

# Common to all AC Axial-flow Fans

## Accessories (Order Separately)

### ■ Plug Cord

R87F-PC Rating: 250 VAC, 3 A  
UL approved/conforms to CSA

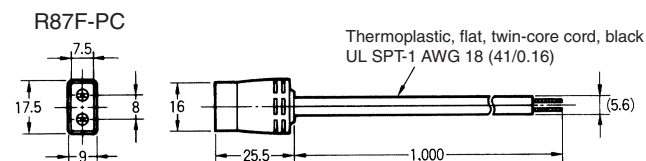


Note: UL File No. E175022

### Available Models

Cord length	Model number
1 m	R87F-PC
2 m	R87F-PC-20

### Dimensions



Connectable to Faston #110 terminals (or equivalent).

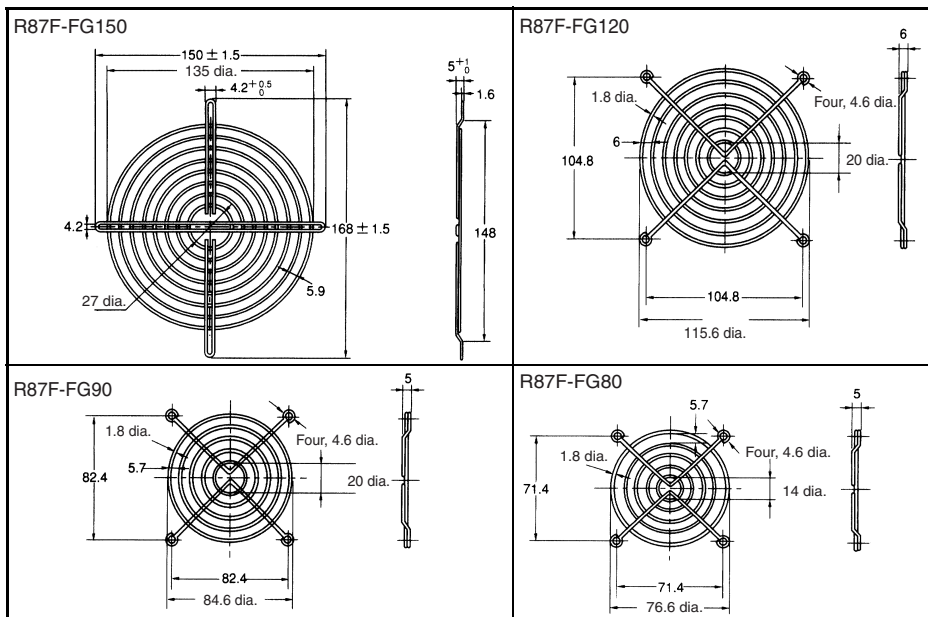
**Note:** This Plug Cord is used for Axial-flow Fans with terminals.

### ■ Finger Guards

#### R87F-FG

#### Dimensions

Material: steel, Joints: spot welded, Surface: nickel-chrome plated



### Applicable Axial-flow Fans

AC Axial-flow Fan		Finger Guard
Size	Model	
150 dia.	R87T-A□A0 Series	R87F-FG150
120×120	R87F-A□A1 Series R87T-A□A1 Series	R87F-FG120
92×92	R87F-A□A9 Series	R87F-FG90
80×80	R87F-A□A8 Series R87T-A□A8 Series	R87F-FG80

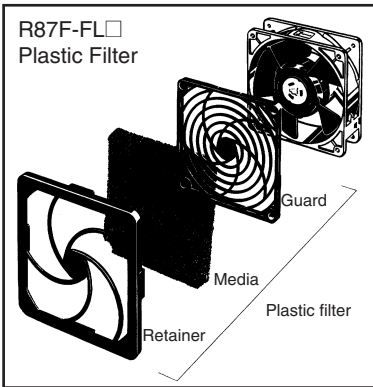
**Note:** Finger Guards reduce the flow rate by approximately 2% to 5%.

