:

1. MEASURE THE BELT SPAN AS SHOWN AND CALCULATE THE DEFLECTION INCHES USING THE GIVEN EQUATION. SET LARGE O-RING FOR CALCULATED INCHES OF DEFLECTION.
2. SET SMALL O-RING AT O AND PRESS DOWN THE BELT TENSIONER AT CENTER OF BELT SPAN AS SHOWN.
   A. ON A SINGLE BELT DRIVE, DEPRESS BELT TENSIONER UNTIL THE LARGE O-RING IS EVEN WITH BOTTOM OF A STRAIGHT EDGE PLACED ACROSS THE OUTSIDE EDGE OF THE TWO SHEAVES.
   B. ON MULTIPLE BELT DRIVE, DEPRESS BELT TENSIONER UNTIL LARGE O-RING IS EVEN WITH THE TOP OF THE NEXT BELT. AVERAGE READINGS FROM ALL BELTS IS THE VALUE TO USE IN THE TABLES BELOW.
3. REMOVE TENSION GAGE AND OBSERVE THE NEW POSITION OF THE SMALL O-RING IS SET AT THE NUMBER OF DEFLECTION POUNDS FOR THE SET NUMBER OF INCHES.
4. COMPARE THIS READING, OR THE AVERAGE OF SEVERAL READINGS IN THE CASE OF MULTIPLE BELTS, TO THE NEW/USED VALUES IN THE TABLES BELOW FOR THE PROPER BELT CROSS SECTION. IF READINGS DO NOT FALL IN THIS RANGE, READJUST THE BELT TENSION AS DESCRIBED IN THE VISUAL METHOD AND REPEAT MEASUREMENT.

EXAMPLE:

1. BELT SPAN =1625.6mm AND SMALL SHEAVE IS 203.2mm P.D. WITH COG BELTS.
2. 1625.6mm/64=25.4mm REQUIRED DEFLECTION.
3. SET LARGE O-RING AT 25.4mm ON GAGE INCH SCALE.
4. SET SMALL O-RING AT ZERO ON PLUNGER.
5. PRESS DOWN ON BELTS WITH GAGE UNTIL LARGE O=RING IS EVEN WITH THE NEXT BELT OR A STRAIGHT EDGE, WHICHEVER THE CASE MAY BE. WITH MULTIPLE BELTS, SEVERAL READINGS ARE NEEDED TO GET AN AVERAGE.
6. USE THE POUND FORCE READING OR AVERAGE OF SEVERAL READINGS REQUIRED FOR 25.4mm DEFLECTION IN THE TABLES BELOW.
7. THE "B" BELT TABLE FOR 203.2mm P.D. SMALL SHEAVE SHOULD HAVE A DEFLECTION FORCE BETWEEN 3.311kg AND 4.672kg .
8. INCREASE OR DECREASE THE TENSION ON BELTS UNTIL THE DEFLECTION FORCE IS BETWEEN 3.311kg AND 4.672kg.

(REF. Page 11)
(Figures 3 & 4)

CROSS SECTION	SMALLEST SHEAVE DIA. mm	RPM RANGE	BELT DEFLECTION FORCE			
			STD. BELTS		COG BELTS	
			USED	NEW	USED	NEW
A, AX	76.2-96.5	1000-2500	1.678	2.495	1.860	2.767
		2501-4000	1.270	1.905	1.542	2.268
	96.5-121.9	1000-2500	2.041	3.084	2.268	3.357
		2501-4000	1.724	2.585	1.950	2.903
	127-177.8	1000-2500	2.449	3.629	2.585	3.810
		2501-4000	2.132	3.175	2.313	3.447
B, BX	86.4-106.7	860-2500	2.404	3.583	2.223	3.266
		2501-4000	2.087	3.084	1.905	2.812
	111.8-147.3	860-2500	2.404	3.583	3.221	4.763
		2501-4000	2.041	3.039	3.221	4.128
	147.3-223.5	860-2500	2.858	4.264	3.856	5.715
		2501-4000	2.722	4.037	3.311	4.672
C, CX	177.8-228.6	500-1740	5.216	7.711	6.668	9.868
		1741-3000	4.264	6.260	5.398	7.938
	241.3-406.4	500-1740	6.396	9.525	7.212	10.659
		1741-3000	5.670	8.391	6.713	9.798
D	304.8-406.4	200-850	11.29	16.78	11.34	16.78
		851-1500	9.62	14.20	9.53	14.06
	457.2-508	200-850	13.79	20.50	13.85	20.41
		851-1500	11.70	17.24	11.34	17.24

CROSS SECTION	SMALLEST SHEAVE DIA. mm	RPM RANGE	BELT DEFLECTION FORCE			
			STD. BELTS		COG BELTS	
			USED	NEW	USED	NEW
3V, 3VX	55.9-61.0	1000-2500	N/R	N/R	1.497	2.223
		2501-4000	N/R	N/R	1.270	1.950
	72.4-97.8	1000-2500	1.633	2.313	1.905	2.359
		2501-4000	1.361	1.996	1.724	2.540
	104.6-175.3	1000-2500	2.223	3.311	2.404	3.583
		2501-4000	1.996	2.994	2.223	3.311
5V, 5VX	111.8-170.2	500-1749	N/R	N/R	4.627	6.895
		1750-3000	N/R	N/R	3.992	5.987
		3001-4000	N/R	N/R	2.540	3.856
	180.3-276.9	500-1740	5.761	8.573	6.713	10.024
		1741-3000	5.080	7.575	6.214	9.117
	299.7-406.4	500-1740	7.031	10.61	7.756	11.57
		1741-3000	6.622	9.888	7.620	11.34
8V	317.5-431.8	200-850	14.97	22.36	N/A	N/A
		851-1500	12.16	18.05	N/A	N/A
	457.2-569	200-850	18.05	26.85	N/A	N/A
		851-1500	16.01	23.90	N/A	N/A

MOTORS:

The fundamental principle of electoral maintenance is KEEP THE MOTOR CLEAN AND DRY. This requires periodic inspection of the motor, the frequency of which depends upon the type of motor and the service.

Periodic checks of voltage, frequency, and current of a motor while in operation is recommended. Such checks assure the correctness of frequency and voltage applied to the motor, and yield an indication of the fan load. Comparison of this data with previous data will give an indication of the fan performance. Any serious deviations should be investigated and corrected.

Fractional motors usually have prelubricated sealed bearings with no grease fittings and are lubricated for life.

Lubricate integral horsepower motors per the motor manufacturer's recommendations. Lubrication frequency depends on the motor horsepower, speed, and service. Use compatible greases. (See Page 14). Do not overgrease.

If the motor is totally enclosed fan cooled (TEFC), nonventilated (TENV), or air over (TEAO), it is recommended that the condensation drain plugs be removed. This is not necessary with motors equipped with automatic drains, which should be left in place as received.

VIBRATION:

Excessive fan vibration can be caused by many things. **ALL POSSIBLE SOURCES OF THE EXCESSIVE VIBRATION MUST BE CHECKED OUT AND CORRECTIVE ACTION TAKEN IMMEDIATELY TO CORRECT THE PROBLEM.** See the fan trouble-shooting chart (Table 2) for possible causes of excessive fan vibration.

A vibration analyzer will be of great assistance in determining the amount of vibration. The following values give an indication of the fan vibration condition. Vibration readings should be taken on the fan bearings (if possible, on belt drive fans), or motor (on direct drive fans), or on the fan housing of duct, ductaxial, and vaneaxial fans. Horizontal, vertical, and axial readings should be taken.

TABLE 1

Vibration displacement in mils, "Double Amplitude"

FAN RPM	GOOD	FAIR	SLIGHTLY ROUGH	ROUGH
870	1.7	3.3	6.5	above 6.5
1160	1.2	2.5	5.0	above 5.0
1750	.75	1.5	3.5	above 3.5
3450	.50	0.9	2.0	above 2.0

Interpolate for fan speeds other than shown above. The fan should not be operated unless the maximum vibration reading is in at least the "fair" range.

GREASE LUBRICATION SCHEDULE.

Lubrication guidelines for horizontal shaft, grease lubricated fan, blower or other high speed rotating equipment.
Lubrication guidelines for vertical shaft -- see note below.

Link-Belt Ball Bearing Units -- Series 200

Relubrication interval				6 mos	4 mos	2 mos	1 mo
Shaft size range		Amt. of Grease		Operating speed (RPM)			
Inches	MM	Cu. In.	Cu. Cm.				
1/2-1	17-25	0.12	2.0	3200	4800	7200	9600
1 1/16 - 1 7/16	30-35	0.30	4.9	2200	3400	5100	6800
1 1/2 - 1 3/4	40-45	0.45	7.4	1700	2600	4000	5300
1 7/8 - 2 3/4	50-55	0.52	8.5	1400	2100	3200	4300
2 1/4 - 2 7/16	60	0.56	9.2	1300	2000	3000	4000
2 1/2 - 3 (1)	65-75	1.36	22.3	1000	1600	2400	3200
3 1/16 - 3 1/2 (1)	85	2.24	36.7	900	1400	2100	2800
3 9/16 - 4 (1)	100	5.00	81.9	800	1200	1800	2300

Link-Belt Roller Bearing Units -- Series 22400H & B22500

Relubrication interval				6 mos	4 mos	2 mos	1 mo	2 wks
Shaft size range		Amt. of Grease		Operating speed (RPM)				
Inches	MM	Cu. In.	Cu. Cm.	Up to	Up to	Up to	Up to	Up to
3/4-1	25	0.4	6.4	1400	2200	3400	5000	6800
1 1/16-1 1/4	30	0.5	7.7	1150	1800	2800	4500	5600
1 5/16-1 1/2	35	0.6	9.2	1000	1550	2400	3800	4800
1 9/16-1 3/4	40	0.8	13.1	870	1350	2100	3300	4200
1 13/16 - 2	45-50	0.9	14.6	700	1100	1700	2700	3400
2 1/16-2 1/4	55	1.1	17.9	630	1000	1500	2400	3000
2 5/16-2 1/2	60	1.3	21	580	910	1400	2250	2800
2 9/16 - 3	65-75	2.4	40	460	730	1100	1800	2200
3 1/16-3 1/2	80-85	3.9	64	410	640	1000	1550	2000
3 9/16 - 4	90-100	5.7	94	350	550	850	1350	1700
4 1/16-4 1/2	110-115	6.5	106	300	470	740	1150	1500
4 9/16 - 5	125	10.0	164	280	440	680	1050	1400

Link-Belt Spherical Roller Bearing Units Series P-LB6800

Relubrication interval				6 mos	4 mos	2 mos	1 mo
Shaft size range		Amt. of Grease		Operating speed (RPM)			
Inches	MM	Cu. In.	Cu. Cm.	Up to	Up to	Up to	Up to
1 7/16 - 1 1/2	40	0.3	4.9	2400	3600	5000	5500
1 11/16 - 1 3/4	45	0.3	5.0	2200	3300	4500	5000
1 15/16 - 2	50	0.4	6.6	2000	3000	4000	4500
2 3/16 - 2 1/4	60	0.8	12.7	1700	2500	3400	3800
2 7/16 - 2 1/2	65	0.8	12.3	1450	2200	3000	3400
2 11/16 - 2 3/4	70	0.9	14.3	1350	2000	2800	3200
2 15/16 - 3	75	1.2	19.7	1300	1900	2600	3000
3 3/16 - 3 1/4	80	1.7	27.4	1200	1800	2400	2700
3 7/16 - 3 1/2	90	2.3	37.7	1100	1650	2200	2300
3 11/16 - 4	100	3.1	50	1000	1500	1950	2100
4 3/16 - 4 1/4	110	4.3	70	900	1350	1850	1900
4 7/16 - 4 1/2	115	5.5	90.1	840	1250	1700	1800
4 15/16 - 5	125	6.4	105	780	1150	1600	1700
Clean and repack intervals				5 yrs	3 yrs	2 yrs	1 yr

Link-Belt Ball Bearing Units -- Series 300

Relubrication interval				6 mos	4 mos	2 mos	1 mo
Shaft size range		Amt. of Grease		Operating speed (RPM)			
Inches	MM	Cu. In.	Cu. Cm.	Up to	Up to	Up to	Up to
3/4 - 1	20-25	0.3	4.1	2800	4400	6400	8400
1 1/16-1 7/16	30-35	0.7	10.7	2000	3100	4500	6000
1 1/2 - 1 3/4	40-45	1.0	16.4	1500	2400	3500	4600
1 13/16-2 3/16	50-55	1.7	28	1200	2000	2900	3800
2 1/4 - 2 7/16	60	2.1	34	1100	1800	2600	3500
2 11/16-2 15/16	70-75	3.3	54	900	1400	2100	2800
3 - 3 3/16	80	4.5	74	800	1300	2000	2600
3 7/16 - 3 1/2	85	6.6	108	800	1200	1800	2400
3 15/16	100	10	170	700	1100	1600	2100

Lubricate with a premium quality NLGI 2 or 3 multi-purpose ball bearing grease having corrosion inhibitors, anit-oxidant additives and mechanical stability for high speed operation. The grease should also have a minimum base oil viscosity of 500 SUS at 100° F and be suitable to operate continuously at 225° F. Do not use a heavy, long fibered grease.

The bearings on this fan shaft have been greased at the factory for the following application:

- General Purpose (Shell Oil-Shell Alvania EP#2)
- High Temperature (Shell Oil-Aeroshell #22 (-85° F. to 400° F.)
- Low Temperature (Shell Oil-Aeroshell #22 (-85° F. to 400° F.)
- Extreme Moisture (Shell Oil-Shell Alvania EP#2)
- Other:_____

These units are prelubricated(except Series P-LB6800) with a multi-purpose Lithium soap grease. When relubricating with greases of different types (especially synthetic soaps or oils), complete flushing is recommended.

The presence of dirt, moisture or chemical fumes around the bearings requires more frequent lubrication. Ambient temperatures below 20° F or above 200° F require special lubricants. Consult the machinery manufacturer for recommendations.

When vibration exceeds 0.15 in./sec., frequent lubrication is required and a need for equipment trim balancing may be indicated.

Fill bearings with lubricant prior to extended shutdown or storage. Rotate the shaft several revolutions each month during idle periods.

(1) It is possible to dislodge the seals on these units if grease is added too fast. It is preferable to use a hand gun or a regulated automatic system

VERTICAL SHAFTS: For vertical applications more frequent relubrication is required. The above relubrication interval (and clean and repack interval for the Series P-LB 6800 bearings,) should be reduced by half.

TABLE 2 FAN TROUBLE-SHOOTING CHART	
PROBLEM	**POSSIBLE CAUSES**
EXCESSIVE VIBRATION	-Accumulation of material on impeller -Worn or corroded impeller -Bent shaft -Impeller or sheaves loose on shaft -Motor out of balance -Impeller out of balance -Sheaves eccentric or out of balance -Bearing or drive misalignment -Mismatched belts -Belts too loose or too tight -Loose or worn bearings -Loose bearing bolts -Loose fan mounting bolts -Weak or resonant foundation -Foundation not flat and level -Structures not crossbraced -System pulsation (DANGER) - Fan operation in a stall -Blades at different angles on adjustable pitch fans
HORSEPOWER TOO HIGH	-Fan speed higher than design -Air density higher than design -Impeller rotating in the wrong direction -Angle set too high in adjustable pitch fans
AIRFLOW TOO LOW	-Impeller rotating in the wrong direction -Fan speed lower than design -Actual system is more restrictive (more resistance to flow) than expected. -Dampers or registers closed -Leaks or obstructions in duct work -Filters or coils are dirty or clogged -Inlet or outlet screens clogged -Restricted fan inlet or outlet -No straight duct at fan outlet -Sharp elbows near fan inlet or outlet -Improperly designed turning vanes
AIRFLOW TOO MUCH	-Actual system is less restrictive (less resistance to flow) than expected -Fan speed higher than design -Filter not in place -Registers, grilles and/or dampers not installed
FAN DOES NOT OPERATE	-Blown fuses -Broken belts -Loose pulleys -Electricity turned off or not wired properly -Wrong voltage -Motor too small and overload protector has broken circuit

(CONT.)

TABLE 2 (CONTINUED) FAN TROUBLE-SHOOTING CHART	
PROBLEM	**POSSIBLE CAUSES**
EXCESSIVE NOISE	-Accumulation of material on impeller -Worn or corroded impeller -Bent shaft -Impeller or sheaves loose on shaft -Impeller hitting housing -Impeller out of balance -Bearing or drive misalignment -Mismatched belts -Belts too loose or too tight -Belts hitting guard -Loose or worn bearings -Belts worn -Belts oily or dirty -Defective or bad bearings -Bearings need lubrication -Loose bearing bolts -Loose fan mounting bolts -System pulsation or surge -Electrical noises -Noise from high velocity air system -Duct work too small -Registers or grilles too small for application -Fan in stall condition (DANGER) -Rattle of components in high velocity airstream -Leaks in duct work -Vibrating duct work -Vibrating parts not isolated from building

It is recommended that the users and installers of this equipment familiarize themselves with AMCA publication #201, "Fans and Systems, and publication #202 "Trouble-Shooting", which are published by Air Movement and Control Association, 20 West
University Drive, Arlington Heights, Illinois 60004.

SPARE PARTS:

Spare parts are not needed for the first year of operation. If spare parts are desired, then it is suggested that a spare motor and impeller be ordered for direct drive fans. For belt drive fans, in addition to the motor and impeller, it is suggested that a spare set of bearings, shaft, sheaves, and belts be ordered.

When ordering spare parts, specify the parts desired, the fan model number, and the fan serial number. Contact your local sales representative for price and delivery.

HARTZELL FAN, INC., PIQUA, OHIO 45356
Phone# 937-773-8494
Fax# 937-773-8994

Fiberglass Backward Curved Centrifugal Fans

Type FA Series 41 Series 41P

HARTZELL®

Hartzell Fan, Inc., Piqua, Ohio 45356
www.hartzellfan.com

Bulletin A-160-C April 2005

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Certified Ratings for Air and Sound

Hartzell Fan, Inc. certifies that the Series 41, Fiberglass Backward Curved Centrifugal Fans, Type FA shown on pages 7–11 and 14–21, and Series 41P, Fiberglass Backward Curved Centrifugal Fan, Packaged, shown on pages 12–20, are licensed to bear the AMCA Seal for Air and Sound Performance. The ratings shown are based on tests and procedures performed in accordance with AMCA Standard 211 and AMCA Standard 311 and comply with the requirements of the AMCA Certified Ratings Program.

Sound Performance data is available upon request. Please contact the factory and ask for Engineering Publication #SD-160.

Hartzell Model Code Explanation

Hartzell Model Code

A 41– 9 –33 1 FA 100 FG OP M 3

- Type
  - A – Production Item
  - S – Stock Item
  - Q – Special Quote
- Product Series
- Arrangement (centrifugals only)
- Size (nominal wheel diameter, inches)
- Class
- Wheel Code
- Wheel Width (entries represent percents)
- Material of Construction
- Motor Enclosure
- Motor Horsepower
- Motor RPM/Phase

Motor RPM/Phase Code

3 Phase	1 Phase
2 = 3450	B = 3450
3 = 1750	C = 1750
4 = 1140	D = 1140
5 = 870	E = 870
6 = 690	F = 690
7 = 575	G = 575

Motor Horsepower

Horsepower	1/4	1/3	1/2	3/4	1	1 1/2	2	3	5	7 1/2	10	15	20	25	30	40	50	60	75	100	125	150	200
Code Letter	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z

Example:

Assume a needed performance of 12,000 CFM at 5" SP, standard air. Reading the 33" rating table for 100% width on page 17, we find a fan RPM of 1,168 and brake horsepower (BHP) of 12.3. Required motor horsepower is 15. The model code can be constructed as follows: Type will be a production item (code A), product series for the Fiberglass Backward Curved Fans is 41, arrangement is 9 (code 9), size of the wheel is 33", class of construction is I (code 1), wheel code for this item is FA, wheel width is 100% (code 100), material of construction is fiberglass (code FG), motor enclosure is open protected drip-proof (code OP), motor horsepower is 15 (code O), and motor RPM/phase is 1750 (code 3).

Note: All other informational fields must be filled with hyphens/dashes (-) if they are not applicable to the fan being considered.

This bulletin lists Hartzell's line of Fiberglass Backward Curved Centrifugal Fans, Type FA and accessories. More than 70 Hartzell offices can provide specific performance and installation data to meet your requirements. Call your Hartzell representative for assistance. Visit our website (**www.hartzellfan.com**) or call toll-free (**1-800-336-3267**) for the name of your Hartzell representative.

General Fiberglass Construction Features

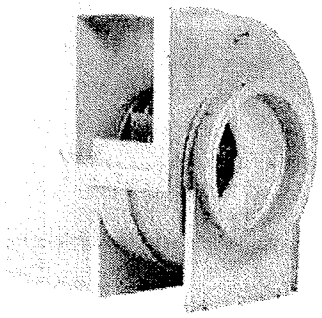
A variety of corrosion problems plague industry today. Fans and blowers made of coated steel or metals such as stainless and monel can handle some problem areas. Please refer to the corrosion resistance table on page 5 of this bulletin. Fiberglass centrifugal blowers can be used in most applications where corrosive elements exist in fume and vapor form. The resistance to corrosive elements is a major advantage, but the physical properties of fiberglass equipment offer these additional advantages:

- Fiberglass equipment is corrosion resistant.
- Fiberglass equipment weighs 25% less than comparable equipment made of carbon steel.
- Fiberglass has an extremely high strength-to-weight ratio, stronger than steel on a per-pound basis.
- Dimensional stability of fiberglass is excellent.
- Fiberglass air moving equipment will not become brittle at low temperatures and at 0°F the laminated fiberglass will be stronger than at room temperature.

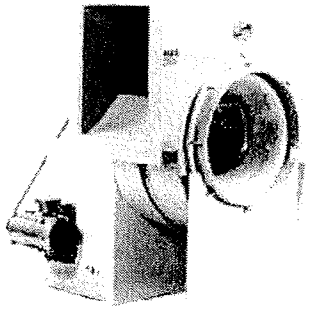
Hartzell Fan, Inc. conforms to ASTM D4167-97, Standard Specification for fiber-reinforced plastic fans and blowers, when optional surfacing veil, electrical grounding, and dynamic balancing to ASTM D4167-97 levels, are added to the fan.

The following are standard Hartzell fiberglass construction features:

- Corrosion resistant polyester resin, having a Class I flame spread rate of 25 or less is used for all housings. Vinylester resin having a Class I flame spread rate of 25 or less is used for all wheels.
- All structural parts in the airstream are fiberglass and resin. All fiberglass surfaces are protected with a minimum 10-mil thickness of chemical, flame, and ultraviolet resistant resin.
- Shafts are turned, ground, polished, and keyed at both ends with a fiberglass sleeve in the airstream. Shafts are sized to operate well below critical speed. 304 or 316 Stainless steel or monel shafting is available as an option at extra cost.
- Internal hardware (airstream) is Type 304 stainless steel. All internal hardware (airstream) is encapsulated. All external hardware (out of airstream) is zinc plated as standard. Where metal is subject to attack by the corrosive elements being handled, all metal parts can be resin-coated after assembly.
- A fiberglass and neoprene shaft seal is placed where the shaft leaves the housing along with a neoprene shaft slinger between the seal and wheel on belt drive units (seal is not gas tight).



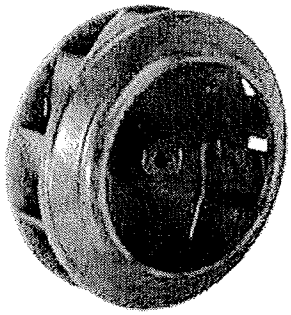
Series 41P



Series 41

Fiberglass Centrifugal Fans

- Bearings on belt drive units are heavy duty, deep row radial ball or double row spherical roller type self-aligning and shielded in cast iron housings. Long inner races ensure even load distribution, providing a high radial and thrust load capacity. Bearings are relubricable for continuous service with lubrication tubes extended to the exterior of fan base as necessary.
- V-Belt Drives are oversized for long life and continuous duty as standard. Fixed pitch or variable pitch drives are available upon request. Belts are oil, heat, and static resistant type.



Type FA Wheel

Type FA Wheel Features

The Type FA wheel is unique in the fan and blower industry. It is available in diameters from 12" to 60" in both clockwise and counter-clockwise rotations. The wheel is airfoil design and solid fiberglass die formed and coated with Dow Derakane 510-A corrosion resistant vinylester resin. The manufactured wheel is a single piece, removed from the pattern whole. This ensures each wheel is aerodynamically identical and provides reliable repeatable performance without the variability of hand made and taped components. The design is the result of a substantial investment in research, development, tooling, and manufacturing methods by Hartzell Fan, Inc.

The type FA wheel is highly efficient, with tapered inlet side and airfoil blades. It has non-overloading horsepower characteristic curve. When used in conjunction with a precision inlet cone it **efficiently moves large volumes of air at high pressures with low noise characteristics at low RPM.**

The fiberglass resin has a Class I flame spread rate of 25 or less. The wheel is electronically statically and dynamically balanced to the requirements of Fan Application Category BV-3 of AMCA ANSI Std. 204-96 and receives an Operational Test and Inspection before shipment. Special constructions are available for abrasive environments or extremely corrosive environments.

Hartzell Selection Guide

The Hartzell Fiberglass Backward Curved Centrifugal Fan performances on the following pages are based on standard air conditions (sea level, 70°F, and 29.92 inches barometric pressure). Performance data does not include drive losses on belt drive units.

How to use Performance Tables

1. Select a model for a given air delivery and pressure by looking up the required flow vertically along the left column of the performance table and moving to the required pressure. The model is identified with each table.
2. Note the required RPM and BHP. Refer to page 2 Hartzell Model Code Explanation for additional details.
3. If non-standard temperature or altitude is involved, correct to standard air density (see Temperature/Altitude Applications).

When placing your order, be sure to specify the Hartzell Model Code. Be sure to include fan model, performance requirements, operating temperature, motor data (enclosure, voltage, mounting position, etc.), and a list of required accessory items. (See pages 22 and 23.) For selection assistance and additional data contact your local Hartzell Sales Representative for assistance.

Temperature/Altitude Applications

When a fan operates in ambient conditions, generally it is handling standard air at 70°F, 29.92" barometric pressure, weighing 0.075-lbs./cu. ft. For an application where the fan operates at other than ambient conditions (temperature, altitude, or both), correction factors must be applied to the selection of the fan. In addition, the standard construction of the fan must be modified.

