Overview and Characteristics of Fan

Overview
DC AC

A cooling fan is widely used to extend life of your system by cooling off heat of the system that many electrical components are mounted in a very high density and dissipating heat. Since we SANYO DENKI developed "San Ace" which is the first AC fan in Japan in 1965, we have increased fan motor lineup until now meeting customer's needs rapidly based on our tremendous career. We SANYO DENKI will continue to develop new fans with high airflow, low noise, low vibration, and energy-saving design.

Characteristics
DC AC

We can roughly devide fan into two types which are AC and DC.

AC Fans
SANYO DENKI succeeded in the mass-production of AC fans in 1965. SANYO DENKI was the first Japanese manufacturer to have succeeded at this.

●High performance
●High reliability
●Safety

DC Fans
SANYO DENKI succeeded in the mass-production of DC fans in 1982.

●High performance
●Low power consumption
●Low vibration
●Low leakage of flux
●High reliability

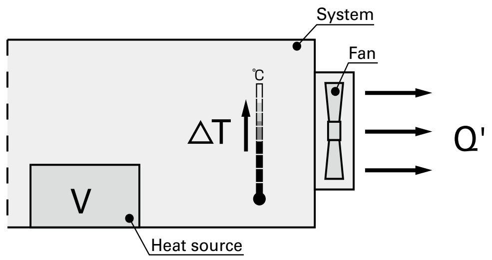
SANYO DENKI currently has a wider variety of products like Long Life Fan, CPU cooler, Splash Proof Fan, and Oil Proof Fan etc to meet all customer needs.

Guideline in Selecting a Fan

How to select an appropriate fan
DC AC

The following example is a guideline regarding how to select an appropriate fan for cooling your system

1. Determining of your system specifications and conditions



Determine the temperature rise inside your system and obtain the total heating value inside your system on the basis of its inputs and outputs.

Example

V : Total heating value of your system（W）=100（W）

△T : Inside temperature rise（K）=15（K）

2. Calculating the required airflow for cooling
After the equipment specifications and conditions of your system have been determined, calculate required airflow to meet the conditions. (Note that the formula shown below only applies when the heat radiation is performed only by cooling air from the fan.)

Example

Q': Motion airflow（m^3/min）

$$Q' = \frac{V}{20\triangle T} = \frac{100\ (W)}{20\times 15\ (K)} \fallingdotseq 0.33\ (m^3/min)$$

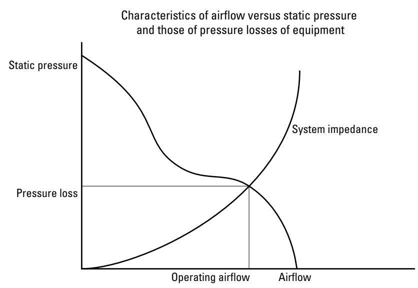
3. Selecting the fan
After the motion airflow has been calculated, select an appropriate fan motor based on the value.The motion airflow when the fan motor is actually mounted in your system can be obtained using the airflow-static pressure characteristics curve and system impedance.However, the system impedance cannot be measured without a measuring equipment, so fan with 1.5 to 2 times higher airflow than the actual max airflow should be selected (operating airflow is one-third to two-thirds of maximum airflow).

Example

Q: Maximum airflow（m^3/min）

Q'=Q×2/3

Q=Q'×3/2=0.33×3/2≒0.5（m^3/min）



Next, In case that you select a fan having an airflow of 0.5 (m^3/min) or more and a appropriate size for the space inside your system.

For example, If you need a fan of 60mm square, 25mm thickness and 12V, you should select is 109R0612H402 (maximum airflow = 0.53m^3/min).

4. Confirming the selected fan
Calculate the temperature rise inside your syetem when your syetem having 100 (W) of total heating value is forcefully cooled down by a 109R0612H402 fan.

Example

Q' =Q×2/3=0.53×2/3≒0.353（m^3/min）

△T =V/20Q'=100（W）/20×0.353（m^3/min）≒14.2（K）

From the above, the temperature rise inside your system is calculated as 14.2（K）.

Since the value obtained from the above equation is only a rough target, final fan selection should be based on your actual installation test.

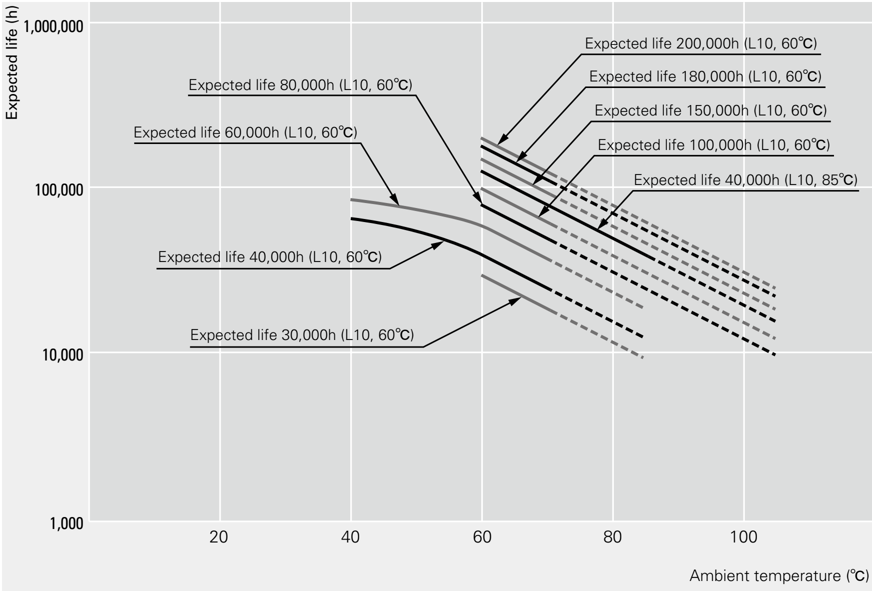
Characteristics Calculation Method and Description