### Available Models

Size	Rated voltage
150 dia.	R87F-FG150
120×120	R87F-FG120
92×92	R87F-FG90
80×80	R87F-FG80

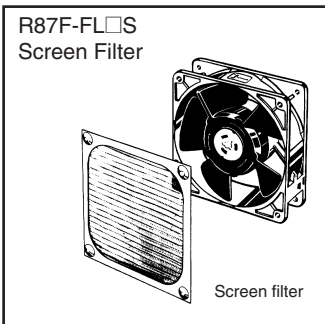
Filters

R87F-FL

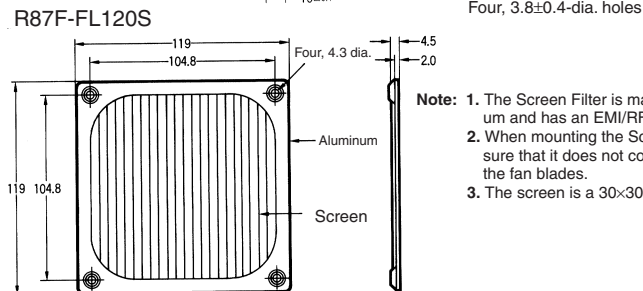
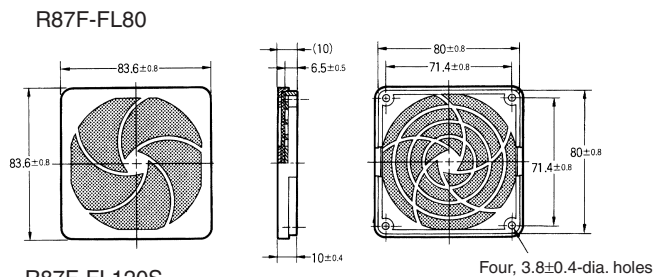
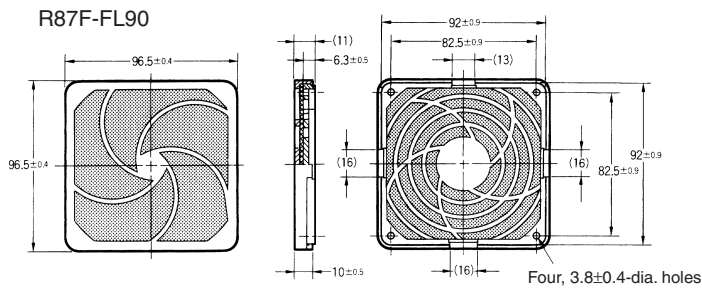
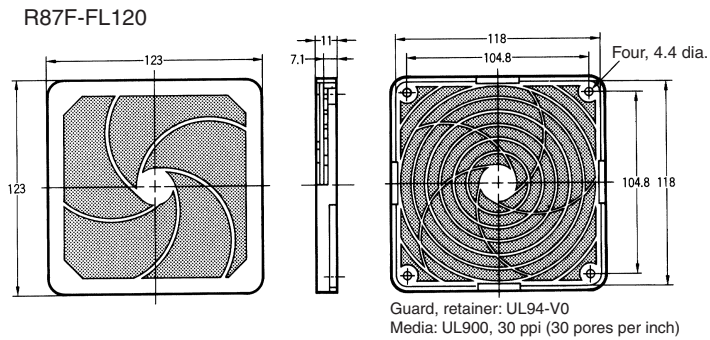


Mounting Method

1. Attach the guard to the Fan using the mounting bolts. (There are no mounting bolts provided with the Plastic Filter.)
2. With the media held between the retainer and the guard, hook the retainer to the guard. (The media and retainer can be one-touch mounted/dismounted.)
3. Use the following model number to order media only.  
R87F-FL□-M□ (□: 120, 90, or 80)  
(One package contains five media.)



