

Twin City Fan & Blower

AXICO ANTI-STALL®

**Controllable Pitch-In-Motion and
Adjustable Pitch-At-Rest Vaneaxial Fans**

Types FPAC, FPMC, FPDA



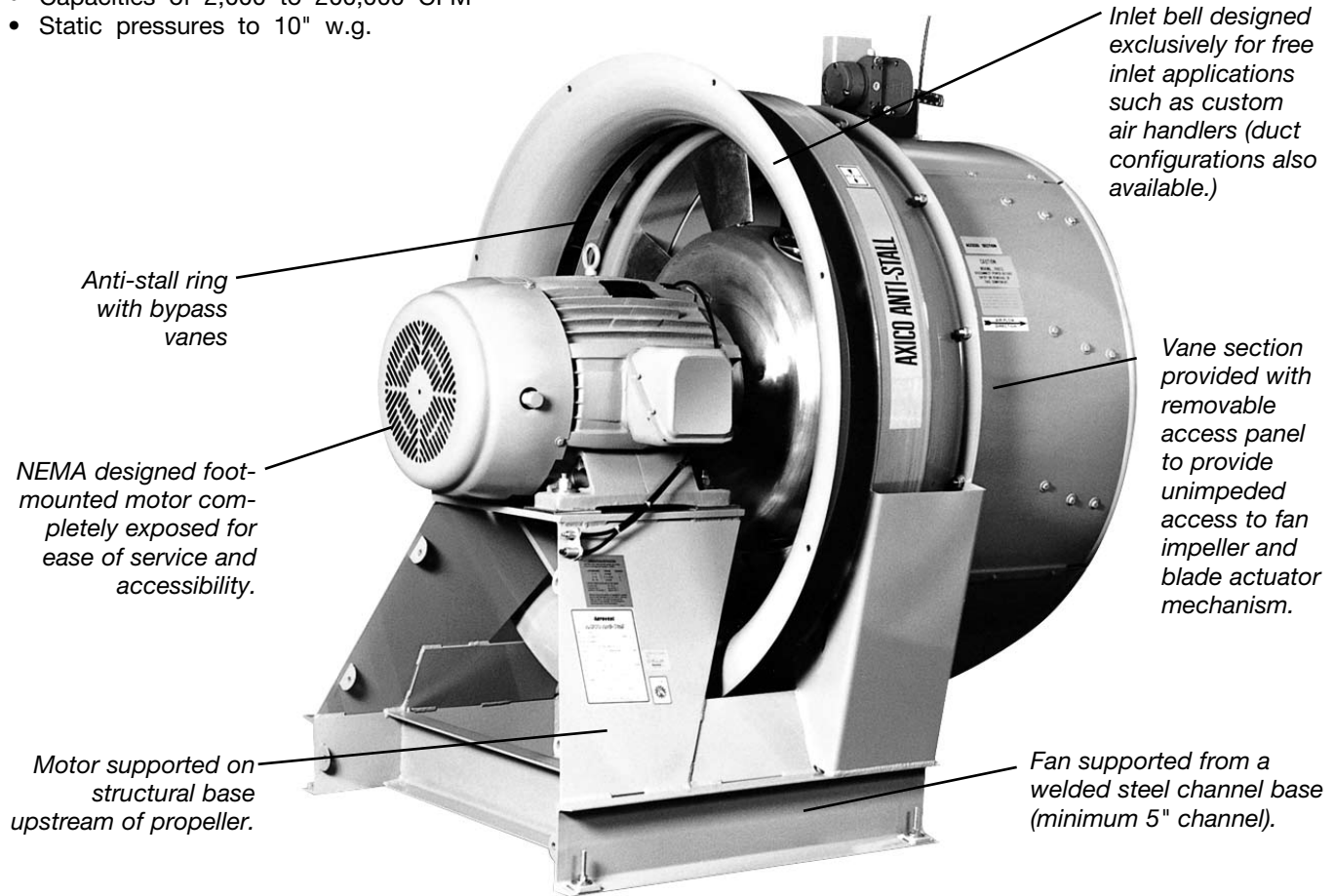
A complete product bulletin including performance curves, sound data, and dimensional drawings is available upon request.



AXICO ANTI-STALL®

Capabilities:

- Impeller diameters from 31½" to 78¾"
- Capacities of 2,000 to 200,000 CFM
- Static pressures to 10" w.g.