Reliability and expected life

DC AC

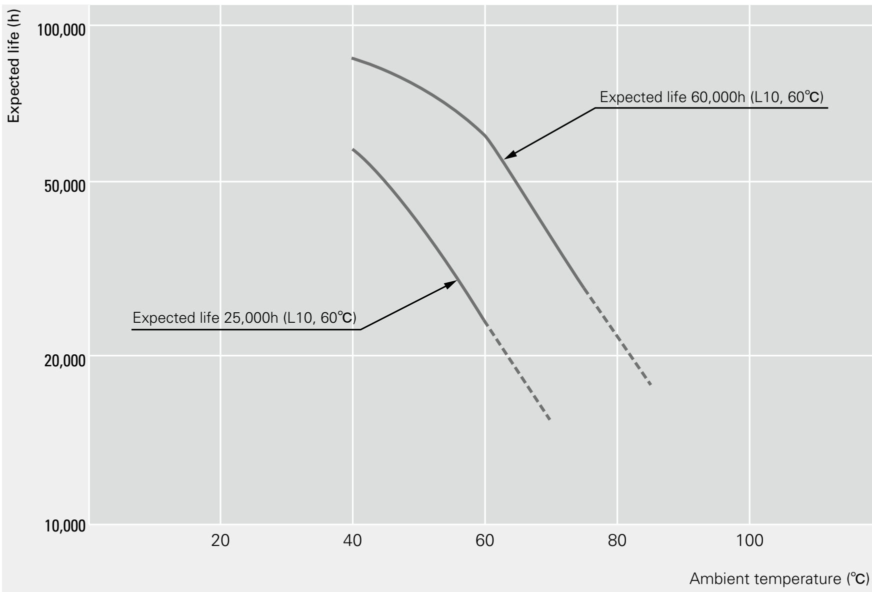
A cooling fan generally cools itself as well. The temperature rise of the motor is relatively low and the temperature rise of the grease in the bearings is also low, so expected life is longer than general some either motors. Since the service life of bearings is a theoretical value that applies when they are ideally lubricated, the life of lubricant can be regarded as expected life of the fan. DC fan consumes less power and its temperature rise of bearing is very low. When the measurement conditions are: L10 (the remaining product life in the lifespan test is 90%),with an atmospheric temperature of 60 degrees, at the rated voltage, and continuously run in a free air state. The table below indicates the relationship between ambient temperature and expected life estimated on the basis of our life tests and same other tests conducted by SANYO DENKI.

Expected life of DC Fans



Rated voltage, continuously run in a free air state, survival rate of 90%

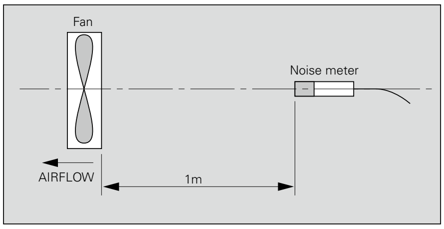
Expected life of AC Fans



Rated voltage, continuously run in a free air state, survival rate of 90%

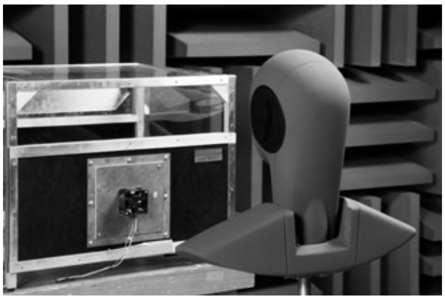
Noise characteristics DC AC

Noise is average value that measured at I meter away from air intake side of fan that is suspended on special frame in anechoic chamber (as per JIS B 8346).



Acoustic radio wave anechoic chamber

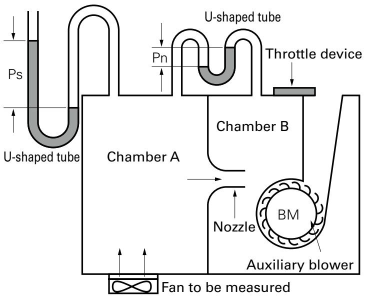
Noise characteristic measurement equipment



Measuring airflow and static pressure DC AC

It is very difficult to measure airflow and static pressure. In fact, the performance curve may vary greatly according to the type of measuring equiment.

The commonly-used type of measuring equipment is a wind tunnel using a Pitot tube. SANYO DENKI uses a very precise method using double chamber equipped with many nozzles.



Double chamber measuring equipment

$Q = 60A\bar{v}$ (A)

where

Q = airflow (m^3/min)

A = cross sectional area of nozzle $= \frac{\pi}{4}D^2$ (m^2)

D = nozzle diameter

$\bar{v}$ = average airflow velocity of nozzle $= \sqrt{2g\frac{Pn}{\gamma}}$ (m/s)

γ = Specific weight of air = ρg (N/m^3)

(Air density ρ = 1.2 kg/m^3 at 20℃, 1 atm)

g = acceleration of gravity = 9.8 (m/s^2)

Pn = differential pressure (Pa)

Ps = static pressure (Pa)

The measuring equipment using double chanber is method to be calculated from airflow goes through nozzle and differential pressure between pressure of inside of chamber (Ps) and atomospheric pressure by measuring differetial pressure between air intake and exhaust of nozzle (Pn).