Dimensions



Applicable Axial-flow Fans

AC Axial-flow Fan		Filter	
Size	Model	Plastic Filter	Screen Filter
150 dia.	R87T-A□A0 Series	---	---
120×120	R87F-A□A1 Series R87T-A□A1 Series	R87F-FL120	R87F-FL120S
92×92	R87F-A□A9 Series	R87F-FL90	---
80×80	R87F-A□A8 Series R87T-A□A8 Series	R87F-FL80	---

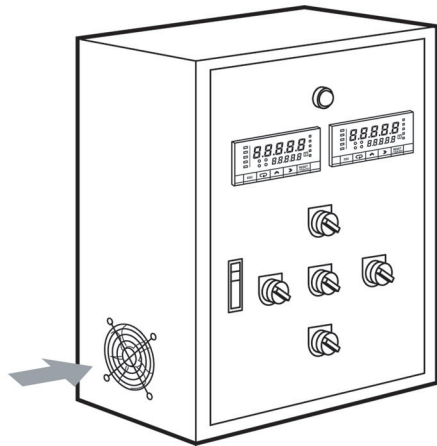
Available Models

Size	Model number
120×120	R87F-FL120
92×92	R87F-FL90
80×80	R87F-FL80
120×120	R87F-FL120

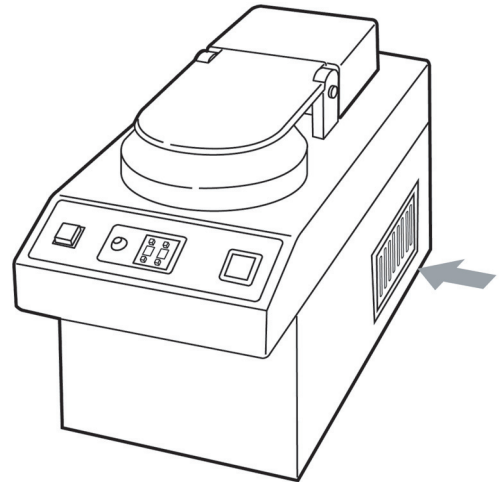
**Note:** Filters reduce the flow rate by approximately 20% to 40%. Ensure that there is no clogging.

