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Introduction

WHY CHOOSE PAMOTOR?

PAMOTOR offers a wide selection of cooling devices, each designed to give you a maximum performance. As a result of many years of engineering excellence, PAMOTOR fans have earned a reputation for reliability, high quality and low-noise operation. The PAMOTOR design has been awarded numerous patents, which, when combined with its rugged all-metal construction, is ounce-for-ounce the best investment for your cooling dollar. PAMOTOR fans are designed to outlast the equipment they cool.

This catalog has been prepared to give the design engineer some basic applications and performance data to help him make an intelligent selection of the right fan for the right job.

OUR DEFINITION OF OPTIMIZED

According to Daniel Webster, optimize means "to make as perfect, effective, or functional as possible." PAMOTOR has

incorporated this concept into its engineering philosophy, and as a result, its line of optimized cooling devices offers the following design characteristics:

- ☐ All-metal construction throughout for greater durability and heat dissipation as shown in Figure 1.
- ☐ Aerodynamically designed fan housings/venturies for maximum air intake with minimum air turbulence and noise.
- ☐ Computer-designed pitch, shape and number of impeller blades.
- ☐ Impulse-welded steel impellers for greater strength and reduced noise levels.
- ☐ A patented "inside-out" motor configuration that delivers greater torque and power at reduced operating temperature.
- ☐ Reduced electromagnetic radiation due to the "inside-out" motor design.
- ☐ A maintenance-free, hand-fitted bearing system of broached sintered iron. Precision high temperature ball bearings are also available.

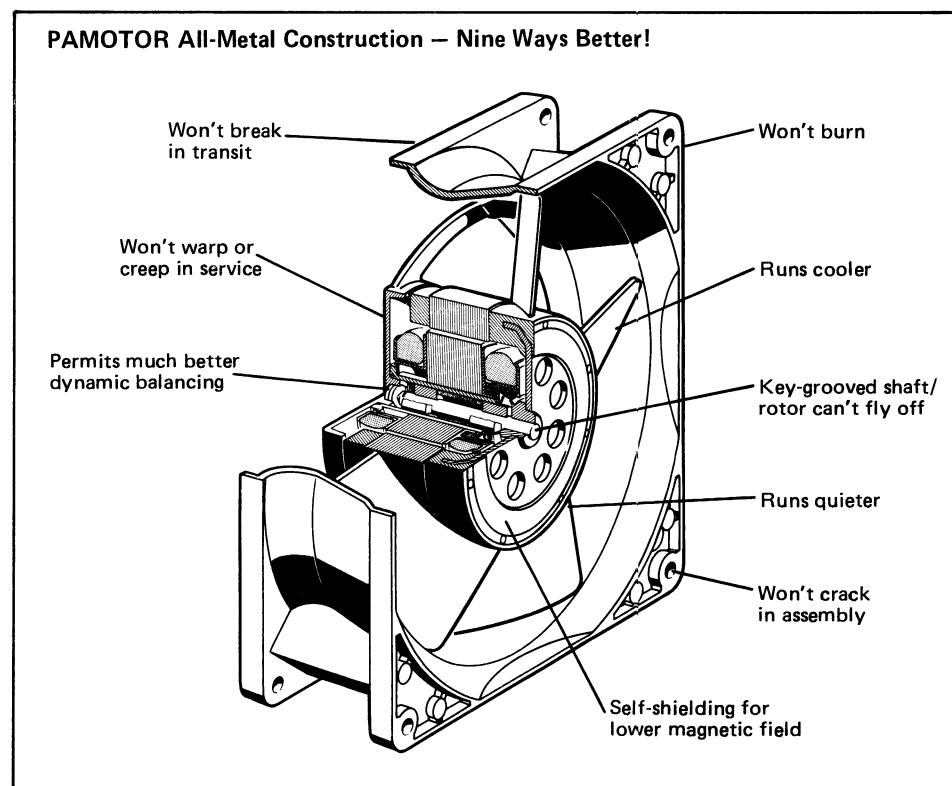


Figure 1

- ☐ Rotors that are dynamically balanced to a maximum shift of the center of gravity of .0001-inch in each end plane.
- ☐ Special moisture resistant finish prevents corrosion or deterioration under humid atmospheric conditions or in extreme temperature variations.

Equally important, PAMOTOR fans are manufactured to a high quality of workmanship and performance consistent with the rigorous quality control standards they must meet. In short, PAMOTOR on the label is your assurance of long, dependable, maintenance-free operation.

PAMOTOR WARRANTY

All PAMOTOR fans are warranted to be free of defects in materials and workmanship for a period of one year. The PAMOTOR PENTAFLOW™ premium grade series are warranted for five years.

TYPICAL APPLICATIONS

PAMOTOR fans are ideal for EDP systems and peripheral equipment, electronic test equipment, medical equipment, broadcast equipment, high-power lamps, color processing equipment, emergency generators, color TV/hi-fi amplifiers, electrical controls, telephone equipment, vending machines, airborne equipment, mobile radio equipment, shipboard computers and communications systems.

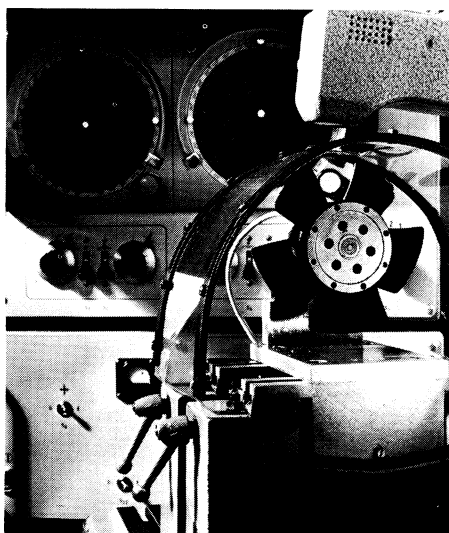


Figure 2

Design Characteristics

OPTIMIZED FOR PERFORMANCE

Housing and venturies of all PAMOTOR fans are aerodynamically designed for maximum airflow with minimum air turbulence, resulting in more efficient airstream characteristics and reduced noise levels. The shape factor of PAMOTOR designs save space. They're typically 1½ to 2-inches deep. In addition, no struts extend beyond the fan housing dimensions.

Their all-metal construction, precision machining and uniformity of components, minimum-friction bearing/lubrication systems, and low operating temperature combine to provide optimum efficiency and dependable operation. And, PAMOTOR fans are designed to outlast the equipment they are cooling, reducing field replacement costs.

REDUCED NOISE LEVELS

Low noise is achieved through the design of the impeller blades and by virtue of superior rotor balance. Microphonic vibrations that can upset mechanical adjustments and electrical connections are effectively damped. The "Speech Interference Level" (SIL) of PAMOTOR fans is characteristically 5 to 10 dB below that of competitive designs with comparable airflow. Peak interference levels at discrete frequencies are consistently 6 to 12 dB lower.

With PAMOTOR fans, noise is neither an acoustical nuisance nor a cause of equipment malfunction, and a quiet fan is more efficient and less likely to fail.

RUGGED CONSTRUCTION

The all-metal construction of PAMOTOR fans makes them strong, durable and non-flammable. Their precision-machined, impulse-welded steel impeller is housed in a metal casing; the rotor is securely fastened

by a key-grooved shaft configuration and cannot fall or fly off. There is no breakage problem in assembly, shipment, installation, or use. No cracking, creeping or warping to cause lock-up or bearing failure . . . and they are immune to catastrophic mechanical failure.

PAMOTOR fans are also resistant to severe ambient conditions because of a special moisture resistant finish that prevents corrosion. Stator laminations, windings, and splices are coated or impregnated with an oven-cured, long-life synthetic varnish.

MORE EFFICIENT MOTOR DESIGN

PAMOTOR's patented "inside-out" motor configuration (the housing rotates around the stator), used in both shaded-pole and special induction type fans provides higher torque with reduced internal heat rise, resulting in lower operating temperature. Cooler temperature is also the result of an effective lubrication system, the exceptionally high thermal conductivity of the protective synthetic varnish, and the mechanical precision of the unit assembly.

The rotor of every PAMOTOR fan is dynamically balanced to a maximum shift of the center of gravity of .0001-inch in each end plane for vibration-free performance, as shown in Figure 2.

Electromagnetic radiation is reduced by the self-shielding, "inside-out" motor. Its field orientation pattern is the least likely to penetrate into the equipment to be cooled; hence it is less likely to couple into sensitive electronic circuitry. The fan's all-metal construction also acts as a natural heat sink.

Fan windings are normally VDE Class E, rated at 120° C. In the higher temperature fans, ratings are VDE Class F, rated at 155° C. PAMOTOR fans are designed to VDE 0530/1.66 standards, and conform to IEC and CSA requirements. PAMOTOR fans are listed under Underwriters' Laboratories, Inc. Yellow Card Component Recognition Number E41168.