Conversion table DC AC

Static pressure

1mm H_2O=0.0394inch H_2O

1mm H_2O=9.8Pa (Pascal)

1inch H_2O=25.4mm H_2O

1Pa=0.102mm H_2O

1inch H_2O=249Pa

Airflow

1m^3/min=35.31ft^3/min (CFM)

1CFM=0.0283m^3/min

1m^3/min=16.67ℓ/s

1CFM=0.472ℓ/s

1ℓ/s=0.06m^3/min

Splash Proof Fan

Ingress protection ratings (IP code)

DC

■ IP Codes used by SANYO DENKI express the level of protection that internal electrical components (for fans: electrical components and motor coils) have against solid objects, water, and access to hazardous parts.
San Ace Splash Proof fans feature high protection levels.

Protected electrical components and motor coils

■ Definition of Ingress Protection (IP Code)
Ingress Protection (IP Code) is defined in IEC (International Electrotechnical Commission) 60529*
DEGREES OF PROTECTION PROVIDED BY ENCLOSURES (IP Code). *IEC 60529:2001

I P X X

Second digit: Protection against water

First digit: Protection against solid objects and access to hazardous parts

First digit	Definition
0	No protection
1	Protection against solid objects > 50 mm
2	Protection against solid objects > 12.5 mm
3	Protection against solid objects > 2.5 mm
4	Protection against solid objects > 1 mm
5	Protection against a level of dust that could hinder operation or impair safety
6	Complete protection against dust

Second digit	Definition
0	No protection
1	Protection against dripping water
2	Protection against water spray up to 15˚
3	Protection against spraying water
4	Protection against splashing water
5	Protection against low pressure water jets
6	Protection against high pressure water jets
7	Protection against temporary immersion in water
8	Protection against submersion in water

UPS, inverter, rectifier, high-voltage power supply, etc.

Cautions for Use of a Cooling Fan in the Vicinity of a Power Switching Circuit (prevention of electrolytic corrosion)

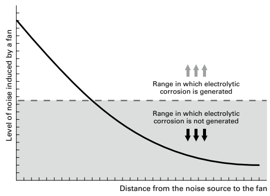
If a fan is installed near a large-power or high-voltage switching circuit, the heavy electromagnetic noise resulting from electromagnetic induction in such circuits or the influence of high-frequency noise imposed through the power line of the fan may induce current through the shaft bearing of the fan.Such current may damage the oil film on the bearing and even the friction surface of the bearing.This adverse effect is known as "electrolytic corrosion of the fan."Electrolytic corrosion affects the smooth revolution of the fan and may reduce its service life. An audible symptom is unusual noise emitted from the fan.This adverse effect is often observed and may partly be explained by the practice of mounting high-density parts, which reduces the gap between the switching circuits and the fan and the use of higher switching frequencies apt to provoke induction. Data processing/communications devices that operate at low voltages are not liable to electrolytic corrosion since they generate less electromagnetic noise.

A Case of electrolytic corrosion DC AC

Fans without anti-corrosion features installed near components that generate electromagnetic noise, such as inverter controllers, are liable to experience electrolytic corrosion.

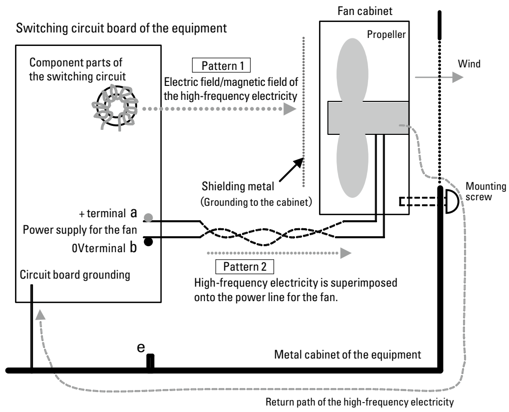
No.	Use	Period until the occurrence of unusual noise
1	Switching power supply	6 months to 2 years
2	UPS	6 months to 2 years
3	General-purpose inverter	1 to 1.5 years
4	Air cleaner	2 to 3 months
5	Inverter for LCDs	6 months

The curve shown in the graph below represents the relationship between the level of the electromagnetic noise induced by a fan and the distance from the fan to the noise source.



Occurrence of electrolytic corrosion Pattern 1

(1)The fan gets charged with high-frequency electricity by high-frequency noise (electric field/magnetic field) generated in the switching circuit.
(2)Because of high-frequency electricity charged in the fan, an electric current flows through the bearing of the fan.
(3)The electric current breaks the oil membrane on the surface of the bearing and the bearing gets abraded (electrolytically corroded).
(4)This symptom often occurs in equipment in which switching circuits are sped up and implemented in high density.
(5)Countermeasure 1: To provide a shield plate (Note 1) inside the fan (The plate should be such that does not interfere with airflow).
(6)Countermeasure 2: To use a fan with ceramic bearings.



Occurrence of electrolytic corrosion Pattern 2

(1)High-frequency electricity flows from the circuit board into the inside of the fan superimposed with the power line for the fan.
(2)High-frequency electricity that has entered into the fan flows through the bearing.
(3)Oil membrane on the surface of the bearing gets broken and the bearing gets abraded (electrolytically corroded).
(4)Countermeasure 1: To remove high-frequency component between terminals "a" and "b", "a" and "e" and "b" and "e" of the power supply for the fan, or to insert a filter (Note 2) into the power line for the fan.
(5)Countermeasure 2: To use a fan with ceramic bearings
(6)Cables should be twisted in order to decrease induction to the power line for the fan.

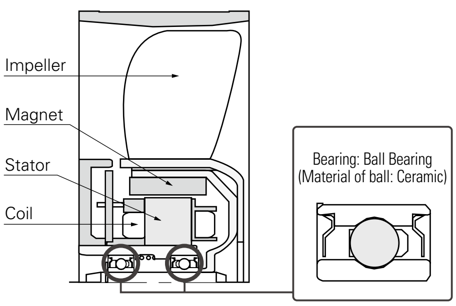
Note 1 : Shielding metal plate
As an electromagnetic shield metal, "EMC Guard" is available from our company. http://www.sanyodenki.co.jp/product/newfan/indexf.html
Certain shielding effect can be expected from mounting a general-purpose finger guard inside the fan. In each case, grounding to the cabinet is required.
Note2 : Filter
Insert a common mode filter when the high-frequency electricity is superimposed on both lines "a" and "b" in the same phase and, if not, insert a normal mode filter.

