

Low Power Consumption Fan “San Ace 38” 9GA Type

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1. Introduction

Information devices such as servers, storage and communication devices have to process significantly large volumes of data and be capable of high speed processing. Due to this, these devices become high-density and the calorific value is increasing.

Because of escalating power cost and heightening environmental awareness, etc., reduction of equipment power consumption is an important issue.

Due to this situation, cooling fans used in information devices should have high static pressure and low power consumption.

Here we introduce features and performance of low power consumption “San Ace 38” 9GA type fan that was developed to meet market needs.

2. Background of the Development

We have previously developed 38 mm sq., 28 mm thick DC cooling fan “San Ace 38” 9GV type.

However, due to the high-density of equipment, required operational range tends to shift to high static pressure side. Moreover, due to the shift towards energy-saving equipment, fan needs to be further low power consumption.

In order to meet these demands, Sanyo Denki has developed low power consumption 38 mm sq. 28 mm thick “San Ace 38” 9GA type, that achieves high static pressure and low power consumption.

3. Product Features

Fig. 1 shows photograph of the “San Ace 38” 9GA type fan (hereinafter “new model”).

The features of the developed product are as follows:

- (1) Low power consumption
- (2) High static pressure
- (3) PWM control function

With new impeller/frame design and optimization of motor, new model achieves low power consumption and high static pressure while maintaining compatibility with conventional model.



Fig. 1: “San Ace 38” 9GA type

4. Product Overview

4.1 Dimensions

Fig. 2 shows dimensions of the new model. The fan size maintains compatibility with installation dimensions of conventional model.

4.2 Characteristics

4.2.1 General characteristics

There are three types of products with rated voltage of 12 V DC and rated speed of 19,000 min⁻¹ (G speed), 23,500 min⁻¹ (J speed), and 25,000 min⁻¹ (K speed).

Table 1 shows general characteristics for new model.

4.2.2 Air flow vs. static pressure characteristics

Fig. 3 shows air flow versus static pressure characteristics for new model.

4.2.3 PWM control function

The new model has PWM control function that controls fan speed from an external source.

The demand for cooling fans with PWM speed control function has become extremely large in recent years. By controlling speed of cooling fan depending on heat

generation of equipment instead of always running fan at full speed, the equipment as a whole can achieve lower power consumption and noise.

Fig. 4 shows air flow versus static pressure at individual PWM duty regarding new model 9GA0312P3K001.

4.3 Expected life

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

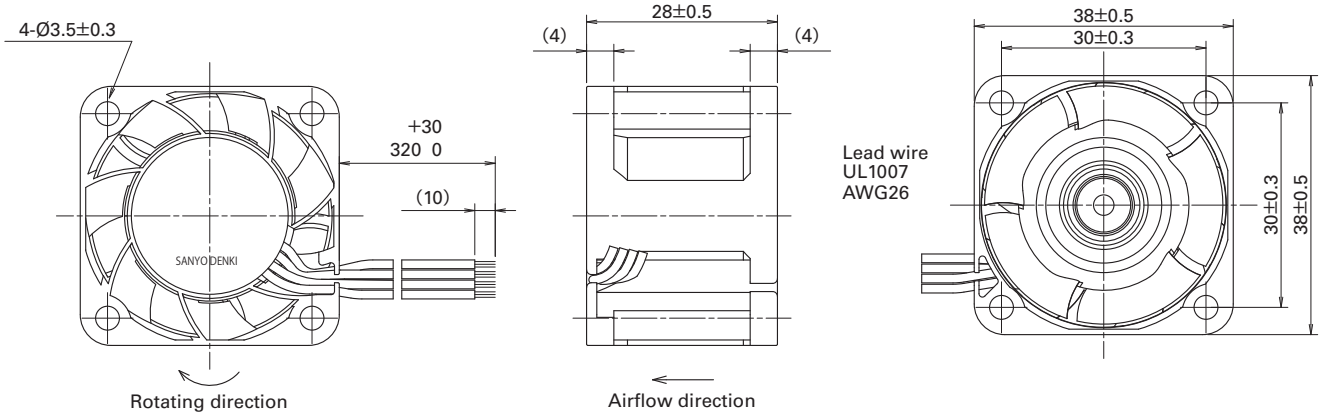


Fig. 2: Dimensions of new model (unit: mm)

