High Air Flow and Low Power Consumption Fan "San Ace 40" GA Type

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1. Introduction

In recent years, growing concern for conservation of the global environment has caused energy saving products to come to attention in various industries as part of the theme of environmental conservation. Cooling fans, which are used in a variety of fields, are no exception. In particular, devices that demand reductions in power consumption are increasing. If we looked at all process from fan production, usage in field, to scrapping the fan, the highest required energy comes from the power consumption during operation. In other words, reduction of the fan's power consumption is directly linked to global environmental protection, and the contribution is quite high.

This document introduces the features and performance of the high air flow and low power consumption 40 mm sq., 20 mm thick fan "San Ace 40" GA type that was developed considering this type of background.

2. Background of the Development

Sanyo Denki has previously produced and sold 40 mm sq., 20 mm thick DC fan "San Ace 40" product. However, as noted in the previous section, demand for fans increased with lower power consumption and improved cooling performance (higher air flow).

To meet these needs, we developed the new "San Ace 40" GA type. This fan retains compatibility of size and mounting holes with the conventional model, and it improves the cooling performance when mounted in a system and achieved the lowest power consumption in the fan market.

3. Product Features

Fig. 1 shows the appearance of the "San Ace 40" GA type.

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The features of this new model are as follows:

(1) High air flow
(2) Low power consumption
(3) Low SPL (sound pressure level)
(4) PWM control function

The impeller, frame, and circuits were newly designed and the motor was optimized for the "San Ace 40" GA type (hereinafter referred to as the new model) in order to achieve high air flow, low power consumption, and low SPL.

4. Product Overview

4.1 Dimensions

Fig. 2 shows the dimensions of the new model. The new model has the same mounting dimensions as the conventional model, making it compatible.

4.2 Characteristics

4.2.1 General characteristics

There are two models with the G speed (16,000 min^{-1}) model and the H speed (12,400 min^{-1}) model.

Table 1 shows the general characteristics for the new model.

4.2.2 Air flow vs. static pressure characteristics

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

4.2.3 PWM control function

The new model has a PWM control function that can control the speed of the cooling fan from an external source.

By controlling the speed of the fan depending on the heat from the equipment instead of always running the fan at full speed, the power consumption and SPL can be reduced for the entire system. Therefore, the demand has drastically increased for fans with a PWM speed control function.

Fig. 4 shows the air flow versus static pressure for PWM duty cycle of the new model.

4.3 Expected life

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

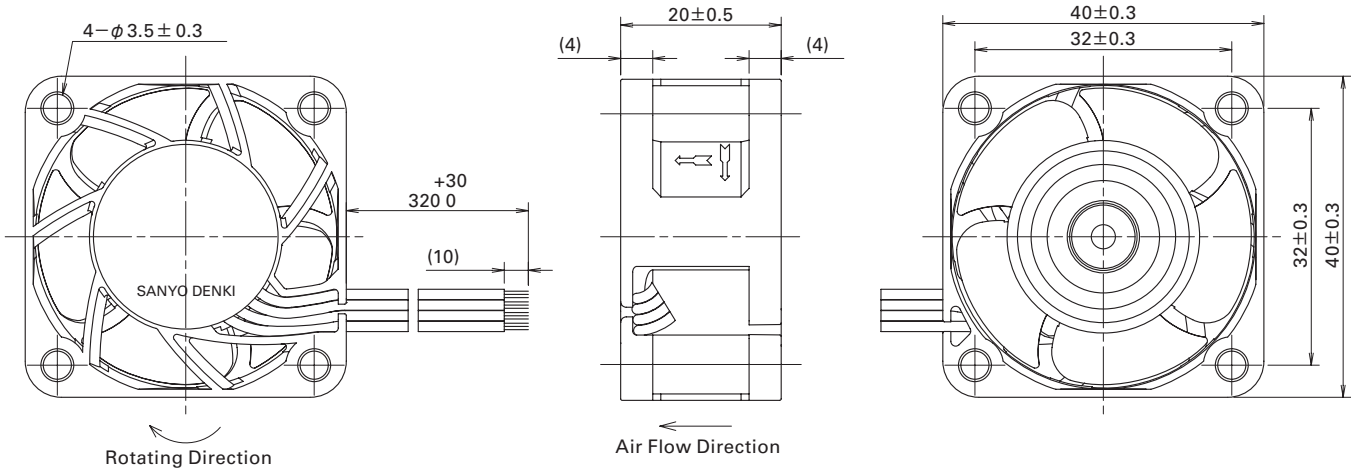

Fig. 2: "San Ace 40" GA type dimensions (unit: mm)