Note: Standard inlet guards have been removed for clarity.

AXICO ANTI-STALL® is the only controllable pitch vaneaxial fan designed to totally eliminate stall, system surging and increased noise levels often experienced by ordinary controllable pitch vaneaxial fans under unstable conditions.

Normal axial fans can be forced to perform within unstable working ranges when operating conditions are unfavorable. This can happen when the fan system is subjected to sudden or unexpected variations in pressure which can be caused by:

- dampers that close suddenly or fail to open
- hypersensitive automation control systems
- improper parallel fan starting sequences
- incorrect or optimistic pressure drop calculations
- clogged filters, etc.

When a fan operates in an unstable range the blades are submitted to sharp variations in pressure which will ultimately result in blade fatigue and eventual fan failure.

AXICO ANTI-STALL® provides a patented solution to solve the problems associated with fan stall in a simple, ingenious method, without the addition of any moving parts or expensive electronic controls. The secret lies in the small bypass vanes that are integrated into the chamber placed around the periphery of the fan impeller. The bypass vanes “catch” turbulent airflows produced at the tips of the blades, which normally cause stalling, and restore them to stability in the proper flow direction.

AXICO ANTI-STALL® has no stall area and no stall limit. While this means that the AXICO ANTI-STALL® can be selected directly at any point on the performance curves in this bulletin without consideration of any safety range against the possibility of stall, we strongly recommend selections be made toward the central part of the fan curve at the point of highest possible efficiency.

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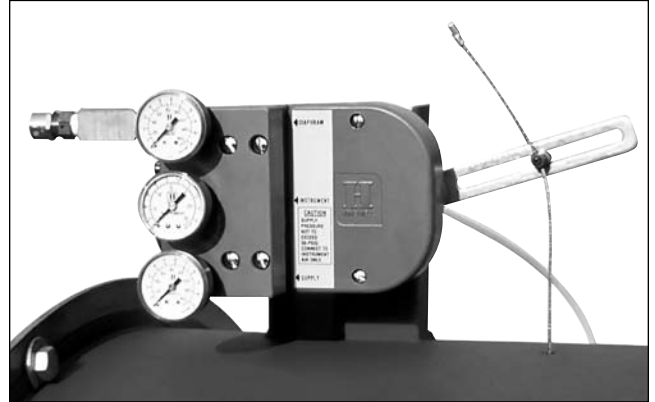
“AXICO ANTI-STALL” is a registered trade name of Twin City Fan Companies, Ltd., Minneapolis, Minnesota. Bulletin illustrations cover the general appearance of Twin City Fan Companies, Ltd. products at the time of publication and we reserve the right to make changes in design and construction at any time without notice.

VAV Control Flexibility

The AXICO ANTI-STALL® fan can easily be controlled to deliver the required flow or pressure in most situations by properly sizing the fan and then adjusting the blade angle of attack while fan is energized. Blade pitch control can be accomplished in the following ways.

FPAC

Variable air volume fan impeller is equipped with an internal pneumatic diaphragm and external Honeywell industrial-grade pilot positioner assembly to simultaneously vary the pitch angle of all blades identically while the fan impeller is rotating at motor speed. An 80 to 100 psi pneumatic supply air line is required for pitch actuation of this fan. These fans typically operate in a direct-acting mode in conjunction with the building automation temperature control system. The standard pneumatic pilot positioner receives a 3 to 15 psi control signal from the building automation system to modulate the fan blades. An optional electro-pneumatic positioner is available that will modulate blade pitch after receipt of an externally generated 4-20mA electronic control signal.

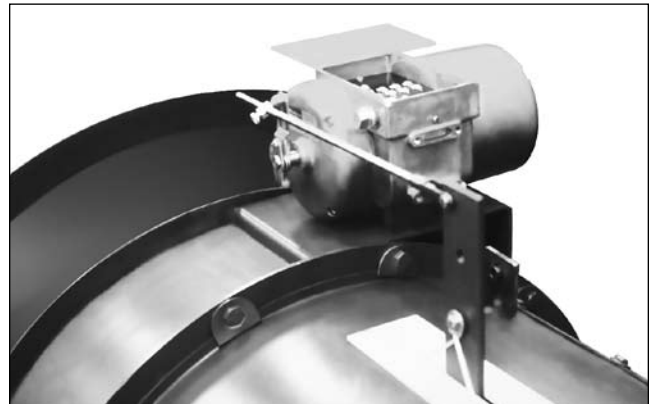


Pneumatic Controllable Pitch

FPMC

Variable air volume fan impeller is equipped with a mechanical linkage system that will simultaneously actuate the pitch angle of all blades via one of three basic options:

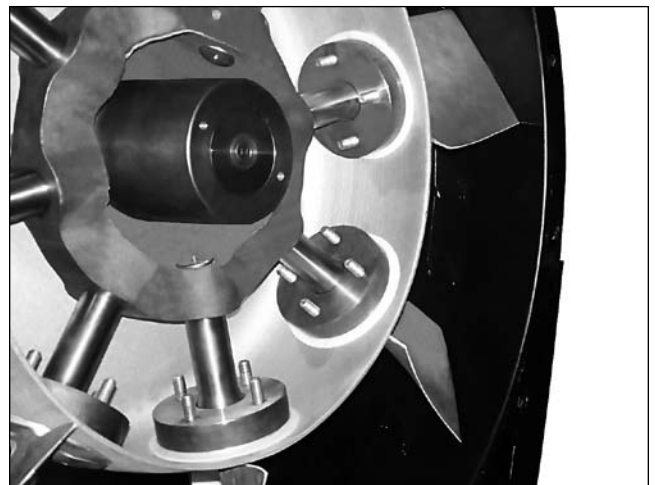
1. A manual lever arm with locking quadrant mounted external to the fan housing.
2. A right-angle gear box with manual handwheel mounted external to the fan housing
3. A lever arm with electric motor actuator mounted external to the fan housing and capable of automatic remote pitch actuation responding to either a 4-20mA or a 135 ohm electronic control signal received from the building-automated temperature control system.



Electric Controllable Pitch

FPDA

Constant air volume fan impeller is equipped with mechanically-fixed, individually manually-adjustable blades that may only be re-pitched when the fan is stopped. This fan may be operated with a variable frequency drive unit to vary the rotational speed of the impeller and thereby vary the air volume produced while maintaining the ANTI-STALL® characteristics of the unit.