Measures against electrolytic corrosion DC AC

- Relocate fans far from all electromagnetic noise sources.
- Attach an EMC guard to ordinary fans. This should have an effect on electromagnetic noise due to radiation.
- As a power supply, the fan is wired from a circuit for which noise is not superimposed.
- Against heavy electromagnetic noise (electromagnetic induction) and conductive noise from the power supply line for a fan, we recommend the use of an "Electrolytic corrosion proof fan" with ceramic bearing.

This cooling fan prevents electrolytic corrosion of bearings even under conditions where electromagnetic noise is generated.
Electrolytic corrosion of ball bearings is prevented by using ceramic balls in ball bearings. The ceramic material is an insulating material.
Manufacturable to meet specifications of all San Ace series fans.

■Component Diagram



Caution

Electrolytic Corrosion Proof Fan has been designed to prevent the electrolytic corrosion of ball bearings in the fan, but this does not guarantee that the fan will operate normally under conditions where there is strong electromagnetic noise.
Please be sure to fully evaluate the value of fan malfunction due to noise in advance.

Specifications for DC Fan Sensors

Pulse sensor (Tach output type) example **DC**

Pulse sensor outputs two pulse waves per revolution of fan, and it is good to detect fan speed. Pulse sensors can be incorporated in all kinds of DC fans.

* Noise from inside the fan or from external devices may effect sensor output.

Contact us for more information.

The specifications listed below are for the 9G1212H101 model, and vary with the model number used. Please contact your point of sale for details.

Output circuit

Open collector

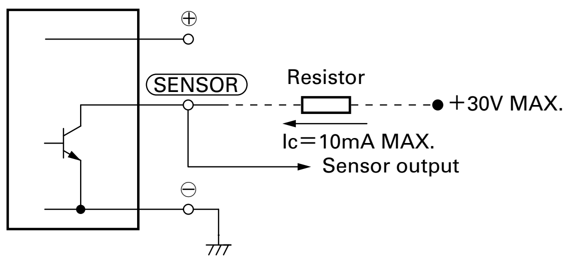
Specifications

V_{CE}=+30V MAX.

(For a 48V-rated fan:Vce=+60V MAX.)

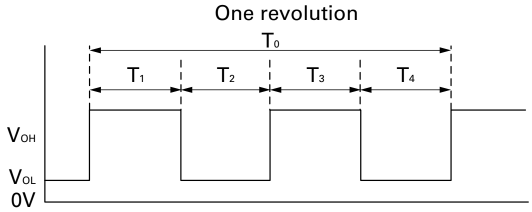
Ic=10mA MAX. [Vol=Vce (SAT) =0.4V or less]

Inside of DC fan



Output waveform (Need pull-up resistor)

In case of steady running



$T_{1 \text{ to } 4} \fallingdotseq (1/4)T_0$

$T_{1 \text{ to } 4} \fallingdotseq (1/4)T_0 = 60/4N(s)$

N=Fan speed(min^{-1})

* If you want detailed specifications that apply when the rotor is locked, please contact SANYO DENKI.

Locked rotor sensor (rotation/lock detection type) example **DC**

Locked rotor sensor outputs fan status signals. It is good to check whether the fan is running or locked

* Noise from inside the fan or from external devices may effect sensor output.
* Regarding details of the reverse logic and specifications of lock sensor output signals, please contact SANYO DENKI.
* Lock sensor can not be used in some models. Contact us for more information.

The specifications listed below are for the 9G1212H1D01 model, and vary with the model number used. Please contact your point of sale for details.

Output circuit

Open collector

Specifications

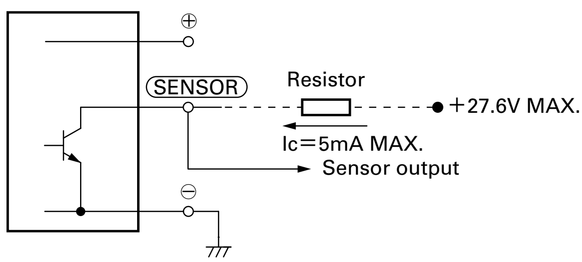
V_{CE}=+27.6V MAX.

For a 48V fan V_{CE} =+60V MAX.

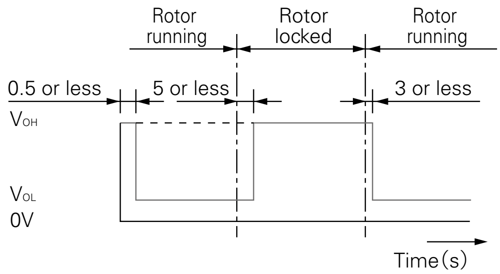
Ic=5mA MAX. [V_{OL}=V_{CE} (SAT) =0.6V or less]

For a 48V fan:V_{CE} (SAT) =0.4V or less

Inside of DC fan



Output waveform (Need pull-up resistor)



Note: The output is completely at Vol with 0.5s or less after power-up.