Performance Evaluation

BEARING/LUBRICATION SYSTEMS

The proprietary bearing/lubrication systems are a major factor in optimizing the performance of PAMOTOR fans. Their exclusive features include: over-sized hand-fitted, broached dual-sleeve bearings of sintered iron, impregnated with high performance lubricants. The lubricants are control-administered through capillary action from a large oil felt reservoir between the sleeve bearings. Precision ball bearing systems are available for critical, high temperature applications.

Fan axial play is controlled by a thrust bearing, resting against a plastic pad on one side and a hardened steel collar on the other.

PAMOTOR fans are manufactured with three types of bearing systems, two of which are shown in Figure 3.

AIRFLOW DATA

The test data and curves shown in this catalog were obtained by methods outlined below, and were conducted in accordance with procedures comparable to AMCA standards.

TUBE METHOD

In the tube method static pressure is measured perpendicularly to airflow direction.

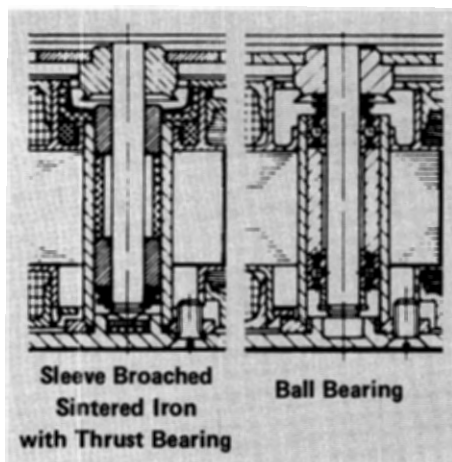


Figure 3

Output is measured by the pressure difference on each side of the diaphragm. Curves are precisely determined by manometer readings for different back pressure.

An auxiliary blower is used to overcome the internal pressure losses caused by air turbulence and friction. The tube measurement method is used when the fan will operate in a pure axial-flow environment, such as air ducts, vents, etc.

CHAMBER METHOD

When the fan is to be used to cool large volume enclosures, the chamber tube method, illustrated in figure 4, will yield more realistic test results than the tube method. In this configuration, the increase in static pressure between the fan opening and the test chamber is determined. Air volume output is obtained by measuring the pressure decrease in the airstream.

The air turbulence caused by measurement of the fan's static pressure has no influence on the test results because the chamber is large enough to calm the available air. As this test method closely duplicates actual application conditions, realistic performance curves and test data may be obtained whenever required.

NOISE MEASUREMENT

As illustrated in Figure 5, fans are suspended by large rubber bands in an anechoic chamber. A microphone is placed 40-inches from the operating fan and measurement is made with a BRUEL and KJAER Tierce-Octave Analyzer, Model 2112.

Upon request, noise performance characteristics are available for each PAMOTOR fan.

QUALITY CONTROL

PAMOTOR fans are manufactured by PAPST-MOTOREN KG in West Germany. Founded in 1937, PAPST-MOTOREN KG has become known throughout the world for its high quality, high reliability motors. Precise mass production techniques, automated machinery and skilled master technicians have enabled PAMOTOR fans to be competitive without sacrifice in quality. Machining tolerances are held to .00004-inch.

To maintain this high degree of precision, 60% of PAPST-MOTOREN KG's employees are skilled technicians. Utilizing the very latest in manufacturing and test equipment, PAPST-MOTOREN KG has maintained the highest standards of quality control in every production stage. PAPST-MOTOREN KG also continually performs market research analysis to determine and meet industry requirements. In most cases, PAMOTOR fans exceed the specifications of the accepted standards at large.

Prior to shipment, a Quality Control Engineer inspects PAMOTOR fans to AQL, per MIL-STD-105, to ensure that they meet or exceed the rigid standards of quality synonymous with the PAMOTOR name.

APPLICATION ENGINEERING

For design and packaging engineers in particular, PAMOTOR has prepared a

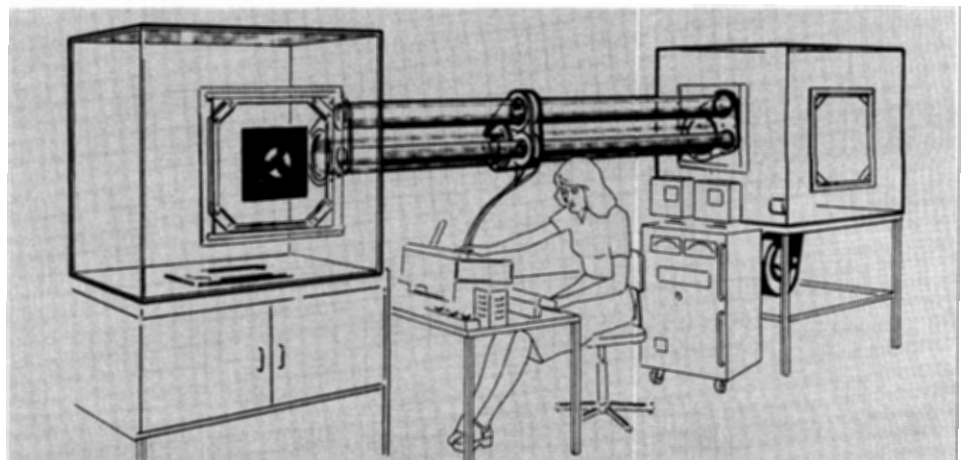


Figure 4

series of applications monographs on **"How to Select the Optimum Fan for Your Application."** Individual bulletins or the complete series are available free, upon request on company letterhead.

For application-engineering consultation on special air-cooling system requirements, PAMOTOR applications engineers and field engineers are always available, without cost or obligation. Phone, wire or write your local PAMOTOR representative, or communicate directly with our Application Engineering Department, for prompt engineering assistance.

Fan Selection

Proper fan selection is dependent upon several related factors such as the amount of heat to be dissipated, the ambient operating temperature, the size of the enclosure, and the velocity of the airflow required to do the job. Except in those rare applications in which one must allow for great variations in the equivalent airflow resistance, or in the density of the air, it makes absolutely no difference what type of air moving device is chosen, just so long as it can produce the cfm against the pressure drop (in inches of water) that it must overcome.

Since almost all of the fans used for cooling electronic equipment are in the 10 - 200 watt class (less than 1/3 hp), the most important factors the design engineer must consider are:

- ☐ Flow rate versus pressure drop
- ☐ Noise level and vibration-free operation

- ☐ Sturdiness and reliability
- ☐ Size and weight
- ☐ Cost and maintainability

Now let's discuss a less straightforward matter; the velocity of airflow. For a given cfm, the average velocity of air through a structure is constant, regardless of the size, shape or type of fan that moves the air.

But, the peak velocity of airflow is another matter. In some fans, the velocity of air leaving the tip of the blades is ten or more times as high as the average velocity. And the larger the fan, the higher the peak velocity. Furthermore, for a given design and size of fan, the higher the operational speed, the higher the velocity. This is where an optimized design becomes important.

Why consider peak velocity? . . . because of noise. Acoustical interference is a very important consideration in fan selection, and adds to human comfort and efficiency. Noise means vibration, and vibration can cause all kinds of trouble in electrical and electronic equipment, including some very subtle kinds of failure.

Consequently, except in the regions in which the airflow is being guided past or through heat exchangers, velocity must be kept low, as near to the average velocity as possible, in fact. Therefore, assuming you have a group of "possible" fans to choose from, choose the one that has:

- ☐ the smallest diameter blades,
- ☐ the slowest motor (lowest rpm),

- ☐ the most uniform velocity profile,*
- ☐ and the cfm/pressure performance you need.

*The venturi-ported, impeller fan designs usually have the most uniform velocity profile, Propellers are the worst of all.

In summary, selecting the right fan for the right job can be divided into six logical steps as follows. Each is discussed in detail in a series of applications monographs, **"How to Select the Optimum Fan for Your Cooling Application,"** PAMOTOR Bulletins 7041 - 7046, and are available to you upon request.

- Step 1 Determine the required airflow and back pressure as described in Bulletin 7041.
- Step 2 Select a size, shape and style of fan that will fit, will be easy to install, and will direct the airflow properly, as described in Bulletin 7042.
- Step 3 Verify that the SIL (Speech Interference Level), and the corollary vibration and microphonic effects of the available fan will be acceptable in your application, as described in Bulletin 7043.
- Step 4 Verify that the magnetic field radiation of the fan will be low enough, or that its orientation is benign for your application. Methods of altering field orientation and of reducing field strength are among the alternatives considered in Bulletin 7044.
- Step 5 Design the tentatively selected fan into a complete cooling system as described in Bulletin 7045.
- Step 6 Consider the acceptable available fans, the ones that pass all the tests in steps 1 - 5. Then pick the most reliable one. Reliability is discussed in plain language in Bulletin 7046.

