

High Air Flow and High Static Pressure Centrifugal Fan "San Ace C133" TJ Type

Haruhisa Maruyama

Takahisa Toda

Tomoaki Ikeda

1. Introduction

In recent years, the market has seen a rapid increase in products that are made with consideration to the natural environment. One of the most important topics is energy conservation for products. In order to solve this problem, there has been an increase in demand for low power consumption and low SPL while maintaining cooling performance for the fan being used.

This document introduces the features and abilities of the high air flow and high static pressure centrifugal fan "San Ace C133" TJ type fan that was developed in order to meet these needs.

2. Background of the Development

In recent years, the customer products in the market have moved towards small size, high performance, and low power consumption. Therefore, fans that are high performance, low power consumption, and low SPL are essential.

We have previously developed axial fans and blowers to meet these demands. However, there were applications for the fans where the axial fans and blowers could not meet the demands.

Needing to meet these market needs, we began development of high air flow and high static pressure centrifugal fan and developed the "San Ace C133" TJ type for these situations.

3. Product Features

Fig. 1 shows a photograph of the "San Ace C133" TJ type fan.



Fig. 1: "San Ace C133" TJ type

The features of this new model are as follows:

- (1) High air flow and high static pressure
- (2) Low power consumption, low SPL
- (3) PWM speed control function
- (4) Wide voltage range

The blade and frame were newly developed for the "San Ace C133" TJ type (referred to below as the new model) in order to achieve high air flow and high static pressure.

4. Product Overview

4.1 Dimensions

Fig. 2 shows the dimensions of the new model. Furthermore, Fig. 3 shows the dimensions of the inlet

Table 1: "San Ace C133" TJ type general characteristics

Model No.	Rated voltage [V]	Operating voltage range [V]	PWM duty cycle [%]	Rated current [A]	Rated input [W]	Rated speed [min ⁻¹]	Max. air flow		Max. static pressure		Sound pressure level [dB(A)]
							[m ³ /min]	[CFM]	[Pa]	[inchH ₂ O]	
9TJ48P0H01	48	36 to 72	100	0.55	26.4	4150	6.39	226	395	1.59	61

nozzle for the new model (model number: 109-1069).

The inlet nozzle is a nozzle installed to the intake of the fan in order to adjust the flow of intake air.

Fig. 4 shows an example of installation for the new model, while Fig. 5 shows the installation dimensions. The new model uses four M4 screws for installation, while the inlet nozzle uses four M4 screws and four nuts.

4.2 Characteristics

4.2.1 General characteristics

Table 1 shows the general characteristics for the new model.

For the characteristics of the centrifugal fan, the standard characteristic value is the value obtained with the inlet nozzle attached (attached conditions: refer to Fig. 4 and Fig. 5).

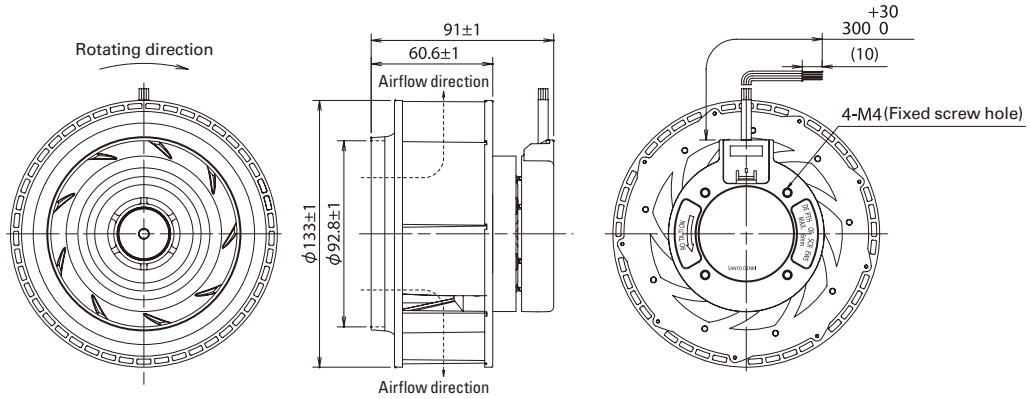


Fig. 2: "San Ace C133" TJ type dimensions (unit: mm)

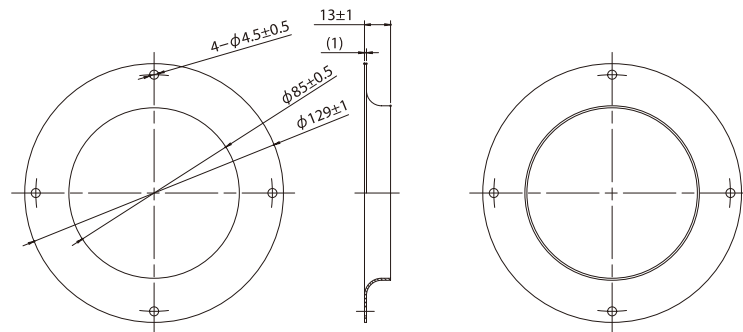


Fig. 3: Inlet nozzle for "San Ace C133" TJ type dimensions (unit: mm)