Correction factors for temperatures and altitudes are provided in Table 1. When a fan operates at other than ambient conditions, the correction factors in Table 1 will be required to correct static pressure and horsepower.

Table 2 shows the maximum safe operating speeds for each size fan wheel. At high temperatures, these maximum safe operating speeds should be derated.

Table 3 provides maximum safe speed correction factors by temperature and material construction. An example on the use of these tables appears at the bottom of this page.

Table 1 Altitude/Temperature Correction Factors

Temp.* (°F)	-50	-25	0	25	50	70	100	125	150	175	200	250
Factor	0.77	0.82	0.87	0.91	0.96	1.00	1.06	1.10	1.15	1.20	1.25	1.34

Alt.** (Ft.)	0	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000	10,000
Factor	1.00	1.04	1.08	1.12	1.16	1.20	1.25	1.30	1.35	1.40	1.46

Above table has inverted values. Actual density is the reciprocal of the above values.
***At sea level. ****At 70°F.**
For corrections involving both temperature and altitude, correction factors should be multiplied.
Example: 150°F at 7000 ft.: Temperature factor 1.15 x altitude factor 1.30 = 1.50 combined correction factor.

Table 2 Maximum Safe Speeds @70°F

Fan Size	100% Width	66% Width
12	4,520	5,320
15	3,600	4,340
18	2,990	3,610
22	2,440	2,950
24	2,240	2,710
27	2,000	2,410
30	1,840	2,220
33	1,670	2,020
36	1,530	1,850
40	1,370	1,660
44	1,240	1,500
49	1,130	1,360
54	1,020	1,230
60	920	1,110

Table 3 Maximum Safe Speed Correction Factors*

Temp. (°F)	0	70	100	150	175	200	225	250
FRP	1.00	1.00	1.00	0.98	0.95	0.91	0.82	0.70

* To correct maximum safe operating speeds (Table 2) for high temperatures, multiply those speeds by correction factors from Table 3.

Use of Correction Factors and Tables

First select size, RPM and BHP of the blower needed.

If temperature or altitude is involved, correct to standard air.

Example: Assume the required performance to be 12,000 CFM at 4.62" SP, 175°F and 2000 feet altitude.

1. Temperature factor 1.20 x altitude factor 1.08 = 1.30 combined correction factor.
2. Correct SP to standard 4.62" SP x 1.30 = 6" SP for 70°F at sea level.
3. A Series 41, size 33" class II 66% width belt drive backward curved centrifugal, selected from the rating tables (page 17) for the new condition shows 12,000 CFM at 6" SP, 1,398 RPM and 15.5 BHP.
4. Correct the horsepower and static pressure in item 3 to non-standard performance by dividing by factor: 6" SP divided by 1.30 = 4.62" SP; 15.5 BHP divided by 1.30 = 11.9 BHP.
5. Check the maximum safe speed. Maximum speed at 70°F for fan size 33" 66% width, 2,020 RPM. Using the maximum safe speed factor table for fiberglass construction yields a safe speed factor of .95. The maximum safe speed is 2,020 x .95 = 1,919 RPM; thus operation at 1,438 RPM at 175°F is satisfactory.
6. Final performance of the unit at the assumed conditions: 12,000 CFM at 4.62" SP, 1,398 RPM, 11.9 BHP at 175°F and 2000 feet altitude.
7. Size motor for cold startups and use a special high altitude motor if altitude exceeds 3300 feet.

Corrosion Resistance Guide

Temperature values shown are for immersion or condensate contact applications. Where temperature values are shown, resin is suitable for hood and duct type applications for the full operating temperature range of the product. See product specifications for materials of construction and maximum operating temperature limits.

Environment	Hetron 693 Ashland F.	6694 Reichold F.	510A Dow F.
ACIDS			
Acetic to 10%	180	200	210
Acetic to 50%	90	160	180
Acetic to 100%		NR	NR
Acrylic to 25%	–	100	100
Benzene Sulfonic to 25%	180	210	150
Benzene Sulfonic 25% up	90	210	NR
Benzoic	250	220	210
Boric	160	220	210
Butyric to 50%	150	150	210
Butyric 50% up	–	100	80
Carbonic	150	220	NR
Chloroacetic to 25%	NR	*180	*150
Chloroacetic 25% to 50%	NR	*150	*120
Chromic to 5%	100	110	150
Chromic to 10% to 20%	–	NR	150
Citric	*200	*220	*210
Fluoboric	*S90	*S220	*S210
Glycolic up to 10%	S100	S150	S180
Formic up to 10%	200	150	180
Gluconic to 50%	120	180	180
Hydrobromic to 20%	*160	*170	*180
Hydrochloric to 15%	*230	*210	*180
Hydrocyanic to 10%	200	170	210
Hydrofluoric to 10%	**S100	**S150	**S150
Hydrofluorosilicic up to 10%	*S100	*S150	*S180
Hypochlorous to 20%	90	110	NR
Lactic	*200	*220	*210
Maleic	170	210	210
Nitric to 5%	200	170	150
Nitric 5% to 20%	–	140	120
Oleic	200	220	210
Oxalic	*220	*220	*210
Perchloric to 10%	H&D	**150	**150
Phosphoric	*220	*S210	*S210
Phosphoric, super	–	*S210	*S210
Phthalic Anhydride	*150	*210	*210
Picric to 10%	160	170	NR
Silicic	–	220	NR
Stearic	200	220	210
Sulfamic to 25%	160	150	NR
Sulfuric to 25%	*200	*220	*210
Sulfuric to 80%	*200	*200	*180
Sulfuric to 70%	*150	*180	*100
Sulfuric to 90%	NR	80	NR
Sulfurous to 10%	90	110	120
Tannic	200	220	210
Tartaric	220	220	210
Trichloroacetic to 50%	*90	*220	*200
ALCOHOLS			
Amyl	200	210	120
Benzyl	NR	100	NR
Butyl	190	150	120
Ethyl	90	120	80
Methyl	90	80	NR
GASES AND VAPORS			
Ammonia, Dry	90	170	100
Ammonia, Wet	90	NR	NR
Bromine, Wet	90	*100	NR
Carbon Dioxide	250	250	250
Carbon Monoxide	200	250	250
Chlorine, Dry	*200	*210	NR
Fluorine	–	NR	80
Hydrogen Fluoride, Vapor	*90	*S180	*S180
Hydrogen Sulfide to 5%	250	240	180
Sulfur Dioxide, Dry	200	250	210
Sulfur Dioxide, Wet	200	250	210
Sulfur Trioxide, Wet	–	220	210

Environment	Hetron 693 Ashland F.	6694 Reichold F.	510A Dow F.
ALKALIES (Synthetic Veil)			
Ammonium Bicarbonate to 50%	140	S170	160
Ammonium Carbonate	120	S140	150
Ammonium Hydroxide to 5%	S90	S180	S180
Ammonium Hydroxide to 10%	S90	S170	S150
Ammonium Hydroxide to 29%	NR	S100	S100
Barium Carbonate	180	S240	210
Barium Hydroxide to 10%	–	S170	150
Calcium Hydroxide to 15%	160	S210	S180
Magnesium Carbonate	160	S210	180
Potassium Bicarbonate to 10%	90	S170	S150
Potassium Carbonate to 10%	90	S180	S150
Potassium Hydroxide to 25%	NR	S120	S150
Sodium Bicarbonate to 10%	140	S210	S180
Sodium Carbonate to 25%	90	S180	S180
Sodium Hydroxide to 10%	NR	S160	S150
Sodium Hydroxide to 25%	NR	S150	S180
Sodium Sulfide	90	S220	S210
Trisodium Phosphate to 50%	–	S175	210
SALTS			
Aluminum Chloride	*120	*240	*210
Aluminum Potassium Sulfate	160	240	210
Aluminum Sulfate	250	240	210
Ammonium Chloride	*200	*220	*210
Ammonium Nitrate	200	220	220
Ammonium Persulfate	150	200	180
Ammonium Persulfate, saturate	150	NR	NR
Ammonium Sulfate	200	220	220
Aniline Sulfate to 25%	150	220	210
Aniline Sulfate, saturated	150	220	NR
Barium Chloride	200	240	210
Barium Sulfide	NR	S210	180
Calcium Chlorate	180	220	220
Calcium Chloride	250	240	220
Calcium Sulfate	*200	*240	*210
Copper Chloride	*250	*220	*220
Copper Cyanide	90	S220	210
Copper Fluoride	NR	S170	NR
Copper Sulfate	250	240	210
Ferric Chloride	*250	*220	*210
Ferric Nitrate	170	220	210
Ferric Sulfate	200	220	210
Ferrous Chloride	*220	*220	*210
Ferrous Nitrate	160	220	210
Ferrous Sulfate	220	220	210
Lead Acetate	160	220	210
Magnesium Chloride	220	240	210
Magnesium Hydroxide	–	S210	210
Magnesium Sulfate	200	210	210
Mercuric Chloride	*210	*220	*210
Mercurous Chloride	210	220	210
Nickel Chloride	220	220	210
Nickel Nitrate	220	220	210
Nickel Sulfate	220	220	210
Potassium Chloride	200	240	210
Potassium Dichromate	200	220	210
Potassium Ferricyanide	200	220	210
Potassium Nitrate	200	220	210
Potassium Permanganate	150	210	210
Potassium Persulfate	90	220	210
Potassium Sulfate	200	240	210
Silver Nitrate	200	220	210
Sodium Acetate	150	220	210
Sodium Bisulfate	200	220	210
Sodium Chloride	200	240	180
Sodium Chlorite to 10%	175	170	150
Sodium Cyanide	100	220	210
Sodium Dichromate	160	220	210

Environment	Hetron 693 Ashland F.	6694 Reichold F.	510A Dow F.
SALTS (cont'd.)			
Sodium Ferricyanide	220	220	210
Sodium Fluoride	–	S180	S180
Sodium Nitrate	220	220	210
Sodium Nitrite		220	NR
Sodium Silicate PH less than 1	160	210	NR
Sodium Sulfate	180	240	210
Sodium Sulfite	–	220	210
Stannic Chloride	*180	*220	*210
Stannous Chloride	*200	*220	*210
Zinc Chloride	200	*220	*210
Zinc Nitrate	180	220	210
Zinc Sulfate	150	220	NR
SOLVENTS			
Acetone to 10%	NR	180	180
Benzene	90	80	NR
Carbon Disulfide	NR	NR	NR
Carbon Tetrachloride	90 VAPOR	110	150
Chlorobenzene	NR	NR	NR
Ethyl Acetate	NR	NR	NR
Ethyl Chloride	90 VAPOR	NR	NR
Ethylene Dibromide	NR	NR	NR
Ethylene Glycol	250	220	210
n-Heptane	120	210	210
Hexane	–	150	150
Methyl Ethyl Ketone to 10%	NR	80	NR
Naphtha	200	210	180
Napathalene	130	220	210
Tetrachloroethylene	NR	100	80
Toluene	90	NR	80
Xylene	90	80	80
BLEACHES			
Calcium Chlorate	180	220	220
Calcium Hypochlorite	100	NR	S160
Chlorine Dioxide up to 15%	–	160	*200
Chlorine Water	*125	*210	*200
Hydrogen Peroxide to 30%	120	100	150
Sodium Chlorate	90	210	210
Sodium Hypochlorite to 15%	NR	125	S180
OTHERS			
Alum, Chlorohydroxide to 50%	–	220	210
Ammonium Phosphate	150	210	210
Aqua Regia	NR	*80	NR
Detergents	120	170	150
Glycerine	200	220	210
Kerosene	120	210	180
Photographic Solutions	–	80	NR
Perchlorethylene	NR	100	80
Sodium Tetraborate	180	S210	180
Sodium Tripolyphosphate	125	210	210
Sodium Xylene Sulfonate	–	170	160
Sorbitol Solutions	180	220	160
Urea	90	170	150
Urea-Ammonium-Nitrate	–	120	120
Fertilizer Fumes	100	120	150
Shell-D-D	NR	100	NR
Steam Vapor	180	210	180

Reference C.R.G.1.1

NOTES: NR = Not Recommended S = Synthetic surfacing veil or mat required. Contact factory. "–" = No test data available

* Special shaft and hardware required, contact factory.

** Special design considerations required (explosive environment), contact factory.

*** Do not use HartKoate. Special shaft and hardware required, contact factory.

For environments not shown, or when temperatures exceed the maximum listed, contact factory.

Hydrocarbon fuel environments may require static grounding, contact factory.

Do not use HartKoate (Alum. Oxide) with Hydrofluoric acid.

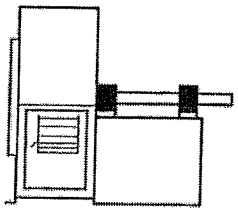
Hartzell Centrifugal Fan Classifications

Hartzell Series 41 Fiberglass Backward Curved Centrifugal Fans, Type FA, 100% width, are designed and classified to perform within the centrifugal fan classification parameters established by AMCA Standard No. 2408; AMCA Publication 99. Hartzell Series 41 Fiberglass Backward Curved Centrifugal Fans, Type FA, 100% width are available in Class I and II construction. Hartzell Series 41 in 66% width are available in Class I, II, and III construction. Series 41P are available in Class I construction only. See performance tables for specific ratings. These parameters are explained in the following table.

FAN CLASS	PERFORMANCE RANGE*	TABLE SHADING
I	5" @ 2300 FPM To 2½" @ 3200 FPM	
II	8½" @ 3000 FPM To 4¼" @ 4175 FPM	
III	13½" @ 3780 FPM To 6¾" @ 5260 FPM	

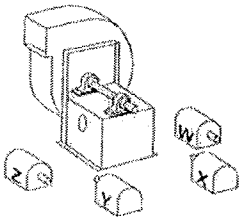
* At standard air conditions (70°F, 29.92 in. HG barometric pressure, .075 lbs./ft.3). Static pressure shown in inches of water; outlet velocity shown in feet per minute. Performance Ranges apply only to 100% width construction.

Centrifugal Fan Arrangements



Arrangement 1

Unit furnished with shaft and bearings, less motor and drive. Designed to be driven by a separately mounted motor. Impeller is overhung – two bearings on base. Temperature limitations: 250°F.

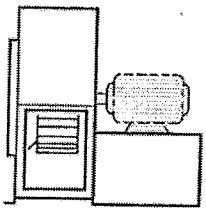


Motor Position Designation

Motor position designation is necessary when ordering the following for Arrangement 1 fans –

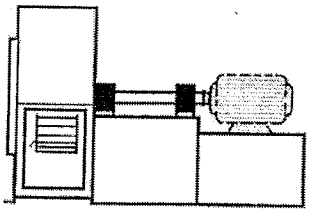
1 – V Belt Drive.
2 – Vibration Bases.
3 – Belt Guards.

Note: Location of motor is determined by facing the drive side of the fan and designating the motor position by letters W, X, Y, or Z. Consider discharge location and height when specifying.



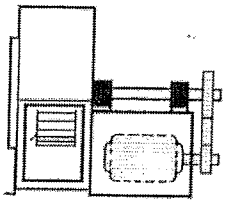
Arrangement 4

Direct drive packaged unit, wheel is overhung and attached to the shaft of the electric motor. No bearings on fan. Temperature limitations: 200°F.



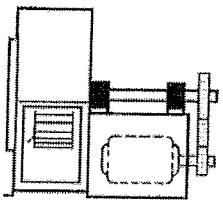
Arrangement 8

Direct coupled configuration with motor mounted to common fan base. Impeller is overhung and supported by two bearings on fan base. Temperature Limitations: 250°F.



Arrangement 9

Belt drive configuration with motor mounted on outside of bearing base support. Packaged unit, wheel is overhung, slide rail motor base permits easy adjustment of belt tension. Available on either left or right hand side of base (when facing drive end of shaft). Temperature limitations: 250°F.



Arrangement 10

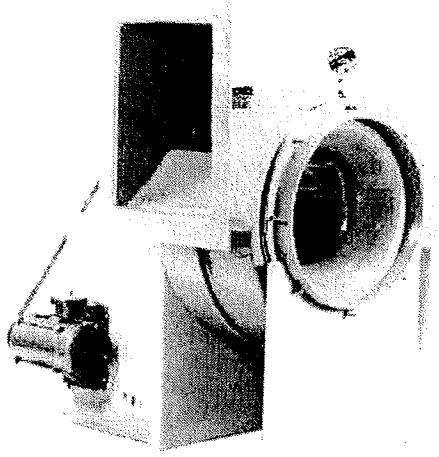
Belt drive configuration with motor mounted inside base. Packaged unit, wheel is overhung. Temperature limitations: 250°F.

Adapted from AMCA Standard 99-2404-03, *Drive Arrangements for Centrifugal Fans*, and AMCA Standard 99-2407-03, *Motor Positions for Belt or Chain Drive Centrifugal Fans*, with written permission from Air Movement and Control Association International, Inc.

Series 41 Backward Curved Centrifugal Fan, Type FA

Series 41 Hartzell Fiberglass Backward Curved Centrifugal Fans offers **non-overloading, high efficiency, low noise,** and economy for corrosive atmospheres. This fan is unique in the fan and blower industry. The fan incorporates the proven, highly efficient, backward curved, airfoil-bladed, solid fiberglass, Type FA wheel in a solid fiberglass housing. This design incorporates the airfoil centrifugal wheel, centrifugal fan housing, and inlet cone to produce a compact, highly efficient unit with low noise characteristics.

- **Applications** – Developed for compatible corrosive applications where it is advantageous to have fiberglass materials and have the motor out of the airstream with the versatility of a belt drive fan.
- **Performance** – Type FA fiberglass airfoil wheel with inlet cone and aerodynamically designed housing produces from **800 CFM to 90,000 CFM at pressures from free delivery to 14" W.G.** at high efficiencies with non-overloading horsepower, low noise, and low RPM. Maximum temperature capability is 250°F.

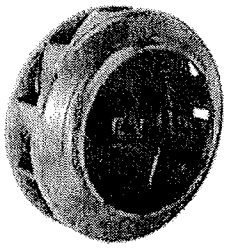


Series 41

AMCA CERTIFIED RATINGS SOUND AIR

Hartzell Fan, Inc. certifies that the Series 41, Fiberglass Backward Curved Centrifugal Fans, Type FA, shown herein are licensed to bear the AMCA seal for air and sound performance. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 211 and Publication 311 and comply with the requirements of the AMCA Certified Ratings Program.

Sound Performance data is available upon request. Please contact the factory and ask for Engineering Publication #SD-160.



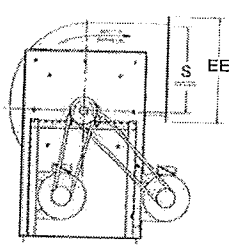
Type FA Wheel

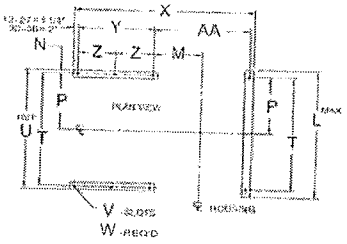
Features

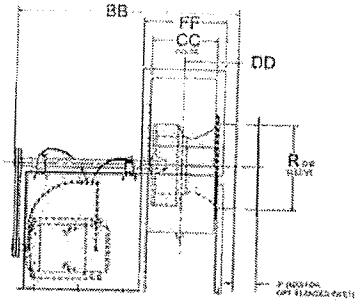
- **Sizes** – 12", 15", 18", 22", 24", 27", 30", 33", 36", 40", 44", 49", 54", and 60" wheel diameters. Available in Class I and II in 100% width and Class I, II, and III in 66% width. Available in Belt Drive Arrangements #1, #9, and #10, Direct Drive Arr. #4 and Direct Coupled Arr. #8. Contact Factory for Arr. #8 dimensions and for other arrangements.
- **FRP Materials** – Solid fiberglass wheel molded with Dow Derakane 510-A corrosion resistant vinylester resin having a Class I flame spread rate of 25 or less. The housing and other standard FRP components are constructed of fiberglass and Ashland Hertron 693 corrosive resistant polyester resin having a Class I flame spread rate of 25 or less. No metal parts are exposed in the airstream. See Corrosion Resistance Guide on page 5 for resin characteristics. Other resins are available.
- **Type FA Wheel** – **High efficiency, airfoil** design with **one-piece, solid fiberglass,** construction. Tapered inlet side design efficiently moves large volumes of air at high pressures. Wheel has non-overloading horsepower characteristic curve.
- **Rotation and Discharge Positions** – Available in both clockwise and counterclockwise rotations and in all standard discharge positions. Housing discharge position can be changed on fan sizes 12" through 36". Larger size housings are non-rotatable.
- **Easy Installation and Maintenance** – Motor, drives, and bearings are readily accessible for ease in wiring, installation, adjustment, and lubrication.
- **Shafts** – Shafts are turned ground and polished, keyed at both ends with fiberglass sleeve in the airstream and sized to operate well below critical speed.
- **Bearings** – Bearings are heavy duty, self-aligning, ball or roller type, in cast iron pillow block housings, selected for minimum L-50 Life of 250,000 hours, and include extended lubrication fittings as standard.
- **Standard Shaft Seal** – A fiberglass and neoprene shaft seal is placed where the shaft leaves the housing along with a neoprene shaft slinger between the seal and wheel. Seal is not gas tight.
- **Hardware** – Airstream hardware is Type 304 stainless steel and encapsulated.
- **Motor Out of the Airstream** – Exterior mounting of Drip-Proof Protected motor on an adjustable motor slide base in belt drive models is standard. Motors can be furnished as TEFC, Mill and Chemical Duty, or to specifications upon request. Motor HP and frame size limits are identified in Dimensions and Material Specifications table.
- **Drives (Belt Drive Fans)** – V-Belt Drives are oversized for long life and continuous duty and are fixed pitch as standard option. Variable pitch drives are available upon request. Belts are oil, heat, and static resistant type.
- **Balancing** – The fan is electronically statically and dynamically balanced to the requirements of Fan Application Category BV-3 of AMCA ANSI Std. 204-96. All fans receive an inspection prior to shipment and, whenever possible, an operational test.
- **Flanged Duct Connections** – Outlet flange is standard, inlet flange is optional. Flange bolt holes are optional.
- **Bases** – Heavy gauge, welded, hot rolled steel with epoxy coating are standard.
- **Options and Accessories** – See pages 22 and 23.
- **Spark Resistant Construction and Protective Coatings** – Spark resistant construction for fiberglass equipment is optional, and for abrasive environments or extremely corrosive environments, special construction is available, see page 23.

Dimensions – Arrangements 1, 9 or 10

SERIES 41, Type FA
Sizes 12" Through 36", Rotatable Housing
Standard Construction – Classes I, II and III, Maximum Temperature – 250°F.







Principal Dimensions (Inches) – Sizes 12" – 36"

Fan Size	A	B		C	D	E	F	G	H	J	L	M		N
		Class I/II	Class III									100% Width	66% Width	
12	18 1/2	15 1/2	15 1/2	13	11 1/2	12 1/4	20 1/8	10 3/4	10	11 1/16	18 3/4	6 29/32	6 3/16	1
15	21 1/2	18 5/8	19 5/8	16 3/16	15 7/8	16 11/16	25 1/2	14 15/16	14	13 1/16	21 3/4	8 3/8	7 11/16	1
18	24 1/2	21 15/16	22 7/8	19	18 7/16	19 9/16	28 1/2	17 5/16	16 3/16	15 1/16	28 3/4	11 3/16	10 3/8	15/16
22	30	26 1/4	27 3/16	21 1/8	22 11/16	24 1/16	34 3/8	21 5/16	19 15/16	18 9/16	29 1/8	11 1/8	10 1/8	1
24	33 15/16	28 5/16	29 1/4	23	24 7/16	25 15/16	37 3/16	22 15/16	21 7/16	19 15/16	31	11 7/8	10 3/4	1
27	32 5/8	32 1/2	32 1/2	24	27 7/16	29 1/8	40 3/16	25 13/16	24 1/8	22 7/16	33 1/8	13 3/16	11 15/16	1
30	37	35	35	28 1/2	29 9/16	31 3/8	43 7/16	27 3/4	25 15/16	24 1/16	38 3/8	17	15 5/8	2 1/8
33	40	38 5/16	38 5/16	28 11/16	33 1/4	35 1/4	47 9/16	31 1/4	29 1/4	27 3/16	38 5/8	18 1/2	16 5/8	2 1/8
36	42	41 5/16	41 5/16	31 5/16	35 1/16	37 1/4	51 11/16	32 7/8	30 11/16	28 1/2	42 3/4	19 1/8	17 5/8	2 1/8

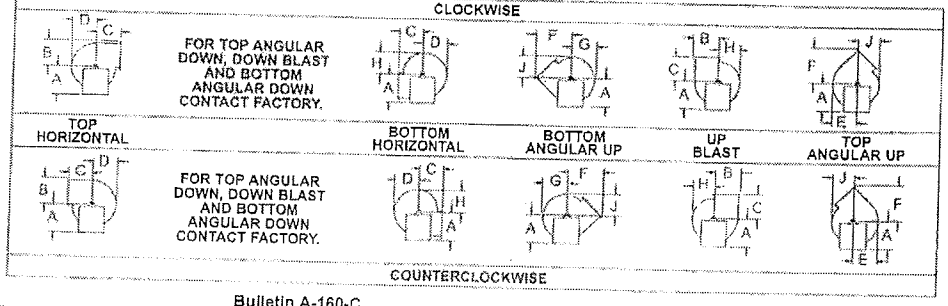
Fan Size	P	R	S	T	U	V	W	X		Y	Z	AA	
								100% Width	66% Width			100% Width	66% Width
12	8 1/8	12 1/4	12 7/8	16 1/4	18 1/4	11/16 x 1 1/16	6	28 1/8	26 31/32	12 3/4	–	13 1/8	11 31/32
15	9 1/8	16 1/2	16 1/8	18 1/4	20 1/4	11/16 x 1 1/16	6	34	32 3/8	15 3/4	–	16	14 9/16
18	12 11/16	19 1/2	19 3/8	25 3/8	27 1/4	11/16 x 1 1/16	8	41	39 1/2	18 3/4	9 3/8	20	18 1/4
22	12 11/16	23 7/8	23 5/8	25 3/8	27 3/8	11/16 x 1 1/16	8	44 1/16	42 3/8	20 1/4	10 1/8	21 9/16	19 1/2
24	12 11/16	25 7/8	25 3/4	25 3/8	27 3/8	11/16 x 1 1/16	8	47 7/8	46	22 1/2	11 1/4	23 1/8	20 7/8
27	11	28 3/4	29	22	24	11/16 x 1 1/16	8	50 9/16	48 3/16	22 1/2	11 1/4	25 13/16	23 5/16
30	16 7/8	31 3/16	31 1/2	33 3/4	38	13/16 x 1 1/4	8	57 1/16	54 3/8	22 3/4	11 3/8	30 13/16	28 1/8
33	16 7/8	34 3/16	34 11/16	33 3/4	38	13/16 x 1 1/4	8	62 7/16	59 7/16	25 3/4	12 7/8	33 3/16	30 3/16
36	16 7/8	37 3/16	37 13/16	33 3/4	38	13/16 x 1 1/4	8	64 11/16	61 7/16	25 3/4	12 7/8	35 7/16	32 3/16

Fan Size	BB		CC		DD		EE				FF			
	100% Width	66% Width	100% Width	66% Width	100% Width	66% Width	100% Width		66% Width		100% Width		66% Width	
							Class I/II	Class III	Class I/II	Class III	Class I/II	Class III	Class I/II	Class III
12	33 1/8	31 31/32	9 3/32	8 5/8	8	7 7/16	18 1/8	18 1/8	18 1/8	18 1/8	14 3/8	14 3/8	13 1/2	13 1/2
15	38 3/4	37 5/16	11 11/16	10 5/16	9 5/16	8 5/16	21 1/16	23 1/8	21 1/16	23 1/8	16 7/8	18 11/16	15 1/4	17 5/16
18	45 3/4	43 15/16	14	12 5/16	10 1/2	9 5/8	24 1/2	25 3/8	24 1/2	25 3/8	19 1/16	21	17 3/8	19 5/16
22	49 5/8	47 5/16	17 1/8	15 1/16	12 1/8	11	28 3/4	30 5/8	28 3/4	30 5/8	22 1/4	24 1/8	20 3/16	22 1/16
24	54 1/8	51 11/16	18 5/8	16 3/8	12 15/16	11 11/16	30 11/16	32 3/4	30 15/16	26 3/8	23 11/16	25 5/8	21 7/16	23 3/8
27	56 3/4	53 15/16	21	18 1/2	14 1/8	12 7/8	36	36	36	36	28	28	25 1/2	25 1/2
30	63 1/16	60 5/8	22 13/16	20 1/16	15 1/16	13 11/16	38 1/2	38 1/2	38 1/2	38 1/2	29 13/16	29 13/16	27 1/16	27 1/16
33	69 1/8	65 7/16	25 1/8	22 1/8	16 1/4	14 3/4	41 11/16	41 11/16	38 1/2	38 1/2	32 1/8	32 1/8	29 1/8	29 1/8
36	72 11/16	69 7/16	27 3/8	24 1/8	17 3/4	16 5/8	44 13/16	44 13/16	41 11/16	41 11/16	34 5/8	34 5/8	29 1/8	31 1/8

Dimensions and specifications are subject to change. Clockwise Rotation is shown. Certified prints are available.