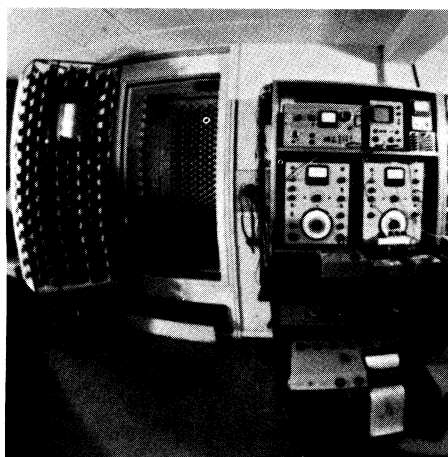


Figure 5



Table I
How to Estimate the Required Airflow

This chart depicts the approximate required airflow in cfm (cubic feet per minute) to dissipate heat (kilowatt per hour) at a given temperature rise of Δt ($^{\circ}\text{C}$) or Δt ($^{\circ}\text{F}$).

The following equations were used in computing the airflow:

Equation 1:

$$\text{CFM} = \frac{(3160 \times \text{KWh})}{\Delta t (^{\circ}\text{F})}$$

Equation 2:

$$\text{CFM} = \frac{(1760 \times \text{KWh})}{\Delta t (^{\circ}\text{C})}$$

Δt $^{\circ}\text{C}$ $^{\circ}\text{F}$	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
50 90	18	35	53	70	88	105	123	141	158	176
45 81	20	39	59	78	98	117	137	156	176	195
40 72	22	44	66	88	110	132	154	176	198	220
35 63	25	50	75	100	125	151	176	201	226	251
30 54	29	59	88	117	146	176	205	234	264	293
25 45	35	70	105	141	176	211	246	281	316	351
20 36	44	88	132	176	220	264	308	351	396	439
15 27	59	117	176	234	293	351	410	469	527	586
10 18	88	176	264	351	439	527	615	704	791	879
5 9	176	351	527	704	879	1055	1230	1406	1582	1758

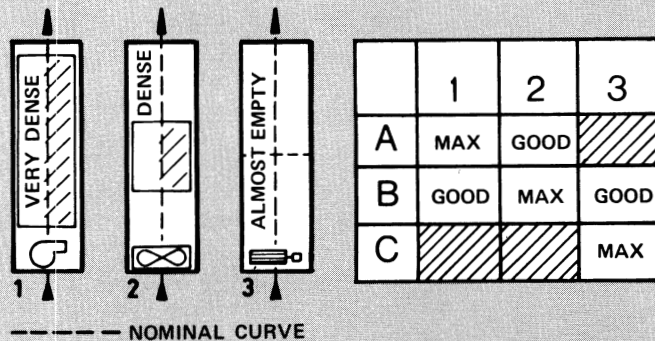


Figure 5. Fan types best suited for various equipment densities.

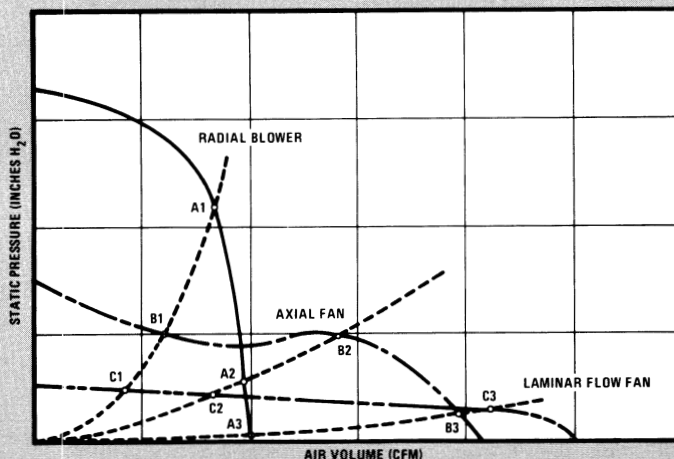
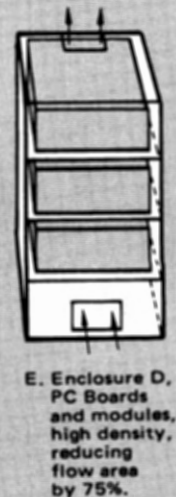
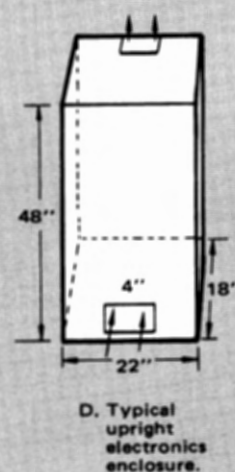
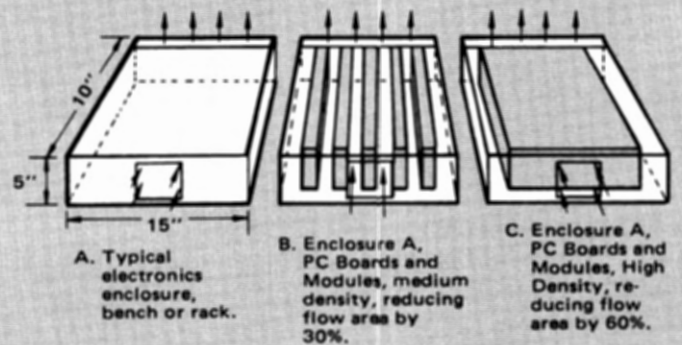
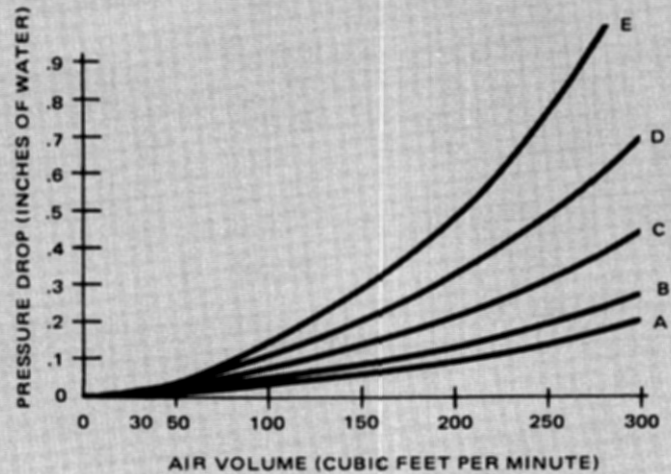


Figure 6. Behavior of various fans at different equipment configurations.



Shaded-Pole Type Fans

PAMOTOR offers a wide variety of shaded-pole type fans for your selection. Each model combines the features of extended life with high airflow delivery at low noise levels. They are ideally suited for use in a variety of applications including computers, memory banks, power supplies, process control equipment, electronic instrumentation, and other applications requiring small, high performance fans.

Lightweight all-metal construction is typical of PAMOTOR fans. This all-metal construction eliminates breakage and warping often found in conventional plastic fans. This all-metal feature also permits the entire fan to function as a natural heat sink, assuring cooler operation by effectively transferring heat from the rotor into the air stream via the impeller blades. Potential injurious heat is also transferred from the stator to the die-cast venturi by way of the metal struts. The operating temperature range is typically between -20°C to $+55^{\circ}\text{C}$, with a life expectancy of 100,000 hours continuous operation at room temperature (25°C), and 20,000 hours continuous operation at an upper temperature of 55°C .

The PAMOTOR exclusive bearing lubrication system incorporates hand-fitted broached sintered iron sleeve bearings on most fans, with precision high-temperature ball bearing versions

also available. The dual sleeve bearings are separated by a large oil felt reservoir, which provides continuous fault free circulation of a special lubricant to the shaft and bearing surface.

An efficient, powerful inside-out motor, housed entirely within the impeller hub to conserve axial depth, has higher torque capabilities and a lower internal heat rise than the contemporary fixed shaft designs.

The impeller blades are computer designed and impulse welded to the precision hub and dynamically balanced to within .0001 inches in each end plane to minimize acoustical and mechanical vibrations.

Most of the PAMOTOR shaded-pole fans are Underwriters' Laboratories, Inc. recognized and have their Yellow Card Component Recognition Number E41168. Many are CSA certified. All conform to IEC and VDE standards. All PAMOTOR fans undergo 100% testing prior to packaging and are ready for use when received.

All accessories for use on these fans are shown on the back cover of this catalog.

Dependability

Significant steps have been taken to ensure dependability and extra high performance of each PAMOTOR fan. Particular attention has been spent within those areas most likely to cause fan malfunction.

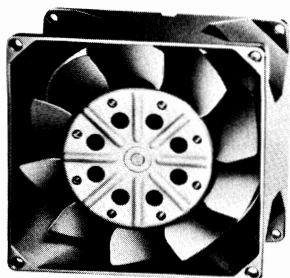
PAMOTOR has invested many man-years to continually improve lubrication design and quality assurance in bearing manufacturing. On the design level, noteworthy developments have included new high performance lubricants, provision of extra-large reservoirs, extra-large bearings, and the design of leak-proof end seals. Beyond design improvements, several other factors have helped to eliminate bearing failure in PAMOTOR fans. These include hand-broaching of bearings, extremely tight tolerances in all shaft and bearing surfaces, and multiple inspection cycles, during which each dimension is subject to at least two independent verifications.

Manufacturing methods and materials are constantly evaluated to further advance the state-of-the-art in fan design. Only the finest materials are considered for use in new design development and elaborate quality checks are employed to safeguard the high degree of PAMOTOR quality during all phases of design, development and manufacturing. A new design or modification is introduced only if it will clearly improve our product.