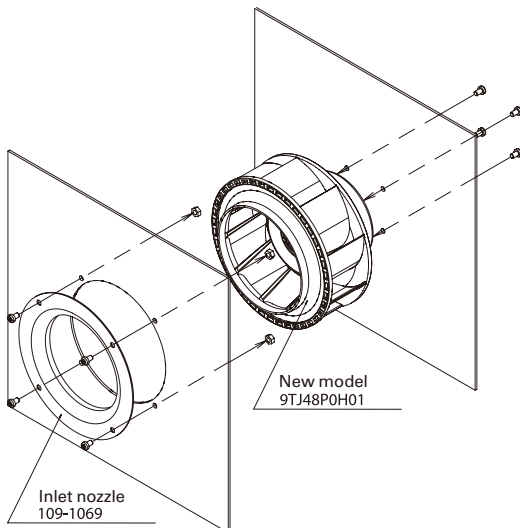


Fig. 4: Example of installation for "San Ace C133" TJ type

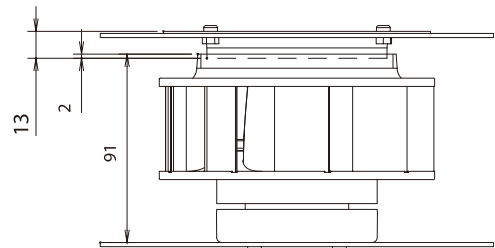


Fig. 5: "San Ace C133" TJ type mounting dimensions (unit: mm)

4.2.2 Air flow vs. static pressure characteristics

Fig. 6 shows the air flow versus static pressure characteristics for the new model.

4.2.3 PWM speed control function

The new model has a PWM control function that controls the fan rotating speed from an external source. This function controls the speed of the fan depending on the heat from the customer's equipment so that the fan is not

always used at full speed. In this way, the function realizes reduction of power consumption and SPL for the entire device.

Fig. 7 shows PWM duty versus speed for the new model.

4.2.4 Wide voltage range

The rated voltage for the new model is 48 VDC.

The operating voltage range is a wide range from 36 to 72 V in order to support a variety of devices.