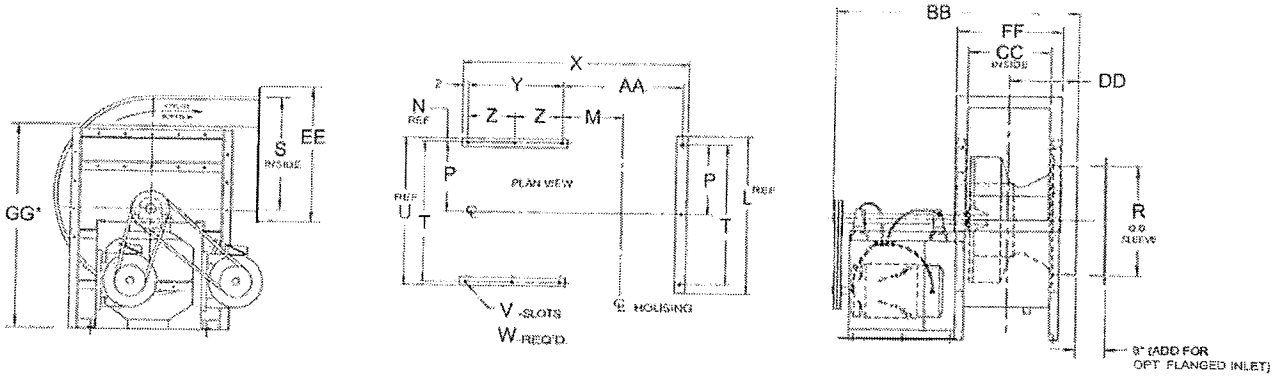
Fan Discharges

TAD, BAD, and DB discharge must have discharge extension. Contact factory.



Dimensions – Arrangements 1, 9 or 10

SERIES 41, Type FA
Sizes 40" Through 60", Fixed Housing
Standard Construction – Classes I, II and III, Maximum Temperature – 250°F.



Principal Dimensions (Inches) – Sizes 40" – 60"

Fan Size	A				B	C	D	E	F	G	H	J	L	M	
	TAU-TH	TAD	BH	BAU-UB										100% Width	66% Width
40	47	47	47	47	46 13/16	35 7/8	40 1/4	42 3/4	58 13/16	37 3/4	35 1/4	32 3/4	55 1/4	21 3/16	19 3/8
44	51 1/4	51 1/4	51 1/4	51 1/4	52 3/8	39 11/16	45 1/2	48 3/4	65 1/2	42 3/4	40	37 3/16	59 5/8	22 7/8	20 7/8
49	56 1/2	56 1/2	56 1/2	56 1/2	57 1/8	43 11/16	49 1/16	52 1/8	71 11/16	46	42 15/16	39 7/8	71 1/2	24 9/16	22 3/8
54	54 1/4	47 3/4	64	61	52 7/8	48 3/8	54 3/8	57 3/4	78 11/16	51	47 9/16	44 1/4	69 5/8	27 3/8	24 15/16
60	60	52 1/2	70	67 1/2	59 1/16	53 1/2	59 7/8	63 3/4	86 11/16	56 1/8	52 3/8	48 5/8	75 1/2	29 5/8	26 15/16

Fan Size	N	P	R	S	T	U	V	W	X		Y	Z	AA	
									100% Width	66% Width			100% Width	66% Width
40	2	22	42 5/8	43 5/16	44	48	13/16 x 1 1/4	9	70 1/8	66 1/2	27 3/4	13 7/8	38 7/8	35 1/4
44	2	22	47 1/8	47 7/8	44	48	13/16 x 1 1/4	9	73 7/16	69 7/16	27 3/4	13 7/8	42 3/16	38 3/16
49	2 1/2	22 1/2	51 7/8	52 5/8	45	50	13/16 x 1 1/4	9	81 7/8	77 7/16	32 3/4	16 3/8	45 5/8	41 3/16
54	2	27	57 5/16	58 3/8	54	58	13/16 x 1 1/4	9	86 1/16	81 1/8	32	16	50 9/16	45 5/8
60	2	27	63 5/16	64 9/16	54	58	13/16 x 1 1/4	9	90 1/2	85 1/16	32	16	55	49 9/16

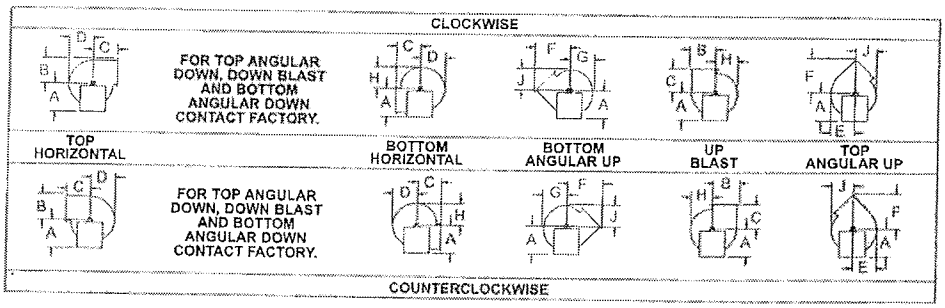
Fan Size	BB		CC		DD		EE	FF		GG*
	100% Width	66% Width	100% Width	66% Width	100% Width	66% Width		100% Width	66% Width	
40	78 13/16	75 3/16	31 3/8	27 3/4	19 1/2	17 11/16	50 5/16	38 3/8	34 3/4	–
44	82 7/16	78 7/16	34 11/16	30 11/16	21 1/4	19 1/4	56 7/8	43 11/16	39 11/16	–
49	90 7/8	86 7/16	38 1/8	33 11/16	22 15/16	20 3/4	61 5/8	47 1/8	42 11/16	–
54	94 13/16	89 7/8	42 9/16	37 3/8	25	22 9/16	67 3/8	51 5/16	46 3/8	98 1/4
60	99 5/16	93 7/8	46 3/4	41 5/16	27 1/4	24 9/16	73 5/16	55 3/4	50 5/16	107 3/8

Dimensions and specifications are subject to change. Clockwise Rotation is shown. Certified prints are available.

Fan Discharges

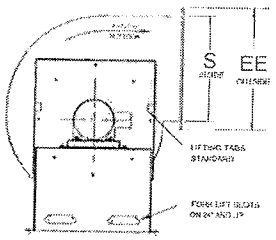
TAD, BAD, and DB discharge must have discharge extension. Contact factory.

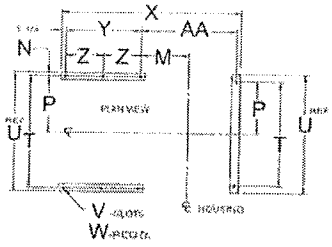
* For top angular up discharge on 54" and 60" only, dimension is for location of removable split scroll to allow for shipping. Assembly required in field.

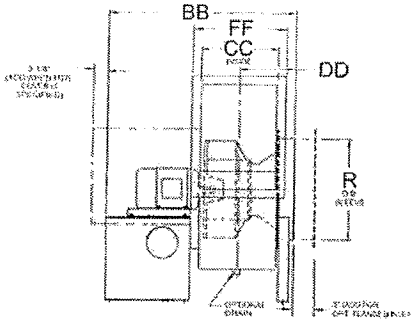


Dimensions – Arrangement 4

SERIES 41, Type FA
Sizes 12" Through 33", Rotatable Housing
Standard Construction – Classes I, II and III, Maximum Temperature – 200°F.







Principal Dimensions (Inches) – Sizes 12" – 33"

Fan Size	A	B		C	D	E	F	G	H	J	M		N
		Class I/II	Class III								100% Width	66% Width	
12	16	15 1/2	15 1/8	13	11 1/2	12 1/4	20 1/8	10 3/4	10	11 1/16	8 7/16	7 7/8	5/8
15	18 3/4	18 5/8	19 5/8	16 3/16	16 7/8	16 11/16	25 1/2	14 15/16	14	13 1/16	9 11/16	9	5/8
18	22	21 15/16	22 7/8	19	18 7/16	19 9/16	28 1/2	17 5/16	16 5/16	15 1/16	10 15/16	10 1/8	5/8
22	26 3/4	26 1/4	27 3/16	21 1/8	22 11/16	24 1/16	34 3/8	21 5/16	19 15/16	18 9/16	12 7/8	11 9/16	5/8
24	28 1/2	28 5/16	29 1/4	23	24 7/16	25 15/16	37 3/16	22 15/16	21 7/16	19 15/16	13 3/8	12 1/4	7/8
27	32 1/4	32 1/2	32 1/2	24	27 7/16	29 1/8	40 5/16	25 13/16	24 1/8	22 7/16	14 5/8	13 3/8	7/8
30	34 3/4	35	35	28 1/2	29 9/16	31 3/8	43 7/16	27 3/4	25 13/16	24 1/16	15 11/16	14 5/16	7/8
33	38	38 3/16	38 3/16	28 11/16	33 1/4	35 1/4	47 9/16	31 1/4	29 1/4	27 3/16	16 13/16	15 5/16	7/8

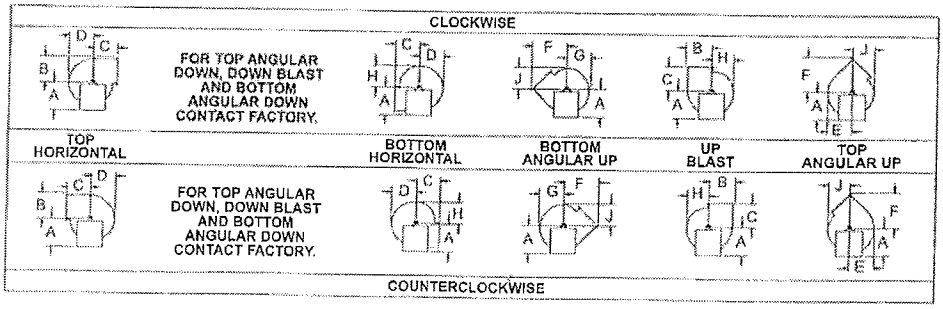
Fan Size	P	R	S	T	U	V	W	X		Y	Z	AA	
								100% Width	66% Width			100% Width	66% Width
12	9 1/8	12 1/4	12 7/8	18 1/4	19 1/2	9/16 x 1 1/16	6	26 7/16	25 9/32	9 1/2	—	14 11/16	13 7/32
15	10 3/4	16 1/2	16 1/8	21 1/2	22 3/4	9/16 x 1 1/16	6	36	34 5/8	16 1/2	–	17 1/4	15 13/16
18	12 3/8	19 1/2	19 3/8	24 3/4	27 3/4	9/16 x 1 1/16	6	40 5/16	39 1/8	19	–	19 11/16	18
22	14 1/2	23 7/8	23 5/8	29	30 1/4	9/16 x 1 1/16	6	44 1/4	42 3/16	19	–	23	21
24	16 1/8	25 7/8	25 3/4	31 3/4	33 1/2	11/16 x 1 3/16	6	45 13/16	43 5/8	19	–	24 9/16	22 3/8
27	17 5/8	28 3/4	29	35 1/4	37	11/16 x 1 3/16	6	48 1/2	46	19	–	27 1/4	24 3/4
30	18 7/8	31 3/16	31 1/2	37 3/4	39 1/2	11/16 x 1 3/16	8	52 5/16	50 1/4	21 1/2	10 3/4	29 3/16	26 1/2
33	20 5/8	34 3/16	34 11/16	41 1/4	43	11/16 x 1 3/16	8	57 1/2	54 3/16	23 3/4	11 7/8	31 1/2	28 9/16

Fan Size	BB		CC		DD		EE				FF			
	100% Width	66% Width	100% Width	66% Width	100% Width	66% Width	100% Width		66% Width		100% Width		66% Width	
							Class I/II	Class III	Class I/II	Class III	Class I/II	Class III	Class I/II	Class III
12	27 3/16	26 1/32	9 9/32	8 5/8	8	7 7/16	18 1/8	18 1/8	18 1/8	18 1/8	14 3/8	14 3/8	13 1/2	13 1/2
15	36 11/16	35 1/4	11 11/16	10 5/16	9 1/4	8 1/2	21 1/16	23 1/8	21 1/16	23 1/8	16 5/8	18 11/16	15 1/4	17 5/16
18	41 5/8	39 3/4	14	12 5/16	10 7/16	9 3/8	24 1/2	26 3/8	24 1/2	26 3/8	19 1/16	21	17 3/8	19 5/16
22	45 1/8	42 13/16	17 1/8	15 1/16	12	11	28 3/4	30 5/8	28 3/4	30 5/8	22 1/4	24 1/8	20 7/16	22 1/16
24	46 7/16	44 3/16	18 5/8	16 3/8	12 13/16	11 11/16	30 13/16	32 3/4	30 13/16	32 3/4	23 11/16	25 5/8	21 7/16	23 3/8
27	49	46 1/2	21	18 1/2	14 1/8	12 7/8	36	36	36	36	28	28	25 1/2	25 1/2
30	53 1/2	50 3/4	22 13/16	20 1/16	15 1/16	13 11/16	38 1/2	38 1/2	38 1/2	38 1/2	29 13/16	29 13/16	27 1/16	27 1/16
33	58 1/16	52 13/16	25 1/8	22 1/8	16 1/4	14 3/4	41 11/16	41 11/16	41 11/16	41 11/16	32 1/8	32 1/8	29 1/8	29 1/8

Dimensions and specifications are subject to change. Clockwise rotation is shown. Certified prints are available.

Fan Discharges

TAD, BAD, and DB discharge must have discharge extension. Contact factory.



Material Specifications/Weights

Series 41

Class	Fan Size	Flanges				Shaft & Bearings		FA Type Wheel WR² (Lbs.-Ft.²)	Motor Frames			Installation Weights (Lbs. Less Motor)	
		Inlet		Outlet					Minimum Arr. #4	Maximum Arr. #4	Maximum Arr. #9 & #10	Arr. #4	Arr. #9 & #10
		Thickness	Holes	Thickness	Holes 100% & 66%	Size	Type						
I	12	1/8	7/16 x 8	1/4	7/16 x 10	1 3/16	P3U219	1.6	56	184T	182T	160	193
	15	3/16	7/16 x 8	1/4	7/16 x 14	1 3/16	P3U219	4.7	143T	215T	184T	235	230
	18	3/16	7/16 x 8	1/4	7/16 x 14	1 7/16	P3U223	11	143T	256T	213T	350	355
	22	1/4	7/16 x 8	1/4	7/16 x 18	1 7/16	P3U223	29	182T	286T	215T	490	490
	24	1/4	7/16 x 8	1/4	7/16 x 18	1 7/16	P3U223	44	182T	286T	254T	580	605
	27	5/16	7/16 x 8	3/8	7/16 x 18	2 3/16	P3U235	78	182T	286T	254T	660	770
	30	5/16	7/16 x 8	3/8	7/16 x 18	2 7/16	P3U239	119	213T	326T	256T	935	975
	33	5/16	7/16 x 8	3/8	7/16 x 22	2 7/16	P3U239	160	254T	365T	284T	1145	1185
	36	5/16	7/16 x 8	3/8	7/16 x 22	2 11/16	P3U243	251	—	—	286T	—	1550
	40	5/16	7/16 x 8	1/2	7/16 x 26	2 15/16	P3U247	423	—	—	324T	—	2015
	44	3/8	7/16 x 8	1/2	7/16 x 30	2 15/16	P3U247	717	—	—	324T	—	2515
	49	3/8	9/16 x 16	1/2	7/16 x 34	2 15/16	P3U247	1180	—	—	326T	—	2940
	54	7/16	9/16 x 16	1/2	7/16 x 34	2 15/16	PB22447	1810	—	—	364T	—	3340
	60	7/16	9/16 x 16	1/2	7/16 x 38	2 15/16	PB22447	2875	—	—	365T	—	3670
II	12	1/8	7/16 x 8	1/4	7/16 x 10	1 7/16	P3U223	1.6	56	184T	184T	160	202
	15	3/16	7/16 x 8	1/4	7/16 x 14	1 7/16	P3U223	4.7	143T	215T	215T	235	235
	18	3/16	7/16 x 8	1/4	7/16 x 14	1 11/16	P3U227	11	143T	256T	256T	350	355
	22	1/4	7/16 x 8	1/4	7/16 x 18	1 11/16	PB22427	29	182T	286T	256T*	490	505
	24	1/4	7/16 x 8	1/4	7/16 x 18	1 11/16	PB22427	44	182T	286T	286T*	580	625
	27	5/16	9/16 x 8	3/8	7/16 x 18	2 3/16	PB22435	78	182T	286T	286T*	660	800
	30	5/16	9/16 x 8	3/8	7/16 x 18	2 7/16	PB22439	119	213T	326T	286T*	935	995
	33	5/16	9/16 x 8	3/8	7/16 x 22	2 7/16	PB22439	160	254T	365T	326T*	1145	1195
	36	5/16	9/16 x 8	3/8	7/16 x 22	2 11/16	PB22443	251	—	—	326T*	—	1620
	40	5/16	9/16 x 8	1/2	7/16 x 26	2 15/16	PB22447	423	—	—	365T*	—	2060
	44	3/8	9/16 x 8	1/2	7/16 x 30	2 15/16	PB22447	717	—	—	365T*	—	2560
	49	3/8	11/16 x 16	1/2	7/16 x 34	2 15/16	PB22447	1180	—	—	405T*	—	3040
	54	7/16	11/16 x 16	1/2	7/16 x 34	2 15/16	PB22447	1810	—	—	405T*	—	3480
	60	7/16	11/16 x 16	1/2	7/16 x 38	2 15/16	PB22447	2875	—	—	405T*	—	3670
III	12	1/8	9/16 x 8	1/4	7/16 x 10	1 11/16	P3U227	1.6	56	184T	184T	160	213
	15	3/16	9/16 x 8	1/4	7/16 x 14	1 11/16	P3U227	4.7	143T	215T	215T*	235	250
	18	3/16	9/16 x 8	1/4	7/16 x 14	1 15/16	P3U231	11	143T	256T	256T*	350	375
	22	1/4	9/16 x 8	1/4	7/16 x 18	1 15/16	PB22431	29	182T	286T	256T*	490	525
	24	1/4	9/16 x 8	1/4	7/16 x 18	1 15/16	PB22431	44	182T	286T	286T*	580	635
	27	5/16	9/16 x 16	3/8	7/16 x 18	2 3/16	PB22435	78	182T	286T	286T*	660	820
	30	5/16	9/16 x 16	3/8	7/16 x 18	2 7/16	PB22439	119	213T	326T	286T*	935	1040
	33	5/16	9/16 x 16	3/8	7/16 x 22	2 7/16	PB22439	160	254T	365T	326T*	1145	1210
	36	5/16	9/16 x 16	3/8	7/16 x 22	2 11/16	PB22443	251	—	—	326T*	—	1630
	40	5/16	9/16 x 16	1/2	7/16 x 26	2 15/16	PB22447	423	—	—	365T*	—	2080
	44	3/8	9/16 x 16	1/2	7/16 x 30	2 15/16	PB22447	717	—	—	365T*	—	2580
	49	3/8	11/16 x 16	1/2	7/16 x 34	2 15/16	PB22447	1180	—	—	405T*	—	3110
	54	7/16	11/16 x 16	1/2	7/16 x 34	2 15/16	PB22447	1810	—	—	405T*	—	3500
	60	7/16	11/16 x 16	1/2	7/16 x 38	2 15/16	PB22447	2875	—	—	405T*	—	3800

*Motor Frames exceeding these values must be Arrangement 9M, Arrangement 1, or Arrangement 8.
For other Arrangement maximum motor frame size and dimensions, please contact factory.

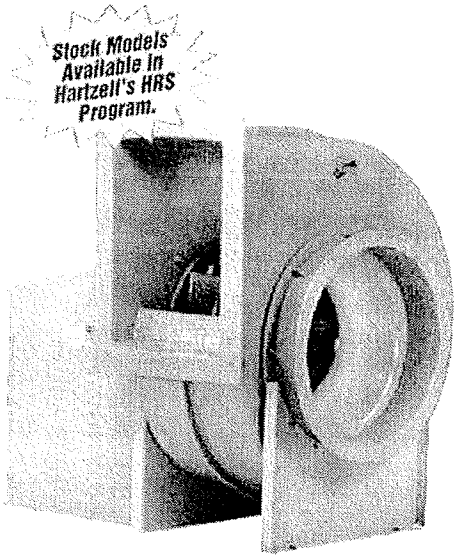
Series 41P

Class	Fan Size	Flanges				Shaft & Bearings			FA Type Wheel WR² (Lbs.-Ft.²)	Maximum Motor Frame Arr. #10	Installation Weights (Lbs. Less Motor)
		Inlet		Outlet							
		Thickness	Holes	Thickness	Holes 100% & 66%	Size	Drive Side	Inlet Side			
II	12	1/8	7/16 x 8	1/4	7/16 x 10	1 11/16	P3U-227	P3U-227	1.6	215T	188
	15	3/16	7/16 x 8	1/4	7/16 x 14	1 11/16	P3U-227	P3U-227	4.7	215T	215
	18	3/16	7/16 x 8	1/4	7/16 x 14	1 15/16	P3U-231	P3U-231	11	254T	309
	22	1/4	7/16 x 8	1/4	7/16 x 18	1 11/16	P3U-227	P3U-227	29	256T	397
	24	1/4	7/16 x 8	1/4	7/16 x 18	1 15/16	P3U-231	P3U-231	44	256T	554
	27	5/16	9/16 x 8	3/8	7/16 x 18	2 3/16	P3U-235	P3U-235	78	286T	728
	30	5/16	9/16 x 8	3/8	7/16 x 18	2 3/16	PB-22435	P3U-235	119	324T	878
	33	5/16	9/16 x 8	3/8	7/16 x 22	2 3/16	P3U-235	P3U-235	160	324T	1013
	36	5/16	9/16 x 8	3/8	7/16 x 22	2 3/16	P3U-235	P3U-235	251	326T	1131

Series 41P Backward Curved Centrifugal Fan, Packaged, Type FA

Series 41P Hartzell Fiberglass Backward Curved Centrifugal Fan, Packaged, offers **non-overloading, high efficiency, low noise**, and economy for corrosive atmospheres in a **compact packaged Class II design**. This fan is unique in the fan and blower industry. The fan incorporates the proven, highly efficient, backward curved, airfoil-bladed, solid fiberglass, Type FA wheel in a solid fiberglass housing. This design incorporates the airfoil centrifugal wheel, centrifugal fan housing, and inlet cone to produce a compact, highly efficient unit with low noise characteristics.

- **Applications** – Developed to perform throughout the entire **Class II Performance Range** for compatible corrosive applications where it is advantageous to have fiberglass materials and have the motor out of the airstream with the versatility of a belt drive fan.
- **Performance** – Type FA fiberglass airfoil wheel with inlet cone and aerodynamically designed housing produces from **800 CFM to 30,000 CFM** at pressures from **free delivery** to **12" W.G. at high efficiencies** with non-overloading horsepower, low noise, and low RPM. Max. temperature capability is 250°F.

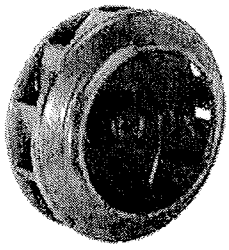


Series 41P
Shown with optional accessories

amca CERTIFIED RATINGS SOUND AIR

Hartzell Fan, Inc. certifies that the Series 41P, Fiberglass Backward Curved Centrifugal Fan, Packaged, shown herein is licensed to bear the AMCA seal for air and sound performance. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 211 and Publication 311 and comply with the requirements of the AMCA Certified Ratings Program.

Sound Performance data is available upon request. Please contact the factory and ask for Engineering Publication #SD-160.