Table 1: "San Ace 40" GA type general characteristics

Model No.	Rated voltage [V]	Operating voltage [V]	PWM duty cycle* [%]	Rated current [A]	Rated input [W]	Rated speed [min^{-1}]	Max. air flow [m^3/min]	[CFM]	Max. static pressure [Pa]	[inchH_2O]	Sound pressure level [dB(A)]	Operating temperature [°C]
9GA0412P6G001	12	10.2 to 13.8	100	0.23	2.76	16,000	0.42	14.8	318	1.28	47	-10 to +70
			0	0.04	0.48	3,800	0.10	3.5	17.9	0.07	14	
9GA0412P6H001			100	0.14	1.68	12,400	0.33	11.7	191	0.77	40	
			0	0.04	0.48	3,800	0.10	3.5	17.9	0.07	14	

* Input PWM frequency: 25 kHz

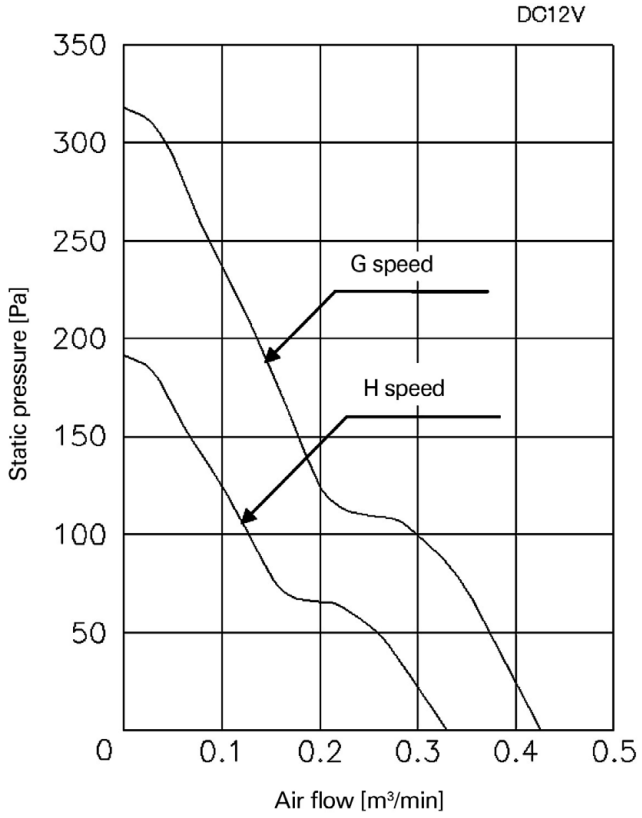

Fig. 3: Air flow - static pressure characteristics

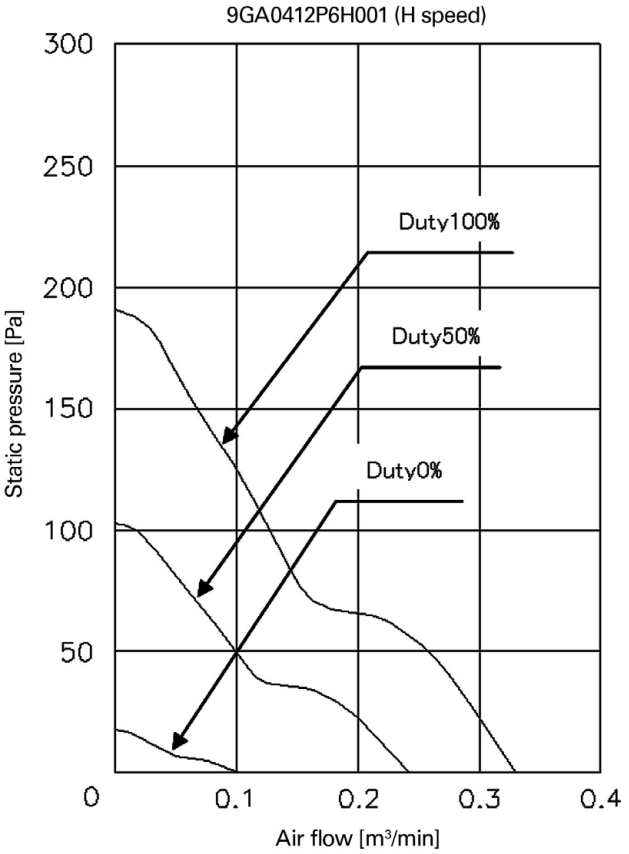

Fig. 4: Air flow - static pressure characteristics at individual PWM duty cycle

5. Comparisons with Our Conventional Model

The new model has newly designed impellers and frame, and an optimized motor in order to achieve massive reductions in the power consumption and sound pressure level compared to our conventional model when same operating range.

The following introduces the specific differences between the new model “San Ace 40” GA type and our conventional model “San Ace 40” P type.