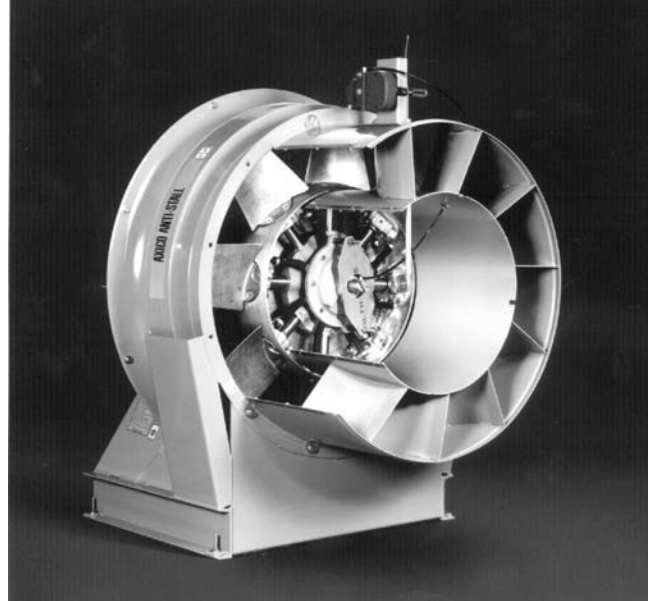


Manual Adjustable Pitch

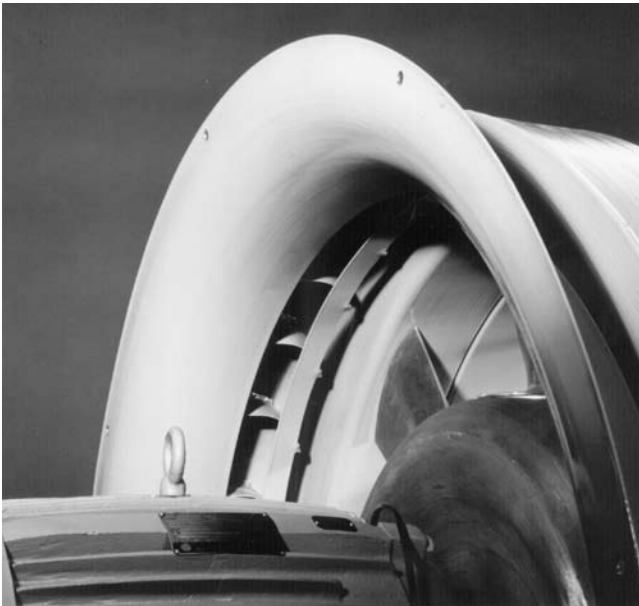
Construction Features



View of AXICO ANTI-STALL® fan from discharge. Honeywell industrial-gauge pilot positioner with closed-loop feedback cable is shown standardly mounted on top of straightening vane section. Bolt-on vane section allows 360° rotation to allow simple field adjustment for improved job site accessibility of pilot positioner.



Similar view of fan discharge with standard access panel removed. Every AXICO ANTI-STALL® fan includes a 17.75" long by 90° of fan circumference access panel located in straightening vane section. Total service accessibility is provided by this exclusive feature.