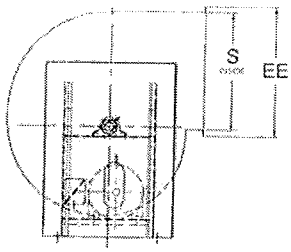
Type FA Wheel

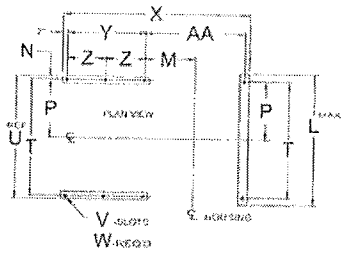
Features

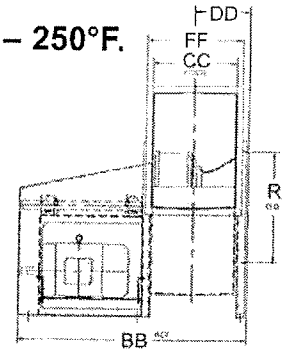
- **Sizes** – 12" through 36" wheel diameters. Packaged Class II construction, Arrangement #10 Belt Drive with weather cover. Available in both 100% and 66% widths.
- **FRP Materials** – Solid fiberglass wheel molded with Dow Derakane 510-A corrosion resistant vinylester resin having a Class I flame spread rate of 25 or less. The housing and other standard FRP components are constructed of fiberglass and Ashland Hertron 693 corrosive resistant polyester resin having a Class I flame spread rate of 25 or less. No metal parts are exposed in the airstream. See Corrosion Resistance Guide on page 5 for resin characteristics. Other resins are available.
- **Type FA Wheel** – **High efficiency, airfoil** design with **one-piece, solid fiberglass,** construction. Tapered inlet side design efficiently moves large volumes of air at high pressures. Wheel has non-overloading horsepower characteristic curve.
- **Rotation and Discharge Positions** – Available in both clockwise and counterclockwise rotations and in all standard discharge positions. Housing discharge position can be changed on fan sizes 12" through 36".
- **Easy Installation and Maintenance** – Motor, drives and bearings are readily accessible for ease in wiring, installation, adjustment, and lubrication. Weather cover and guards are available.
- **Shafts** – Shafts are turned ground and polished, keyed at both ends with fiberglass sleeve in the airstream and sized to operate well below critical speed.
- **Bearings** – Bearings are heavy duty, self-aligning, ball or roller type, in cast iron pillow block housings, selected for long life at maximum Class II construction limits, and include extended lubrication fittings as standard.
- **Standard Shaft Seal** – A fiberglass and neoprene shaft seal is placed where the shaft leaves the housing along with a neoprene shaft slinger between the seal and wheel. Seal is not gas tight.
- **Hardware** – Airstream hardware is Type 304 stainless steel and encapsulated.
- **Motor Out of the Airstream** – Exterior mounting of Drip-Proof Protected motor on an adjustable motor pivot base is standard. Motors can be furnished as TEFC, Mill and Chemical Duty, or to specifications upon request. Motor HP and frame size limits are identified in Dimensions and Material Specifications table.
- **Drives (Belt Drive Fans)** – V-Belt Drives are oversized for long life and continuous duty and are fixed pitch as standard. Variable pitch drives for sizes 24" through 36" are available upon request. Belts are oil, heat, and static resistant type.
- **Balancing** – The fan is electronically statically and dynamically balanced to the requirements of Fan Application Category BV-3 of AMCA ANSI Std. 204-96. All fans receive an inspection prior to shipment and, whenever possible, an operational test.
- **Flanged Duct Connections** – Outlet flange is standard, inlet flange is optional. Flange bolt holes are optional.
- **Bases** – Heavy gauge, welded, hot rolled steel with epoxy coating are standard. **Base is sized to accept maximum motor frame size required for Class II operation.**
- **Options and Accessories** – See pages 22 and 23.
- **Spark Resistant Construction and Protective Coatings** – Spark resistant construction for fiberglass equipment is optional, and for abrasive environments or extremely corrosive environments, special construction is available, see page 23.

Dimensions – Series 41P, Arrangement 10

SERIES 41P, Type FA
Sizes 12" Through 36", Rotatable Housing
Standard Construction – Class II, Maximum Temperature – 250°F.







Principal Dimensions (Inches) – Sizes 12" – 36"

Fan Size	A	B	C	D	E	F	G	H	J	L	M 100% Width	M 66% Width	N
12	17	15 1/2	13	11 1/2	12 3/8	20 1/8	10 7/8	10 1/8	11 1/16	20 3/4	7 15/16	7 5/8	5/8
15	17	18 5/8	16 3/16	14 1/2	15 7/16	24 5/8	13 3/16	12 5/8	13 1/4	20 3/4	9 3/16	8 7/16	5/8
18	20	21 15/16	19	17 1/2	18 7/8	28 15/16	16 3/8	15 1/4	15 1/4	24 3/4	9 5/16	8 1/2	5/8
22	24 3/4	26 1/4	21 1/8	21 5/16	22 11/16	33 1/2	19 15/16	18 9/16	17 3/16	29 3/4	10 7/8	9 7/8	5/8
24	27	28 5/16	23	23 1/8	24 5/8	36 5/16	21 11/16	20 3/16	18 11/16	31 1/8	11 5/8	10 1/2	5/8
27	28 1/2	32 1/2	24	26	27 11/16	39 15/16	24 5/16	22 5/8	20 15/16	34 3/8	13 1/16	11 7/16	13/16
30	30 1/2	35	28 1/2	28 1/4	30 1/16	44 15/16	26 3/8	24 9/16	22 3/4	37 5/8	14	12 5/8	13/16
33	37	38 3/16	28 11/16	31	33	47 1/4	29	27	24 15/16	41 5/8	15 1/8	13 5/8	13/16
36	37	41 5/16	31 1/4	33 3/4	36	51 5/16	31 5/8	29 5/8	27 3/16	44 1/8	16 1/4	14 5/8	13/16

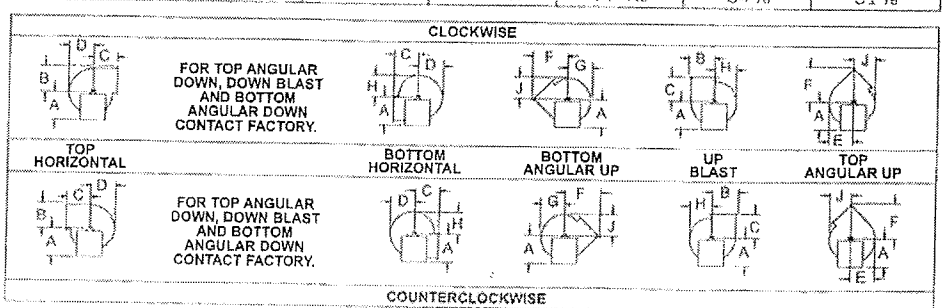
Fan Size	P	R	S	T	U	V	W	X 100% Width	X 66% Width	Y	Z	AA 100% Width	AA 66% Width
12	9 3/4	12 1/4	12 7/8	19 1/2	20 3/4	9/16 x 1	6	36 11/16	36	19 5/8	–	14 1/16	13 3/8
15	9 3/4	16 3/8	16 1/8	19 1/2	20 3/4	9/16 x 1	6	39 1/16	37 5/8	19 5/8	–	16 7/16	15
18	10 1/2	19 3/8	19 3/8	21	22 1/4	9/16 x 1	6	46 1/8	44 3/8	25 1/4	–	17 7/8	16 1/8
22	11 1/8	23 3/4	23 11/16	22 1/4	23 1/2	9/16 x 1	6	49 1/4	47 1/8	25 1/4	–	21	18 7/8
24	10 1/2	25 3/4	25 3/4	21	22 1/4	9/16 x 1	6	50 3/4	48 1/2	25 1/4	–	22 1/2	20 1/4
27	13 5/16	28 5/8	29	26 3/8	28	11/16 x 1 1/2	8	58	55 7/16	29 5/8	14 13/16	25 3/8	22 13/16
30	13 7/8	31 1/16	31 1/2	27 3/4	29 3/8	11/16 x 1 1/2	8	63 3/16	60 7/16	33	16 1/2	27 3/16	24 7/16
33	13 7/8	34 1/16	34 11/16	27 3/4	29 3/8	11/16 x 1 1/2	8	65 9/16	62 1/2	33	16 1/2	29 3/16	26 1/2
36	13 7/8	37 1/16	37 13/16	27 3/4	29 3/8	11/16 x 1 1/2	8	67 13/16	64 1/2	33	16 1/2	31 13/16	28 1/2

Fan Size	BB 100% Width	BB 66% Width	CC 100% Width	CC 66% Width	DD 100% Width	DD 66% Width	EE	FF 100% Width	FF 66% Width
12	37 5/8	37	9 5/16	8 11/16	8 1/8	7 13/16	18 1/8	14 3/8	13 1/2
15	40 1/8	38 5/8	11 11/16	10 7/16	9 5/16	8 1/2	21 1/16	16 5/8	15 1/4
18	47 1/16	45 3/8	14	12 5/16	10 9/16	9 11/16	24 1/2	19 1/16	17 3/8
22	50 3/16	48 1/8	17 1/8	15 1/16	12 1/8	11 1/16	28 3/4	22 1/4	20 3/16
24	51 3/4	49 1/2	18 11/16	16 3/8	12 15/16	11 3/4	30 13/16	23 11/16	21 1/2
27	59	56 1/2	21	18 1/2	14 5/16	13 1/16	36	28	25 1/2
30	64 3/16	61 1/2	22 13/16	20 1/8	15 1/4	13 7/8	38 1/2	29 13/16	27 1/8
33	66 9/16	63 3/16	25 1/8	22 1/8	16 7/16	14 15/16	41 5/8	32 7/8	29 1/8
36	68 13/16	65 5/16	27 7/16	24 1/8	17 9/16	15 15/16	44 13/16	34 3/8	31 1/8

Dimensions and specifications are subject to change. Clockwise Rortatiom is shown. Certified prints are available.

Fan Discharges

Scrolls are rotatable. BH and BAU rotations require a 3" tall height adjusting sub-base. TAD, BAD and DB discharge must have discharge extension. Contact factory.



Performance Data

Class I Class II Class III

A41-_-12_FA100FG_ _ _ _or A41PO-122FA100FG_ _ _ _

Wheel Diameter: 12.25 in.
Outlet Area: 0.67 sq. ft.

CFM	Outlet Velocity FPM	Static Pressure 1" RPM	1" BHP	2" RPM	2" BHP	3" RPM	3" BHP	4" RPM	4" BHP	5" RPM	5" BHP	6" RPM	6" BHP	8" RPM	8" BHP	10" RPM	10" BHP
1000	1149	1691	0.27	2078	0.50	2418	0.75										
1200	1379	1873	0.36	2219	0.61	2529	0.89	2814	1.20	3083	1.54						
1400	1609	2066	0.48	2379	0.76	2665	1.06	2929	1.39	3177	1.74	3414	2.12				
1600	1839	2260	0.62	2557	0.93	2819	1.26	3066	1.61	3297	1.98	3517	2.38	3934	3.23	4324	4.18
1800	2069	2451	0.78	2747	1.15	2987	1.50	3218	1.87	3436	2.27	3643	2.69	4034	3.57	4404	4.54
2000	2299	2646	0.98	2941	1.39	3169	1.77	3382	2.17	3588	2.60	3784	3.04	4155	3.97	4504	4.96
2200	2529	2846	1.21	3137	1.67	3359	2.10	3558	2.52	3751	2.97	3937	3.43	4291	4.41		
2400	2759	3052	1.48	3326	1.97	3554	2.46	3745	2.92	3924	3.38	4100	3.87	4437	4.91		
2600	2989	3263	1.80	3518	2.32	3750	2.87	3937	3.37	4109	3.86	4272	4.37				
2800	3218	3477	2.18	3714	2.70	3941	3.30	4131	3.86	4298	4.40	4456	4.93				
3000	3448	3694	2.61	3913	3.14	4132	3.78	4328	4.41	4492	4.98						
3200	3678	3912	3.10	4115	3.64	4324	4.30	4520	4.99								

A41-_-12_ FA-66FG_ _ _ _or A41PO-122FA-66FG_ _ _ _

Wheel Diameter: 12.25 in.
Outlet Area: 0.73 sq. ft.

CFM	Outlet Velocity FPM	Static Pressure 2" RPM	2" BHP	3" RPM	3" BHP	4" RPM	4" BHP	5" RPM	5" BHP	6" RPM	6" BHP	8" RPM	8" BHP	10" RPM	10" BHP	12" RPM	12" BHP
800	1096	2144	0.46	2472	0.71	2777	1.00	3062	1.31	3328	1.65						
1000	1370	2359	0.62	2646	0.87	2914	1.17	3168	1.50	3412	1.85	3868	2.64				
1200	1644	2593	0.81	2861	1.11	3101	1.40	3329	1.74	3549	2.11	3966	2.92	4359	3.83	4729	4.81
1400	1918	2838	1.03	3094	1.39	3320	1.73	3528	2.07	3728	2.44	4109	3.28	4470	4.21	4818	5.21
1600	2192	3095	1.29	3333	1.70	3553	2.11	3751	2.49	3937	2.88	4288	3.72	4623	4.66	4943	5.70
1800	2466	3362	1.59	3583	2.05	3791	2.51	3985	2.97	4164	3.41	4494	4.28	4805	5.23	5105	6.28
2000	2740	3637	1.95	3843	2.46	4038	2.97	4224	3.48	4399	3.99	4718	4.96	5011	5.94	5291	6.98
2200	3014	3918	2.38	4112	2.92	4294	3.48	4470	4.04	4638	4.60	4951	5.72	5233	6.77		
2400	3288	4205	2.89	4386	3.46	4558	4.05	4724	4.67	4884	5.28	5187	6.50				
2600	3562	4494	3.48	4666	4.06	4829	4.69	4986	5.35	5137	6.02						
2800	3836	4788	4.17	4950	4.76	5104	5.42	5254	6.11								
3000	4110	5084	4.96	5237	5.56												

A41-_-15_ FA100FG_ _ _ _or A41PO-152FA100FG_ _ _ _

Wheel Diameter: 15.375 in.
Outlet Area: 1.3 sq. ft.

CFM	Outlet Velocity FPM	Static Pressure 1" RPM	1" BHP	2" RPM	2" BHP	3" RPM	3" BHP	4" RPM	4" BHP	5" RPM	5" BHP	6" RPM	6" BHP	8" RPM	8" BHP	10" RPM	10" BHP
1500	1154	1316	0.38	1615	0.68	1874	1.03										
1800	1385	1462	0.51	1725	0.85	1965	1.22	2184	1.64	2384	2.08						
2100	1615	1615	0.68	1852	1.05	2073	1.46	2277	1.90	2467	2.38	2645	2.88				
2400	1846	1758	0.87	1995	1.30	2193	1.75	2384	2.22	2563	2.73	2733	3.26	3047	4.39		
2700	2077	1894	1.08	2146	1.60	2326	2.08	2503	2.59	2671	3.13	2832	3.69	3134	4.89	3411	6.17
3000	2308	2038	1.34	2300	1.95	2473	2.48	2632	3.02	2791	3.59	2943	4.19	3230	5.45	3498	6.79
3300	2538	2193	1.66	2444	2.33	2625	2.93	2774	3.51	2919	4.12	3063	4.75	3336	6.07	3593	7.48
3600	2769	2358	2.04	2578	2.73	2779	3.45	2924	4.08	3058	4.71	3191	5.38	3451	6.77		
3900	3000	2526	2.48	2716	3.19	2929	4.01	3077	4.71	3206	5.39	3328	6.08	3574	7.55		
4200	3231	2697	3.00	2861	3.71	3064	4.59	3231	5.41	3358	6.15	3476	6.88				
4500	3462	2870	3.59	3013	4.31	3199	5.22	3381	6.17	3511	6.98						
4800	3692	3044	4.25	3174	5.01	3338	5.92	3516	6.93								

A41-_-15_ FA-66FG_ _ _ _or A41PO-152FA-66FG_ _ _ _

Wheel Diameter: 15.375 in.
Outlet Area: 1.15 sq. ft.

CFM	Outlet Velocity FPM	Static Pressure 2" RPM	2" BHP	3" RPM	3" BHP	4" RPM	4" BHP	5" RPM	5" BHP	6" RPM	6" BHP	8" RPM	8" BHP	10" RPM	10" BHP	12" RPM	12" BHP
800	696	1512	0.38														
1200	1043	1642	0.54	1913	0.82	2155	1.12	2375	1.46	2578	1.83						
1600	1391	1820	0.75	2064	1.09	2284	1.44	2487	1.82	2676	2.21	3023	3.06	3338	4.00		
2000	1739	2026	1.03	2248	1.42	2451	1.83	2637	2.26	2812	2.71	3137	3.64	3436	4.63	3713	5.69
2400	2087	2250	1.39	2454	1.84	2641	2.31	2815	2.79	2979	3.29	3283	4.33	3564	5.43	3827	6.56
2800	2435	2487	1.84	2676	2.36	2849	2.88	3012	3.42	3166	3.98	3453	5.13	3718	6.33	3967	7.58
3200	2783	2734	2.40	2909	2.97	3071	3.56	3223	4.16	3368	4.77	3640	6.04	3892	7.35	4129	8.71
3600	3130	2989	3.08	3150	3.71	3303	4.37	3446	5.03	3583	5.70	3840	7.08	4080	8.51	4307	9.98
4000	3478	3250	3.90	3400	4.59	3542	5.31	3678	6.04	3807	6.77	4061	8.27	4280	9.81		
4400	3826	3517	4.88	3655	5.63	3788	6.40	3916	7.19	4040	7.99	4272	9.61				
4800	4174	3787	6.04	3915	6.84	4040	7.66	4161	8.51	4278	9.38						
5200	4522	4060	7.39	4181	8.24	4298	9.12										

Performance shown is for installation Type D: ducted inlet/ducted outlet. Power rating (BHP) does not include drive losses. Performance data is based on standard air conditions (0.075 #/ft.3). Performance ratings do not include the effects of appurtenances in the airstream. MOST EFFICIENT FAN SELECTION APPEARS IN BOLD PRINT. To complete model code, add arrangement, class of construction, motor enclosure code, motor horsepower code and motor speed code. Refer to page 2 for more information.

Performance Data

☐ Class I ☐ Class II ☐ Class III

A41-_-18_ FA100FG_ _ _ _or A41PO-182FA100FG_ _ _ _

Wheel Diameter: 18.5 in.
Outlet Area: 1.68 sq. ft.

CFM	Outlet Velocity FPM	Static Pressure 1" RPM	1" BHP	2" RPM	2" BHP	3" RPM	3" BHP	4" RPM	4" BHP	5" RPM	5" BHP	6" RPM	6" BHP	8" RPM	8" BHP	10" RPM	10" BHP
2000	1064	1030	0.46	**1288**	**0.85**	1530	1.34										
2500	1330	1154	0.64	1383	1.10	**1586**	**1.60**	**1781**	**2.17**	1970	2.81						
3000	1596	1288	0.87	1496	1.40	**1681**	**1.97**	**1851**	**2.57**	**2013**	**3.21**	**2176**	**3.93**				
3500	1862	1417	1.16	1622	1.77	1792	2.40	1943	3.07	**2096**	**3.76**	**2237**	**4.48**	**2516**	**6.10**	2784	7.91
4000	2128	1544	1.47	1756	2.22	1912	2.91	2059	3.65	2197	4.41	**2328**	**5.18**	**2577**	**6.83**	**2821**	**8.67**
4500	2394	1680	1.87	1892	2.75	2043	3.53	2179	4.31	**2309**	**5.14**	**2433**	**5.99**	**2665**	**7.74**	**2885**	**9.60**
5000	2660	1826	2.37	2017	3.31	2178	4.24	2307	5.09	2428	5.97	2545	6.89	2767	8.79	**2973**	**10.7**
5500	2926	1978	2.97	2143	3.95	2314	5.04	2441	5.99	2556	6.93	2666	7.90	2876	9.93		
6000	3191	2133	3.69	2275	4.68	2439	5.87	2576	6.99	2689	8.02	2793	9.05	2993	11.2		
6500	3457	2290	4.52	2414	5.54	2564	6.78	2711	8.09	2824	9.23	2926	10.3				
7000	3723	2449	5.49	2561	6.55	2693	7.81	2835	9.21	2959	10.6						
7500	3989	2609	6.59	2712	7.70	2828	8.97	2960	10.4								

A41-_-18_ FA-66FG_ _ _ _or A41PO-182FA-66FG_ _ _ _

Wheel Diameter: 18.5 in.
Outlet Area: 1.66 sq. ft.

CFM	Outlet Velocity FPM	Static Pressure 2" RPM	2" BHP	3" RPM	3" BHP	4" RPM	4" BHP	5" RPM	5" BHP	6" RPM	6" BHP	8" RPM	8" BHP	10" RPM	10" BHP	12" RPM	12" BHP
1500	904	**1315**	**0.68**	1542	1.06	1750	1.48										
2000	1205	**1442**	**0.91**	**1649**	**1.36**	**1832**	**1.83**	2002	2.34	2161	2.87						
2500	1506	1584	1.20	**1779**	**1.72**	**1952**	**2.26**	**2109**	**2.84**	**2255**	**3.43**	2527	4.69	2780	6.04	3023	7.50
3000	1807	1741	1.57	1921	2.14	**2086**	**2.76**	**2236**	**3.41**	**2374**	**4.07**	**2630**	**5.47**	**2864**	**6.93**	3084	8.48
3500	2108	1911	2.03	2076	2.67	2229	3.34	**2372**	**4.06**	**2507**	**4.80**	**2751**	**6.34**	**2974**	**7.95**	**3182**	**9.62**
4000	2410	2089	2.60	2241	3.31	2384	4.05	2518	4.81	2646	5.62	**2883**	**7.31**	**3098**	**9.06**	**3297**	**10.9**
4500	2711	2273	3.29	2415	4.08	**2548**	**4.88**	2674	5.71	2794	6.56	3021	8.38	**3231**	**10.3**	**3424**	**12.2**
5000	3012	2464	4.11	2595	4.97	2720	5.86	2838	6.75	2952	7.67	3167	9.58	3369	11.6	**3559**	**13.7**
5500	3313	2659	5.07	2780	6.01	2897	6.98	3009	7.96	3117	8.94	3321	11.0	3514	13.1		
6000	3614	2858	6.19	2970	7.22	3079	8.26	3185	9.31	3288	10.4	3482	12.5				
6500	3916	3060	7.49	3164	8.60	3267	9.71	3366	10.8	3463	12.0						
7000	4217	3264	8.99	3362	10.2	3457	11.4	3551	12.6								

A41-_-22_ FA100FG_ _ _ _or A41PO-222FA100FG_ _ _ _

Wheel Diameter: 22.625 in.
Outlet Area: 2.81 sq. ft.

CFM	Outlet Velocity FPM	Static Pressure 1" RPM	1" BHP	2" RPM	2" BHP	3" RPM	3" BHP	4" RPM	4" BHP	5" RPM	5" BHP	6" RPM	6" BHP	8" RPM	8" BHP	10" RPM	10" BHP
3200	1139	843	0.70	**1051**	**1.30**	1253	2.02										
4000	1423	931	0.95	1131	1.67	**1294**	**2.43**	**1455**	**3.29**	1616	4.25						
4800	1708	1027	1.28	1225	2.14	**1374**	**2.99**	**1511**	**3.90**	**1643**	**4.87**	**1779**	**5.95**				
5600	1993	1144	1.73	1311	2.65	1467	3.67	1593	4.66	**1711**	**5.71**	**1826**	**6.81**	**2056**	**9.23**	2284	11.9
6400	2278	1266	2.30	1400	3.25	1558	4.42	1686	5.57	1796	6.70	**1901**	**7.88**	**2103**	**10.4**	**2303**	**13.1**
7200	2562	1393	2.99	1511	4.03	1642	5.22	1780	6.57	1890	7.85	1990	9.12	**2176**	**11.8**	**2354**	**14.6**
8000	2847	1520	3.82	1629	4.99	1735	6.18	1852	7.60	1985	9.11	2084	10.5	2261	13.4	**2428**	**16.3**
8800	3132	1650	4.81	1752	6.11	1848	7.38	1950	8.77	2067	10.4	2178	12.0	2355	15.1		
9600	3416	1781	5.97	1877	7.40	1966	8.78	2054	10.2	2153	11.8	2260	13.6				
10400	3701	1914	7.31	2004	8.89	2087	10.4	2169	11.9	2251	13.5	2346	15.2				
11200	3986	2047	8.86	2132	10.6	2211	12.2	2287	13.8	2363	15.5	2440	17.2				
12000	4270	2181	10.6	2261	12.5	2337	14.2	2409	16.0								

A41-_-22_ FA-66FG_ _ _ _or A41PO-222FA-66FG_ _ _ _

Wheel Diameter: 22.625 in.
Outlet Area: 2.48 sq. ft.

CFM	Outlet Velocity FPM	Static Pressure 2" RPM	2" BHP	3" RPM	3" BHP	4" RPM	4" BHP	5" RPM	5" BHP	6" RPM	6" BHP	8" RPM	8" BHP	10" RPM	10" BHP	12" RPM	12" BHP
2800	1129	**1131**	**1.19**	**1308**	**1.80**	**1461**	**2.42**	1603	3.10								
3500	1411	1230	1.54	**1394**	**2.24**	**1542**	**2.98**	**1675**	**3.75**	**1797**	**4.53**	2025	6.22				
4200	1694	1343	1.96	1494	2.75	**1631**	**3.59**	**1759**	**4.47**	**1878**	**5.38**	**2092**	**7.22**	2288	9.17		
4900	1976	1465	2.48	1604	3.36	1732	4.29	**1852**	**5.26**	**1965**	**6.26**	**2175**	**8.36**	**2362**	**10.5**	**2535**	**12.7**
5600	2258	1590	3.10	1723	4.09	1843	5.10	1955	6.16	**2062**	**7.25**	**2262**	**9.54**	**2446**	**11.9**	**2616**	**14.4**
6300	2540	1718	3.82	1847	4.93	1961	6.05	2067	7.19	2167	8.37	**2357**	**10.8**	**2534**	**13.4**	**2699**	**16.1**
7000	2823	1853	4.68	1973	5.89	2084	7.13	2185	8.37	2280	9.64	2460	12.3	**2629**	**15.0**	**2788**	**17.9**
7700	3105	1993	5.69	2102	6.99	2209	8.35	2307	9.70	2398	11.1	2570	13.9	2732	16.8	**2884**	**19.9**
8400	3387	2139	6.89	2236	8.28	2336	9.70	2433	11.2	2521	12.7	2686	15.7	2840	18.8		
9100	3669	2287	8.28	2374	9.71	2466	11.2	2558	12.8	2647	14.5	2806	17.7	2954	21.0		
9800	3952	2439	9.87	2517	11.4	2601	13.0	2687	14.6	2772	16.4	2929	19.8				
10500	4234	2591	11.7	2664	13.3	2740	14.9	2820	16.7	2900	18.5						

Performance shown is for installation Type D: ducted inlet/ducted outlet. Power rating (BHP) does not include drive losses. Performance data is based on standard air conditions (0.075 #/ft.3). Performance ratings do not include the effects of appurtenances in the airstream. MOST EFFICIENT FAN SELECTION APPEARS IN BOLD PRINT. To complete model code, add arrangement, class of construction, motor enclosure code, motor horsepower code and motor speed code. Refer to page 2 for more information.