Professional engineering, technical skills, manufacturing expertise and extreme quality control mandates are the basis of our warranty. They blend together to result in a rejection rate, based upon actual returned units, of less than .1% of the millions of PAMOTOR fans sold over the past 17 years.

2500 Series

115 CFM



Size: 4 1/2" Square x 2" Deep

Advantages: Powerful, concentrated air stream, high cooling capacity.

Construction: All-metal, shaded-pole motor, 12" leads.

Life: 100,000 hours continuous at 25°C without maintenance.

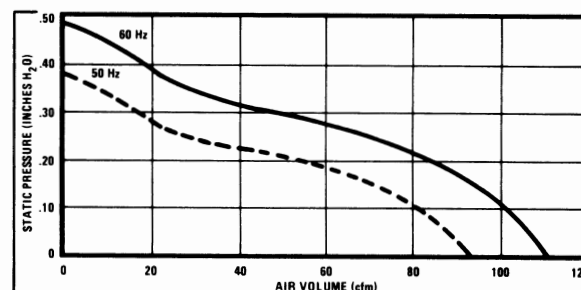
Max. Operating Temp.: $+55^{\circ}\text{C}$.

Safety Codes: UL recognized, Yellow Card E41168. CSA certified. Also conforms to IEC and VDE standards.

Accessories: 5501, 5502, 5503, 5504.

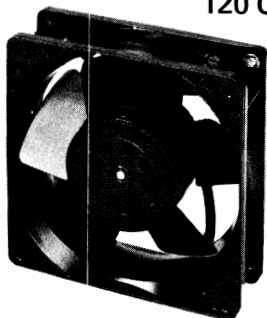
Fan Drawing: See figure 1, page 15.

Model Number	Sintered Iron Sleeve	Ball Bearing	Voltage (ac)	Frequency (Hz)	Input Power	Airflow (cfm)	Speed (rpm)	Weight (ounces)	Noise Level dB (A) dB (SIL)
2500S	X		115	50/60	27 W	115	3300	32	53 37.5
2550S	X		230	50/60	27 W	115	3300	32	53 37.5



4600X Series

120 CFM



Size: 4½" Square x 1½" Deep

Advantages: Extra high airflow at maximum back pressures.

Construction: All-metal, shaded-pole motor, terminal block.

Life: 100,000 hours continuous at 25° C without maintenance.

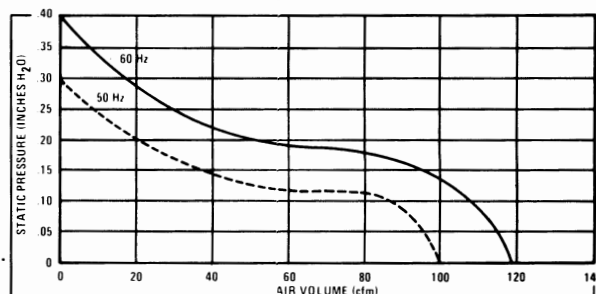
Max. Operating Temp.: +55° C (*+85° C).

Safety Codes: UL recognized, Yellow Card E41168. CSA certified. Also conforms to IEC and VDE standards.

Accessories: 5501, 5502, 5503, 5504, 5505.

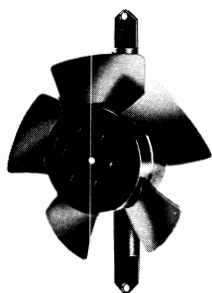
Fan Drawing: See figure 2, page 15.

Model Number	Sintered Iron Sleeve	Ball Bearing	Voltage (ac)	Frequency (Hz)	Input Power	Airflow (cfm)	Speed (rpm)	Weight (ounces)	Noise Level dB (A)	Noise Level dB (SIL)
4600X	X		115	50/60	18 W	120	3100	18	46	34
4606X*		X	115	50/60	18 W	120	3100	18	47	35
4650X	X		230	50/60	18 W	120	3100	18	46	34
4656X*		X	230	50/60	18 W	120	3100	18	47	35



4700 Series

65 CFM



Size: 4½" Diameter x 1½" Deep

Advantages: Readily adaptable to custom construction.

Construction: All-metal, shaded-pole motor, 12" leads.

Life: 100,000 hours continuous at 25° C without maintenance.

Max. Operating Temp.: +55° C.

Safety Codes: UL recognized, Yellow Card E41168. CSA certified. Also conforms to IEC and VDE standards.

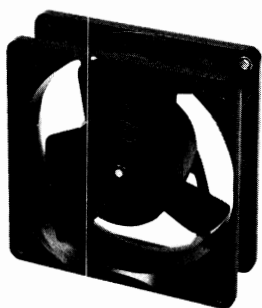
Fan Drawing: See figure 3, page 15.

Model Number	Sintered Iron Sleeve	Ball Bearing	Voltage (ac)	Frequency (Hz)	Input Power	Airflow (cfm)	Speed (rpm)	Weight (ounces)	Noise Level dB (A)	Noise Level dB (SIL)
4700	X		115	50/60	20 W	65	2900	15	41	25

Note: It is not possible to present CFM versus pressure curve because of wide variance of custom applications. Ideally, the curve would be the same as for the Model 4600X.

Model 4800X

70 CFM



Size: 4½" Square x 1½" Deep

Advantages: The quietest of fans in this size.

Construction: All-metal, shaded-pole motor, terminal block.

Life: 100,000 hours continuous at 25° C without maintenance.

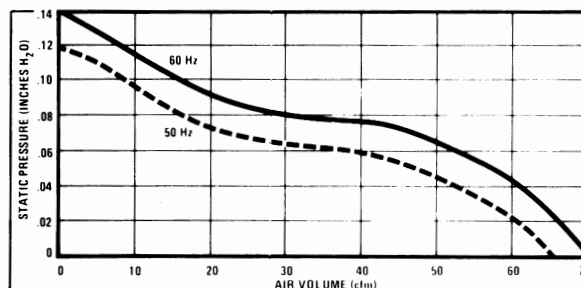
Max. Operating Temp.: +55° C.

Safety Codes: UL recognized, Yellow Card E41168. CSA certified. Also conforms to IEC and VDE standards.

Accessories: 5501, 5502, 5503, 5504, 5505.

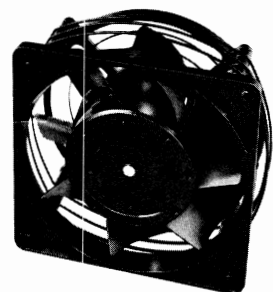
Fan Drawing: See figure 2, page 15.

Model Number	Sintered Iron Sleeve	Ball Bearing	Voltage (ac)	Frequency (Hz)	Input Power	Airflow (cfm)	Speed (rpm)	Weight (ounces)	Noise Level dB (A)	Noise Level dB (SIL)
4800X	X		115	50/30	10 W	70	1900	18	32	21
4850X	X		230	50/30	10 W	70	1900	18	32	21



5500 Series

140 CFM



Size: 4½" Square x 2" Deep

Advantages: Axial and radial air entry for use in high density cooling applications, built-in finger guard.

Construction: All-metal, shaded-pole motor, 12" leads.

Life: 100,000 hours continuous at 25° C without maintenance.

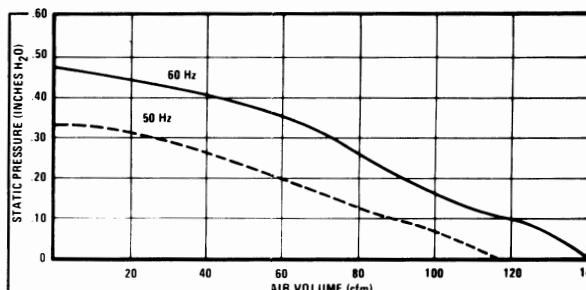
Max. Operating Temp.: +55° C.

Safety Codes: UL recognized, Yellow Card E41168. CSA certified. Also conforms to IEC and VDE standards.

Accessories: 5501, 5502, 5503, 5504.

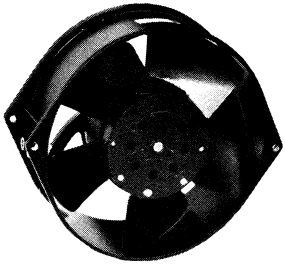
Fan Drawing: See figure 4, page 15.

Model Number	Sintered Iron Sleeve	Ball Bearing	Voltage (ac)	Frequency (Hz)	Input Power	Airflow (cfm)	Speed (rpm)	Weight (ounces)	Noise Level dB (A)	Noise Level dB (SIL)
5500S	X		115	50/60	40 W	140	3300	35	50	37
5550S	X		230	50/60	38 W	140	3300	35	50	37



7600 Series

250 CFM



Size: 6" Diameter x 2" Deep

Advantages: High airflow, excellent back pressures.

Construction: All-metal, shaded-pole motor, 12" leads.

Life: 100,000 hours continuous at 25° C without maintenance.