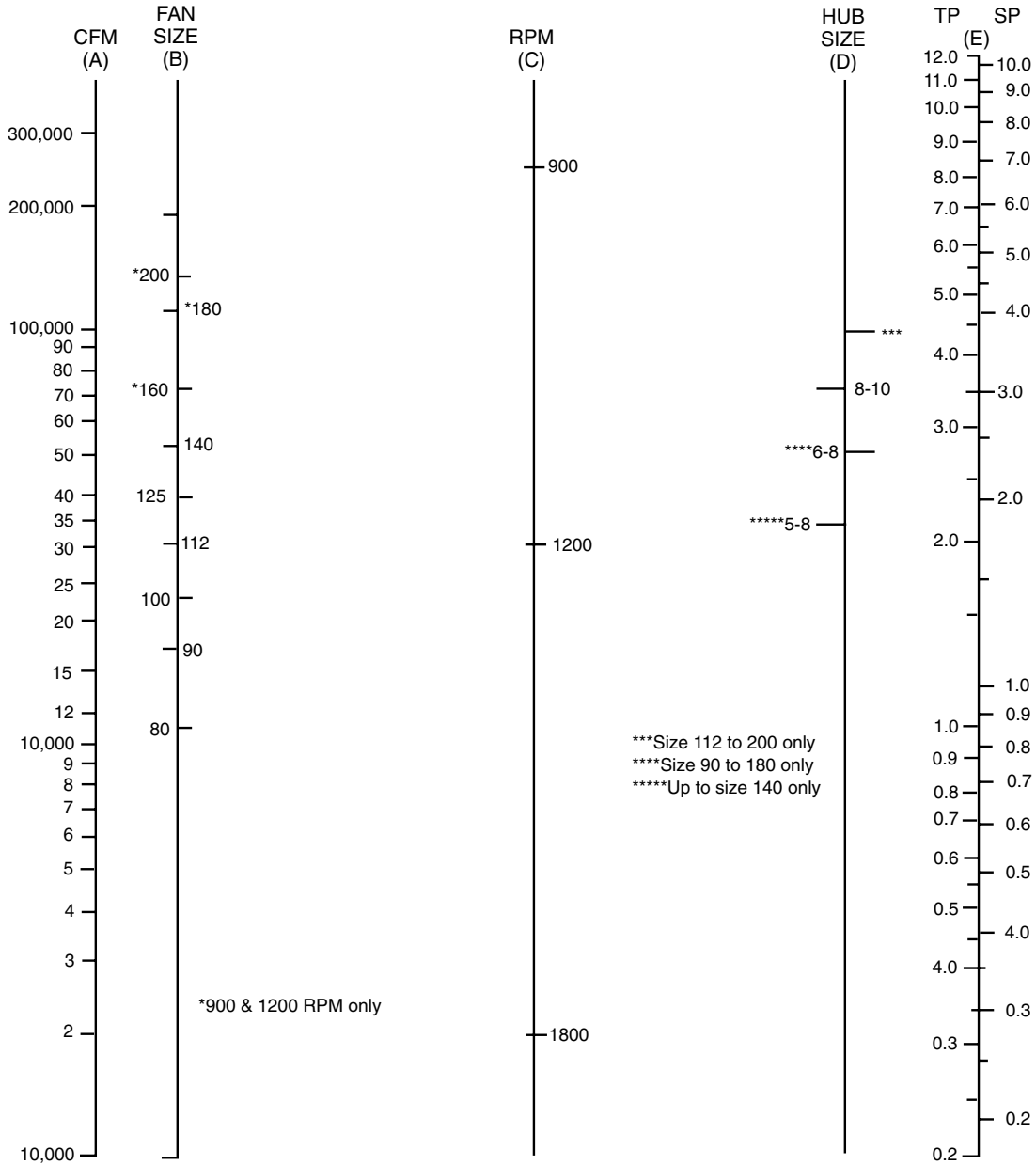


As can be seen in this close-up of the inlet bell continuously welded to the patented ANTI-STALL® ring, an exclusive AXICO® feature, ANTI-STALL® is accomplished by welded bypass vanes without the use of any extra moving parts or electronic "black boxes."



A close-up of the pneumatic controllable pitch impeller mechanism viewed through the standard access panel. Pneumatic supply air (80 to 100 psi) is introduced to the diaphragm through the rotary union (center of photo with feedback cable attached) inflating the pneumatic piston forcing the spider arms to move away from the hub and increase the blade angle of attack.

Fan Selection Process



Step 1. Draw a line from the appropriate CFM on vertical axis marked CFM (A) to the appropriate RPM on vertical axis marked RPM (C). The point at which this line intersects the vertical axis marked FAN SIZE (B) indicates the most appropriate fan size given that RPM and CFM. As an example, a line drawn between 60,000 CFM and 1800 RPM intersects the fan size line almost precisely in the middle of the area noted as 112. Based upon this, it is probable that a size 112 fan is the best selection. The same line intersects the fan size line at the border between size 125 and size 100. This indicates that a 125 is probably oversized and a 100 is probably undersized. There may be circumstances where these selections should be investigated. If that is the case, you should consult your local sales representative.

Step 2. Having now selected the fan, one must now select the hub and blade combination which is appropriate. Draw a line from the vertical axis RPM (C) to the vertical axis marked TP/SP (E). In the example shown we have a given value of 4.25" of static pressure. Be sure that you use the same fan speed in selecting the hub and blade as you have used in selecting the fan. In this case, we draw the line from 1800 RPM to 4.25" static pressure and it intersects the HUB SIZE vertical axis (D) close to the middle of the zone marked 5-8. This would indicate that the probable selection for 60,000 CFM and 4.25" static pressure is 112-5-8. Note that the same line intersected the hub size vertical axis almost at the 6-8 junction. This indicates that the pressure is probably low so that utilization of a 6 hub with 8 blades will result in relatively low efficiencies. NOTE: See performance curve on page 6.

Aspects of Fan Selection

AXICO ANTI-STALL® fans are characterized by completely stable high efficiency operation over an extremely wide operating range. The risk of stall (surging, instability, etc.) encountered in conventional vaneaxial fan designs has been completely eliminated. Fan performance in this publication is presented as Total Pressure versus CFM at standard air density (0.075 lbs/ft³). The maximum blade angles presented in the published performance curves are the maximum angles for which the fan is designed.

For **controllable pitch in-flight** fans in variable volume situations the maximum design load should ideally be selected to the right and slightly above the peak efficiency ring so that normal operation at modulated partial loads will result in operation at areas of highest efficiency on the fan curve.