Performance Data

Class I Class II Class III

A41-_-24_FA100FG_ _ _ _or A41PO-242FA100FG_ _ _ _

Wheel Diameter: 24.625 in.
Outlet Area: 3.33 sq. ft.

CFM	Outlet Velocity FPM	Static Pressure 1" RPM	1" BHP	2" RPM	2" BHP	3" RPM	3" BHP	4" RPM	4" BHP	5" RPM	5" BHP	6" RPM	6" BHP	8" RPM	8" BHP	10" RPM	10" BHP
3000	901	**706**	**0.61**	939	1.27												
4000	1201	794	0.89	**980**	**1.62**	**1155**	**2.48**										
5000	1502	877	1.22	1062	2.12	**1207**	**3.05**	**1346**	**4.07**	**1488**	**5.27**						
6000	1802	978	1.67	1154	2.73	1290	3.79	**1411**	**4.90**	**1528**	**6.08**	**1643**	**7.35**	1878	10.2		
7000	2102	1094	2.29	1234	3.39	1382	4.69	1496	5.92	**1601**	**7.19**	**1702**	**8.53**	**1900**	**11.4**	2103	14.7
8000	2402	1214	3.07	1330	4.23	1465	5.64	1588	7.11	1688	8.52	**1781**	**9.96**	**1960**	**13.0**	**2132**	**16.2**
9000	2703	1338	4.01	1442	5.32	1549	6.72	1673	8.38	1781	10.0	1871	11.6	**2037**	**14.8**	**2195**	**18.3**
10000	3003	1463	5.15	1559	6.61	1651	8.08	1754	9.75	1865	11.6	1964	13.5	2125	17.0		
11000	3303	1589	6.50	1679	8.14	1763	9.73	1848	11.4	1946	13.3	2047	15.3	2217	19.3		
12000	3604	1717	8.10	1802	9.91	1880	11.6	1956	13.4	2035	15.2	2128	17.4				
13000	3904	1846	9.95	1926	11.9	1999	13.8	2070	15.7	2141	17.6	2216	19.7				
14000	4204	1976	12.1	2050	14.2	2121	16.3	2188	18.3								

A41-_-24_FA-66FG_ _ _ _or A41PO-242FA-66FG_ _ _ _

Wheel Diameter: 24.625 in.
Outlet Area: 2.94 sq. ft.

CFM	Outlet Velocity FPM	Static Pressure 2" RPM	2" BHP	3" RPM	3" BHP	4" RPM	4" BHP	5" RPM	5" BHP	6" RPM	6" BHP	8" RPM	8" BHP	10" RPM	10" BHP	12" RPM	12" BHP
3000	1020	**1008**	**1.28**	**1173**	**1.94**	1320	2.65										
4000	1361	**1113**	**1.74**	**1266**	**2.55**	**1403**	**3.42**	**1525**	**4.29**	**1639**	**5.21**						
5000	1701	1237	2.34	1375	3.28	**1501**	**4.28**	**1618**	**5.32**	**1728**	**6.40**	**1924**	**8.60**	**2104**	**10.9**		
6000	2041	1373	3.10	1499	4.17	1615	5.30	**1723**	**6.47**	**1826**	**7.68**	**2016**	**10.2**	**2189**	**12.8**	**2346**	**15.5**
7000	2381	1512	4.03	1633	5.26	1740	6.52	1841	7.82	**1936**	**9.16**	**2116**	**12.0**	**2282**	**14.9**	**2437**	**17.9**
8000	2721	1658	5.16	1772	6.56	1874	7.97	1968	9.40	2058	10.9	**2226**	**13.9**	**2384**	**17.1**	**2532**	**20.4**
9000	3061	1812	6.56	1913	8.08	2013	9.67	2103	11.3	2187	12.9	2346	16.2	**2496**	**19.6**	**2637**	**23.2**
10000	3401	1973	8.25	2062	9.87	2153	11.6	2242	13.4	2323	15.1	2474	18.7	2616	22.4		
11000	3741	2138	10.3	2216	12.0	2298	13.8	2381	15.7	2462	17.7	2608	21.6				
12000	4082	2306	12.7	2376	14.5	2450	16.4	2526	18.5	2602	20.5						
13000	4422	2477	15.4	2540	17.4	2606	19.4	2675	21.6								
14000	4762	2649	18.6	2707	20.7												

A41-_-27_FA100FG_ _ _ _or A41PO-272FA100FG_ _ _ _

Wheel Diameter: 27.625 in.
Outlet Area: 4.22 sq. ft.

CFM	Outlet Velocity FPM	Static Pressure 1" RPM	1" BHP	2" RPM	2" BHP	3" RPM	3" BHP	4" RPM	4" BHP	5" RPM	5" BHP	6" RPM	6" BHP	8" RPM	8" BHP	10" RPM	10" BHP
4800	1137	687	1.05	**857**	**1.95**	1019	3.01										
6000	1422	762	1.45	921	2.52	**1055**	**3.66**	**1186**	**4.93**	1313	6.32						
7200	1706	835	1.93	999	3.24	1119	4.51	**1231**	**5.87**	**1339**	**7.32**	**1449**	**8.91**				
8400	1991	929	2.58	1073	4.06	1196	5.55	1297	7.04	**1394**	**8.60**	**1488**	**10.2**	**1675**	**13.8**	1856	17.8
9600	2275	1028	3.41	1143	4.95	1276	6.75	1375	8.42	1463	10.1	**1549**	**11.9**	**1714**	**15.6**	**1877**	**19.7**
10800	2559	1130	4.42	1228	6.08	1343	7.99	1455	9.99	1541	11.9	1621	13.8	**1773**	**17.7**	**1919**	**21.9**
12000	2844	1234	5.64	1323	7.46	1415	9.40	1525	11.6	1621	13.8	1700	15.9	1842	20.2	**1978**	**24.6**
13200	3128	1340	7.08	1422	9.08	1502	11.1	1593	13.4	1693	15.9	1780	18.3	1919	22.9		
14400	3412	1446	8.78	1524	11.0	1597	13.2	1671	15.4	1760	18.0	1851	20.8	1999	25.9		
15600	3697	1554	10.8	1627	13.1	1695	15.5	1762	17.9	1834	20.5	1918	23.3				
16800	3981	1662	13.0	1731	15.6	1795	18.1	1858	20.7	1921	23.3	1990	26.2				
18000	4265	1771	15.6	1836	18.3	1897	21.1	1956	23.8								

A41-_-27_FA-66FG_ _ _ _or A41PO-272FA-66FG_ _ _ _

Wheel Diameter: 27.625 in.
Outlet Area: 3.73 sq. ft.

CFM	Outlet Velocity FPM	Static Pressure 2" RPM	2" BHP	3" RPM	3" BHP	4" RPM	4" BHP	5" RPM	5" BHP	6" RPM	6" BHP	8" RPM	8" BHP	10" RPM	10" BHP	12" RPM	12" BHP
3600	965	**870**	**1.50**	1026	2.31												
4800	1287	959	2.06	**1091**	**2.99**	**1213**	**4.00**	**1330**	**5.09**								
6000	1609	1065	2.80	1185	3.89	**1293**	**5.03**	**1395**	**6.23**	**1492**	**7.49**	**1679**	**10.2**				
7200	1930	1169	3.73	1291	5.00	1392	6.29	**1485**	**7.63**	**1573**	**9.02**	**1739**	**12.0**	**1898**	**15.1**	2051	18.6
8400	2252	1281	4.86	1395	6.34	1499	7.81	1587	9.31	1669	10.8	**1823**	**14.1**	**1967**	**17.4**	**2106**	**21.0**
9600	2574	1405	6.22	1503	7.91	1602	9.60	1694	11.3	1773	13.0	1919	16.5	2054	20.1	**2182**	**23.9**
10800	2895	1536	7.85	1620	9.75	1709	11.7	1797	13.5	1881	15.4	2022	19.3	2151	23.2	**2272**	**27.3**
12000	3217	1669	9.80	1747	11.9	1823	14.0	1904	16.1	1984	18.2	2130	22.4	2255	26.7	2370	31.1
13200	3539	1806	12.1	1878	14.4	1947	16.7	2017	19.0	2091	21.3	2234	26.0	2362	30.6		
14400	3861	1943	14.8	2011	17.2	2076	19.7	2140	22.2	2203	24.8	2338	29.9				
15600	4182	2082	17.9	2147	20.6	2208	23.2	2267	25.9	2326	28.7						
16800	4504	2222	21.5	2284	24.3	2342	27.1	2398	30.0								

Performance shown is for installation Type D: ducted inlet/ducted outlet. Power rating (BHP) does not include drive losses. Performance data is based on standard air conditions (0.075 #/ft.3). Performance ratings do not include the effects of appurtenances in the airstream. MOST EFFICIENT FAN SELECTION APPEARS IN BOLD PRINT. To complete model code, add arrangement, class of construction, motor enclosure code, motor horsepower code and motor speed code. Refer to page 2 for more information.

Performance Data

[ ] Class I [ ] Class II [ ] Class III

A41-_-30_FA100FG_ _ _ _or A41P0-302FA100FG_ _ _ _

Wheel Diameter: 30.0 in.
Outlet Area: 4.98 sq. ft.

CFM	Outlet Velocity FPM	Static Pressure 1" RPM	1" BHP	2" RPM	2" BHP	3" RPM	3" BHP	4" RPM	4" BHP	5" RPM	5" BHP	6" RPM	6" BHP	8" RPM	8" BHP	10" RPM	10" BHP
6000	1205	651	1.35	801	2.45	943	3.71										
7500	1506	721	1.87	869	3.21	987	4.59	1101	6.11	1214	7.79	1322	9.58				
9000	1807	799	2.53	947	4.16	1055	5.74	1154	7.39	1249	9.14	1344	11.0	1530	15.1		
10500	2108	893	3.43	1014	5.20	1132	7.12	1234	8.95	1309	10.9	1392	12.8	1554	17.1	1716	21.9
12000	2410	992	4.56	1087	6.43	1205	8.65	1301	10.8	1381	12.9	1457	15.0	1603	19.6	1744	24.4
13500	2711	1093	5.96	1178	8.01	1271	10.3	1376	12.8	1459	15.2	1531	17.6	1666	22.4	1795	27.5
15000	3012	1195	7.64	1273	9.90	1349	12.3	1441	14.9	1534	17.8	1609	20.4	1738	25.7		
16500	3313	1298	9.64	1371	12.1	1446	14.7	1513	17.3	1599	20.4	1684	23.5	1815	29.3		
18000	3614	1403	12.0	1471	14.7	1535	17.4	1599	20.3	1669	23.3	1748	26.6				
19500	3916	1508	14.7	1573	17.7	1632	20.6	1691	23.6	1750	26.7	1817	30.1				
21000	4217	1615	17.9	1675	21.1	1732	24.3	1786	27.4	1841	30.7						
22500	4518	1722	21.5	1778	24.9	1833	28.3										

A41-_-30_FA-66FG_ _ _ _or A41P0-302FA-66FG_ _ _ _

Wheel Diameter: 30.0 in.
Outlet Area: 4.39 sq. ft.

CFM	Outlet Velocity FPM	Static Pressure 2" RPM	2" BHP	3" RPM	3" BHP	4" RPM	4" BHP	5" RPM	5" BHP	6" RPM	6" BHP	8" RPM	8" BHP	10" RPM	10" BHP	12" RPM	12" BHP
4500	1025	814	1.87	952	2.85												
6000	1367	906	2.62	1024	3.76	1132	4.98	1236	6.30	1335	7.69						
7500	1708	1010	3.61	1120	4.95	1217	6.34	1308	7.81	1394	9.34	1560	12.6				
9000	2050	1112	4.85	1224	6.43	1316	8.03	1400	9.67	1479	11.4	1628	14.9	1768	18.8	1904	22.8
10500	2392	1225	6.37	1325	8.22	1421	10.1	1502	11.9	1577	13.8	1714	17.7	1843	21.8	1967	26.2
12000	2733	1351	8.21	1434	10.3	1522	12.4	1606	14.5	1681	16.7	1812	21.0	1933	25.4	2048	30.1
13500	3075	1480	10.4	1555	12.8	1629	15.2	1707	17.6	1783	19.9	1916	24.7	2031	29.5	2140	34.5
15000	3417	1612	13.1	1681	15.7	1747	18.3	1815	21.0	1885	23.6	2019	28.9	2135	34.2		
16500	3759	1746	16.3	1810	19.1	1871	22.0	1931	24.9	1993	27.8	2120	33.6				
18000	4100	1881	20.0	1942	23.1	1999	26.1	2054	29.3	2109	32.5	2225	38.8				
19500	4442	2018	24.4	2075	27.6	2129	30.9	2181	34.3								
21000	4784	2156	29.3	2209	32.8												

A41-_-33_FA100FG_ _ _ _or A41P0-332FA100FG_ _ _ _

Wheel Diameter: 33.0 in.
Outlet Area: 6.02 sq. ft.

CFM	Outlet Velocity FPM	Static Pressure 1" RPM	1" BHP	2" RPM	2" BHP	3" RPM	3" BHP	4" RPM	4" BHP	5" RPM	5" BHP	6" RPM	6" BHP	8" RPM	8" BHP	10" RPM	10" BHP
6000	997	543	1.26	701	2.47												
8000	1329	620	1.88	752	3.31	869	4.88	986	6.67								
10000	1661	688	2.63	826	4.44	927	6.22	1023	8.14	1116	10.2	1210	12.4				
12000	1993	778	3.70	899	5.80	1002	7.93	1086	10.1	1168	12.3	1246	14.6	1402	19.7	1554	25.4
14000	2326	875	5.10	968	7.32	1079	9.94	1162	12.4	1236	14.8	1307	17.4	1443	22.8	1576	28.6
16000	2658	976	6.87	1055	9.31	1144	12.1	1240	15.1	1313	17.9	1379	20.7	1503	26.4	1622	32.6
18000	2990	1078	9.06	1150	11.8	1226	14.6	1305	17.9	1390	21.3	1457	24.4	1575	30.7		
20000	3322	1182	11.7	1248	14.7	1311	17.8	1376	21.0	1455	24.7	1532	28.5	1652	35.5		
22000	3654	1287	14.9	1349	18.2	1406	21.5	1463	25.0	1525	28.6	1597	32.7				
24000	3987	1393	18.6	1450	22.3	1504	25.9	1556	29.6	1609	33.3	1667	37.4				
26000	4319	1499	23.0	1553	27.0	1604	30.9	1653	34.8								
28000	4651	1607	28.1	1657	32.3												

A41-_-33_FA-66FG_ _ _ _or A41P0-332FA-66FG_ _ _ _

Wheel Diameter: 33.0 in.
Outlet Area: 5.32 sq. ft.

CFM	Outlet Velocity FPM	Static Pressure 2" RPM	2" BHP	3" RPM	3" BHP	4" RPM	4" BHP	5" RPM	5" BHP	6" RPM	6" BHP	8" RPM	8" BHP	10" RPM	10" BHP	12" RPM	12" BHP
6000	1128	763	2.51	882	3.75	993	5.12										
7500	1410	836	3.31	941	4.72	1038	6.23	1130	7.84	1219	9.55						
9000	1692	914	4.32	1014	5.92	1103	7.60	1186	9.36	1265	11.2	1416	15.2				
10500	1974	991	5.52	1093	7.36	1177	9.24	1254	11.2	1327	13.2	1464	17.4	1595	22.0	1722	26.8
12000	2256	1073	6.95	1169	9.06	1255	11.2	1329	13.3	1398	15.5	1526	20.1	1647	24.9	1763	30.0
13500	2538	1164	8.63	1247	11.0	1331	13.4	1408	15.7	1474	18.1	1596	23.1	1710	28.3	1819	33.6
15000	2820	1259	10.5	1332	13.2	1409	15.9	1484	18.5	1553	21.1	1672	26.5	1780	32.0	1883	37.8
16500	3102	1356	12.9	1423	15.8	1491	18.7	1561	21.6	1629	24.6	1750	30.3	1858	36.2	1953	42.3
18000	3383	1456	15.6	1518	18.7	1579	21.9	1642	25.0	1706	28.2	1828	34.5	1933	40.9		
19500	3665	1556	18.7	1615	22.0	1672	25.4	1727	28.9	1786	32.3	1903	39.1	2013	46.0		
21000	3947	1657	22.2	1713	25.8	1767	29.4	1819	33.1	1871	36.8	1981	44.2				
22500	4229	1759	26.2	1813	30.0	1864	33.8	1913	37.7	1961	41.7						

Performance shown is for installation Type D: ducted inlet/ducted outlet. Power rating (BHP) does not include drive losses. Performance data is based on standard air conditions (0.075 #/ft.3). Performance ratings do not include the effects of appurtenances in the airstream. MOST EFFICIENT FAN SELECTION APPEARS IN BOLD PRINT. To complete model code, add arrangement, class of construction, motor enclosure code, motor horsepower code and motor speed code. Refer to page 2 for more information.

Performance Data

Class I Class II Class III

A41-_-36_FA100FG_ _ _ _or A41PO-362FA100FG_ _ _ _

Wheel Diameter: 36.0 in.
Outlet Area: 7.17 sq. ft.

CFM	Outlet Velocity FPM	Static Pressure 1" RPM	1" BHP	2" RPM	2" BHP	3" RPM	3" BHP	4" RPM	4" BHP	5" RPM	5" BHP	6" RPM	6" BHP	8" RPM	8" BHP	10" RPM	10" BHP
10000	1395	965	2.48	684	4.16	**782**	**5.98**										
12000	1674	620	5.27	741	5.34	870	7.47	**913**	**9.59**	**995**	**12.0**						
14000	1953	688	4.35	796	6.76	887	9.14	963	11.6	**1034**	**14.1**	**1104**	**16.7**				
16000	2232	761	5.71	848	8.37	946	11.2	1020	13.9	1086	16.6	**1149**	**19.5**	**1271**	**25.5**		
18000	2510	837	7.39	911	10.3	996	13.4	1079	16.5	1143	19.6	1203	22.7	**1315**	**29.0**	**1423**	**35.9**
20000	2789	913	9.42	981	12.6	1050	15.9	1130	19.4	1202	22.9	1261	26.2	1367	33.2	**1467**	**40.3**
22000	3068	990	11.8	1054	15.2	1114	18.8	1182	22.6	1255	26.5	1320	30.2	1424	37.7	1519	45.4
24000	3347	1068	14.7	1128	18.3	1184	22.2	1239	26.2	1305	30.3	1372	34.6	1482	42.7		
26000	3626	1147	18.0	1204	21.9	1256	26.0	1307	30.2	1360	34.6	1423	39.2				
28000	3905	1226	21.8	1280	26.0	1330	30.3	1377	34.8	1424	39.4	1476	44.2				
30000	4184	1306	26.2	1357	30.6	1405	35.2	1449	39.9	1493	44.8	1538	49.8				
32000	4463	1386	31.2	1435	35.9	1481	40.7	1523	45.7								

A41-_-36_FA-66FG_ _ _ _or A41PO-362FA-66FG_ _ _ _

Wheel Diameter: 36.0 in.
Outlet Area: 6.33 sq. ft.

CFM	Outlet Velocity FPM	Static Pressure 2" RPM	2" BHP	3" RPM	3" BHP	4" RPM	4" BHP	5" RPM	5" BHP	6" RPM	6" BHP	8" RPM	8" BHP	10" RPM	10" BHP	12" RPM	12" BHP
6600	1043	**668**	**2.67**	**777**	**4.02**	879	5.49										
8800	1390	742	3.62	**841**	**5.36**	**930**	**7.11**	**1010**	**8.91**	**1087**	**10.8**						
11000	1738	824	5.02	916	6.94	**999**	**9.02**	**1074**	**11.1**	**1145**	**13.3**	**1274**	**17.8**	**1397**	**22.6**	1519	27.8
13200	2085	914	6.80	998	8.93	1076	11.2	**1148**	**13.7**	**1215**	**16.2**	**1337**	**21.3**	**1449**	**26.7**	**1554**	**32.1**
15400	2433	1010	8.90	1087	11.5	1159	14.0	**1227**	**16.6**	**1290**	**19.4**	**1408**	**25.2**	**1514**	**31.2**	**1615**	**37.3**
17600	2780	1110	11.4	1181	14.5	1248	17.4	1311	20.2	1371	23.1	1483	29.5	**1587**	**36.1**	**1682**	**42.9**
19800	3128	1215	14.4	1279	17.9	1341	21.3	1400	24.5	1457	27.7	1563	34.3	1663	41.5	**1756**	**49.0**
22000	3476	1322	18.1	1381	21.8	1438	25.6	1493	29.5	1547	33.0	1648	40.1	1743	47.6	1833	55.5
24200	3823	1432	22.5	1485	26.4	1538	30.6	1590	34.8	1640	39.0	1736	46.9	1827	54.7		
26400	4171	1544	27.6	1593	31.8	1641	36.2	1689	40.8	1737	45.4	1828	54.4				
28600	4518	1657	33.6	1702	38.1	1747	42.7	1792	47.6	1836	52.6						
30800	4866	1771	40.5	1813	45.2	1855	50.1										

A41-_-40_FA100FG_ _ _ _

Wheel Diameter: 40.25 in.
Outlet Area: 9.43 sq. ft.

CFM	Outlet Velocity FPM	Static Pressure 1" RPM	1" BHP	2" RPM	2" BHP	3" RPM	3" BHP	4" RPM	4" BHP	5" RPM	5" BHP	6" RPM	6" BHP	8" RPM	8" BHP	10" RPM	10" BHP
12500	1326	506	3.03	611	5.18	**700**	**7.47**										
15000	1591	554	4.09	663	6.68	743	9.27	**816**	**12.0**	**890**	**15.0**						
17500	1856	616	5.44	712	8.44	794	11.4	861	14.5	**924**	**17.6**	**987**	**20.9**				
20000	2121	681	7.14	766	10.5	846	14.0	912	17.3	971	20.8	**1027**	**24.3**	**1137**	**31.9**		
22500	2386	748	9.23	815	12.8	891	16.7	965	20.6	1023	24.4	1076	28.3	**1176**	**36.3**	**1273**	**44.8**
25000	2651	817	11.8	877	15.7	939	19.9	1011	24.3	1075	28.6	1128	32.8	1223	41.5	**1312**	**50.3**
27500	2916	886	14.8	942	19.0	996	23.6	1057	28.2	1122	33.1	1180	37.8	1273	47.1	1358	56.7
30000	3181	955	18.4	1009	22.9	1059	27.7	1108	32.7	1168	37.9	1227	43.2	1326	53.4		
32500	3446	1026	22.5	1077	27.4	1123	32.5	1169	37.8	1217	43.3	1272	49.0				
35000	3712	1097	27.3	1145	32.5	1189	37.9	1232	43.5	1274	49.3	1321	55.3				
37500	3977	1168	32.8	1214	38.3	1256	44.0	1296	49.9	1336	56.0	1375	62.3				
40000	4242	1240	39.0	1283	44.8	1324	50.9	1362	57.1								

A41-_-40_FA-66FG_ _ _ _

Wheel Diameter: 40.25 in.
Outlet Area: 8.34 sq. ft.

CFM	Outlet Velocity FPM	Static Pressure 2" RPM	2" BHP	3" RPM	3" BHP	4" RPM	4" BHP	5" RPM	5" BHP	6" RPM	6" BHP	8" RPM	8" BHP	10" RPM	10" BHP	12" RPM	12" BHP
10000	1199	**639**	**4.11**	**730**	**6.06**	**811**	**8.09**	**887**	**10.2**	**962**	**12.5**						
12500	1499	703	5.44	**788**	**7.74**	**864**	**10.1**	**934**	**12.6**	**998**	**15.2**	**1120**	**20.5**	1241	26.4		
15000	1799	773	7.22	852	9.72	924	12.5	**990**	**15.3**	**1051**	**18.2**	**1164**	**24.3**	**1268**	**30.5**	**1368**	**37.0**
17500	2098	848	9.42	921	12.2	989	15.2	1052	18.3	**1111**	**21.6**	**1218**	**28.4**	**1317**	**35.4**	**1408**	**42.5**
20000	2398	927	11.9	995	15.3	1058	18.5	1117	21.9	1173	25.4	**1277**	**32.9**	**1372**	**40.6**	**1460**	**48.5**
22500	2698	1010	14.9	1072	18.8	1131	22.6	1187	26.2	1240	29.9	1339	37.9	**1431**	**46.3**	**1518**	**54.9**
25000	2998	1095	18.4	1152	22.7	1207	27.1	1260	31.2	1310	35.2	1405	43.5	1494	52.5	**1577**	**61.9**
27500	3297	1183	22.6	1235	27.3	1286	32.1	1336	36.8	1383	41.3	1474	50.2	1559	59.5	1639	69.4
30000	3597	1272	27.6	1320	32.5	1367	37.6	1414	42.9	1459	48.1	1545	57.8	1627	67.9		
32500	3897	1363	33.3	1407	38.4	1451	43.9	1495	49.6	1537	55.3	1620	66.2				
35000	4197	1455	39.8	1495	45.3	1536	51.1	1577	57.1	1618	63.2						
37500	4496	1547	47.3	1585	53.1	1623	59.1										

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Performance Data

Class I Class II Class III

A41-_-44_FA100FG_ _ _ _

Wheel Diameter: 44.6 in.
Outlet Area: 11.53 sq. ft.