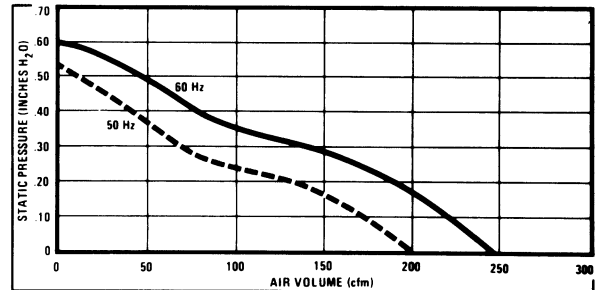
Max. Operating Temp.: +55° C (*+85° C).

Safety Codes: UL recognized, Yellow Card E41168. CSA certified. Also conforms to IEC and VDE standards.

Accessories: 5506.

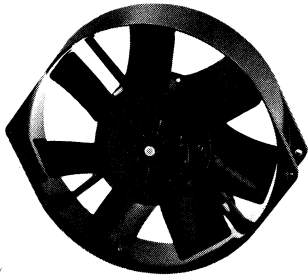
Fan Drawing: See figure 5, page 15.

Model Number	Sintered Iron Sleeve	Ball Bearing	Voltage (ac)	Frequency (Hz)	Input Power	Airflow (cfm)	Speed (rpm)	Weight (ounces)	Noise Level dB (A)	Noise Level dB (SIL)
7600S	X		115	50/60	38 W	250	3200	38	54	40
7606*	X	X	115	50/60	38 W	250	3200	38	54	41
7650S			230	50/60	38 W	250	3200	38	54	40
7656*		X	230	50/60	38 W	250	3200	38	54	41



7900 Series

225 CFM



Size: 6" Diameter x 1 1/2" Deep

Advantages: Minimum depth, high air-flow, low noise in operating modes.

Construction: All-metal, shaded-pole motor, 12" leads.

Life: 100,000 hours continuous at 25° C without maintenance.

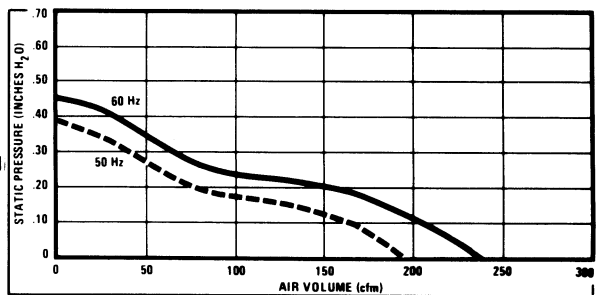
Max. Operating Temp.: +55° C.

Safety Codes: UL recognized, Yellow Card E41168. CSA certified. Also conforms to IEC and VDE standards.

Accessories: 5506.

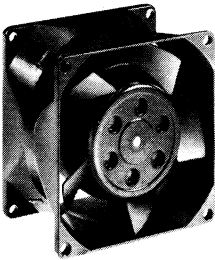
Fan Drawing: See figure 6, page 15.

Model Number	Sintered Iron Sleeve	Ball Bearing	Voltage (ac)	Frequency (Hz)	Input Power	Airflow (cfm)	Speed (rpm)	Weight (ounces)	Noise Level dB (A)	Noise Level dB (SIL)
7900S	X		115	50/60	41 W	225	2900	27	58	47
7950S	X	X	115	50/60	40.5 W	225	2900	27	58	47



8500 Series

40 CFM



Size: 3-1/8" Square x 1 1/2" Deep

Advantages: Compact, high airflow, low noise.

Construction: All-metal, shaded-pole motor, 12" leads.

Life: 100,000 hours continuous at 25° C without maintenance.

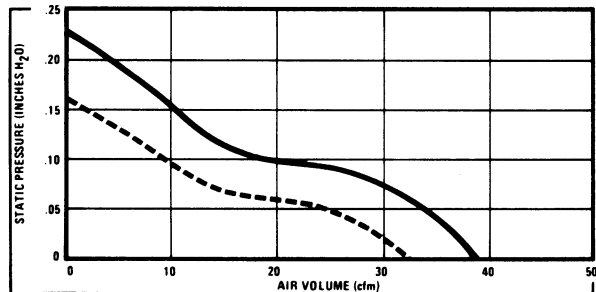
Max. Operating Temp.: +55° C (*+85° C).

Safety Codes: UL recognized, Yellow Card E41168. Conforms to CSA, IEC and VDE standards.

Accessories: 5508.

Fan Drawing: See figure 7, page 15.

Model Number	Sintered Iron Sleeve	Ball Bearing	Voltage (ac)	Frequency (Hz)	Input Power	Airflow (cfm)	Speed (rpm)	Weight (ounces)	Noise Level dB (A)	Noise Level dB (SIL)
8500D	X		115	50/60	12W	40	3250	17	35	22.5
8506D*	X	X	115	50/60	12W	40	3250	17	36	23
8550D			230	50/60	12.5W	40	3250	17	35	22.5
8556D*		X	230	50/60	12.5W	40	3250	17	36	23



DC Fans

PAMOTOR has an all new series of self-contained solid state brushless DC fans for you to choose from. Through their new design, these fans have been engineered to tackle those specialized applications which require highly reliable DC performance. Common uses include mobile radio equipment, medical electronics, shipboard computers, airborne applications, communications systems, automotive applications, marine use and telecommunications; wherever DC voltage is normally available. They are also finding wide acceptance for use in power stand-by modes to prevent memory loss in the event of AC power failure.

These fans are especially efficient and will outperform any similar sized fans at normal operating back pressure. Typically, they offer greater air volume (cfm), reduced noise levels and reduced power drain. For example, the power drain at maximum back pressure is approximately

20% of that required in conventional AC units. These fans also achieve a new low in magnetic radiation and RF noise, thereby assuring the pure signals necessary for critical airborne and shipboard use.

These fans work well at all rated voltages, and are extremely quiet. They can be adjusted for performance and noise level by altering the voltage desired for your particular application.

The new DC fan line offers a wide range of models and sizes. Each has solid state electronics and conforms to UL, CSA, IEC and VDE standards. They feature a single phase brushless motor with all electronics mounted on a PC card within the motor frame. Drive amplifiers for the motor are controlled by a patented Hall-effect generator circuit which is coupled by small pole pieces to the motor's field magnet (Patent No. 3-873-897). Available voltage ranges include 9.5 to 14 VDC (12 VDC nominal), 19 to 28 VDC (24 VDC nominal), and 38 to 56 VDC (48 VDC nominal).

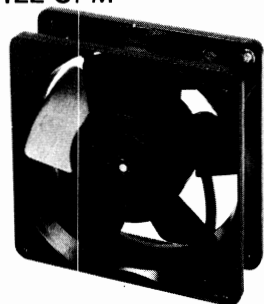
The brushless DC motor is polarity protected to avoid accidental damage and costly down time. If the input polarity is accidentally reversed, integral diodes block all circuits and the motor simply stops. Even in a locked rotor condition, the motor goes into a neutral state to avoid damage. Precision high temperature ball bearings and high temperature lubricants help to achieve a life expectancy of 100,000 hours of continuous operation at 25° C without maintenance.

These fans are the first electronic DC cooling fans that do not require an external voltage inverter. This means that you save valuable mounting space and weight because the only consideration in mounting is the fan itself. This new concept has eliminated many of the inherent reliability and RF noise problems generally associated with using AC motors in a DC environment.

All accessory items for use with these fans are shown on the back cover of this catalog.

Model 4112X

122 CFM



U.S. Patent No. 3-873-897

Size: 4½" Square x 1½" Deep

Advantages: Solid state integral electronics, no external inverter required, low input power, high airflow, locked rotor and polarity protected.

Construction: All-metal, brushless electronic motor, terminal block.

Life: 100,000 hours continuous at 25° C without maintenance.

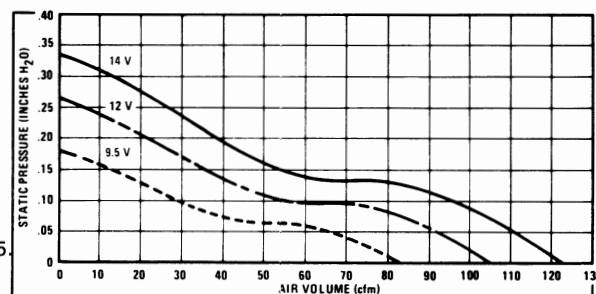
Max. Operating Temp.: +80° C.

Safety Codes: Conforms to UL, CSA, IEC and VDE standards.

Accessories: 5501, 5502, 5503, 5504, 5505.

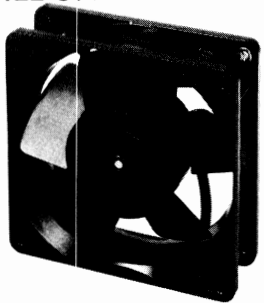
Fan Drawing: See figure 2, page 15.