Table 1: General characteristics for new model

Model No.	Rated voltage [V]	Operating voltage [V]	PWM duty cycle [%]	Rated current [A]	Rated input [W]	Rated speed [min ⁻¹]	Max. air flow		Max. static pressure		SPL [dB(A)]	Operating temperature [°C]	Expected life ^(Note1) [h]
							[m ³ /min]	[CFM]	(Pa)	[inchH ₂ O]			
9GA0312P3K001	12	10.8 to 13.2	100	0.62	7.4	25000	0.60	21.2	800	3.21	59.0	-10 to +70	40,000/60°C (70,000/40°C)
			0	0.06	0.7	3000	0.07	2.5	11	0.04	15.0		
9GA0312P3J001			100	0.52	6.2	23500	0.57	20.1	720	2.89	57.5		
			0	0.06	0.7	3000	0.07	2.5	11	0.04	15.0		
9GA0312P3G001			100	0.33	4.0	19000	0.45	15.9	460	1.85	53.0		
			0	0.06	0.7	3000	0.07	2.5	11	0.04	15.0		

Note 1: The expected life is a reference value when ambient temperature is 40°C.

*Input PWM frequency: 25 kHz

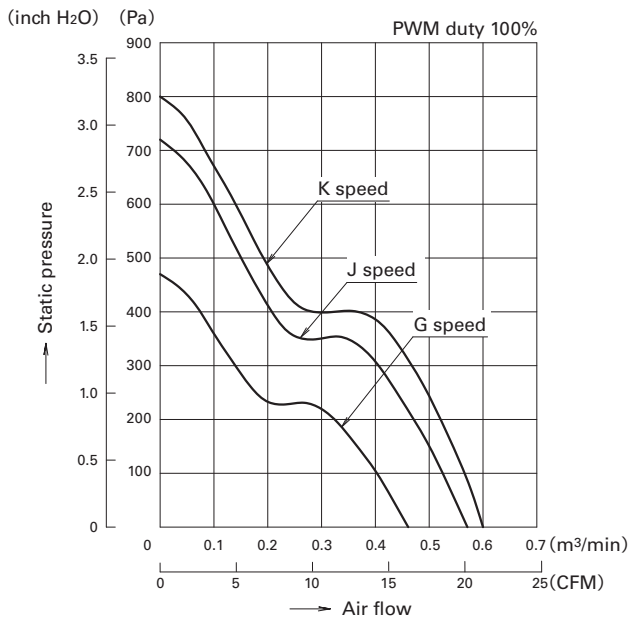


Fig. 3: Air flow vs. static pressure characteristics of new model

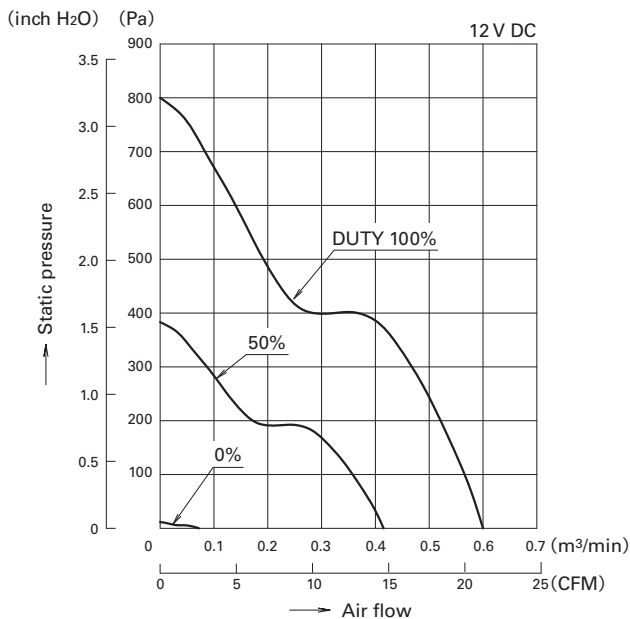


Fig. 4: Air flow vs. static pressure characteristics at individual PWM duty cycle (9GA0312P3K001)

5. Comparison with Conventional Model

The new model has newly designed blade and frame, and optimized motor in order to achieve low power consumption and high static pressure.

Here we introduce key things for the development of new model as well as some differences from “San Ace 38” 9GA type.