CFM	Outlet Velocity FPM	Static Pressure 1" RPM	1" BHP	2" RPM	2" BHP	3" RPM	3" BHP	4" RPM	4" BHP	5" RPM	5" BHP	6" RPM	6" BHP	8" RPM	8" BHP	10" RPM	10" BHP
15000	1301	454	3.60	549	6.19	**630**	**8.97**										
18000	1561	496	4.84	594	7.94	667	11.1	**734**	**14.4**	**803**	**18.1**						
21000	1821	550	6.41	639	10.0	712	13.6	773	17.3	**831**	**21.0**	**889**	**25.1**				
24000	2082	607	8.39	679	12.4	759	16.6	818	20.6	872	24.8	**923**	**29.1**	**1024**	**38.3**		
27000	2342	667	10.8	728	15.2	799	19.9	865	24.5	917	29.1	966	33.8	**1057**	**43.4**	**1147**	**53.8**
30000	2602	727	13.8	783	18.5	841	23.6	907	28.8	964	34.0	1011	39.0	1098	49.5	**1179**	**60.2**
33000	2862	788	17.3	840	22.4	890	27.6	947	33.5	1007	39.3	1068	44.9	1142	56.1	1220	67.7
36000	3122	850	21.4	899	26.9	945	32.7	992	38.7	1047	45.0	1101	51.2	1189	63.5		
39000	3382	913	26.3	959	32.1	1002	38.2	1044	44.6	1090	51.3	1141	58.1	1236	71.7		
42000	3643	975	31.8	1026	38.1	1060	44.6	1099	51.3	1138	58.3	1183	65.5				
45000	3903	1039	38.2	1081	44.8	1120	51.7	1156	58.8	1193	66.1	1229	73.7				
48000	4163	1102	45.3	1142	52.4	1180	59.6	1215	67.1								

A41-_-44_FA-66FG_ _ _ _

Wheel Diameter: 44.6 in.
Outlet Area: 10.19 sq. ft.

CFM	Outlet Velocity FPM	Static Pressure 2" RPM	2" BHP	3" RPM	3" BHP	4" RPM	4" BHP	5" RPM	5" BHP	6" RPM	6" BHP	8" RPM	8" BHP	10" RPM	10" BHP	12" RPM	12" BHP
12000	1178	**574**	**4.92**	**657**	**7.27**	**730**	**9.72**	**800**	**12.3**	869	15.1						
15000	1472	630	6.48	**708**	**9.26**	**777**	**12.2**	**840**	**15.2**	**899**	**18.2**	**1010**	**24.7**				
18000	1766	692	8.56	764	11.6	**830**	**14.9**	**890**	**18.3**	**945**	**21.8**	**1048**	**29.1**	**1142**	**36.6**	**1235**	**44.6**
21000	2061	758	11.1	825	14.5	887	18.1	944	21.9	**997**	**25.9**	**1095**	**34.0**	**1185**	**42.5**	**1268**	**51.0**
24000	2355	828	14.1	890	18.1	947	22.0	1002	26.0	1053	30.4	**1147**	**39.4**	**1233**	**48.6**	**1314**	**58.2**
27000	2650	901	17.6	958	22.3	1012	26.7	1063	31.1	1111	35.5	1202	45.3	**1286**	**55.5**	**1363**	**65.8**
30000	2944	976	21.7	1029	26.9	1079	32.1	1127	37.0	1173	41.8	1260	51.9	1340	62.8	**1416**	**74.1**
33000	3238	1054	26.6	1102	32.2	1149	37.9	1194	43.6	1238	48.9	1320	59.6	1398	70.9	1471	82.9
36000	3533	1133	32.3	1177	38.2	1220	44.4	1263	50.7	1305	56.9	1383	68.5	1458	80.2		
39000	3827	1213	38.9	1254	45.2	1294	51.8	1334	58.6	1374	65.4	1449	78.4				
42000	4122	1294	46.6	1332	53.1	1370	60.1	1407	67.3	1444	74.6						
45000	4416	1376	55.2	1412	62.2	1447	69.4	1482	77.1								

A41-_-49_FA100FG_ _ _ _

Wheel Diameter: 49.0 in.
Outlet Area: 13.98 sq. ft.

CFM	Outlet Velocity FPM	Static Pressure 1" RPM	1" BHP	2" RPM	2" BHP	3" RPM	3" BHP	4" RPM	4" BHP	5" RPM	5" BHP	6" RPM	6" BHP	8" RPM	8" BHP	10" RPM	10" BHP
16000	1144	383	3.49	478	6.32	**562**	**9.69**										
20000	1431	428	4.92	517	8.28	**588**	**11.9**	**656**	**15.9**	724	20.4						
24000	1717	479	6.65	556	10.8	628	14.8	**688**	**19.1**	**745**	**23.7**	**801**	**28.7**	914	39.7		
28000	2003	532	8.85	602	13.7	667	18.4	728	23.1	**780**	**28.0**	**830**	**33.2**	**927**	**44.6**	1023	57.2
32000	2289	585	11.6	653	17.0	710	22.5	767	28.0	820	33.3	**868**	**38.8**	**955**	**50.5**	**1040**	**63.5**
36000	2575	640	14.9	705	20.9	759	27.2	809	33.5	860	39.4	908	45.4	**992**	**57.8**	**1070**	**71.1**
40000	2861	696	19.0	757	25.5	810	32.3	856	39.4	902	46.3	948	53.0	1033	66.2	**1107**	**80.2**
44000	3147	755	23.7	810	30.9	862	38.3	907	45.9	949	53.6	990	61.3	1072	75.9		
48000	3433	814	29.3	864	37.2	914	45.1	959	53.2	999	61.6	1037	70.1	1113	86.4		
52000	3720	873	35.8	920	44.3	967	52.8	1011	61.5	1050	70.4	1087	79.5				
56000	4006	934	43.3	977	52.4	1021	61.6	1063	70.8	1103	80.2						
60000	4292	995	51.8	1034	61.6	1075	71.4	1116	81.2								

A41-_-49_FA-66FG_ _ _ _

Wheel Diameter: 49.0 in.
Outlet Area: 12.36 sq. ft.

CFM	Outlet Velocity FPM	Static Pressure 2" RPM	2" BHP	3" RPM	3" BHP	4" RPM	4" BHP	5" RPM	5" BHP	6" RPM	6" BHP	8" RPM	8" BHP	10" RPM	10" BHP	12" RPM	12" BHP
12000	971	**489**	**4.95**	577	7.63												
16000	1294	541	6.84	**615**	**9.94**	**682**	**13.2**	**748**	**16.8**	811	20.7						
20000	1618	597	9.01	669	12.9	**730**	**16.7**	**786**	**20.7**	**840**	**24.8**	**944**	**33.8**	1045	43.5		
24000	1942	661	11.8	724	16.1	784	20.7	**838**	**25.4**	**887**	**30.0**	**979**	**39.6**	**1068**	**50.0**	1164	61.1
28000	2265	728	15.3	785	20.1	841	25.2	893	30.5	942	36.0	**1028**	**46.7**	**1108**	**57.8**	**1185**	**69.5**
32000	2589	795	19.5	852	25.0	903	30.5	950	36.2	997	42.3	1083	54.7	**1159**	**67.0**	**1230**	**79.5**
36000	2913	865	24.4	920	30.7	968	36.8	1013	43.0	1055	49.4	1137	63.0	1214	77.0	**1282**	**90.8**
40000	3236	938	30.3	988	37.1	1036	44.1	1078	50.9	1118	57.8	1195	72.1	1268	87.4	1337	103
44000	3560	1012	37.3	1058	44.7	1103	52.3	1146	59.9	1184	67.4	1256	82.6	1325	98.6		
48000	3883	1089	45.5	1130	53.3	1172	61.5	1213	69.9	1252	78.2	1321	94.6				
52000	4207	1167	55.0	1204	63.3	1243	72.0	1282	81.0	1319	90.0						
56000	4531	1246	65.9	1280	74.7	1316	83.9	1352	93.4								

Performance shown is for installation Type D: ducted inlet/ducted outlet. Power rating (BHP) does not include drive losses. Performance data is based on standard air conditions (0.075 #/ft.3). Performance ratings do not include the effects of appurtenances in the airstream. MOST EFFICIENT FAN SELECTION APPEARS IN BOLD PRINT. To complete model code, add arrangement, class of construction, motor enclosure code, motor horsepower code and motor speed code. Refer to page 2 for more information.

Performance Data

☐ Class I ☐ Class II ☐ Class III

A41-_-54_FA100FG_ _ _ _

Wheel Diameter: 54.25 in.
Outlet Area: 17.13 sq. ft.

CFM	Outlet Velocity FPM	Static Pressure 1" RPM	1" BHP	2" RPM	2" BHP	3" RPM	3" BHP	4" RPM	4" BHP	5" RPM	5" BHP	6" RPM	6" BHP	8" RPM	8" BHP	10" RPM	10" BHP
20000	1168	349	4.41	**434**	**7.91**	**509**	**12.1**										
25000	1459	391	6.22	470	10.4	535	14.9	**595**	**19.8**	655	25.3						
30000	1751	439	8.44	507	13.6	571	18.6	**625**	**23.9**	**676**	**29.6**	**726**	**35.8**	826	49.3		
35000	2043	487	11.3	550	17.5	608	23.3	662	29.1	**710**	**35.1**	**754**	**41.6**	**840**	**55.6**	925	71.1
40000	2335	536	14.8	597	21.6	648	28.6	699	35.3	746	41.9	790	48.7	**868**	**63.3**	**943**	**79.2**
45000	2627	587	19.1	645	26.6	693	34.4	738	42.3	783	49.8	826	57.2	**903**	**72.6**	**972**	**89.0**
50000	2919	639	24.3	693	32.5	741	41.0	782	49.6	822	58.5	863	66.9	940	83.4	**1007**	**101**
55000	3211	693	30.5	742	39.5	789	48.6	829	58.1	867	67.8	903	77.5	976	95.7		
60000	3503	748	37.7	793	47.5	**837**	57.4	**877**	67.5	913	78.0	947	88.5	1014	109		
65000	3795	803	46.1	844	56.7	886	67.4	925	78.2	961	89.3	993	101				
70000	4086	859	55.8	896	67.2	935	78.7	973	90.2	1009	102						
75000	4378	915	66.9	950	79.0	986	91.3										

A41-_-54_FA-66FG_ _ _ _

Wheel Diameter: 54.25 in.
Outlet Area: 15.15 sq. ft.

CFM	Outlet Velocity FPM	Static Pressure 2" RPM	2" BHP	3" RPM	3" BHP	4" RPM	4" BHP	5" RPM	5" BHP	6" RPM	6" BHP	8" RPM	8" BHP	10" RPM	10" BHP	12" RPM	12" BHP
15000	990	**444**	**6.19**	**522**	**9.50**												
20000	1320	493	8.58	559	12.4	**619**	**16.5**	**677**	**21.0**	734	26.7						
25000	1650	545	11.3	609	16.1	**664**	**21.0**	**714**	**25.8**	**762**	**31.0**	**855**	**42.0**	946	54.0		
30000	1980	604	15.0	661	20.3	714	26.0	763	31.8	**807**	**37.6**	**889**	**49.5**	**968**	**62.3**	**1045**	**76.0**
35000	2310	666	19.4	718	25.4	767	31.7	813	38.3	857	45.1	**935**	**58.6**	**1007**	**72.3**	**1075**	**86.7**
40000	2640	728	24.7	780	31.7	824	38.5	867	45.6	908	53.1	986	68.6	**1054**	**84.0**	**1118**	**99.5**
45000	2970	793	31.1	842	38.9	885	46.6	925	54.3	963	62.2	1036	79.1	1105	96.6	**1167**	**114**
50000	3300	860	38.7	905	47.2	948	56.0	986	64.5	1022	73.1	1090	90.8	1155	110	1217	129
55000	3630	929	47.7	970	56.9	1010	66.4	1049	76.0	1083	85.4	1147	104	1209	124		
60000	3960	1001	58.4	1037	68.1	1074	78.3	1110	88.7	1146	99.2	1207	120				
65000	4290	1073	70.6	1105	81.0	1139	91.8	1174	103	1207	114						
70000	4620	1146	84.7	1176	95.7	1207	107										

A41-_-60_FA100FG_ _ _ _

Wheel Diameter: 60.0 in.
Outlet Area: 20.9 sq. ft.

CFM	Outlet Velocity FPM	Static Pressure 1" RPM	1" BHP	2" RPM	2" BHP	3" RPM	3" BHP	4" RPM	4" BHP	5" RPM	5" BHP	6" RPM	6" BHP	8" RPM	8" BHP	10" RPM	10" BHP
24000	1148	313	5.24	**390**	**9.48**	**459**	**14.5**										
30000	1435	380	7.38	422	12.4	**481**	**17.8**	**536**	**23.8**	591	30.5						
36000	1722	392	9.98	455	16.2	513	22.2	**562**	**28.6**	**608**	**35.5**	**654**	**43.1**	746	59.6		
42000	2010	434	13.3	492	20.6	545	27.7	595	34.6	**637**	**42.0**	**678**	**49.8**	**757**	**66.9**	836	85.7
48000	2297	478	17.4	533	25.5	580	34.0	626	41.9	670	49.9	**709**	**58.2**	**780**	**75.8**	**850**	**95.2**
54000	2584	523	22.4	576	31.4	620	40.8	661	50.2	702	59.2	741	68.1	**811**	**86.7**	**874**	**107**
60000	2871	569	28.5	618	38.3	661	48.5	700	59.1	737	69.5	774	79.5	844	99.3	**904**	**120**
66000	3158	616	35.6	662	46.4	704	57.4	741	68.9	775	80.5	809	91.9	876	114		
72000	3445	665	44.0	706	55.8	747	67.6	783	79.9	816	92.4	847	105	909	130		
78000	3732	714	53.8	752	66.5	790	79.3	826	92.2	858	106	888	119				
84000	4019	763	65.0	798	78.6	834	92.4	869	106	901	120						
90000	4306	813	77.8	845	92.4	879	107	912	122								

A41-_-60_FA-66FG_ _ _ _

Wheel Diameter: 60.0 in.
Outlet Area: 18.53 sq. ft.

CFM	Outlet Velocity FPM	Static Pressure 2" RPM	2" BHP	3" RPM	3" BHP	4" RPM	4" BHP	5" RPM	5" BHP	6" RPM	6" BHP	8" RPM	8" BHP	10" RPM	10" BHP	12" RPM	12" BHP
24000	1295	442	10.3	**502**	**14.9**	**557**	**19.9**	**611**	**25.3**	662	31.0						
30000	1619	488	13.5	546	19.3	**596**	**25.1**	**642**	**31.0**	**686**	**37.2**	**771**	**50.6**	853	65.2		
36000	1943	540	17.7	592	24.2	641	31.1	**684**	**38.1**	**725**	**45.0**	**800**	**59.4**	**872**	**75.0**	942	91.6
42000	2267	595	23.0	642	30.2	687	37.7	729	45.8	769	54.0	**840**	**70.1**	**905**	**86.7**	**968**	**104**
48000	2590	650	29.2	696	37.5	737	45.7	776	54.3	814	63.4	884	82.1	**946**	**100**	**1004**	**119**
54000	2914	707	36.6	752	46.0	791	55.2	827	64.5	862	74.1	929	94.8	991	116	**1047**	**136**
60000	3238	766	45.5	807	55.7	846	66.2	881	76.4	914	86.7	976	108	1036	131	1092	154
66000	3562	827	55.9	864	67.0	901	78.4	936	89.9	967	101	1026	124	1082	148		
72000	3886	890	68.2	923	80.0	958	92.3	991	105	1023	117	1079	142				
78000	4209	954	82.5	984	95.0	1016	108	1047	122	1078	135						
84000	4533	1018	98.6	1046	112	1075	126	1104	140								
90000	4857	1083	117	1109	132												

Performance shown is for installation Type D: ducted inlet/ducted outlet. Power rating (BHP) does not include drive losses. Performance data is based on standard air conditions (0.075 #/ft.3). Performance ratings do not include the effects of appurtenances in the airstream. MOST EFFICIENT FAN SELECTION APPEARS IN BOLD PRINT. To complete model code, add arrangement, class of construction, motor enclosure code, motor horsepower code and motor speed code. Refer to page 2 for more information.

Performance Data

☐ Class I ☐ Class II ☐ Class III

A41-4-_ _ _FA100FG_ _ _ _

Size	Class	Motor HP	Motor Code	Motor (Fan) HP	Motor (Fan) Code	Peak Fan BHP	Cubic Feet Per Minute vs.Static Pressure 0"	½"	1"	1½"	2"	2½"	3"	4"	5"	6"	7"	8"	9"	10"	Outlet Area	Wheel Dia. Inches
12	1	¼	E	1750	3	0.30	1509	1293	1068	785											0.37	12¼
	2	¾	K	3450	2	2.31	2976	2879	2775	2659	2529	2400	2294	2079	1820	1477						
15	1	1	H	1750	3	0.69	2870	2693	2382	2124	1861	1503									1.30	15¾
	2	7½	M	3450	2	6.79	5663	5581	5494	5400	5298	5185	5034	4653	4380	4147	3896	3598	3254	2836		
18	1	¼	G	1160	4	0.65	3463	3082	2524	1980											1.88	18¾
	1	¾	K	1750	3	2.24	5225	5007	4745	4344	3979	3658	3217									
22	1	2	J	1160	4	1.85	5636	6181	5709	5085	4253	3373									2.81	22¾
	1	7½	M	1750	3	6.34	10010	9714	9410	9097	8788	8464	8104	6934	5982							
24	1	3	K	1160	4	2.62	8555	8063	7552	7003	6077	5260	4182								3.33	24¾
	2	10	N	1750	3	9.68	12907	12585	12256	11919	11578	11241	10885	9948	8671	7624						
27	1	2	J	870	5	2.19	9191	8452	7657	6803	5081										4.22	27¾
	1	5	L	1160	4	5.18	12255	11711	11141	10564	9870	8690	7850									
	2	20	P	1750	3	17.8	18489	18132	17769	17398	17019	16642	16253	15444	14227	12756	11650	10362				
30	1	3	K	870	5	3.30	11772	10974	10139	8904	7516	5924									4.98	30
	1	7½	M	1160	4	7.82	15696	15106	14494	13875	13215	12312	11032	9137								
	2	30	R	1750	3	26.9	23679	23291	22899	22500	22093	21679	21272	20434	19500	18036	16429	15230	13937	12219		
33	1	5	L	870	5	5.32	15668	14796	13889	12892	11129	9789	8039								6.02	33
	1	15	O	1160	4	12.6	20891	20245	19578	18894	18210	17463	16455	13938	11752							

A41-4-_ _ _FA-66FG_ _ _ _

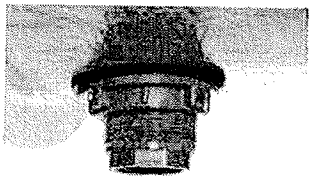
Size	Class	Motor HP	Motor Code	Motor (Fan) HP	Motor (Fan) Code	Peak Fan BHP	Cubic Feet Per Minute vs.Static Pressure 0"	½"	1"	1½"	2"	2½"	3"	4"	5"	6"	7"	8"	10"	12"	Outlet Area	Wheel Dia. Inches
12	1	½	E	1750	3	0.25	1104	950	777	569											0.73	12¾
	2	2	J	3450	2	1.94	2176	2101	2024	1945	1864	1781	1694	1512	1325	1065						
15	1	¾	G	1750	3	0.67	2389	2188	1965	1724	1452	1106									1.16	15¾
	2	5	L	3450	2	5.14	4711	4611	4510	4407	4301	4192	4080	3848	3607	3355	3086	2793	2050			
18	1	¾	G	1160	4	0.45	2651	2312	1899	1390											1.66	18¾
	1	2	J	1750	3	1.63	4000	3786	3565	3301	3027	2726	2391	1501								
	3	15	O	3450	2	12.5	7885	7780	7673	7563	7452	7338	7222	6981	6727	6462	6187	5901	5281	4596		
22	1	1½	I	1160	4	1.29	4970	4626	4158	3620	3019	2263									2.48	22¾
	1	5	L	1750	3	4.44	7498	7283	7048	6785	6467	6107	5755	5017	4128							
24	1	2	J	1160	4	1.97	6408	6040	5572	4989	4393	3693	2843								2.94	24¾
	2	7½	M	1750	3	6.78	9667	9435	9185	8913	8601	8239	7842	7075	6237	5238	4037					
27	1	1½	I	870	5	1.54	6990	6312	5567	4611	3605										3.73	27¾
	1	5	L	1160	4	3.65	9320	8816	8303	7773	7097	6367	5700									
	2	15	O	1750	3	12.5	14060	13728	13393	13054	12712	12374	12027	11241	10250	9336	8436	7368				
30	1	3	K	870	5	2.32	8952	8218	7459	6431	5455	4135									4.39	30
	1	5	L	1160	4	5.51	11936	11390	10832	10273	9651	8854	8081	6535								
	2	20	P	1750	3	18.9	16007	17647	17284	16917	16547	16178	15810	15040	14107	13012	12029	11066	8547			
33	1	5	L	870	5	3.74	11915	11110	10290	9323	8154	7077	5616								5.32	33
	1	10	N	1160	4	8.87	15287	15287	14677	14065	13436	12715	11831	10173	8360							
	3	30	R	1750	4	30.5	23967	23571	23173	22771	22356	21958	21553	20737	19876	18834	17037	16497	14368	11577		

Performance shown is for installation Type D: ducted inlet/ducted outlet. Performance data is based on standard air conditions (0.075 #/ft.3) and constant speed. Performance ratings do not include the effects of appurtenances in the airstream. To complete model code, add size, class of construction, motor enclosure code, motor horsepower code and motor speed code. Refer to page 2 for more information.

Options and Accessories

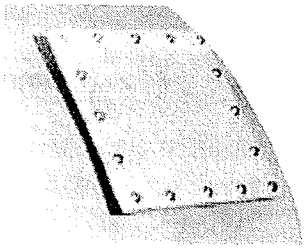
Drain

Fiberglass bulk head fitting assembled in housing, NPT female threaded fitting. 1" NPT on Series 41 and Series 41P.



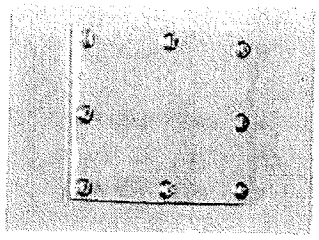
Access Door

Raised, bolted type door - held in place with zinc plated bolts and gasketed for a tight seal.



Inspection Door

Allows periodic visual inspection of wheel - fastened with stainless steel bolts and gasketed for tight seal.



Flanged Inlet

Fiberglass inlet flange is available. Flanges are drilled upon request. Flanged and drilled inlet is required when inlet control damper is furnished.

Disconnect Switch

On-off switch mounted to the unit to provide safety during maintenance.

V-Belt Drives

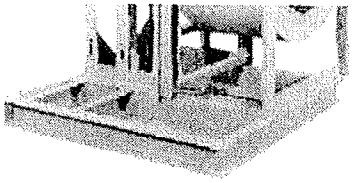
Constant speed (fixed pitch) or adjustable speed (variable pitch) oil, heat, and static resistant type V-Belt Drives, oversized for long life and continuous duty as standard, are available upon request.

Inlet Boxes

Solid fiberglass construction. Inlet box improves entry conditions and minimizes losses which are generally associated with duct elbows at the fan inlet. Inlet boxes are designed for specific applications. Contact factory.

Arrangement 1 Sub-Base

Common structural support for Arrangement 1 fan and motor. Specify motor mounting position (see page 6). Epoxy coated steel. Series 41 only.



Arrangements

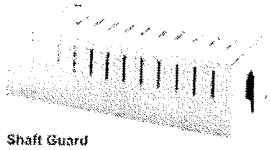
Arrangement 8 and other arrangements not shown are available, (see page 6). Contact factory.

Vibration Isolators

Rubber-in-shear or spring type isolators available on all models.

Drive Guards

Encloses the drive assembly while permitting circulation of ambient air. Standard features include: tach opening, belt tension openings and adjustable length. Series 41 only.



Shaft Guard
Arrangement 9 or 1

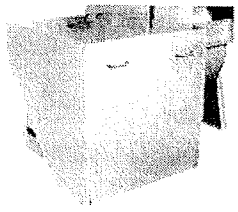
Belt Drive Guard
Arrangement 9

Inlet and Outlet Guards

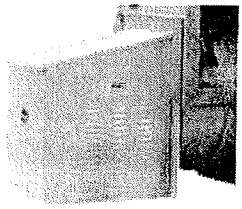
Spiral ring guard offers protection on inlet side and a wire mesh guard can be furnished for the outlet side. Guards are epoxy coated steel.

Combination Drive Guard and Weather Cover

Covers motor and shaft sheaves as well as belts. Combines guarding the drive as well as protection from the weather. Epoxy coated steel. Specify fan arrangement.



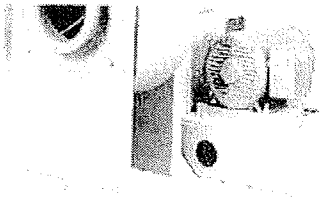
Arrangement 9
Series 41



Arrangement 10
Series 41P

Arrangement 9M Motor Base

Accommodates a larger frame size motor than the standard arrangement 9 base. Series 41 only.



General Construction Options

Abrasive/Erosive Resistant Coating

HartKoate is an abrasive/erosive resistant coating developed by Hartzell Fan for application in environments where abrasive/erosive conditions may exist. HartKoate helps prevent premature deterioration of equipment in environments where uncoated fans may fail.

Impact resistant HartKoate is applied to a 50-60 mil thickness suitable for temperatures to 250°F.

HartKoate is particularly appropriate for use when water mist and/or abrasive particles exist in the airstream.

Contact your Hartzell representative for further details concerning the application of HartKoate coating to fiberglass fans in corrosive atmospheres.

Hi-Cor Construction

All airstream surfaces exposed to a corrosive environment will be protected with a layer of Synthetic (Nexus) surfacing veil. An additional final coat of resin will be applied for extra corrosion resistance.

When Hi-Cor construction is required, the factory should be consulted concerning the corrosive environment involved.

Electrostatically Grounded Fiberglass Fans

For applications in which fiberglass fans are handling gas fumes that are not only corrosive but also potentially explosive, the equipment should be specially constructed to control and remove static electricity. Interior airstream surfaces can be coated with a "carbon rich" resin coat and grounding straps secured from the side of the housing to the fan's steel base. All that remains to effectively ground the airstream is to ground the fan base at the time of installation.