Model Number	Sintered Iron Sleeve	Ball Bearing	Voltage (dc)	Input Current	Input Power	Airflow (cfm)	Speed (rpm)	Weight (ounces)	Noise Level dB (A)	Noise Level dB (SIL)
4112X		X	9.5 - 14 12 Nominal	330 mA	4 W	106	2775	21	44	32.9



Model 4124X

122 CFM



U.S. Patent No. 3-873-897

Size: 4½" Square x 1½" Deep

Advantages: Solid state integral electronics, no external inverter required, low input power, high airflow, locked rotor and polarity protected.

Construction: All-metal, brushless electronic motor, terminal block.

Life: 100,000 hours continuous at 25° C without maintenance.

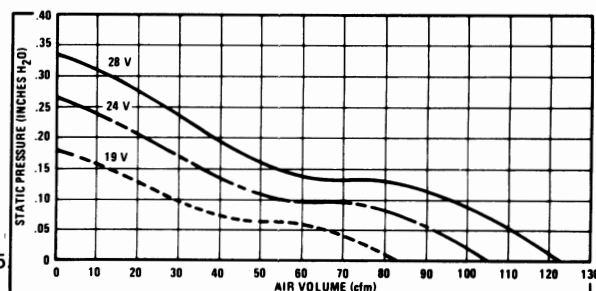
Max. Operating Temp.: +80° C.

Safety Codes: UL recognized, Yellow Card E41168. Also conforms to CSA, IEC and VDE standards.

Accessories: 5501, 5502, 5503, 5504, 5505.

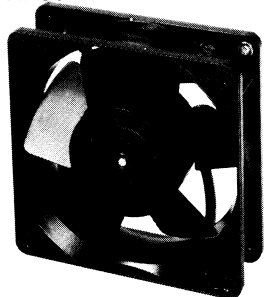
Fan Drawing: See figure 2, page 15.

Model Number	Sintered Iron Sleeve	Ball Bearing	Voltage (dc)	Input Current	Input Power	Airflow (cfm)	Speed (rpm)	Weight (ounces)	Noise Level dB (A)	Noise Level dB (SIL)
4124X		X	19 - 28 24 Nominal	170 mA	4.1 W	106	2775	21	44	32.9



Model 4148X

122 CFM



U.S. Patent No. 3-873-897

Size: 4½" Square x 1½" Deep

Advantages: Solid state integral electronics, no external inverter required, low input power, high airflow, locked rotor and polarity protected.

Construction: All-metal, brushless electronic motor, terminal block.

Life: 100,000 hours continuous at 25° C without maintenance.

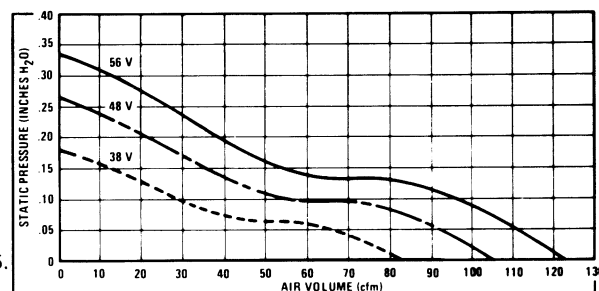
Max. Operating Temp.: +80° C.

Safety Codes: Conforms to UL, CSA, IEC and VDE standards.

Accessories: 5501, 5502, 5503, 5504, 5505.

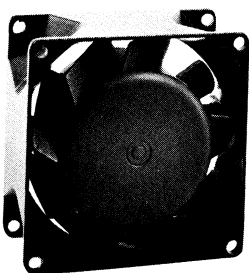
Fan Drawing: See figure 2, page 15.

Model Number	Sintered Iron Sleeve	Ball Bearing	Voltage (dc)	Input Current	Input Power	Airflow (cfm)	Speed (rpm)	Weight (ounces)	Noise Level dB (A) dB (SIL)
4148X		X	38 56 48 Nominal	85 mA	4.1 W	106	2775	21	44 32.9



Model 8112

41 CFM



U.S. Patent No. 3-873-897

Size: 3-1/8" Square x 1½" Deep

Advantages: Solid state integral electronics, no external inverter required, low input power, high airflow, locked rotor and polarity protected.

Construction: All-metal, brushless electronic motor, 12" leads.

Life: 100,000 hours continuous at 25° C without maintenance.

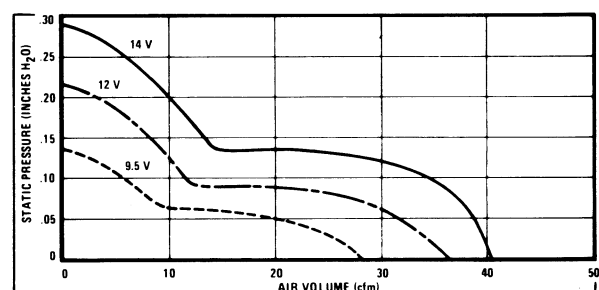
Max. Operating Temp.: +80° C.

Safety Codes: Conforms to UL, CSA, IEC and VDE standards.

Accessories: 5508.

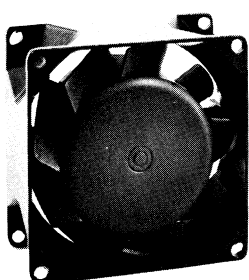
Fan Drawing: See figure 7, page 15.

Model Number	Sintered Iron Sleeve	Ball Bearing	Voltage (dc)	Input Current	Input Power	Airflow (cfm)	Speed (rpm)	Weight (ounces)	Noise Level dB (A) dB (SIL)
8112		X	9.5 14 12 Nominal	230 mA	4 W	37	3225	19	37 27.9



Model 8124

41 CFM



U.S. Patent No. 3-873-897

Size: 3-1/8" Square x 1½" Deep

Advantages: Solid state integral electronics, no external inverter required, low input power, high airflow, locked rotor and polarity protected.

Construction: All-metal, brushless electronic motor, 12" leads.

Life: 100,000 hours continuous at 25° C without maintenance.

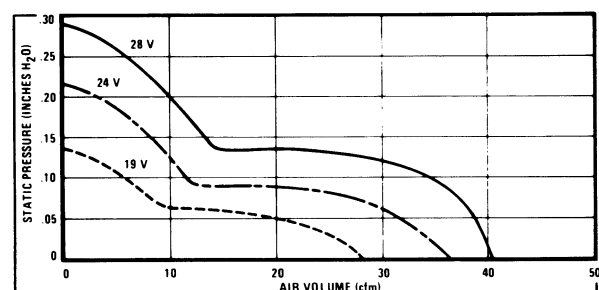
Max. Operating Temp.: +80° C.

Safety Codes: UL recognized, Yellow Card E41168. Also conforms to CSA, IEC and VDE standards.

Accessories: 5508.

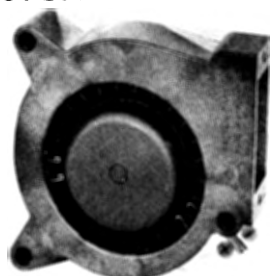
Fan Drawing: See figure 7, page 15.

Model Number	Sintered Iron Sleeve	Ball Bearing	Voltage (dc)	Input Current	Input Power	Airflow (cfm)	Speed (rpm)	Weight (ounces)	Noise Level dB (A) dB (SIL)
8124		X	19 28 24 Nominal	115 mA	2.8 W	37	3225	19	37 27.9



RL90-18/24

31 CFM



U.S. Patent No. 3-873-897

Size: 4-3/4" Square x 1½" Deep

Advantages: Solid state integral electronics, no external inverter required, low input power, high concentrated airflow, locked rotor and polarity protected.

Construction: Makrolon housing, ultramid wheel, brushless electronic motor, 12" leads.

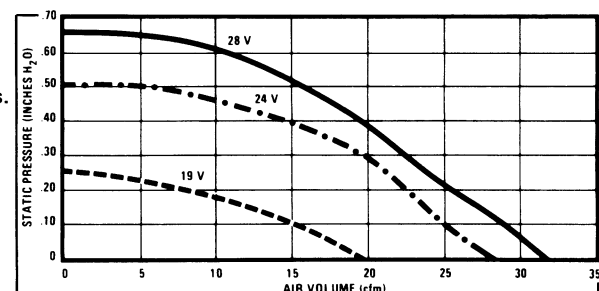
Life: 100,000 hours continuous at 25° C without maintenance.

Max. Operating Temp.: +80° C.

Safety Codes: UL recognized, Yellow Card E41168. Also conforms to CSA, IEC and VDE standards.

Fan Drawing: See figure 8, page 15.

Model Number	Sintered Iron Sleeve	Ball Bearing	Voltage (dc)	Input Current	Input Power	Airflow (cfm)	Speed (rpm)	Weight (ounces)	Noise Level dB (A) dB (SIL)
RL90-18/24		X	19 28 24 Nominal	235 mA	5 W	28	2500	22	56 44.9



Pentaflow Premium Grade Fans

Perhaps the two most important fields of application for PENTAFLOW fans are: (1) in limited-production deluxe equipment, in professional-grade instrumentation, in few-of-a-kind, custom-designed and permanently-installed systems requiring optimum performance and absolute dependability for many years; (2) as field replacements or retrofit units for original-equipment fans that have proven to be unreliable, are too noisy, or do not produce sufficient cooling airflow.