5.1 Key things for the development

In general, air flow vs. static pressure characteristic of fan motor increases according to speed increase. However, unfortunately power consumption and sound pressure level (SPL) also increase at the same time.

In developing new model, Sanyo Denki focused on improving air flow vs. static pressure characteristic without increasing power consumption and sound pressure level (SPL). Specifically, following three items were adopted.

- (1) Optimization of number and shape of moving blades and static blades (guide-vane).
- (2) Adoption of electronic components with low loss
- (3) Modification of motor material



Fig. 5: Comparison of moving blade shape between conventional model and new model

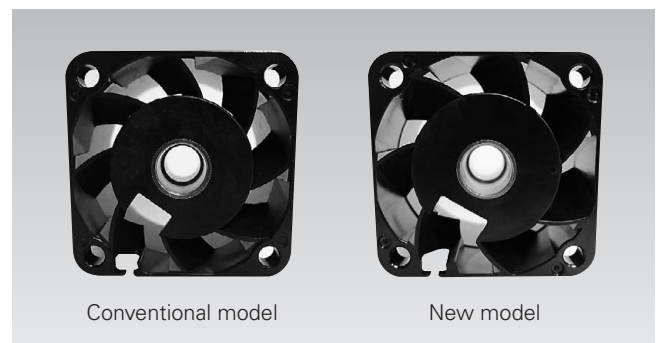


Fig. 6: Comparison of static blade shape between conventional model and new model

5.2 Comparison of air flow versus static pressure

Fig. 7 shows air flow versus static pressure characteristics for conventional model and new model.

Compared with 9GV0312P3K01 that is conventional model with the highest air flow, 9GA0312P3K001 that is new model with the highest air flow achieves 1.9 times static pressure in assumed operating area.

5.3 Comparison of power consumption

Compared with 9GV0312P3K01 that is conventional model with the highest air flow, 9GA0312P3K001 that is new model with the highest air flow, achieves 5 to 14% less power consumption in assumed operating area.

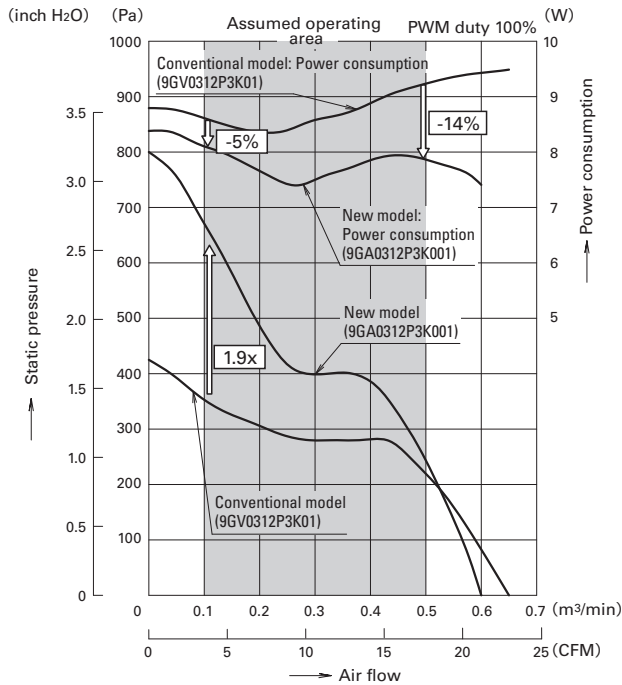


Fig. 7: Air flow vs. static pressure characteristics for new and conventional model

5.4 Comparison of SPL

The SPL of 9GV0312P3K01 that is conventional model with the highest air flow is 59.0 dB (A) at free air. In comparison, 9GA0312P3K001 that is new model with the highest air flow achieves high speed and equivalent SPL of 59.0 dB (A), meaning that SPL has been successfully suppressed.

6. Conclusion

These are some features and abilities of newly developed low power consumption "San Ace 38" 9GA type fan.

The new model has achieved significantly higher static pressure and lower power consumption compared with conventional model. Due to this, new model also achieves performance for high density equipment with high impedance.

We believe new model will contribute to cooling of high density equipment and lower power consumption, thereby improving reliability of equipment.

Sanyo Denki wishes to continue product development responding to market demands and provide suitable products for equipment cooling.



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