# Application Examples

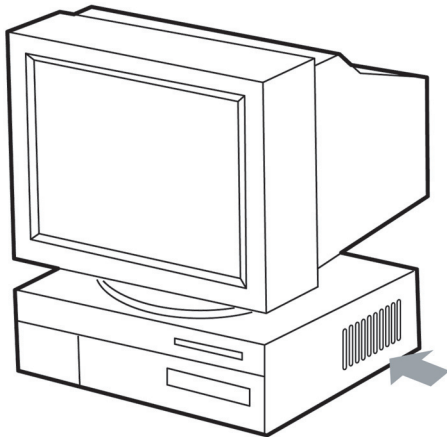
## 1. Control Panels



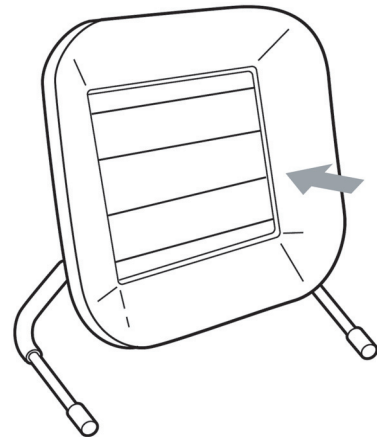
## 4. Medical Equipment



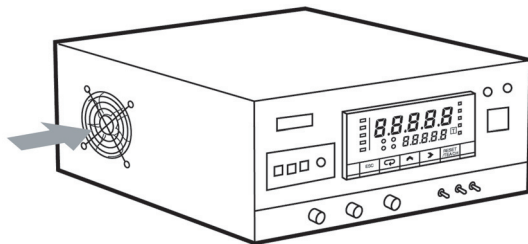
## 2. Computer



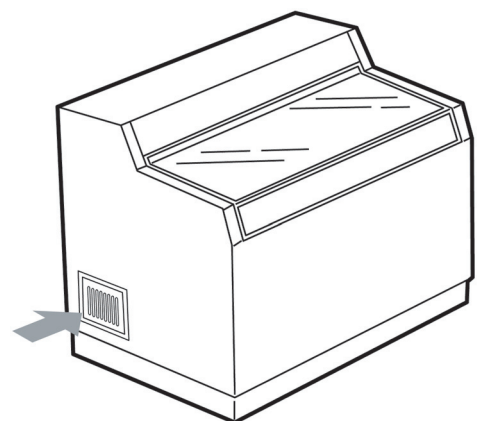
## 5. Soldering Fume Extractor



## 3. Measurement Devices



## 6. Automatic Vending Machines and Display Cases



# Precautions

## WARNING

### Assembly

Be sure to attach a Finger Guard if there is a danger of the user touching the Fan.  
 Attach a guard, protective net, or a Finger Guard (available as an option) to the Axial Fan's mounting section.  
 A variety of Finger Guards are available as options (R87F-FG). Select a Finger Guard of a size appropriate for the Fan used. For details of the available Finger Guards, refer to page 27.  
 Be sure to turn OFF the power supply and confirm that the blades have stopped before performing inspections or replacing Filters.  
 Not doing so may result in injury due to contact with the blades.

## WARNING

### Application

Do not touch the blades. Doing so may result in injury.  
 Ensure that no part of your body and no objects come in contact with the blades while they are moving, otherwise injury may result due to contact with the blades or due to scattering of object fragments.

## Handling

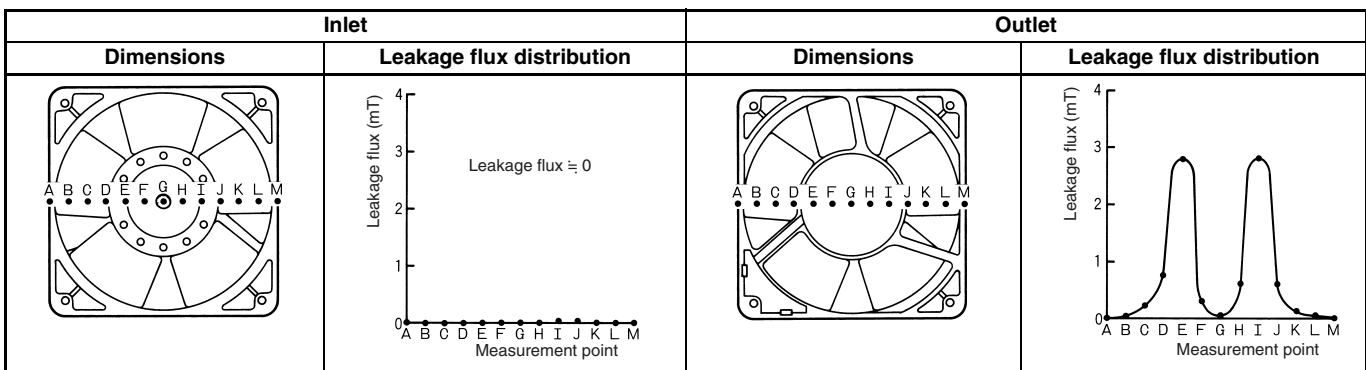
Do not use the Fan in locations subject to explosive, flammable, or corrosive gases, or in locations subject to drops of water. Doing so may result in fire, electric shock, or injury.  
 Do not use the Fan outside the rated temperature range or above the rated voltage. Doing so will cause the temperature of the coil (at the center of the Fan) to increase, and may result in deformation or scorching of the blades.  
 Operate the Fan using a sine-wave power supply.  
 Do not hold the Fan by its power lines, or pull the power lines with excessive force. Doing so may cause damage to the wire insulation or break the wire, resulting in injury due to electric shock or the Fan falling.

## Mounting

Be sure to secure the Fan with the mounting bolts. Not doing so may result in injury due to the Fan falling.  
 A precision-type ball bearing is used to hold the shaft of the Fan. The structure of the ball bearing is prone to damage if the Fan is subjected to shock (e.g., dropped). Ensure that the Fan is not subjected to shock, otherwise the service life and performance characteristics of the Fan will be adversely affected.

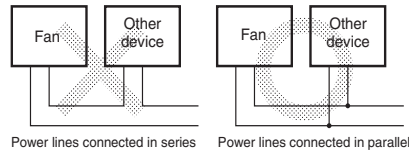
## Leakage Flux Distribution Curves

The leakage flux distribution curves for inlet and outlet sides of the R87T Axial-flow Fans are shown below as examples.