SAFETY ACCESSORIES, APPLICATION AND USE WARNING

The safe application and use of equipment supplied by Hartzell Fan, Inc. is the responsibility of the installer, the user, the owner, and the employer. Since the application and use of its equipment can vary greatly, Hartzell Fan, Inc. offers various product types, optional safety accessories, and sound performance data per laboratory tests. Hartzell Fan, Inc. sells its equipment with and without safety accessories, and accordingly, it can supply such safety accessories only upon receipt of an order. The need for safety accessories will frequently depend upon the type of system, fan location and operating procedures being employed. The proper protective safety accessories to meet company standards, local codes, and the requirements of the Occupational Safety and Health Act must be determined by the user since safety requirements vary depending on the location and use of the equipment. If applicable local conditions, standards, codes or OSHA rules require the addition of the safety accessories, the user should specify and obtain the required safety accessories from Hartzell Fan, Inc. and should not allow the operation of the equipment without them.

Owners, employers, users and installers should read "RECOMMENDED SAFETY PRACTICES FOR USERS AND INSTALLERS OF INDUSTRIAL AND COMMERCIAL FANS" published by the Air Movement and Control Association International, Inc., 30 West University Drive, Arlington Heights, Illinois 60004. A copy of this publication is enclosed with each fan shipped from Hartzell Fan, Inc., and is available upon request at Hartzell's office in Piqua, Ohio 45356.

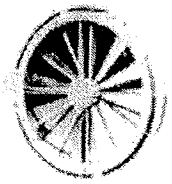
Please contact Hartzell Fan, Inc. or your local Hartzell representative for more information on product types, safety accessories, and sound performance estimates.

Remember, the selection of safety accessories and the safe application and use of equipment supplied by Hartzell Fan, Inc. is your responsibility.

Heavy-Duty Control Dampers

Inlet Control Damper

Dampers are mounted on the blower's drilled inlet flange to both increase the efficiency of the system and permit control of air volume. Dampers are epoxy coated or stainless steel construction.

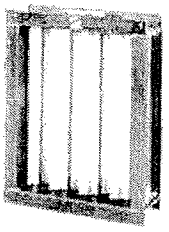


Outlet Dampers

Dampers are mounted directly on the blower outlet to control the volume of air delivered to the system. Opposed and parallel blade dampers are available in steel, stainless steel, coated steel and solid fiberglass.

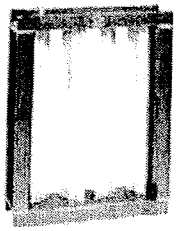
Parallel Blade Type

Best suited for applications requiring accurate air volume in a range from wide open to 75% of wide open. Usually used for balancing the system or for modulated control when pressure drop is variable.



Opposed Blade Type

Best suited for control over a broad range of air volume with more precise control.



Both types of outlet control dampers are available in three classifications:

Class I – Maximum static pressure: 5" SP
Maximum velocity: 3900 FPM

Class II – Maximum static pressure: 8½" SP
Maximum velocity: 5100 FPM

Class III – Maximum static pressure: 20" SP
Maximum velocity: 6000 FPM

CONTACT YOUR LOCAL HARTZELL REPRESENTATIVE FOR ASSISTANCE.

1-800-336-3267

Hartzell Warranty

LIMITED WARRANTIES

Hartzell represents to Buyer that any goods to be delivered hereunder will be produced in compliance with the requirements of the Fair Labor Standards Act of 1938 as amended.

Hartzell also warrants to Buyer its goods to be free from defects in workmanship and material under normal use and service for one (1) year after tender of delivery by Hartzell, plus six months allowance for shipment to approved stocking dealers and distributors. No warranty extends to future performance of goods and any claims for breach of warranty or otherwise accrues upon tender of delivery.

The foregoing constitute Hartzell's sole and exclusive warranties and are in lieu of all other warranties, whether written, oral, express, implied or statutory.

LIMITATION OF LIABILITY FOR BREACH OF WARRANTY

Hartzell's obligation for any breach of warranty is limited to repairing or replacing, at its option, without cost to Buyer at its factory any goods which shall, within such a warranty period, be returned to it with transportation charges prepaid, and which its examination shall disclose to its satisfaction to have been defective. Any request for repair or replacement should be directed to Hartzell Fan, Inc., P.O. Box 919, Piqua, Ohio 45356. Hartzell will not pay for any repairs made outside its factory without its prior written consent. This does not apply to any such Hartzell goods which have failed as a result of faulty installation or abuse, or incorrect electrical connections or alterations, made by others, or use under abnormal operating conditions or misapplication of the goods.

LIMITATION OF LIABILITY

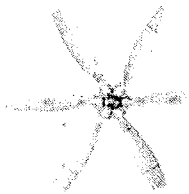
To the extent the above limitation of liability for breach of warranty is not applicable, the liability of Hartzell on any claim of any kind, including negligence, for any loss or damage arising out of or connected with, or resulting from the sale and purchase of the goods or services covered by these Terms and Conditions of Sale or from the performance or breach of any contract pertaining to such sale or purchase or from the design manufacture, sale, delivery, resale, installation, technical direction installation, inspection repair, operation or use of any goods or services covered by these Terms and Conditions shall, in no case exceed the price allocable to the goods or services which gave rise to the claim and shall terminate one year after tender of delivery of said goods or services, plus six months allowance for shipment to approved stocking dealers and distributors.

In no event whether as a result of breach of contract, or warranty or alleged negligence, defects, incorrect advice or other causes, shall Hartzell be liable for special or consequential damages, including, but not limited to, loss of profits or revenue, loss of use of the equipment or any associated equipment, cost of substitute equipment, facilities or services, down time costs, or claims of customers of the Buyer for such damages. Hartzell neither assumes nor authorizes any person to assume for it any other liability in connection with the sale of its goods or services.

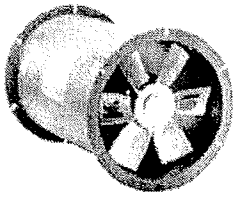
NO IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS

HARTZELL DOES NOT WARRANT THAT SAID GOODS ARE OF MERCHANTABLE QUALITY OR THAT THEY ARE FIT FOR ANY PARTICULAR PURPOSE. THERE IS NO IMPLIED WARRANTY OF MERCHANTABILITY AND THERE IS NO IMPLIED WARRANTY OF FITNESS.

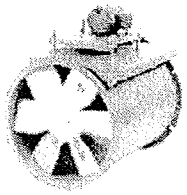
Propeller Fans



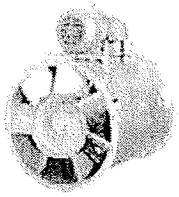
Cooling Tower & Heat Exchanger Fans



Duct Fans

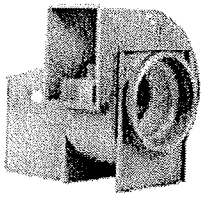


Duct Axial Fans

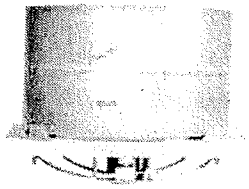


Vaneaxial Blowers

Cool Blast & Utility Fans

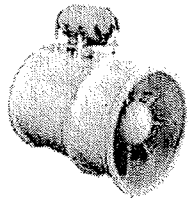


Steel Centrifugal Blowers



Roof Ventilators – Steel & Fiberglass

Heating Equipment – Gas & Steam



Fiberglass Axial Flow Fans

Fiberglass Centrifugal Blowers

Marine – Mine Duty Blowers

Hartzell Fan, Inc., Piqua, Ohio 45356 • Plants in Piqua, Ohio and Portland, Indiana

Litho in U.S.A. A-160-C 4/05 2.5M

HARTZELL FAN, INC.

EPOXY CHEMICAL RESISTANT COATING

PHYSICAL DATA

1.	Product Class:	Sherwin-Williams Waterbased Tile-Clad Epoxy
2.	Mfg./Prod. #:	B73-100 Series / B73V100 Hardener
3.	Texture:	Smooth
4.	Color:	Light Gray - Federal Standard #26373
5.	Gloss:	High-gloss
6.	Weight per gal:	10.5 lbs.
7.	Shelf life:	1 years at 77 deg. F. - unopened

APPLICATION DATA

1.	Substrate:	Steel and aluminum
2.	Surface Preparation:	Steel - minimum SSPC-SP1, phosphatized for in-factory application - mininum SSPC-SP2, for field use, plus 2 to 4 mils of Tile Clad Epoxy Primer Galvanized, galvanneal, aluminum - minimum SSPC-SP1 Note: Do not use hydrocarbon solvents Paint bare steel within 8 hours
3.	Application:	Spray, brush or roll.
4.	Reduction:	Not required - water as needed, 10% max.
5.	Sweat-in:	30 min.
6.	Cure:	Air dry - do not force dry.
7.	Drying Time:	Recoat: 8 hrs. @ 50° F. 6 hrs. @ 77° F. 3 hrs. @ 100° F. Maximum 30 days, then abrade before repainting Dry Hard: 7 days
8.	Min. Dry Film Thickness:	3-4 mils
9.	Pot Life:	3.5 hours (77° F./50% rh)
10.	Cleaner:	Water

TECHNICAL DATA

1.	Surface Coverage:	260 sq. ft./gal. at 3.0 mils DFT
2.	Viscosity:	Not available
3.	VOC:	1.65 lbs./gallon
4.	Lead Content:	0%
5.	Volume Solids:	44%
6.	Temperature Limit:	250° F. dry

ENGINEERING STANDARD	EPOXY CHEMICAL RESISTANT COATING DATA	REVISED BY: RLF	DATE: 11/15/04	ESS: 9.1.2
		APPROVED BY: TJG	SUPERSEDES DATED: 12/3/02	PAGE: 1 of 1

Ex-6

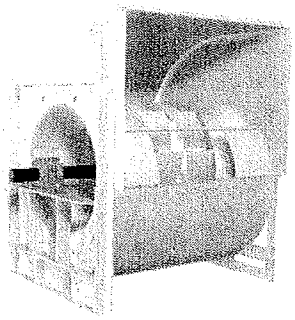
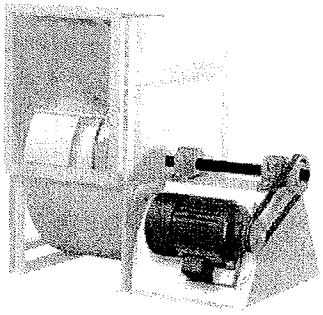
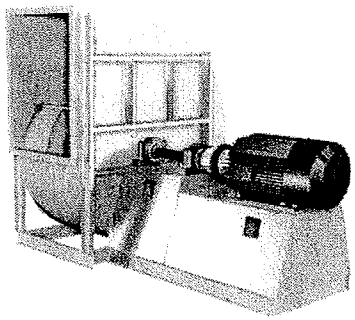
READ AND SAVE THESE INSTRUCTIONS

PN 463687

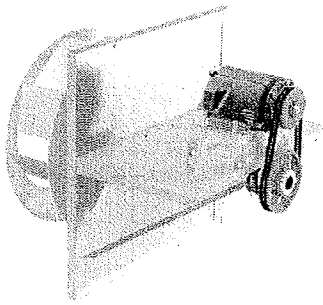
GREENHECK
Building Value in Air.

- CENTRIFUGAL (BISW, AFSW, BIDW, AFDW)
- INDUSTRIAL PROCESS (IPA, IPO, IPW)
- PLENUM (QEP)
- PLUG (PLG)

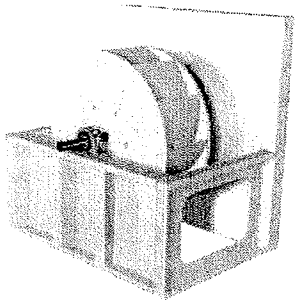
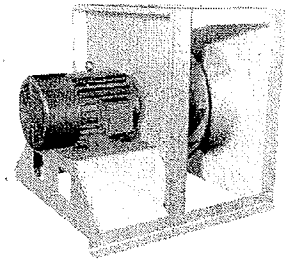
Installation, Operation and Maintenance Manual

CENTRIFUGAL AND INDUSTRIAL



PLUG

PLENUM

TABLE OF CONTENTS

Report any damaged equipment to the shipper immediately!

All Centrifugal, Industrial Process, Plenum and Plug fans are shipped on a skid or packaged to minimize damage during shipment. The transporting carrier has the responsibility for delivering all items in their original condition as received from Greenheck. The individual receiving the equipment is responsible for inspecting the unit for obvious or hidden damage, recording any damage on the bill of lading before acceptance and filing a claim (if required) with the final carrier.

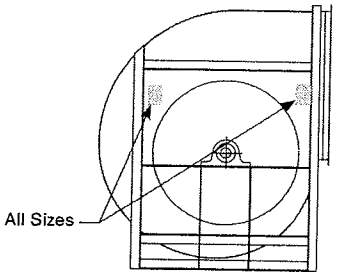
GENERAL INFORMATION

To insure a successful installation, the instructions in this manual should be read and adhered to. Failure to comply with proper installation procedures may void the warranty.

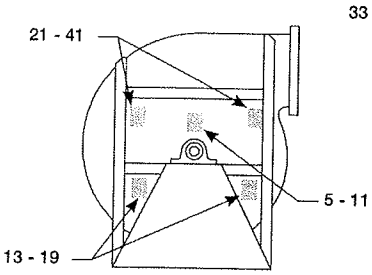
HANDLING

Fans are to be rigged and moved by the lifting brackets provided or by the skid when a forklift is used. See figures below for proper lifting locations. Location of brackets varies by model and size. QEP plenum fans utilize holes located in the framework of the fan. Handle in such a manner as to keep from scratching or chipping the coating. Damaged finish may reduce ability of fan to resist corrosion.

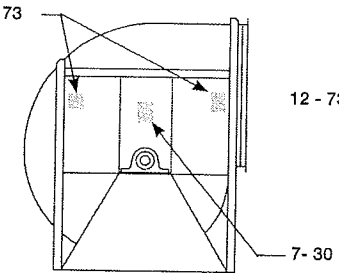
FANS SHOULD NEVER BE LIFTED BY THE SHAFT, HOUSING, MOTOR, BELT GUARD OR ACCESSORIES.



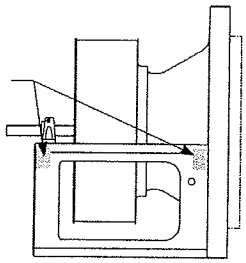
AFDW & BIDW



IPA, IPW, IPO



AFSW & BISW



QEP

STORAGE

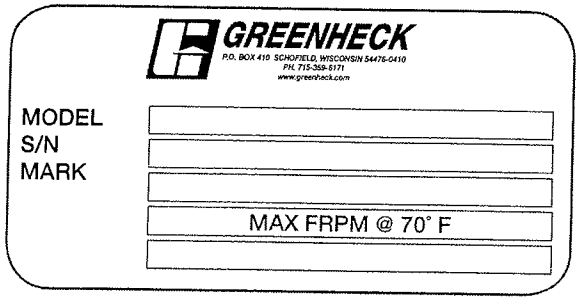
When a fan is not going to be in service for an extended amount of time, certain procedures should be followed to keep the fan in proper operating condition.

- Rotate fan wheel monthly and purge bearings once every three months
- Cover unit with tarp to protect from dirt and moisture (Note: do not use a black tarp as this will promote condensation)
- Energize fan motor once every three months
- Store belts flat to keep them from warping and stretching
- Store unit in location which does not have vibration
- After storage period, purge grease before putting fan into service

If storage of fan is in a humid, dusty or corrosive atmosphere, rotate the fan and purge the bearings once a month. Improper storage which results in damage to the fan will void the warranty.

UNIT IDENTIFICATION

The tag below is an example of an identification label on the fan. The information provides general details about the fan, as well as containing specific information unique to the unit. When contacting your Greenheck representative with future needs or questions, please have the information on this label available.



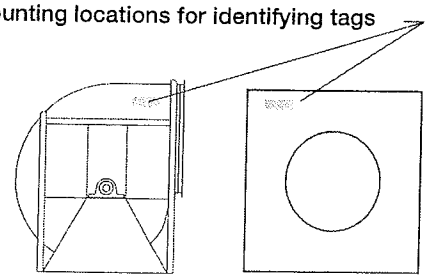
Model - General description of fan

S/N - Serial Number assigned by Greenheck, which is a unique identifier for every unit

Mark - Customer supplied identification

Tags are mounted in an area which is clearly visible, usually near the fan outlet on the drive side of the fan. The exact tag location may differ due fan model and size.

Typical mounting locations for identifying tags



CAUTION!

When installing a fan, ensure the proper protective devices are used to protect personnel from moving parts and other hazards. A complete line of protective accessories are available from Greenheck including: inlet guards, outlet guards, belt guards, shaft guards, protective cages and electrical disconnects.

Check local codes to ensure compliance for all protective devices.

For further details on safety practices involving industrial and commercial fans please refer to AMCA Publication 410.

ELECTRICAL DISCONNECTS
All fan motors should have disconnects located in close visual proximity to turn off electrical service. Service disconnects shall be locked out when maintenance is being performed.

MOVING PARTS
All moving parts must have guards to protect personnel. Refer to local codes for requirements as to the number, type and design. Fully secure fan wheel before performing any maintenance. The fan wheel may start "free wheeling" even if all electrical power has been disconnected. Before the initial start-up or any restart, check the following items to make sure that they are installed and secure.

GUARDS (BELT, SHAFT, INLET, OUTLET)
Do not operate fans without proper protective devices in place. Failure to do so may result in serious bodily injury and property damage.

ACCESS DOORS
Before opening access doors ensure the fan wheel has stopped moving and that the wheel has been secured from being able to rotate. Do not operate fan without access door in its fully closed position.

AIR PRESSURE AND SUCTION
In addition to the usual hazards associated with rotating machinery, fans also create a dangerous suction at the inlet. Special caution needs to be used when moving around a fan whether it is in operation or not. Before start-up, make sure the inlet area is clear of personnel and loose objects.

INSTALLATION

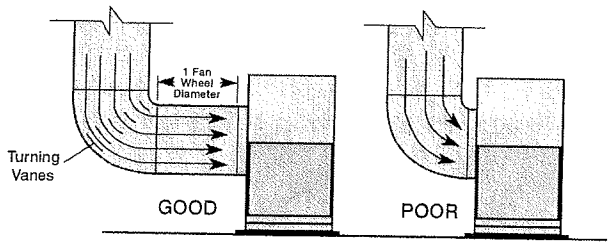
Installations with inlet or discharge configurations that deviate from this standard may result in reduced fan performance. Restricted or unstable flow at the fan inlet can cause pre-rotation of incoming air or uneven loading of the fan wheel yielding large system losses and increased sound levels. Free discharge or turbulent flow in the discharge ductwork will also result in system effect losses. Refer to the following diagrams for the most efficient installation conditions.

CENTRIFUGAL AND INDUSTRIAL PROCESS FANS - INSTALLATIONS

DUCTED INLET INSTALLATIONS

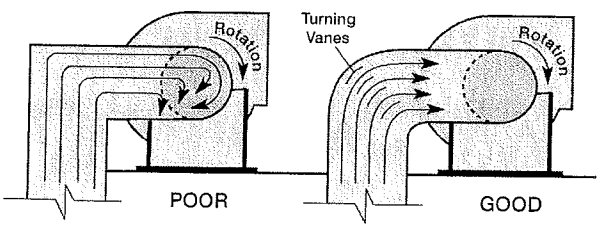
Inlet Duct Turns

Installation of a duct turn or elbow too close to the fan inlet reduces fan performance because air is loaded unevenly into the fan wheel. To achieve full fan performance, there should be at least one fan wheel diameter between the turn or elbow and the fan inlet.



Inlet Spin

Inlet spin is a frequent cause of reduced fan performance. The change in fan performance is a function of the intensity of spin and not easily defined. The best solution is proper duct design and airflow patterns.

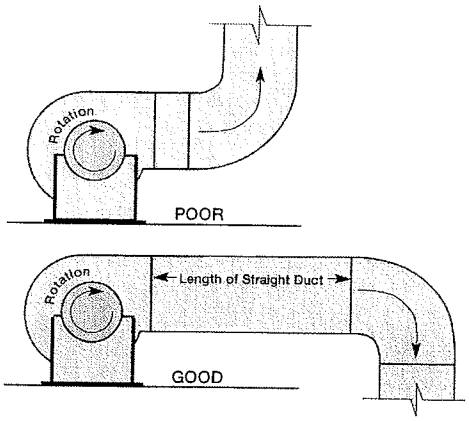


DUCTED OUTLET INSTALLATIONS

Discharge Duct Turns

Duct turns located near the fan discharge should always be in the direction of the fan rotation.

Fan performance is reduced when duct turns are made immediately off the fan discharge. To achieve cataloged fan performance there should be at least three equivalent duct diameters of straight ductwork between the fan discharge and any duct turns.



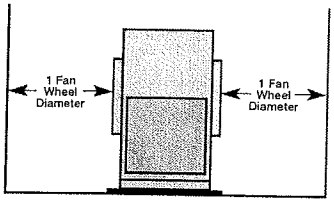
NON-DUCTED INSTALLATIONS

Non-Ducted Inlet Clearance

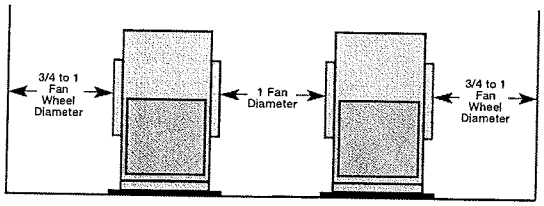
Installation of a fan with an open inlet too close to a wall or bulkhead will cause reduced fan performance. It is desirable to have one fan wheel diameter between parallel fan units and a minimum of three-fourths of a wheel diameter between the fan inlet and the wall.

Free Discharge

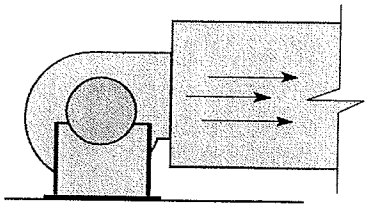
Free or abrupt discharge into a plenum results in a reduction in fan performance. The effect of static regain in discharge is not realized.



Single Fan Installation



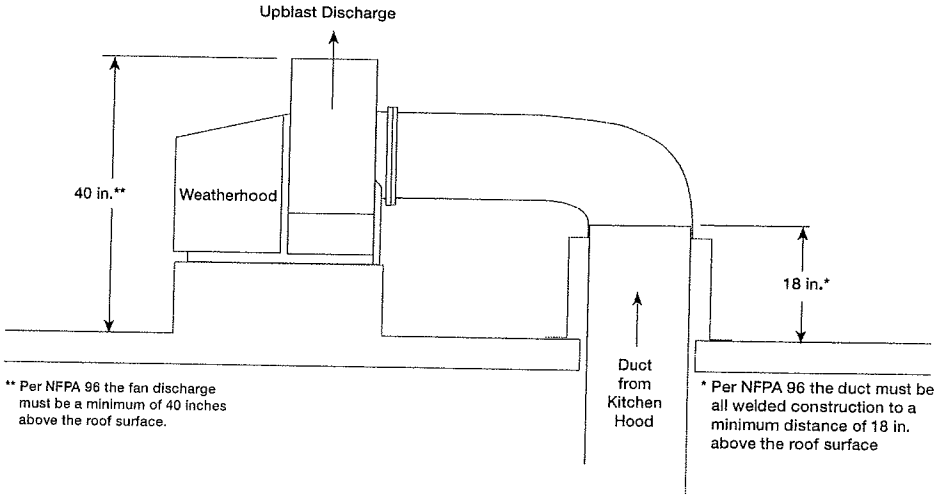
Parallel Fan Installation



CENTRIFUGAL - Outdoor Installation for UL/cUL 762 Listed Fans for Restaurant Exhaust

The UL/cUL 762 listing for restaurant exhaust is available on BISW model. Fans are listed for a maximum operating temperature of 375°F and include a bolted access door and 1 in. drain connection. An outlet guard is strongly recommended when the fan discharge is accessible. An upblast discharge is recommended. The fan discharge must be a minimum of 40 in. above the roof line and the exhaust duct must be fully welded to a distance of 18 in. above the roof surface.

This drawing is for dimensional information only. See the latest edition of NFPA 96 Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations for detailed installation instructions, materials, duct connections and clearances.

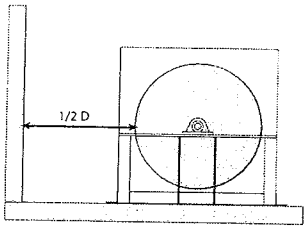


PLENUM AND PLUG FANS - INSTALLATIONS

UNHOUSED WHEELS

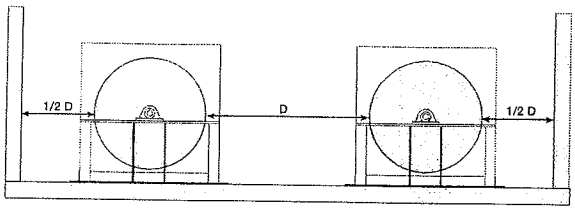
Adjacent Walls

The distance between the fan and walls or ceilings will effect the performance of the fan. The recommended distance between the fan wheel and any wall is a minimum of one-half wheel diameter. Multiple walls reduce the performance even more.



Side by Side

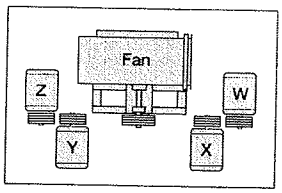
When two or more plenum fans are in parallel, there should be at least one fan diameter spacing between the wheels. Applications with less spacing will experience performance losses.



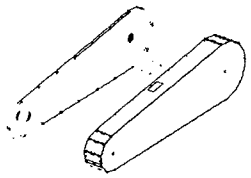
BELT GUARDS

Greenheck offers four types of customized belt guards dependent upon fan model, arrangement and motor position. The four types of belt guards are shown in illustrations to the right.

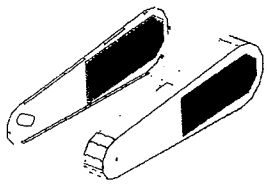
If the guard is not purchased from Greenheck, they must be supplied by the installer or owner.