5.1 Comparison of air flow versus static pressure

Fig. 5 shows a comparison of the air flow versus static pressure characteristics between the fastest conventional model 109P0412G601 (12,500 min^{-1}) for the 40 mm sq., 20 mm thick P type and the fastest new model 9GA0612P6G001 (16,000 min^{-1}).

The new model has maximum air flow increased 20% and maximum static pressure increased 110% compared with our conventional model.

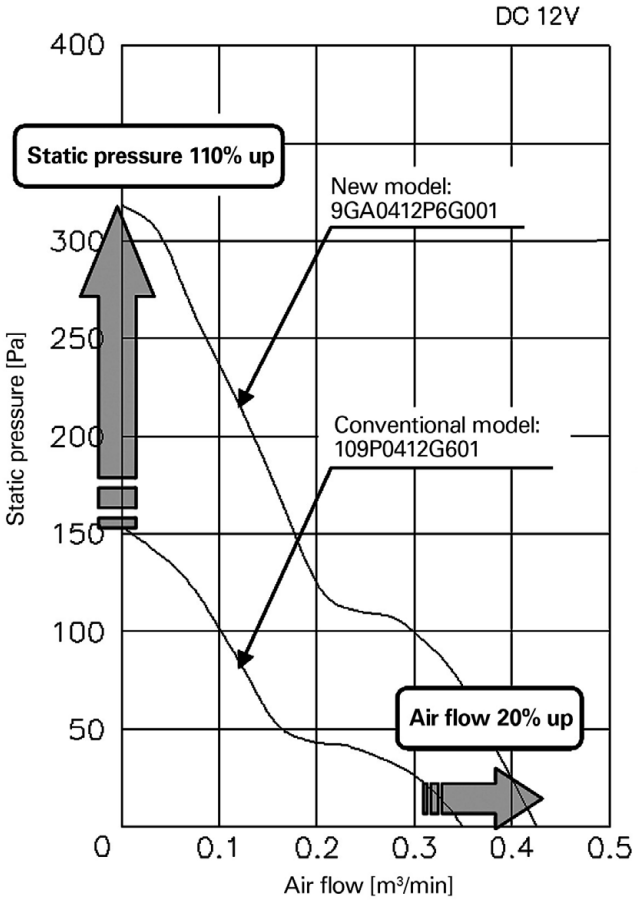

Fig. 5: Comparison of air flow - static pressure characteristics between our conventional model and the new model

5.2 Comparison of power consumption

Fig. 6 through Fig. 8 show a comparison of power characteristics between the new model and our conventional model when the speed of the new model is adjusted to be the same as our conventional model and both models show the same performance in the assumed operating range.

The new model reduces power consumption by 60% in free air conditions compared to our conventional model, as shown in Fig. 7, and the new model even reduces power consumption by 57% in the assumed operating range compared to our conventional model, as shown in Fig. 8.