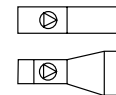
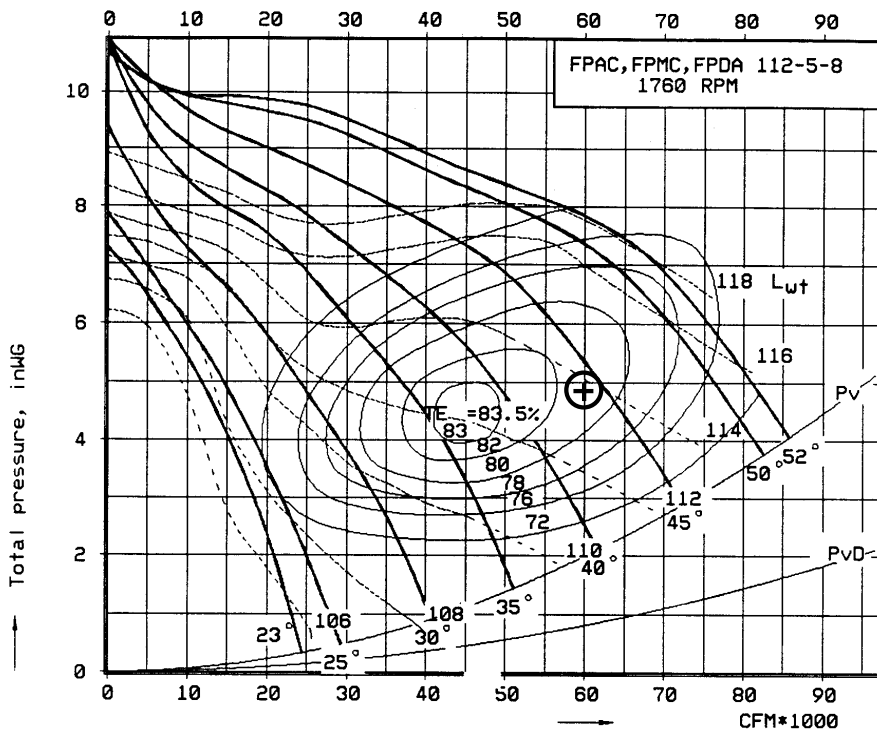
Fans with **manually adjustable pitch blades** for applications in either constant volume or variable speed (frequency) systems should ideally be chosen for normal operation within the peak efficiency ring of the fan curve to insure the highest possible energy savings throughout the complete range of operation.

The pressure/flow characteristic of the fan is presented as a total pressure rise between the fan inlet and the fan outlet, providing that the fan is connected to ductwork of the same diameter as the fan. The curves are applicable to either a free or a duct connection at the fan inlet and no provision is made for less than ideal fan inlet conditions within the performance curves. The outlet side of the fan is often connected to a conical regain diffuser that

is in turn connected to ductwork or a discharge plenum. Various system requirements and layouts result in numerous combinations of standard or compact fan designs often used in conjunction with a variety of discharge options (ductwork, outlet transitions, C-D diffusers, acoustic diffusers, etc.). The pressure regain and or applicable discharge connection losses for any instance other than that of a fan connected directly to fan diameter discharge ductwork requires the inclusion of these losses in all presentations of Total Pressure.

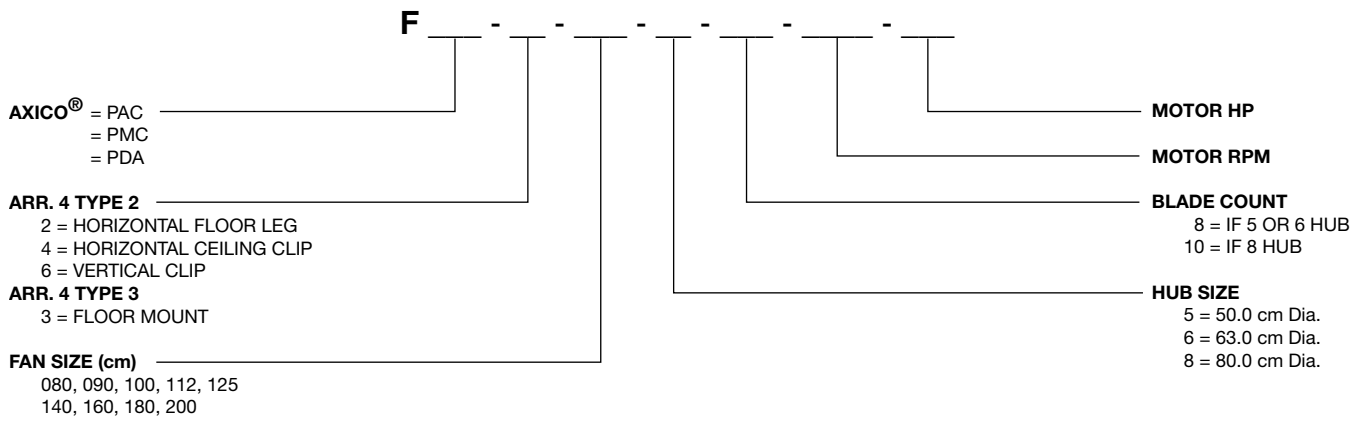
The following explanation of the performance curves, associated fan laws and formulas should be used to determine and analyze various aspects of fan performance.