## Wiring

Prevent short-circuiting of the Fan from adversely affecting other devices by installing circuit-breakers in the Fan's power lines.  
 Do not wire the power lines of the Fan in series with those of other Fans or devices. Doing so may cause a voltage above the Fan's rated voltage to be applied, and this may result in malfunction or burning. Be sure to wire devices in parallel.



## Cleaning

Ensure that drops of water do not come in contact with the Fan.  
 Ensure that no organic solvents or alkaline chemicals are in contact with plastic parts of the Fan, otherwise cracks, swelling, or dissolution may result.

When performing any action that requires touching the blades, such as inspections, ensure that power is turned OFF. Unexpected operation of the Fan after, for example, the Fan has stopped due to contact failure or due to the operation of the overheating protection function (thermal protection), may result in injury.

Do not apply grease to the Fan or attempt to remodel it. Doing so may result in malfunction or injury.

## Correct Use

### (1) Leakage Flux

Leakage flux from an Axial-flow Fan may distort the image on nearby CRT screens. Measures to prevent this problem include:  
 1. Keeping CRT's at least 30 cm away from the Axial-flow Fan  
 2. Shielding the Axial-flow Fan side with metal mesh.

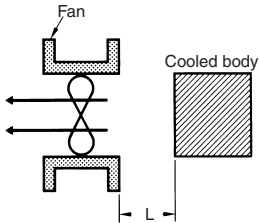
The leakage flux from a Fan with metal blades is less than with plastic blades. Note, however, that the leakage flux differs between the inlet and outlet sides.

**(2) Noise Countermeasures**

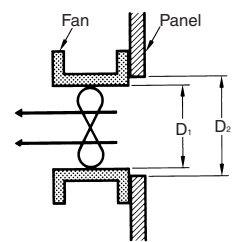
The cooling effect and noise levels of Axial-flow Fans are greatly affected by the mounting conditions. Take the points listed below into account when installing the Fans.

Maintain as much clearance as possible (L) between the Fan inlet and the cooled object.

(If the cooled object occupies about the same surface area as the Fan on a flat surface, a distance of approximately 10 cm is appropriate.)



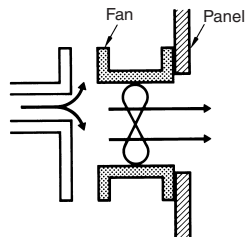
The diameter of the Fan installation hole ( $D_2$ ) should be larger than the diameter of the Fan ( $D_1$ ).



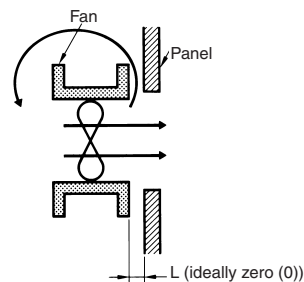
$D_1$ : Fan installation hole diameter  
 $D_2$ : Fan diameter  
 $D_1 > D_2$

**(3) Cooling Effect**

Avoid rapid changes in air flow direction or air-flow cross-section which reduce the cooling effect.



When installing the Fan, keep the clearance at the outlet side as small as possible. (If there is a large clearance at the outlet side, it may not be possible to obtain a sufficient cooling effect.)



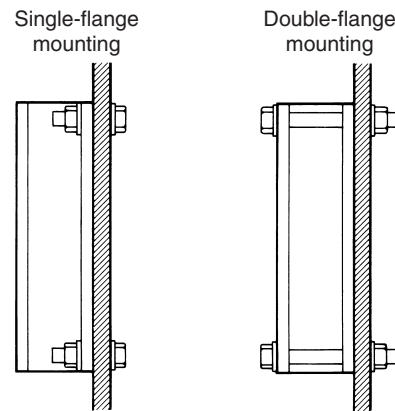
**Measurement Conditions**

Number of Fans tested	Ambient conditions	Measurement device
5	Temperature: $23 \pm 2^\circ\text{C}$ Humidity: $65 \pm 5\%$	Measurement was performed using the multi-nozzle double chamber method based on AMCA (Air Moving Condition Association, U.S.A.) standards 270 to 274.