Low-speed sensor (rotating speed detection type) example DC

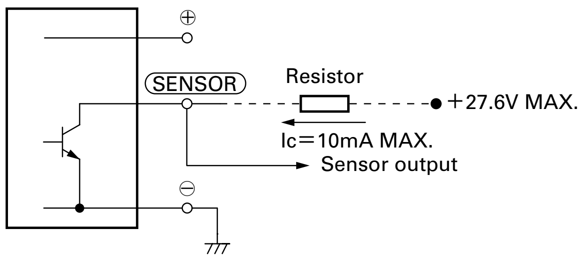
Low-speed sensor outputs a signal when fan speed goes down to trip point or less. It is good to detect cooling degradation of fan.
*Noise from inside the fan or from external devices may effect sensor output, please.
*If you want detailed specification and reverse signal output,please contact SANYO DENKI.
*Low-speed sensors can not be used in some models. Contact us for more information.

The specifications listed below are for the 9G1212H1H01 model, and vary with the model number used. Please contact your point of sale for details.

Output circuit

Open collector

Inside of DC fan

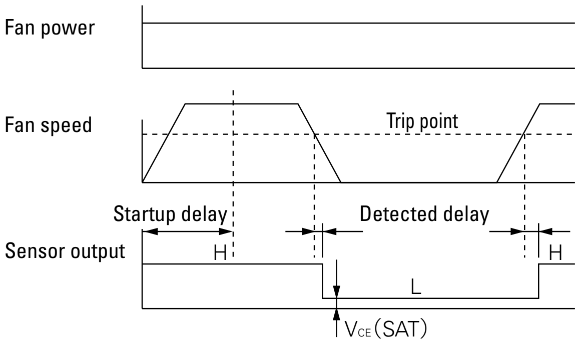


Specifications

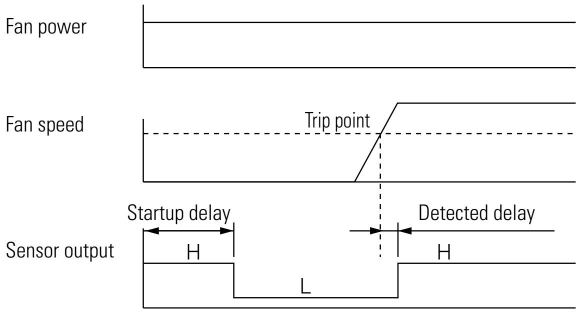
V_{CE}=27.6V MAX.
Ic=10mA MAX. [V_{OL}=V_{CE} (SAT) =0.5V or less]

Sensor scheme

Example 1: In case steady running



Example 2: In case that the rotor is locked when the fan motor is turned on and released after the start-up delay time.



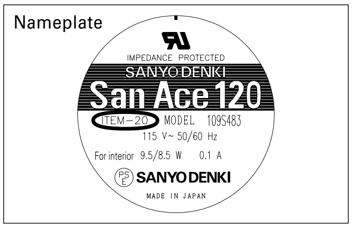
Specifications for AC Fan Sensor

ACDC fan sensor specifications differ from those below. Please refer to each product page.

Specifications of sensor circuit AC

	5V (ITEM-20*)	12V (ITEM-30*)
Example of model.no	109S405UL	
System	Speed detection, Auto-restart, Open collector	
Power supply	DC5V±10% At 5V, 6mA	DC12V±20% At 12V, 10mA
Recommend sensor circuit output	At Vp=5V, I=100mA MAX.	At Vp=12V, I=200mA MAX.
Trip point	Standard speed : 1,700min^{-1}±10% Low speed : 850min^{-1}±10%	
Response speed	Standard speed : Startup delay 18s Detection delay 1s Low speed : Startup delay 36s Detection delay 2s	
Insulation resistance	10 MΩ MIN. at a 500V DC megger (Note)	
Dielectric strength	50/60 Hz, 1,000V AC, 1 minute (Note)	
Ambient conditions	Temperature: −10 to +60℃ , humidity: 90%RH MAX. (at 40℃)	

Nameplate

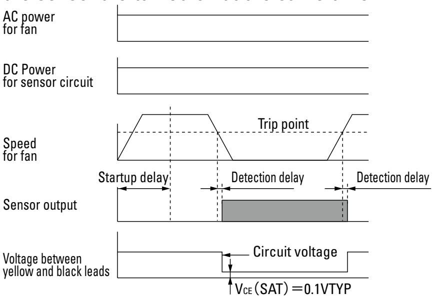


*[ITEM-20] and [ITEM-30] are printed on the fan nameplate.

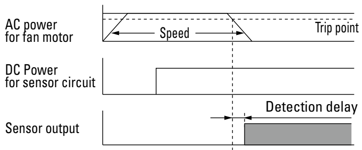
Note: Between one end that all sensor leads consisting of brown, yellow and black are tied together and the G terminal or power terminal of the fan.

Sensor scheme

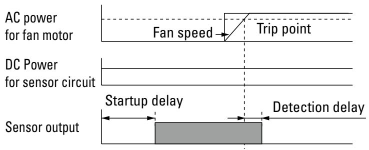
Example 1: When the AC power for the fan and the DC power for the sensor are turned on at the same time



Example 2: When the AC power for the fan is turned on first, then the DC power for sensor is powered on

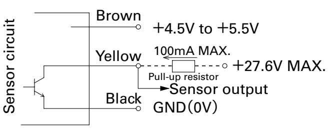


Example 3: When the DC power for sensor is first powered on, then the AC power for the fan is turned on

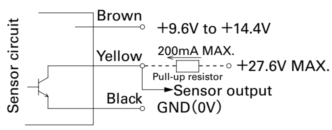


Sensor output circuit

5V (ITEM-20*)



12V (ITEM-30*)



GND (Black) should be shared in case that power supply for sensor circuit (Brown) and that for sensor pull-up (Yellow) are separated.