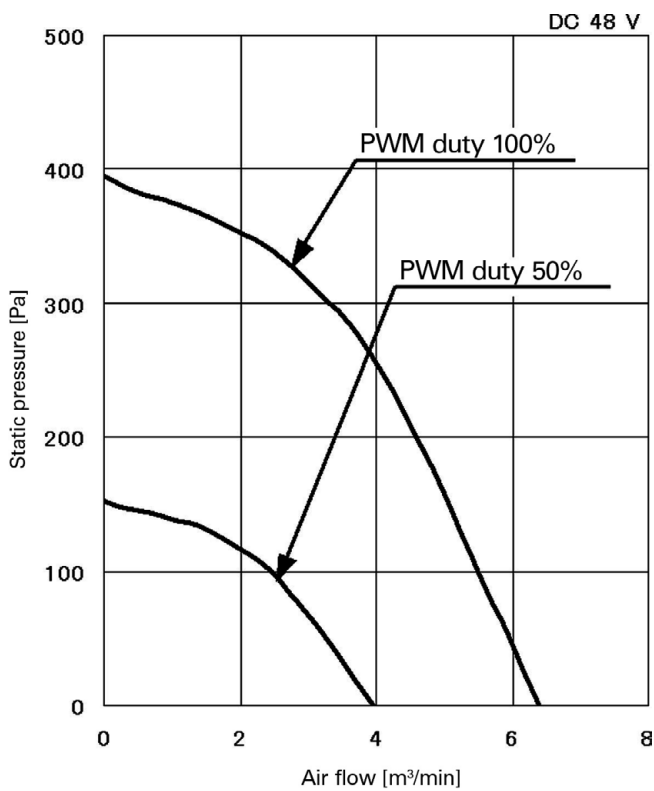


Fig. 6: Air flow vs. static pressure

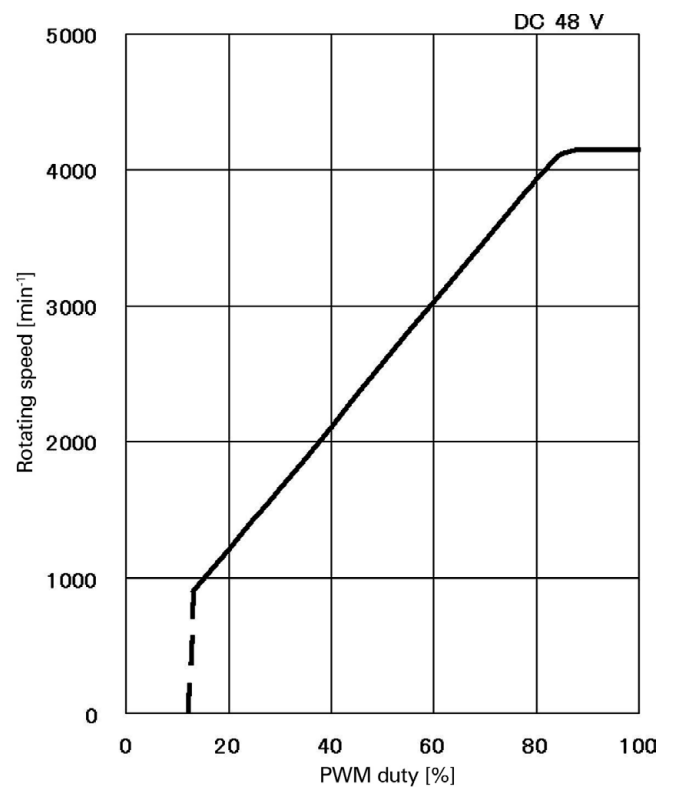


Fig. 7: PWM duty vs. rotating speed

4.3 Expected life

The new model has an expected life of 40,000 hours at 60°C (survival rate of 90% with continuous operation at the rated voltage under free air conditions and at normal humidity).

5. Comparison with the Axial Fan

By optimizing the blade shape and the motor drive circuit, the new model achieves high air flow, high static pressure, and low power consumption.

This section compares the new model with an axial fan of the same volume and verifies difference of air flow versus static pressure, power consumption, and sound pressure level from the new model.

The below introduces the differences between the newly developed "San Ace C133" TJ type (9TJ48P0H01) and the axial fan "San Ace 172" SG type (9SG48P5H01).

5.1 Comparison of air flow versus static pressure

Fig. 8 shows the air flow versus static pressure at free air with a sound pressure level of 61 dB(A).

Assuming that the equipment has system impedance as shown in Fig. 8, the axial flow fan is operated at operation point A, and the new model is operated at operation point B

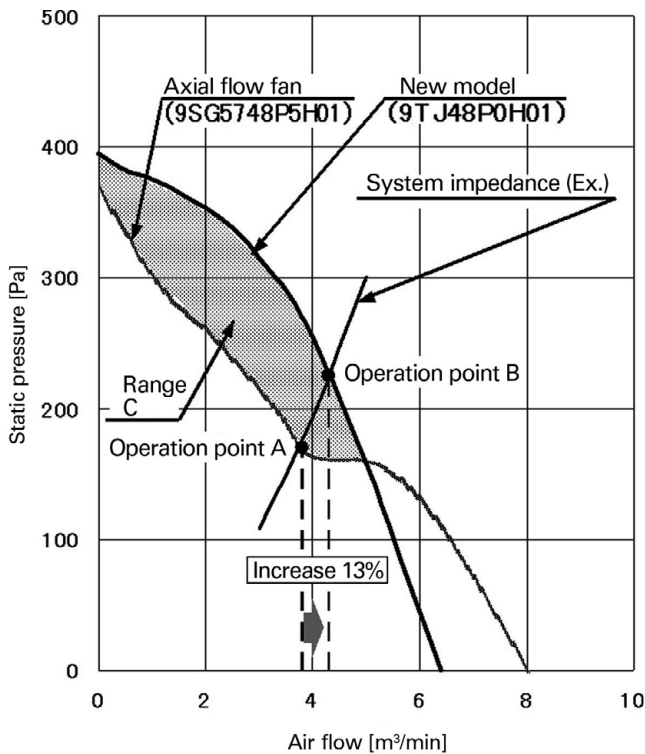


Fig. 8: Comparison of air flow vs. static pressure (At the same sound pressure level 61 dB(A))

B. In this figure, the air flow at operation point A for the axial fan is 3.8 m³/min, but the air flow at operation point B for the new model is 4.29 m³/min, which is approximately a 13% increase in operation flow with the same system impedance.

5.2 Comparison of power consumption and sound pressure level

Fig. 9 shows a comparison of the power consumption and sound pressure level at the operation points for both fans, assuming the system impedance shown in Fig. 8.

The power consumption for the new model is reduced 9% compared to the axial flow fan. The sound pressure level for the new model is reduced 9 dB(A) compared to the axial flow fan.