**(4) Installation**

The Fan can be mounted with bolts through only one flange (single-flange mounting) or with through-bolts through both flanges (double-flange mounting). Take care not to distort the frame when using double-flange mounting.

Tighten the bolts to a torque of approximately 0.44 N·m when installing the Fan.



**Flow Rate and Static Pressure**

The characteristic graphs provided for each of the models represent the average of actual measurement data obtained under the measurement conditions given below. They are provided as reference for determining the Fan most suitable for the type of cooling required; the actual characteristics may differ from the values represented in the graphs.

A simple explanation of the flow rate/static pressure characteristics and the methods of measuring them is given below.

**Maximum Static Pressure,  $P_s \text{ max}$  (flow rate = 0):**

Fully close the damper. Take the pressure difference between chamber B and ambient pressure ( $P_s$ ). The maximum value of the pressure difference ( $P_s$ ) is the maximum static pressure ( $P_s \text{ max}$ ).

**Intermediate Region, (Q,  $P_s$ ):**

Adjust the auxiliary blower to change the static pressure ( $P_s$ ). Measure the pressure difference between chamber A and chamber B ( $P_d$ ). Calculate the flow rate (Q).

**Maximum Flow Rate, Q max (static pressure = 0):**

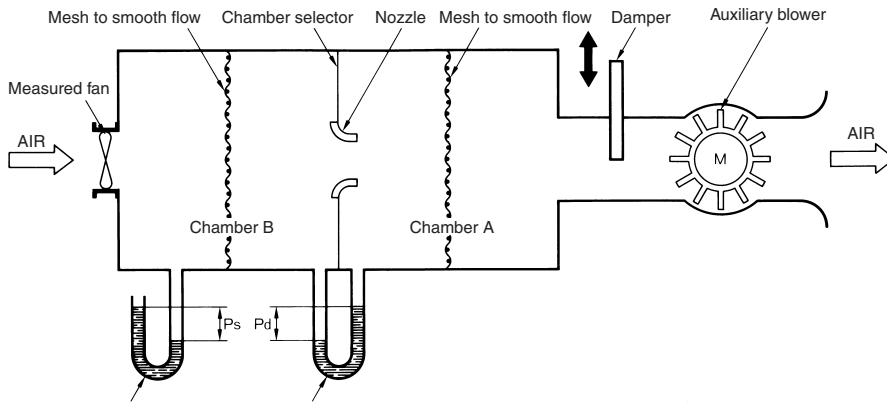
Fully open the damper and adjust the auxiliary blower to set the static pressure to zero (0). Measure the pressure difference between chamber A and chamber B ( $P_d$ ). Take the flow rate (Q) calculated at this point as the maximum flow rate (Q max).

**Fan Operating Point:**

A Fan installed in equipment operates near the point where the Fan characteristic curve crosses the system impedance curve.

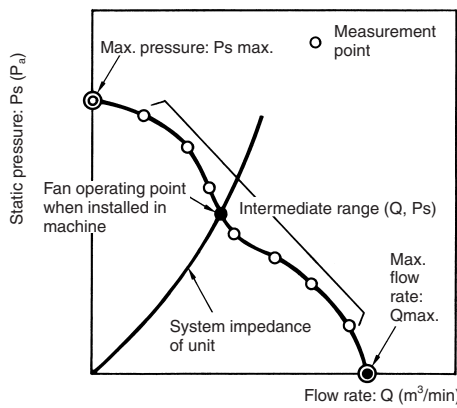
**Note:** The maximum flow rate and maximum static pressure do not indicate the Fan operating point when it is installed in equipment. However, these characteristics are important for comparing Fan performances and for selecting Fans.

**Flow Rate Measurement Device**



Manometer to measure static pressure (digital pressure-gauge on machine)  
 Manometer to measure static pressure (digital pressure-gauge on machine)  
 Measure pressure difference across nozzle (difference between chamber A and B pressures) and calculate air flow rate.