Both models in the premium PENTAFLOW series incorporate the seven basic points of superiority that are so designed into all standard PAMOTOR fans: lightweight, durable all-metal construction . . . high reliability . . . low noise level . . . low operating tempera-

ture . . . optimized shape factor . . . minimum electromagnetic field . . . low true cost.

In addition, PENTAFLOW models possess other important proprietary de-

sign features for extended long life, optimized performance, and highest reliability; accordingly, they carry a full 5-year warranty against defects in materials and workmanship.

FIVE YEAR WARRANTY

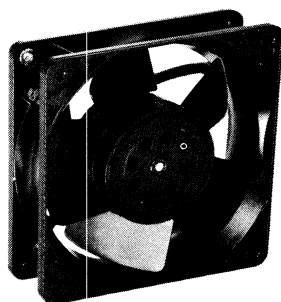
PAMOTOR warrants this fan to be free from defect in material and factory workmanship, and agrees to repair or replace it, or return the purchase price, if, under normal use and service, it reveals defects disclosed to be the fault of PAMOTOR's manufacturing within 5 years of the date of delivery of the fan to the purchaser. This Warranty shall not apply to any fan that has been (I) repaired, worked on or altered by persons not authorized by PAMOTOR to do so; (II) subjected to misuse, negligence or accident; or (III) connected, installed, used, or adjusted otherwise than in accordance with the instructions furnished by PAMOTOR. This Warranty is in lieu of any other warranty, express or implied, including the warranty of merchantability and fitness for particular purpose. Fans believed to be defective should be returned to the factory, transportation prepaid by the purchaser.

PAMOTOR reserves the right to make any changes in the design or construction of its products at any time, and without incurring any obligation to make any change whatsoever in units previously delivered. In no event shall PAMOTOR be liable for consequential or incidental damages for defective fans, failure of delivery in whole or in part, or for any other cause.

This Warranty and the writing to which it is attached constitute the full understanding of the parties, and no terms, conditions, understanding or agreement purporting to modify or vary the terms hereof shall be binding unless hereafter made in writing and signed by an authorized agent of the home office of PAMOTOR.

Model 4600XP

120 CFM



Size: 4 1/2" Square x 1 1/2" Deep

Advantages: Extra high airflow at maximum back pressures.

Construction: All-metal, shaded-pole motor, terminal block.

Life: 100,000 hours continuous at 25° C without maintenance.

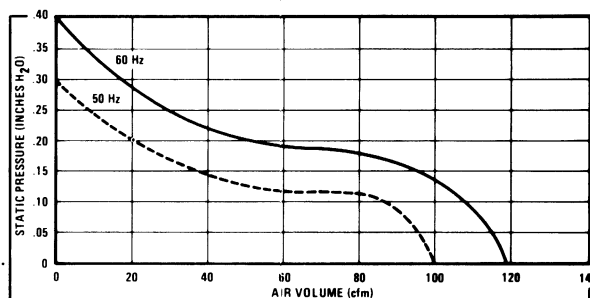
Max. Operating Temp.: +55° C.

Safety Codes: UL recognized, Yellow Card E41168. CSA certified. Also conforms to IEC and VDE standards.

Accessories: 5501, 5502, 5503, 5504, 5505.

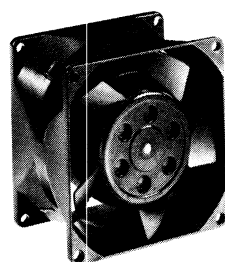
Fan Drawing: See figure 2, page 15.

Model Number	Sintered Iron Sleeve	Ball Bearing	Voltage (ac)	Frequency (Hz)	Input Power	Airflow (cfm)	Speed (rpm)	Weight (ounces)	Noise Level dB (A) dB (SIL)
4600XP	X		115	50/60	18 W	120	3100	18	46 34



Model 8500P

40 CFM



Size: 3-1/8" Square x 1 1/2" Deep

Advantages: Compact, high airflow, low noise.

Construction: All-metal, shaded-pole motor, 12" leads.

Life: 100,000 hours continuous at 25° C without maintenance.

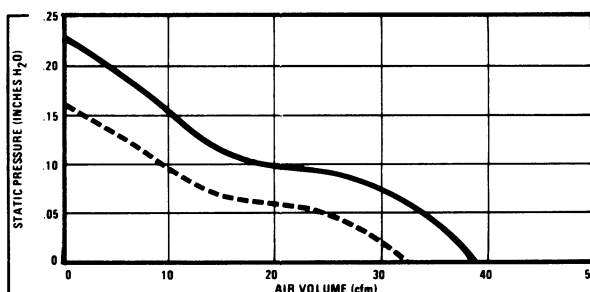
Max. Operating Temp.: +55° C.

Safety Codes: UL recognized, Yellow Card E41168. Conforms to CSA, IEC and VDE standards.

Accessories: 5508.

Fan Drawing: See figure 7, page 15.

Model Number	Sintered Iron Sleeve	Ball Bearing	Voltage (ac)	Frequency (Hz)	Input Power	Airflow (cfm)	Speed (rpm)	Weight (ounces)	Noise Level dB (A) dB (SIL)
8500P	X		115	50/60	12W	40	3250	17	35 22.5



Radial Blowers

PAMOTOR also offers radial blowers as a supplement to its line of air moving devices. Their aerodynamic design helps to achieve the desirable combinations of concentrated air delivery and low acoustical disturbance. A stable linear performance within its full range of pressure capabilities and the packaging advantages of a radial-impeller combination gives you superior performance.

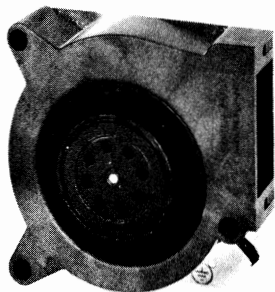
Performance characteristics of these radial blowers indicate a linear slope from 29 cfm at zero back pressure to the maximum back pressure level of .50 inches of H₂O. PAMOTOR radial blowers are thinner in construction than most competitive products and offer more effective high velocity cooling air at a higher pressure than most other fans.

An exclusive hand-fitted, broached sintered iron sleeve bearing system with a large oil felt reservoir assures long and

reliable fan performance. These radial blowers are designed to operate continuously at room temperature (25° C) for more than 100,000 hours. Even when placed in extremely adverse conditions, these radial blowers will perform for 20,000 hours of continuous duty at 55° C.

These PAMOTOR radial blowers have the Underwriters' Laboratories, Inc. Yellow Card Component Recognition Number E41168, and conform to CSA, IEC and VDE requirements.

RL90-18 Series 29 CFM



Size: 4-3/4" Square x 1 1/2" Deep

Advantages: High concentrated airflow at maximum pressures, low acoustical disturbance, perfect for spot cooling.

Construction: Makrolon housing, ultramid wheel, shaded-pole motor, 12" leads.

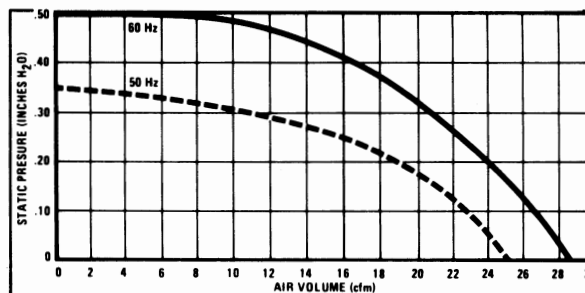
Life: 100,000 hours continuous at 25° C without maintenance.

Max. Operating Temp.: +55° C.

Safety Codes: UL recognized, Yellow Card E41168. Also conforms to CSA, IEC and VDE standards.

Fan Drawing: See figure 8, page 15.

Model Number	Sintered Iron Sleeve	Ball Bearing	Voltage (ac)	Frequency (Hz)	Input Power	Airflow (cfm)	Speed (rpm)	Weight (ounces)	Noise Level dB (A)	Noise Level dB (SIL)
RL90-18/00	X		115	50/60	21 W	29	2700	23	57	42.7
RL90-18/50	X		230	50/60	19 W	29	2600	23	57	42.7



Induction Type Fans

PAMOTOR Induction-Type fans are designed for high performance and reliability. Of all-metal construction (except Model 900), these fans act as a heat sink assuring cooler operation and longer life.

The efficient design of the induction-type motor provides high torque with low internal heat rise. These fans are designed to operate continuously for more than 100,000 hours at room temperature (25° C), and continuously for more than 20,000 hours at an upper temperature limit of 55° C, without maintenance.

The special moisture resistant finish prevents corrosion or deterioration under humid atmospheric conditions, or extreme temperature variations. Stator laminations, windings, and splices are varnished and baked at 130° C.

Longer, more reliable performance is assured by an exclusive hand-fitted broached sintered iron bearing system which has a large oil felt reservoir between the dual sleeve bearings. The lubrication is guaranteed to -40° C.