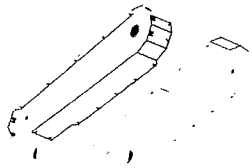
Motor position and fan rotation are determined from drive side



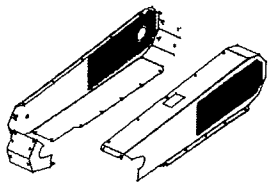
QEP & SW - Arr. 1, 3
(Mtr Pos. W / Z)
SW - Arr. 9, 10
PLG



DW - Arr. 3
(Mtr Pos. W / Z)

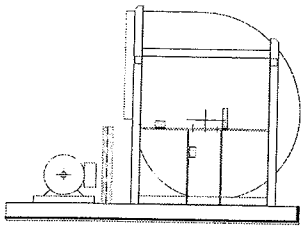


QEP & SW - Arr. 1, 3
(Mtr Pos. X / Y)

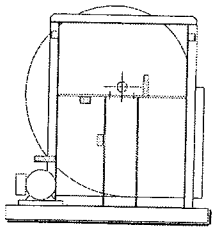


DW - Arr. 3
(Mtr Pos. X / Y)

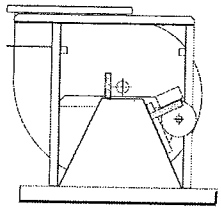
If the belt guard is not factory mounted or was not supplied by Greenheck, then it must be field mounted. **Brackets and mounting hardware are the responsibility of the installer.** The figures below illustrate suggested attachment points for belt guard mounting bracket locations. These locations vary with motor mounting position, arrangement, and fan type. The bearing supports and fan structure are used in most instances and when the motor is not mounted to the fan itself, a bracket should also be located near it. This information is intended as only a guide and actual field conditions may dictate another mounting location for the guard brackets. Refer to local codes for securing guarding.



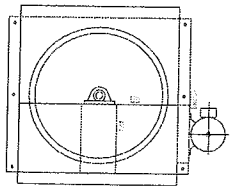
Mtr. Position: W/Z
Arr. - 1,3



Mtr. Position: X/Y
Arr. - 1,3



Mtr. Position: L/R
Arr. - 9



Mtr. Position: Side

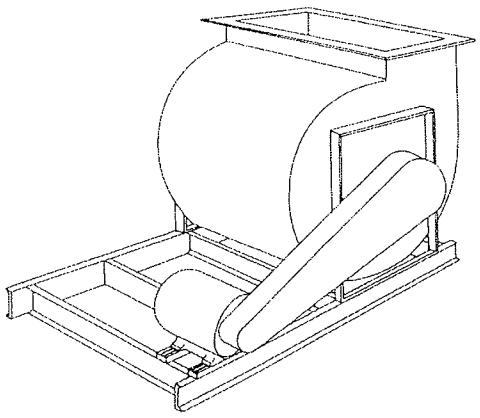
Suggested Attachment Points

BASES
(FOUNDATION AND ISOLATION)

Critical to every fan installation is a strong, level foundation. A reinforced poured concrete pad with a structural steel base or inertia base provides an excellent foundation. Structural bases must be sturdy enough, with welded construction, to prevent flexing and vibration.

To eliminate vibration and noise from being transferred to the building, vibration isolators should be used. The fan is mounted directly on the isolation base and must be supported for the entire length of the fan base angle (Refer to the installation manual for structural bases if the base was supplied by Greenheck). Isolators are installed between the isolation base and the foundation.

After the fan, isolation base, and isolators are installed, the entire assembly must be leveled. Position the level on the isolation base, not the fan shaft, for proper leveling. Additionally, the motor and fan shafts must be level and parallel relative to each other for proper alignment.



Typical Fan on Isolation Base

ROTATABLE HOUSINGS

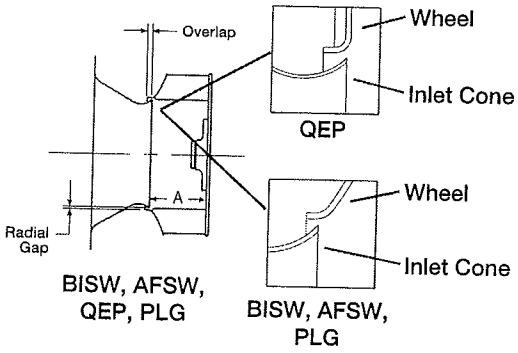
It may be necessary to rotate the scroll of the fan to achieve a different discharge position than what was originally supplied. Centrifugal fans models BISW, AFSW (sizes 7 - 30, arr. 1, 4, 8, 9, and 10, class I and II) and Industrial Process fans (sizes 5 - 19, standard and heavy duty) have the flexibility to be rotated in the field. This is accomplished by removing the housing bolts, rotating the housing to a new discharge position, and reinstalling the bolts.

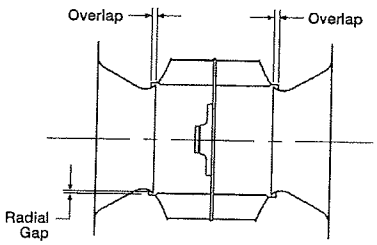
RADIAL GAP, OVERLAP & WHEEL ALIGNMENT

Efficient fan performance can be maintained by having the correct radial gap, overlap and wheel alignment. These items should be checked after the fan has been in operation for 24 hours and before start-up after the unit has been serviced. Radial gap and overlap information applies to models: BISW, AFSW, BIDW, AFDW, QEP, and PLG.

Inlet Cone to Backplate Distance (inches)

Unit Size	"A" Dimension	
7 - 10	3 5/8	± 1/8
12	4	± 1/8
13	4 7/16	± 1/8
15	5	± 1/8
16	5 7/16	± 1/8
18	6 3/8	± 1/8
20	7	± 3/16
22	7 13/16	± 3/16
24	8 5/8	± 1/4
27	9 7/16	± 1/4
30	10 9/16	± 3/8
33	11 7/16	± 3/8
36	12 3/4	± 3/8
40	14 3/16	± 3/8
44	15 9/16	± 3/8
49	17 1/8	± 1/2
54	18 13/16	± 1/2
60	20 15/16	± 1/2
66	22 7/8	± 1/2
73	25 1/2	± 1/2





BIDW, AFDW

RADIAL GAP

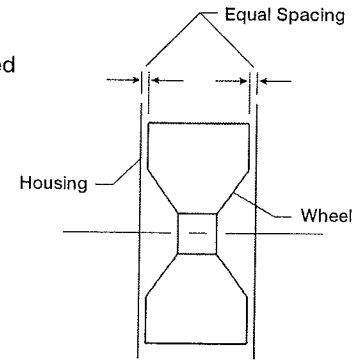
Radial gap is adjusted by loosening the inlet cone/ring bolts and centering the cone/ring on the wheel. If additional adjustment is required to maintain a constant radial gap, loosening the bearing bolts and centering the wheel is acceptable as a secondary option.

OVERLAP

Overlap is adjusted by loosening the wheel hub from the shaft and moving the wheel to the desired position along the shaft. The transition between the inlet cone and wheel should be as shown; there is a smooth feel to the profile when moving from one component to the other. Overlap on double width fans is set by having equal spacing on each side of the wheel.

WHEEL ALIGNMENT CONTINUED

Correct wheel alignment for an industrial process fan (model IPA, IPO, or IPW) is achieved by centering the wheel in the housing.

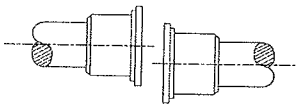


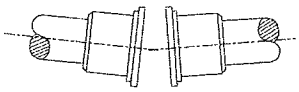
IPA, IPO, IPW

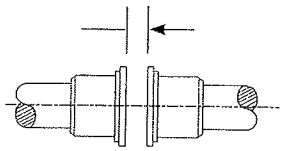
FLEXIBLE COUPLINGS (ARR. 8 ONLY)

Check for misalignment between the coupling halves. Parallel and angular misalignment and separation gap are illustrated below. Refer to coupling manufacturer's installation instructions for allowable misalignment and separation gap tolerances. When correcting for misalignment using shims, the shims should only be located under the motor. Do not place shims under the shaft bearings.

After aligning procedure, check for tightness of all coupling component pieces and ensure that they are clean from dirt and debris.


Parallel Misalignment


Angular Misalignment

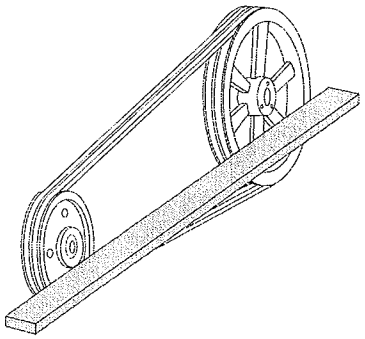

Separation Gap

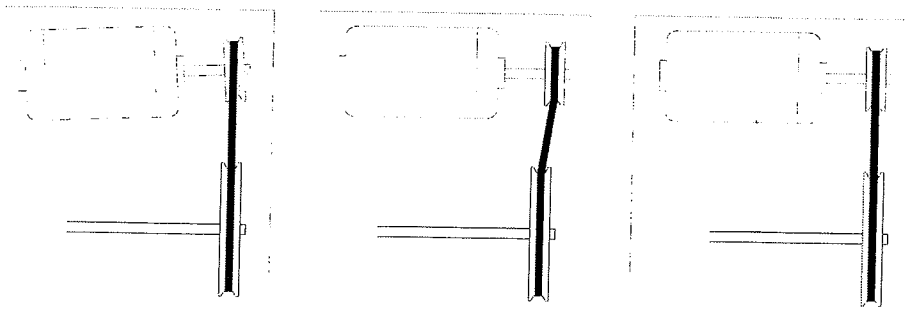
V-BELT DRIVES

The V-belt drive components, when supplied by Greenheck Fan Corporation, have been carefully selected for this unit's specific operating condition. Caution: changing V-belt drive components could result in unsafe operating conditions which may cause personal injury or failure of the following components: 1. Fan Shaft, 2. Fan Wheel, 3. Bearings, 4. V-belt, 5. Motor.

V-BELT DRIVE INSTALLATION

1. Remove the protective coating from the end of the fan shaft and assure that it is free of nicks and burrs.
2. Check fan and motor shafts for parallel and angular alignment.
3. Slide sheaves on shafts - do not drive sheaves on as this may result in bearing damage.
4. Align fan and motor sheaves with a straight-edge or string, and tighten.
5. Place belts over sheaves. Do not pry or force belts, as this could result in damage to the cords in the belts.
6. Adjust the tension until the belts appear snug. Run the unit for a few minutes (see section on unit start-up) and allow the belts to seat properly.
7. With the fan off, adjust the belt tension by moving the motor base. (See belt tensioning procedures in the maintenance section of this manual). When in operation, the tight side of the belts should be in a straight line from sheave to sheave with a slight bow on the slack side.


Aligning Sheaves with a Straight Edge


Improper Sheave Alignment

Proper Sheave Alignment

UNIT START UP

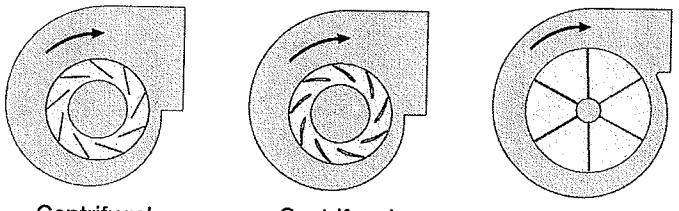
1. Disconnect and lock-out all power switches to fan. See warning below.
2. Check all fasteners, set screws and locking collars on the fan, bearings, drive, motor base and accessories for tightness.
3. Rotate the fan wheel by hand and assure no parts are rubbing.
4. Check for bearing alignment and lubrication.
5. Check for coupling alignment (Arr. 8 only).
6. Check the V-belt drive for proper alignment and tension.
7. Check the all guarding (if supplied) for being securely attached and not interfering with rotating parts.
8. Check operation of variable inlet vanes or discharge dampers (if supplied) for freedom of movement.
9. Check all electrical connections for proper attachment.
10. Check housing and ductwork, if accessible, for obstructions and foreign material that may damage the fan wheel.

WARNING
Disconnect and secure to the "Off" position all electrical power to the fan prior to inspection or servicing. Failure to comply with this safety precaution could result in serious injury or death.

ADDITIONAL STEPS FOR INITIAL START-UP

1. Check for proper wheel rotation by momentarily energizing the fan. Rotation is always determined by viewing the wheel from the drive side and should correspond to the rotation decal affixed to the unit. One of the most frequently encountered problems with Centrifugal Fans is motors which are wired to run in the wrong direction. This is especially true with 3-phase installations where the motor will run in either direction, depending on how it has been wired. To reverse rotation of a 3-phase motor, interchange any two of the three electrical leads. Single phase motors can be reversed by changing internal connections as described on the motor label or wiring diagram.

CW ROTATION



Centrifugal Backward Inclined | Centrifugal Airfoil | Industrial Process Radial Blade

Always viewed from the drive side.

2. If the fan has inlet vanes, they should be partially closed to reduce power requirements. This is especially important if the fan is designed for a high temperature application and is being started at room temperature.
3. Fans with multi-speed motors should be checked on low speed during initial start-up.
4. Check for unusual noise, vibration or overheating of bearings. Refer to the "Troubleshooting" section of this manual if a problem develops.
5. Grease may be forced out of the bearing seals during initial start-up. This is a normal self-purging feature of this type of bearing.

VIBRATION

Excessive vibration is the most frequent problem experienced during initial start-up. Left unchecked, excessive vibration can cause a multitude of problems, including structural and/or component failure. The most common sources of vibration are listed below.

1. Wheel Unbalance
2. Drive Pulley Misalignment
3. Incorrect Belt Tension
4. Bearing / Coupling Misalignment
5. Mechanical Looseness
6. Faulty Belts
7. Drive Component Unbalance
8. Poor Inlet/Outlet Conditions
9. Foundation Stiffness

Many of these conditions can be discovered by careful observation. Refer to the trouble-shooting section of this manual for corrective actions. If observation cannot locate the source of vibration, a qualified technician using vibration analysis equipment should be consulted. If the problem is wheel unbalance, in-place balancing can be done providing there is access to the fan wheel. Any correction weights added to the wheel should be welded to either the wheel back (single-plane balance) or to the wheel back and wheel cone (two-plane balance).

Greenheck performs a vibration test on all centrifugal fans before shipping. Three vibration readings are taken on each bearing in the horizontal, vertical, and axial directions. The allowable maximum vibration for belt drive units is 0.15 in/sec. peak (0.08 in/sec. direct drive) velocity filter-in at the fan RPM per AMCA standard 204. These vibration signatures are a permanent record of how the fan left the factory and are available upon request.

Generally, fan vibration and noise is transmitted to other parts of the building by the ductwork. To eliminate this undesirable effect, the use of heavy canvas connectors is recommended. If fireproof material is required, Flexweave 1000 - type FN-30 can be used.

ROUTINE MAINTENANCE

Once the unit has been put into operation, a routine maintenance schedule should be set up to accomplish the following:

1. Lubrication of bearings and motor (see below).
2. Variable inlet vanes should be checked for freedom of operation and wear.
3. Wheel, housing, bolts and set screws on the entire fan should be checked for tightness.
4. Any dirt accumulation on the wheel or in the housing should be removed to prevent unbalance and possible damage.
5. Isolation bases should be checked for freedom of movement and the bolts for tightness. Springs should be checked for breaks and fatigue. Rubber isolators should be checked for deterioration.
6. Inspect fan impeller and housing looking for fatigue, corrosion, or wear.

When performing any service to the fan, disconnect the electrical supply and secure fan impeller.

CAUTION!
When operating conditions of the fan are to be changed (speed, pressure, temperature, etc.) consult Greenheck to determine if the unit can operate safely at the new conditions.

MOTORS

Motor maintenance is generally limited to cleaning and lubrication. Cleaning should be limited to exterior surfaces only. Removing dust and grease build up on the motor housing assists proper motor cooling. Never wash-down motor with high pressure spray. Greasing of motors is only intended when fittings are provided. Many fractional motors are permanently lubricated for life and require no further lubrication. Motors supplied with grease fittings should be greased in accordance with the manufacturer's recommendations. When motor ambient temperature does not exceed 104°F (40°C), the grease should be replaced after 2000 hours of running time.

SHAFT BEARINGS

The bearings for Greenheck fans are carefully selected to match the maximum load and operating conditions of the specific class, arrangement, and fan size. The instructions provided in this manual and those provided by the bearing manufacturer, will minimize any bearing problems. Bearings are the most critical moving part of the fan, therefore special care is required when mounting them on the unit and maintaining them.

Refer to the following chart and the manufacturers instructions for grease types and intervals for various operating conditions. Never mix greases made with different bases. This will cause a breakdown of the grease and possible failure of the bearing.

Recommended Bearing Lubrication Schedule for Greenheck Fans

Relubrication Schedule in Months*

Fan RPM	Bearing Bore (inches)							
	1/2 - 1	1 1/8 - 1 1/2	1 5/8 - 1 7/8	1 15/16 - 2 3/16	2 7/16 - 3	3 3/16 - 3 1/2	3 15/16 - 4 1/2	4 15/16 - 5 1/2
To 250	6	6	6	6	6	5	4	3
500	6	6	6	5	4	3	3	2
750	6	5	4	3	3	2	2	1
1000	6	4	3	2	2	1	1	0.5
1250	5	3	2	1	1	0.5	0.5	0.25
1500	5	2	1	1	0.5	0.5	0.25	0.25
2000	5	1	1	0.5	0.25	0.25	0.25	0.25
2500	4	0.5	0.5	0.25	0.25	0.25		
3000	4	0.5	0.25	0.25	0.25			
4000	3	0.25	0.25	0.25	0.25			
5000	2	0.25	0.25	0.25				

* Suggested initial greasing interval is based on 12 hour per day operation and 150 degree F. maximum housing temperature. For continuous (24 hour) operation, decrease greasing interval by 50%.

- If possible relubricate with grease while in operation, without endangering personnel.
- For ball bearings (operating) relubricate until clean grease is seen purging at the seals. Be careful not to unseat the seal by over lubricating.
- For ball bearings (idle) add 1-2 shots of grease up to 2 inch bore sizes, and 4-5 shots of grease above 2 inch bore sizes with hand grease gun.
- For roller bearings relubricate with 4 shots of grease up to 2 inch bore size, 8 shots for 2 inch - 5 inch bore size, and 16 shots above 5 inch bore size with hand grease gun.
- Adjust lubrication frequency based on condition of purged grease.
- A high quality lithium base grease conforming to NLGI Grade 2 consistency, such as those listed below, should be used.

MOBILITH SHC 220	TEXACO MULTIFAK AFB2	SHELL ALVANIA #2
MOBILITH AW2	TEXACO PREMIUM RB	EXXON UNIREX N2

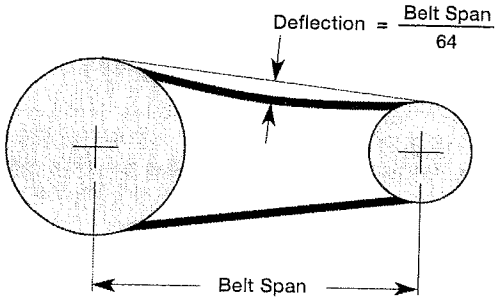
WARNING: Lubricate bearings prior to periods of extended shutdowns or storage and rotate shaft monthly to aid in preventing corrosion. If the fan is stored more than three months, the bearings should be purged with new grease prior to start-up.

V-BELT DRIVES

V-belt drives must be checked on a regular basis for wear, tension, alignment and dirt accumulation. Premature or frequent belt failures can be caused by improper belt tension, (either too loose or too tight) or misaligned sheaves. Abnormally high belt tension or drive misalignment will cause excessive bearing loads and may result in failure of the fan and/or motor bearings. Conversely, loose belts will cause squealing on start-up, excessive belt flutter, slippage, and overheated sheaves. Either excessively loose or tight belts may cause fan vibration.

When replacing V-belts on multiple groove drives all belts should be changed to provide uniform drive loading. Do not pry belts on or off the sheave. Loosen belt tension until belts can be removed by simply lifting the belts off the sheaves. After replacing belts, insure that slack in each belt is on the same side of the drive. Belt dressing should never be used.

Do not install new belts on worn sheaves. If the sheaves have grooves worn in them, they must be replaced before new belts are installed.



The proper tension for operating a V-belt drive is the lowest tension at which the belts will not slip at peak load conditions. For initial tensioning, the proper belt deflection halfway between sheave centers is 1/64 in. for each inch of belt span. For example, if the belt span is 64 inches, the belt deflection should be 1 inch using moderate thumb pressure at mid-point of the drive. Check belt tension two times during the first 24 hours of operation and periodically thereafter.

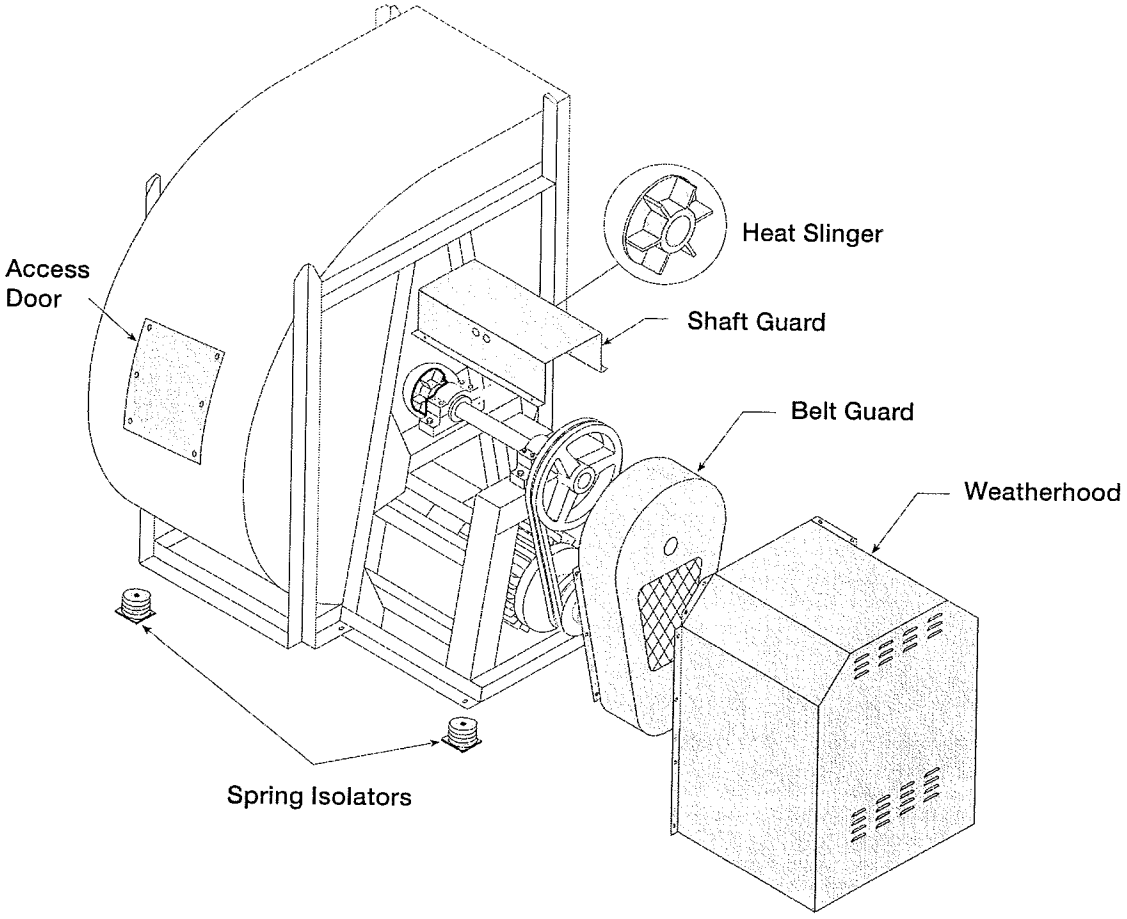
TROUBLESHOOTING

Problem	Cause	Corrective Action
Excessive Noise	Wheel Rubbing - Inlet	Adjust wheel and/or inlet cone. Tighten wheel hub or bearing collars on shaft.
	V-Belt Drive	Tighten Sheaves on motor/fan shaft. Adjust belt tension. Align sheaves properly (see page 7). Replace worn belts or sheaves.
	Bearings	Replace defective bearing(s). Lubricate bearings. Tighten collars and fasteners.
	Wheel Unbalance	Clean all dirt off wheel. Check wheel balance, rebalance in place if necessary.
Low CFM	Fan	Check wheel for correct rotation. Increase fan speed.*
	Duct System	See page 3.
High CFM	Fan	Decrease fan speed.
	Duct System	Resize ductwork. Access door, filters, grilles not installed.
Static Pressure Wrong	Duct system has more or less restriction than anticipated	Change obstructions in system. Use correction factor to adjust for temperature/altitude. Resize ductwork. Clean filters/coils. Change fan speed.*
High Horsepower	Fan	Check rotation of wheel. Reduce fan speed.
	Duct System	Resize ductwork. Check proper operation of face and bypass dampers. Check filters and access doors.
Fan Doesn't Operate	Electrical Supply	Check fuses/circuit breakers. Check for switches turned off or disconnected. Check for correct supply voltage.
	Drive	Check for broken belts. Tighten loose pulleys.
	Motor	Assure motor is correct horsepower and not tripping overload protector.
Overheated Shaft Bearing	Lubrication	Check for excessive or insufficient grease in the bearings.
	Mechanical	Replace damaged bearing. Relieve excessive belt tension. Align bearings. Check for bent shaft.
Excessive Vibration	Belts	Adjust tightness of belts. Replacement belts should be a matched set.
	System Unbalance	Check alignment of shaft, motor and pulleys. Adjustable pitch pulleys with motors over 15 HP are especially prone to unbalance. Check wheel balance, rebalance if necessary.
	Coupling Misalignment	Check alignment between coupling, motor and fan shafts. Any adjustments should be made per coupling manufacturer's instructions. Shim only under motor.

* Always check motor amps and compare to nameplate rating. Excessive fan speed may overload the motor and result in motor failure. Do not exceed the maximum cataloged RPM of the fan.

NOTE: Always provide the unit model and serial numbers when requesting parts or service information.

CENTRIFUGAL / INDUSTRIAL
PARTS LIST



WARRANTY

Greenheck warrants this equipment to be free from defects in material and workmanship for period of one year from the purchase date. This warranty limits our responsibility to repairing or replacing, to the original purchaser, any part or parts of said equipment found to be defective upon examination by representatives of Greenheck. Additionally, said part or parts will be returned to and received by the factory only after prior authorization, with transportation charges prepaid.

Greenheck shall not be obligated under this warranty, for payment of any delivery, removal or installation charges with regard to repair or replacement of any defective part or parts.

Motors are warranted by the motor manufacturer for a period of one year. Should motors furnished by Greenheck prove defective during this period, they should be returned to the nearest authorized motor service station.

GREENHECK

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PN 463687 Centrifugal IOM FS
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