**Sample Flow Rate/Static Pressure Characteristic**



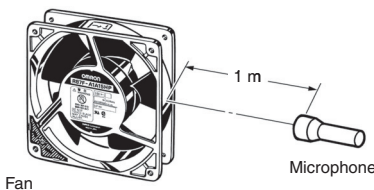
**Noise Measurements**

The following two methods are available for measuring Fan noise. These are used interchangeably by Fan manufacturers so that the measurement method is not standardized.

JIS B 8330: Testing and Inspection Methods for Fans

JIS C 9603: Extractor Fans

OMRON conducts testing according to JIS (Japan Industrial Standard) C 9603 because of the small size and low noise levels of the Fans and because of their similarity in shape to extractor fans. This standard prescribes that the noise be measured at a distance of 1 m from the side of the Fan.



Fan

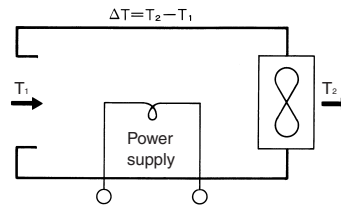
Microphone

**Selecting a Fan**

Follow the steps below to select Fans.

**1. Procedure**

- (1) Estimate the amount of heat generated inside the Unit.
- (2) Set the maximum permitted temperature rise limit inside the Unit.



T<sub>1</sub>: Temperature of the inlet air (°C).

T<sub>2</sub>: Temperature of the outlet air (°C).

- (3) Calculate the required flow rate.  
 $Q = 50W/\Delta T$  (m<sup>3</sup>/min)  
 Q = flow rate (m<sup>3</sup>/min.)  
 ΔT = permitted temperature rise limit (°C)  
 (Normally between 8 to 10°C.)  
 W = amount of heat generated (kW)
- (4) Estimate the system impedance from the air flow through the Unit or from previous data.

$$\Delta P = KQ^n$$

ΔP: Pressure drop (Pa)

K: Unit constant

n: Coefficient determined by air flow

n=1: laminar flow

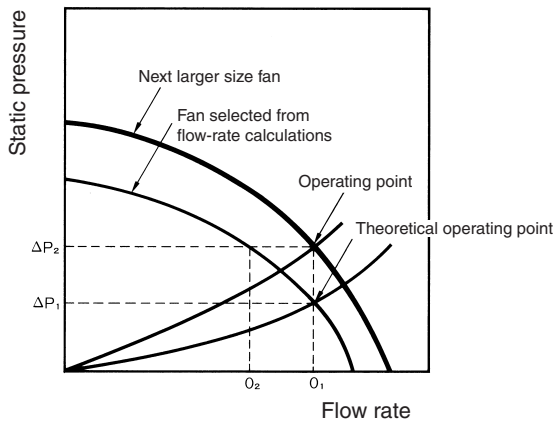
n=2: turbulent flow

(n=2 is the normal value.)

- (5) Select the Fan according to the P - Q characteristics.
- (6) Measure the temperature rise in an installed Unit.
- (7) Reappraise the Fan if the measured cooling effect is insufficient.

## 2. Recheck the Selected Fan

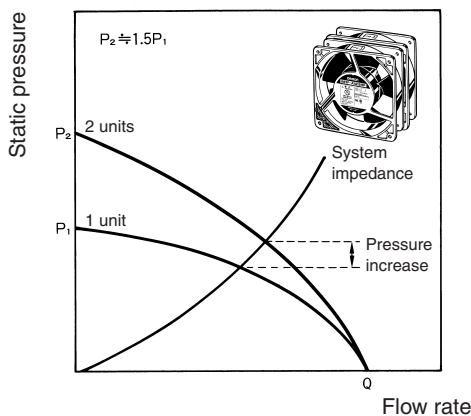
In the following diagram, the value for the system impedance  $\Delta P_1$  is unknown. It is assumed that a flow rate of  $Q_1$  is required but measurements of the cooling effect show a reduced flow rate of  $Q_2$ , for example. This result indicates that the system impedance was  $\Delta P_1$ , so the Fan one size larger is necessary to produce the flow rate  $Q_1$  to obtain the prescribed cooling effect.