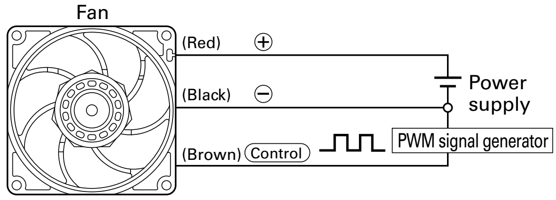
Fans with PWM Control Function

PWM control function

DC

1. Overview

Pulse Width Modulation (PWM) control function enables you to externally control the speed of the fan by varying the duty cycles of PWM input signals between control and grounding terminals.
It allows fans to operate optimally in response to the device's heat level, lowering the noise and power consumption of the system.



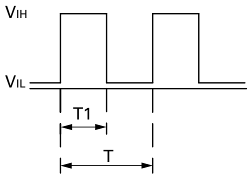
PWM control function has the following advantages:

(1) Because the PWM signal is digitally input, precise control is possible.
(2) Because the PWM signal is digitally input, multiple fans can be controlled.
(3) Upon users request, how the fan speed responds to PWM signals can be customized. For example, fan can be set to stop or run at low speed at 0% PWM duty cycle.

2. PWM duty input signals and wiring diagram

Other than a TTL input, an open collector/drain input can be used for PWM signal input.
Be noted that if an open collector/drain input is used or applied an input voltage and frequency is out of specified range, how the fan speed responds to the PWM duty cycle may be altered.
The input signal voltage and the frequency differ with models. Please contact us for details.

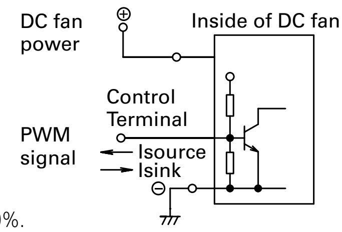
■Example of input signal (TTL input)



V_{IH}=4.75V to 5.25V
V_{IL}=0V to 0.4V
PWM duty cycle (%) = $\frac{T1}{T}$ x 100
PWM frequency 25 (kHz) = $\frac{1}{T}$

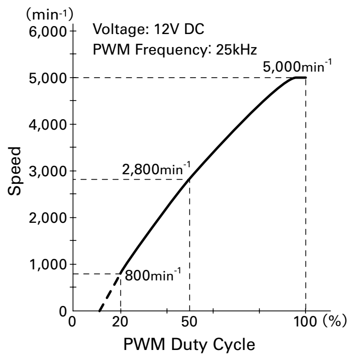
Current source (Isource) = 1 mA max.(when control voltage is 0 V)
Current sink (Isink) = 1 mA max.(when control voltage is 5.25 V)
Control terminal voltage = 5.25 V max. (when control terminal is open)
When the control terminal is open, fan speed is the same as when PWM duty cycle is 100%.

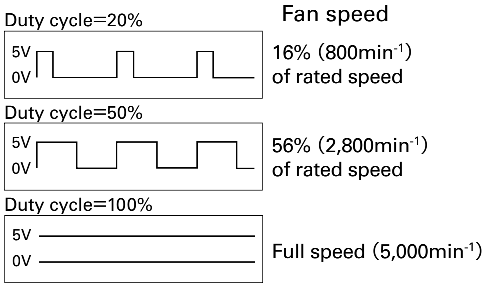
■Wiring example



3. PWM duty cycle – Speed characteristics

Fan speed of PWM control fans change, as the below performance curve shows, in response to the PWM duty cycle input.
If necessary, users can do the speed setting by themselves, making the fans operate at the optimum speed.
Also, upon user's request, how fan speed responds to a PWM signal can be customized so that the fan stops or runs at low speed for a certain PWM duty cycle input. The below performance curve is for a fan that stops at 0% PWM duty cycle. Specifications differ with models. Please contact us for details.





The dotted part of the performance curve (area below 20% PWM duty cycle in the above case) indicates the fan speed is unstable in the area.

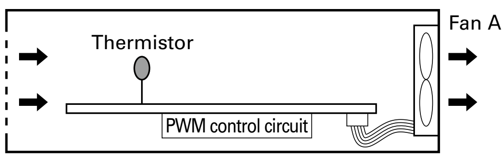
4. When you wish to obtain a fan performance with 100 or 0% PWM duty cycle without a PWM signal generator for built-in test.

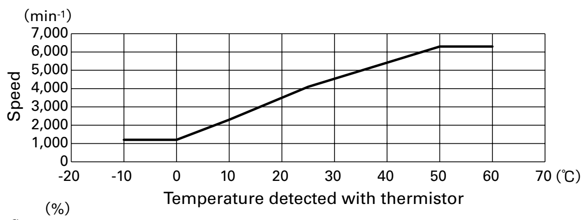
Performance at 100% PWM duty cycle: Leave the control lead wire open and no connection.
Performance at 0% PWM duty cycle: Connect the control lead wire directly to ⊖ pin.

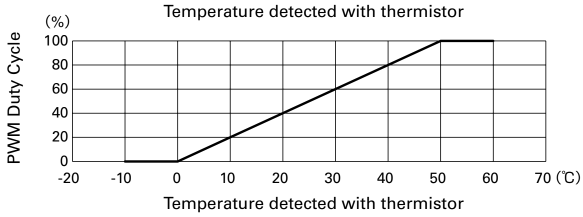
5. Application examples of PWM control fan

Here are a few application examples of PWM control fan.

(1) This system controls the fan speed in response to changing device temperature.
By combining a PWM control circuit and thermistor that detects temperature of device and its parts, it is able to control the fan speed of PWM control fan in response to the changing temperature.