PAMOTOR induction-type fans are

manufactured to Underwriters' Laboratories, Inc. standards, and most have Yellow Card Recognition Number E41168. The fans also conform to CSA, IEC and VDE requirements.

All accessory items for use on these fans are shown on the back cover.

CAPACITORS FOR INDUCTION-TYPE FANS

Part Number	Capacitance mfd	Fan Models
1005	4.0	3000
1005G	4.0	3000
1006	2.0	1300
1009	1.0	3050U
1009G	1.0	3050U
1010	0.5	2110
1011	5.6	900

Model 900

34 CFM



Size: 3-1/8" Diameter x 1 1/2" Deep

Advantages: Ultra compact - little mounting space required, very quiet, extremely low stray field, axial and radial air entry.

Construction: Special polyamid, induction motor, 6" leads.

Life: 100,000 hours continuous at 25° C without maintenance.

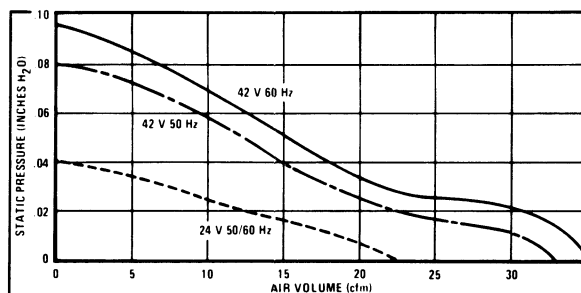
Max. Operating Temp.: +55° C.

Safety Codes: UL recognized, Yellow Card E41168. Also conforms to CSA, IEC and VDE standards.

Capacitor Required: 5.6 mfd.

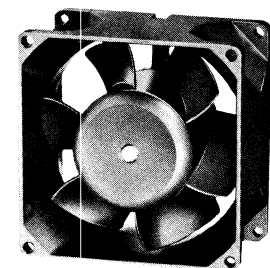
Fan Drawing: See figure 9, page 15.

Model Number	Sintered Iron Sleeve	Ball Bearing	Voltage (ac)	Frequency (Hz)	Input Power	Airflow (cfm)	Speed (rpm)	Weight (ounces)	Noise Level	
900	X		24 42	50/60	2 3 W	34	1700	4	22	16.8



3000 Series

65 CFM



Size: 3 1/2" Square x 2" Deep

Advantages: Highest airflow for size, low noise.

Construction: All-metal, induction motor, 6" leads.

Life: 100,000 hours continuous at 25° C without maintenance.

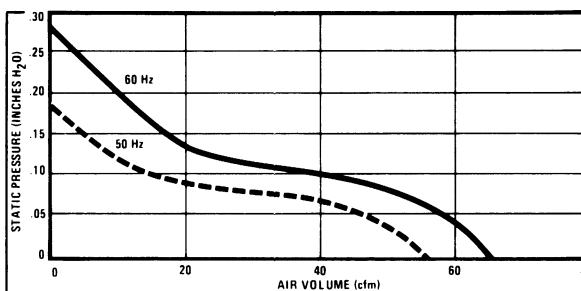
Max. Operating Temp.: +55° C.

Safety Codes: UL recognized, Yellow Card E41168. CSA certified. Also conforms to IEC and VDE standards.

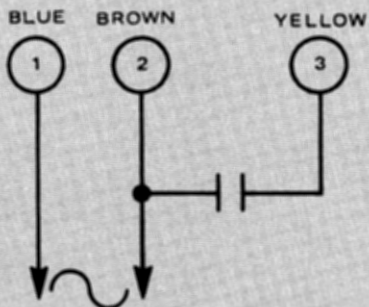
Capacitor Required: Model 3000 - 4 mfd
Model 3050U - 1 mfd

Fan Drawing: See figure 11, page 15.

Model Number	Sintered Iron Sleeve	Ball Bearing	Voltage (ac)	Frequency (Hz)	Input Power	Airflow (cfm)	Speed (rpm)	Weight (ounces)	Noise Level	
3000	X		115	50/60	15 W	65	3180	19	46	29.3
3050U	X		230	50/60	15 W	65	3150	19	46	29.3

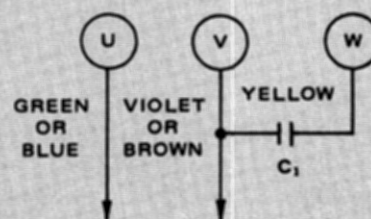


WIRING DIAGRAM



Model 900

WIRING DIAGRAM



3000 Series

Application Engineering

For design and packaging engineers in particular, PAMOTOR has prepared a series of applications monographs on HOW TO SELECT THE OPTIMUM FAN FOR YOUR APPLICATION as described on page 5 of this catalog. Individual bulletins, or the complete

series, are available free, upon request on company letterhead.

For applications-engineering consultation on special air-cooling system requirements, PAMOTOR applications engineers and field engineers are always

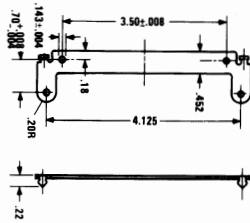
available, without cost or obligation. Phone, wire, or write your local PAMOTOR representative, or communicate directly with our Applications Engineering Department, for prompt engineering assistance.

Accessories

5501

Brackets

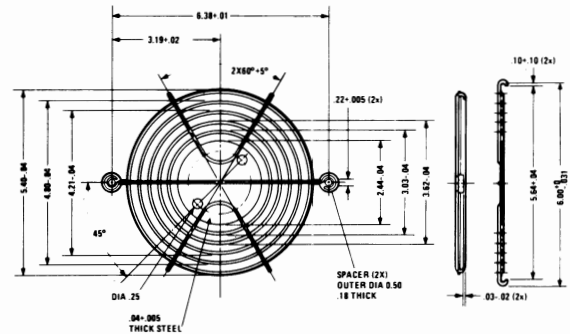
Supplied in pairs as replacements.



5506

Finger Guard — Large

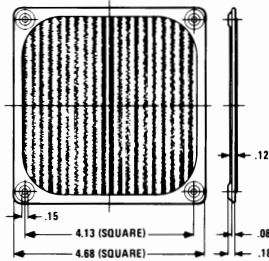
Constructed of steel wire, spot welded and zinc coated.



5502

Filter

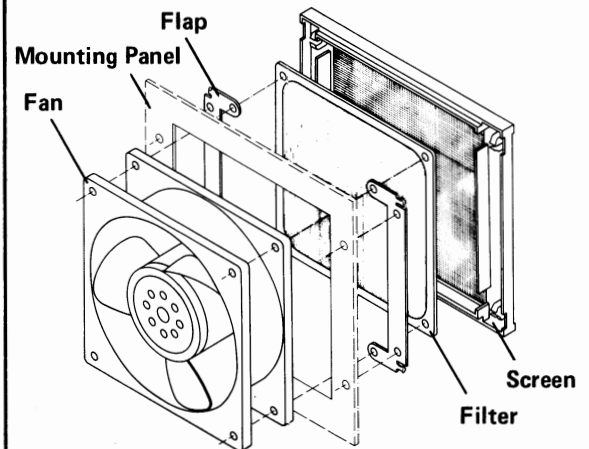
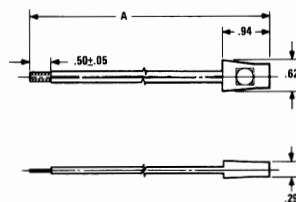
A general purpose filter which prevents ingress of coarse dirt into equipment. The light-alloy sheet frame supports a woven mesh element.



5505

Plug and Lead

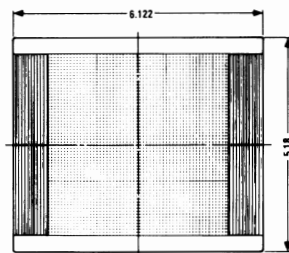
Plug and Lead assembly with integrally molded leads 24 inches long. For six inch leads, order Part No. 5505-6. Sleeved with black P.V.C.



5503

Framework and Screen

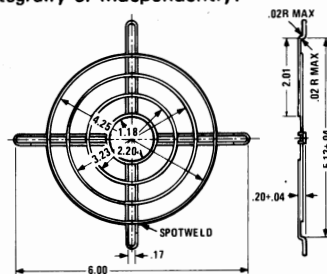
Can be used as finger guard or debris guard where appearance is important. The attractive finish makes additional treatment unnecessary.



5504

Finger Guard — Medium

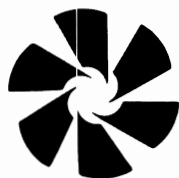
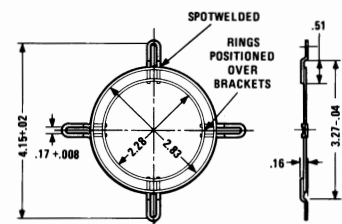
Constructed from steel wire, spot welded and zinc coated. Slightly increases noise level of fan when used. Can be fitted to either side of the fan integrally or independently.



5508

Finger Guard — Small

Similar to, but smaller than 5504.



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PAMOTOR reserves the right to change these specifications as required to permit improvements in the design of its products.