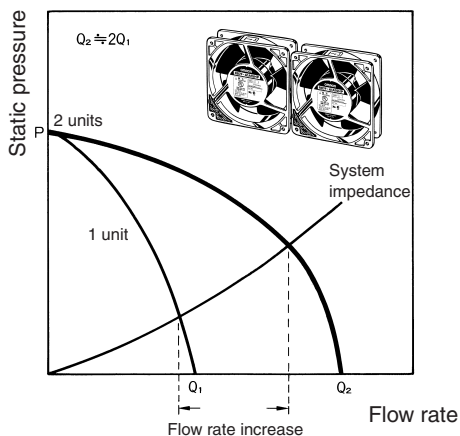
## 3. Serial and Parallel Fan Operation

The characteristics of two identical Fans operated in series or parallel are determined as shown in the following diagrams.

Serial Operation:



Parallel Operation:



## Terminology

### Nominal Value:

The average value of data based on actual measurements. Nominal values cannot be treated as rated values. Enquire separately for details on rated values.

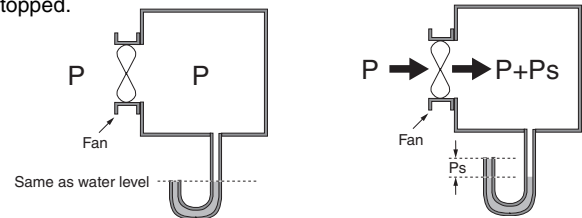
### Flow Rate: Q (m<sup>3</sup>/min.)

The volume of air discharged by the Fan in a unit of time.

### Static Pressure: Ps (Pa)

The pressure difference across the front to the back of the Fan generated by the discharged air, which is unaffected by air flow speed.

1. The air pressure across the front to the back of the fan does not change when the fan is stopped.
2. Static pressure (Ps) is generated at the front of the fan when it rotates.

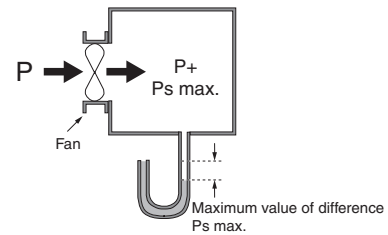


### Maximum Flow Rate: Q max (m<sup>3</sup>/min.)

The volume of air discharged by the Fan when the static pressure is adjusted to zero (Pa) at the flow measurement unit.

### Maximum Static Pressure: Ps max (Pa)

The pressure difference inside and outside the Unit when the flow rate is adjusted to zero (0 m<sup>3</sup>/min.) at the flow measurement unit.



### System Impedance:

The flow resistance inside a mounted Axial-flow Fan caused by the density of parts and shape of the flow path.

### Impedance Protection:

A method of preventing burning damage when the motor is restricted from rotating by setting the motor winding impedance (AC resistance) to a value giving a temperature rise in the windings below the temperature at which burning occurs.

### Thermal Protection:

A method of preventing burning damage when the motor is restricted from rotating by setting a thermal element to interrupt (the restricting) operation before the motor reaches a temperature at which burning occurs.

# Warranty and Application Considerations

## Read and Understand this Catalog

Please read and understand this catalog before purchasing the products. Please consult your OMRON representative if you have any questions or comments.

## Warranty and Limitations of Liability

### WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

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In no event shall the responsibility of OMRON for any act exceed the individual price of the product on which liability is asserted. IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR, OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON'S ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED, AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.

## Application Considerations

### SUITABILITY FOR USE

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the products.

Take all necessary steps to determine the suitability of the product for the systems, machines, and equipment with which it will be used.

Know and observe all prohibitions of use applicable to this product.

NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

## Disclaimers

### PERFORMANCE DATA

Performance data given in this catalog is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of OMRON's test conditions, and the users must correlate it to actual application requirements. Actual performance is subject to the OMRON *Warranty and Limitations of Liability*.

### CHANGE IN SPECIFICATIONS

Product specifications and accessories may be changed at any time based on improvements and other reasons. Consult with your OMRON representative at any time to confirm actual specifications of purchased product.

### DIMENSIONS AND WEIGHTS

Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.