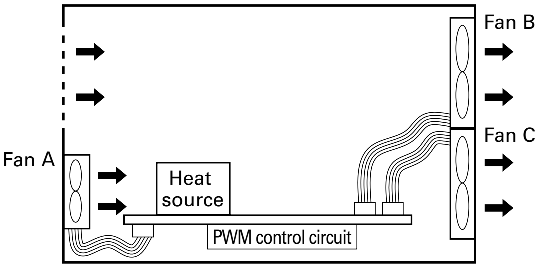




(2) Simultaneous control of multiple fans

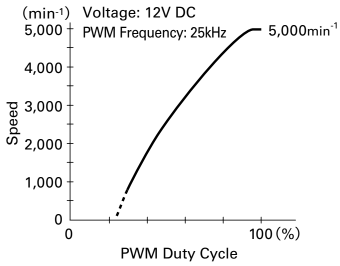
Because PWM control is done with digital signal inputs, regardless of fan types or input voltage, multiple fans can be controlled simultaneously.

Below figure shows a system that can control multiple fans with various PWM characteristics simultaneously. Such systems contribute to the low power consumption and noise.

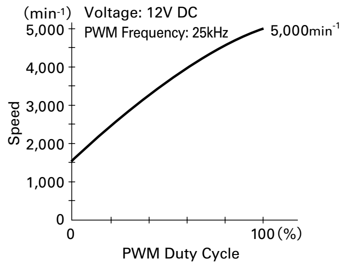


Operation mode	PWM Duty	Fan A	Fan B, C
Full-power	100%	5,000min^{-1}	5,000min^{-1}
Normal	60%	3,500min^{-1}	4,000min^{-1}
Standby (eco mode)	0%	Stop	1,500min^{-1}

Fan A
(model that stops at 0% PWM duty cycle)



Fan B, C
(model that runs at low speed at 0% PWM duty cycle)



Controlling device that easily regulates the rotational speed of PWM control fans function DC

San Ace PWM Controller

■Features

Reduces system power consumption and fan noise

For PWM fan speed control, a PWM control circuit needs to be newly designed and configured.

By using this product, however, PWM control function fans can be fully utilized without the need for preparing new circuits, contributing to reducing the system power consumption and the fan noise.

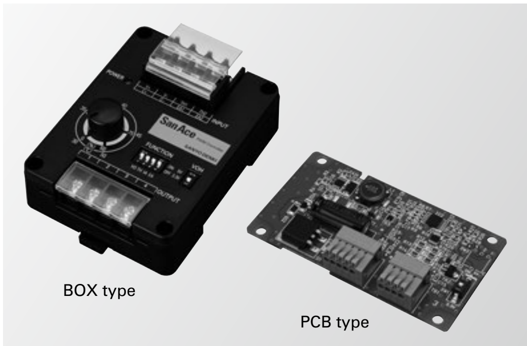
Can be common-powered by the fan power supply

The controller can be powered by the fan power supply of rated voltage 12, 24, and 48 VDC, and no separate supply is required.

Maximum of four fans connectable

Up to four fans with PWM control function can be connected and controlled.

Please refer to page 457 for detail.



Operating Precautions DC AC

Temperature conditions

Operating temperature: Refer to the specifications table for each model.

Storage temperature: −20℃ to +70℃／−30℃ to +70℃ (Varies for each model / Non condensing)

※Rapid change in temperature may cause condensation. Prevent condensation when storing. Condensation may affect lubrication performance and insulation.

Power specifications

For the specification of rated voltage and voltage range, please check the catalog or drawing for the model number.

Use of voltage exceeding the specified range may lead to performance degradation, device failure, or fire hazards. Do not apply voltage that exceeds specifications to the fan.

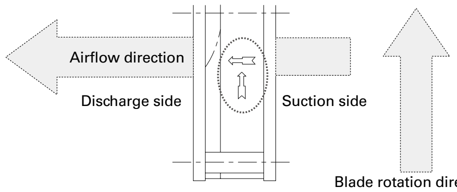
An electronic circuit is used for the DC fan.For power supply, use power with ripple less than 5% with low line noise and surge to prevent electronic circuit trouble.

Handling precautions

The fan motor is equipped with a precision ball bearing. Therefore, please handle the motors carefully in order not to shock the bearings.

Installation tips

There are no limitations on the installation direction of fans or blowers. Fans have symbols on the fan indicating the airflow direction and blade rotation direction. When installing, use these symbols to check the airflow direction.



Symbols indicating the fan airflow direction and blade rotation direction

Recommended screw torque

This shows the recommended values for the screw torque when installing the fans. If the tightening torque is higher than the recommended values, the fan can be deformed or damaged.

Use care when tightening. Also, be sure to always use a fan with a ribbed structure when securing by screws with both flanges.

DC fan

Fan mounting hole diameter [mm]	Nominal screw diameter	Recommended screw torque
ϕ3.5	M3	0.44N･m MAX.
ϕ4.3, ϕ4.5	M4	0.78N･m MAX.
ϕ4.3, ϕ4.5	M4	0.98N･m MAX.（ϕ172mm×51mm, ϕ172mm×150mm×51mm, ϕ200×70mm）

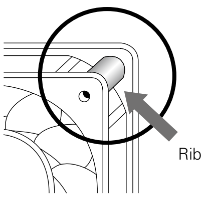
AC fan

Fan mounting hole diameter [mm]	Nominal screw diameter	Recommended screw torque
ϕ3.5, ϕ3.7	M3	0.44N･m MAX.
ϕ4.3	M4	0.58N･m MAX.（120mm×120mm MAX.）
ϕ4.3	M4	0.78N･m MAX.（ACDC fan, ϕ172mm）
ϕ5.5	M4, M5	0.78N･m MAX.（160mm×160mm）

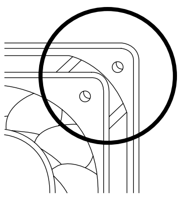
Comparison of ribbed and ribless structures

Regarding plastic frame, we have a option ribbed and ribless about mounting. Please use preferred type up to your application. Please use ribbed fan in case that you hook fan up clamping either side fan mounting hole target. (According to the model, only models with or without ribs are available.)

*Use a fan with a rib structure when securing by screws with both flanges.