- SP = Static Pressure
- VP = Velocity Pressure
- Pv = Velocity pressure in fan diameter duct
- PvD = Velocity pressure in diffuser diameter duct
- DL = Discharge Loss
- TP = Total Pressure
- TE = Total Efficiency
- bHP = Brake Horsepower
- TP = SP + VP + DL
- bHP = $\frac{CFM \times TP}{6356 \times TE}$



Fan chart is valid for a gas density of .075 lb/ft³.
 Lwt: Total sound power level dB(A)
 Pv: Velocity pressure in fan diameter duct
 PvD: Velocity pressure in diffuser diameter duct
 TE: Total efficiency

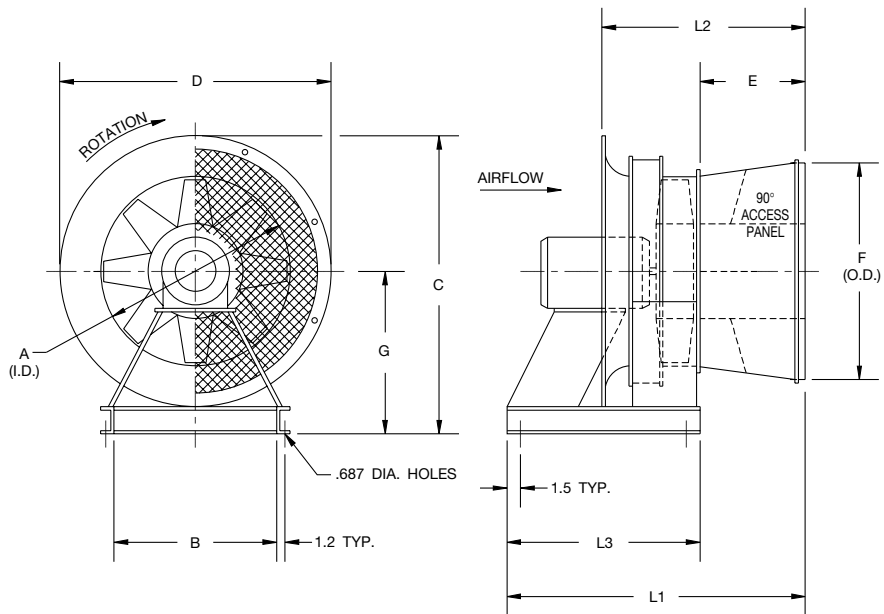
Model Number Designation



NOTES:

1. Motor frame size must be specified in the body of the order and will no longer be indicated within the model number.
2. Blade pitch setting must be indicated in the body of the order.

FPDA Compact Design (Arr. 4 Type 3)



FAN SIZE	A	B	C	D	E	F	G	L1	L2	L3	APPROX. WT. (LBS.)*
080	31.50	28.00	48.50	41.50	21.65	35.43	28.00	50.78	37.15	29.13	910
090	35.43	30.00	52.70	45.40	21.65	39.37	30.00	52.35	37.15	30.70	1000
100	39.37	34.00	56.70	49.40	21.65	44.09	32.00	53.35	37.15	31.70	1080
112	44.09	37.00	62.05	54.10	21.65	49.21	35.00	59.83	37.15	38.18	1230
125	49.21	42.00	71.60	63.20	21.65	55.12	40.00	63.90	39.15	42.25	1405
140	55.12	45.00	78.55	69.10	29.53	63.00	44.00	71.78	47.03	42.25	1655
160	63.00	48.00	85.50	77.00	29.53	70.87	47.00	71.78	47.03	42.25	1880
180	70.87	53.00	93.45	84.90	29.53	78.74	51.00	71.78	47.03	42.25	2055
200	78.74	58.00	100.35	92.70	29.53	83.85	54.00	71.78	47.03	42.25	2415

DIMENSIONS ARE NOT TO BE USED FOR CONSTRUCTION.

*SHIP WEIGHT LESS MOTOR

Unlimited Options...