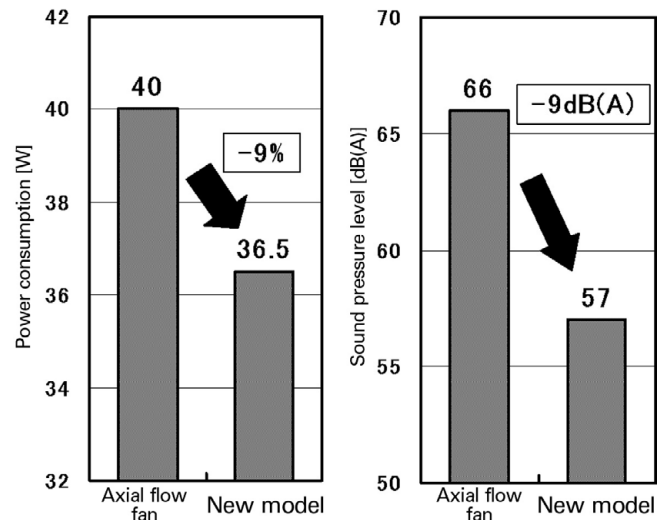


Fig. 9: Comparison of power consumption and sound pressure level

5.3 Features that support high system impedance

The new model has improved air flow versus static pressure characteristics compared to the axial flow fan over the range C shown in Fig. 8.

However, the flow of air is different for a centrifugal fan and an axial fan, and therefore we need to determine which to use depending on the restrictions on the flow channel for the included equipment and thoughts on the flow channel design.

For actual equipment cooling, the flow of the air may affect the cooling performance, and therefore this must be kept in mind during the design.

Fig. 10 shows an image of the air flow for both the new model and the axial flow fan.

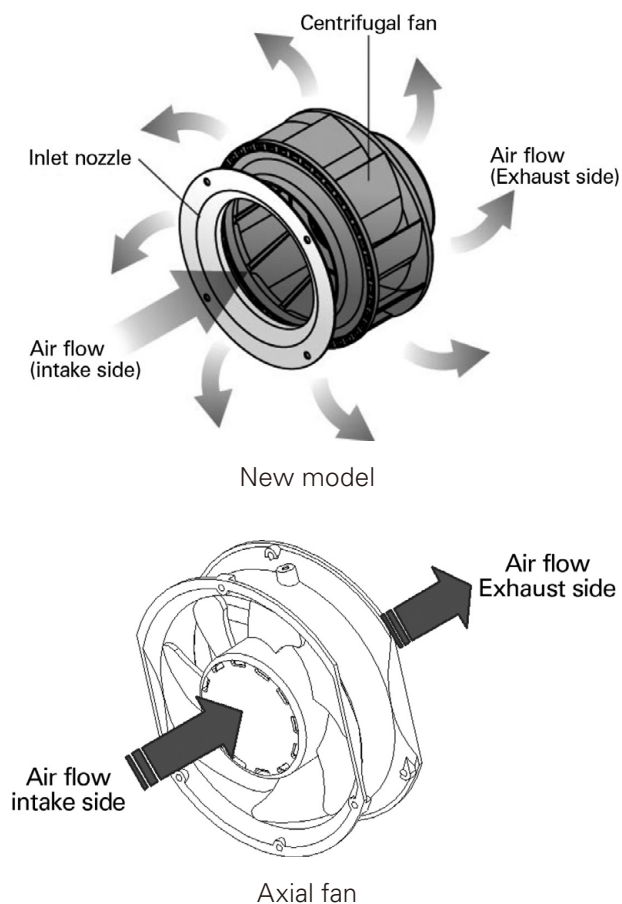


Fig. 10: Air flow with the new model and axial fan

6. Conclusion

This document introduced some of features and abilities of the newly developed centrifugal fan “San Ace C133” TJ type fan.

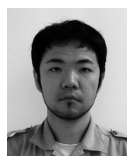
By optimizing the blade shape and the motor drive circuit, the new model achieves high air flow, high static pressure, low power consumption, and low SPL. It has the top performance in the industry for centrifugal fans of the same size.

For information systems and devices related to heat exchangers, mounting density will continue to become higher and the heat density is expected to increase even further.

Furthermore, we predict that more products will be produced with attention paid to environmental issues and that the demands for low power consumption and low noise will continue to grow.

The new model has features that make it effective for high cool, low power consumption, and low SPL, allowing it to contribute greatly to solving these problems.

In the future, we plan to expand the centrifugal fan lineup based on the new model in order to meet all of the market needs.



Haruhisa Maruyama

Joined Sanyo Denki in 1997.
Cooling Systems Division, Design Dept.
Worked on the development and design of cooling fans.



Takahisa Toda

Joined Sanyo Denki in 1997.
Cooling Systems Division, Design Dept.
Worked on the development and design of cooling fans.



Tomoaki Ikeda

Joined Sanyo Denki in 1990.
Cooling Systems Division, Design Dept.
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