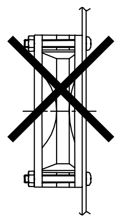


Ribbed

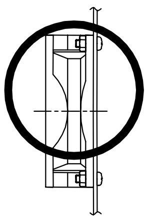


Ribless

· When securing screws to ribless plastic frame models, use a flange to secure on one side.



Securing with flanges on both sides



Securing with a flange on one side

Fan Mounting Using Self-tapping Screw DC

Installing self-tapping screws into the plastic frame of the fan may split or deform it.
If using self-tapping screws, use screws that are recommended by our company, and refer to our recommended tightening torques and recommended pilot hole shapes. Pay close attention to the operating precautions and fully understand your equipment before you use it.

Recommended screw torques

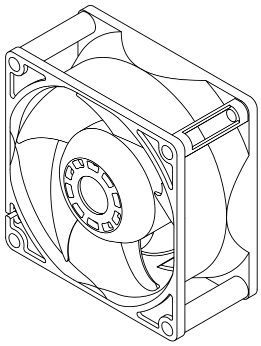


Fig. A: Ribbed fan

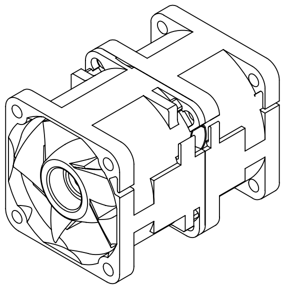


Fig. B: Counter rotating fan

	Recommended screw torque [N·m]	Fan mounting hole diameter [mm]
Ribbed fan (Fig. A)	0.8 Max.	ϕ3.5, ϕ4.3, ϕ4.5
Counter rotating fan (Fig. B)	0.6 Max.	

Do not use self-tapping screws in the following cases:

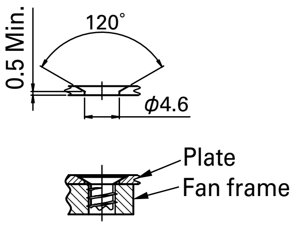
- For ribless fans (except for counter rotating fans)
- When mounting finger guards on fans

Using self-tapping screws could deform or split the frame. Please use regular screws.

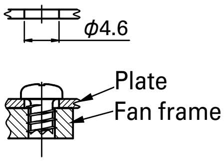
Recommended pilot hole shape

[For nominal diameter 4mm]

Self-tapping screw model No.
SY-NS020412P11



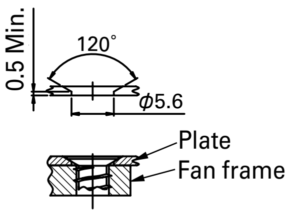
Self-tapping screw model No.
SY-NS010412P11



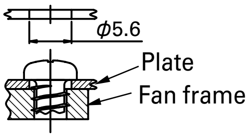
Minimum mounting plate thickness: T=1.2mm

[For nominal diameters of 4.8mm and 5mm]

Self-tapping screw model No.
SY-NS024812P15
SY-NS020512P15



Self-tapping screw model No.
SY-NS014812P15
SY-NS010512P15



Minimum mounting plate thickness: T=1.2mm

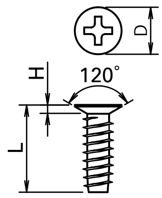
Recommended self-tapping screws

- Material: Steel
- Plating: Trivalent chromating plating

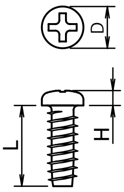
unit : mm

Fan mounting hole diameter	Self-tapping screw model No.	Nominal screw diameter	Length [L]	Head shape	Flat-head/pan-head dimensions: Head diameter [D]	Height of head [H]	Cross recess No.
ϕ3.5	SY-NS020412P11	4	12	Flat	6.2	1.1 Max.	2
	SY-NS010412P11	4	12	Pan	5.5	2.0	2
ϕ4.3	SY-NS024812P15	4.8	12	Flat	6.8	1.2 Max.	2
	SY-NS014812P15	4.8	12	Pan	7.0	2.6	2
ϕ4.5	SY-NS020512P15	5	12	Flat	6.8	1.2 Max.	2
	SY-NS010512P15	5	12	Pan	7.0	2.6	2

Head shape: Flat

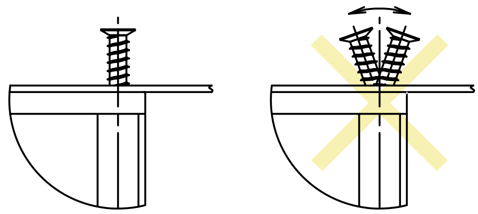


Head shape: Pan



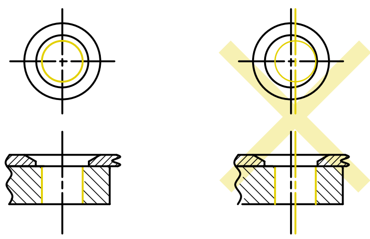
Operating precautions

- Place the self-tapping screw so that it is vertical and centered with the frame mounting hole (Fig. A) and then screw it in. The self-tapping screw could deform or split the frame if you screw it into the frame when the screw is not vertical.
- Screw in the self-tapping screw with the center of the mounting hole on the fan and the center of the pilot hole on the mounting plate aligned (Fig. B). Misaligned holes could lead to the frame being deformed or split.



Vertically placed screw   Inclined screw

Fig. A



Aligned and centered holes   Misaligned holes

Fig. B

- Tightening the screw beyond the recommended screw torque could deform or split the frame.
- With flat-head screws, failure to use the recommended pilot hole shape will cause interference between the flat-head screw and fan frame which could split the frame.

Recommended screw manufacturer

To purchase the screws, please contact the screw manufacturer directly.

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