Commercial Fans

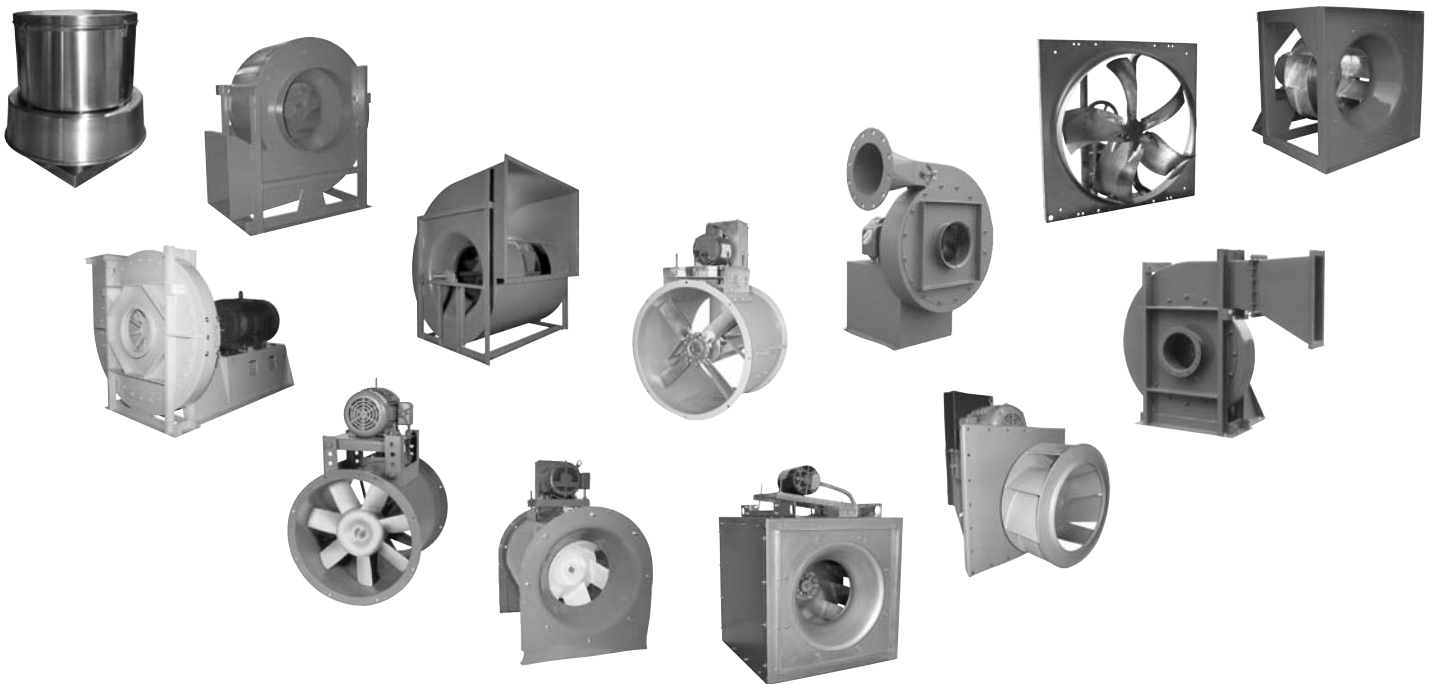
Centrifugal Fans • Utility Sets • Inline Centrifugal Fans • Plenum Fans
Radial Bladed Fans • Centrifugal Roof & Wall Exhausters • Filtered Supply Fans
Gravity Relief Ventilators • Ceiling & Cabinet Ventilators • Propeller Wall Fans
Tubeaxial Fans • Vaneaxial Fans • Propeller Roof Ventilators
Fume Hood/Smoke & Heat Exhaust Fans • Mancoolers • Fiberglass Fans

Industrial Fans

Centrifugal Fans • Forward Curved & Air Kit Components • Inline Centrifugal Fans
Plug Fans • Radial Bladed Fans • Radial Tip & High Efficiency Fans
Pressure Blowers • Tubeaxial Fans • Vaneaxial Fans

Custom Design Fans

Easy Access Fans • Insulated Fans • Inlet Boxes - Integral and Detached
Inlet Box Dampers • Independent Bearing Pedestals • Split Housings • Bolted Housings
Spark Resistant Construction • Ultra Fine Balancing • Modified Widths and Diameters
Variable Frequency Drives • API Specifications • Special Materials • Anti-Rotation Devices
Sleeve Oil Bearings • Volume Control Dampers • Inlet Vane Control with External Mechanisms



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5959 TRENTON LANE NORTH • MINNEAPOLIS, MN 55442-3237

PHONE: 763-551-7600 • FAX: 763-551-7601

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