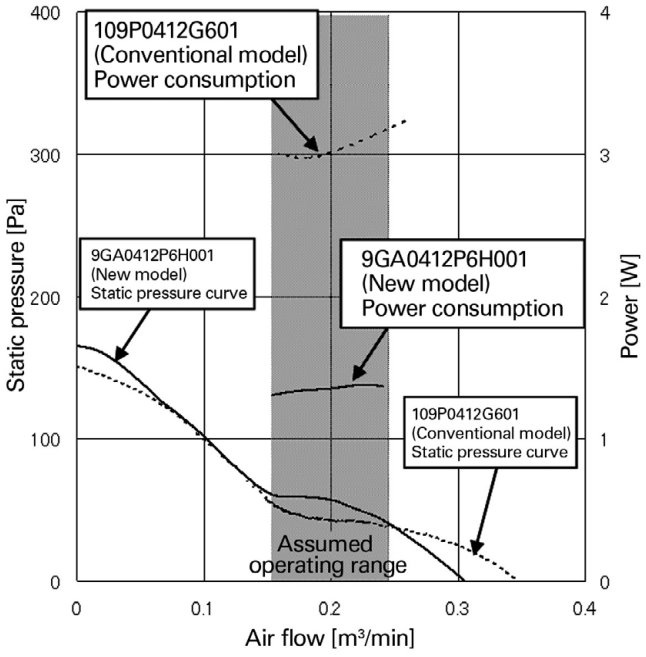

Fig. 6: Comparison of air flow - static pressure - power characteristics

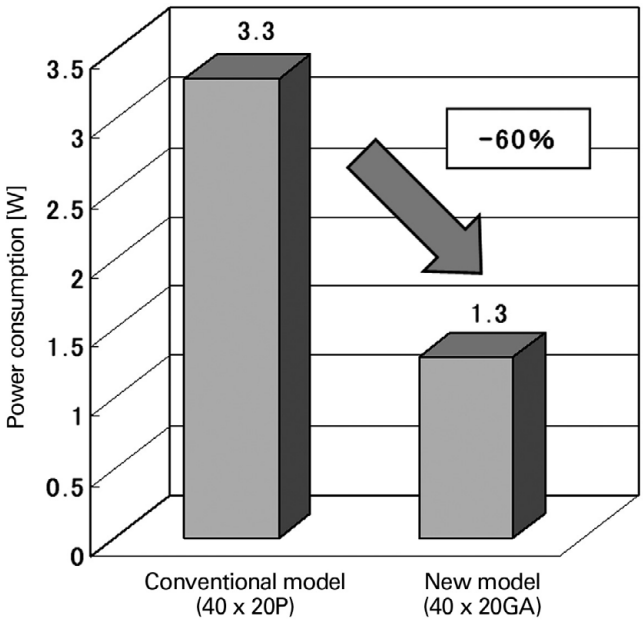

Fig. 7: Comparison of power at free air

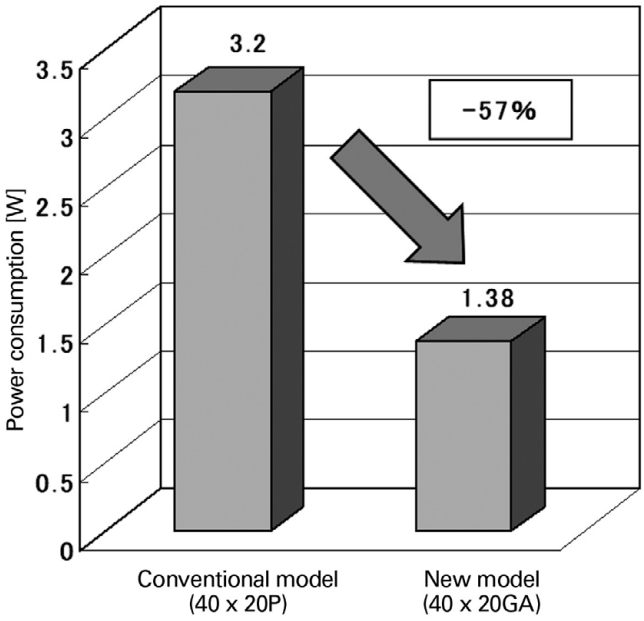

Fig. 8: Comparison of power in the assumed operating range

5.3 Comparison of sound pressure level

Fig. 9 shows a comparison of the sound pressure level between the new model and our conventional model when operating at the same cooling performance as described in the previous section. The new model reduces the sound pressure level by 7 dB (A) during free air condition compared with our conventional model.

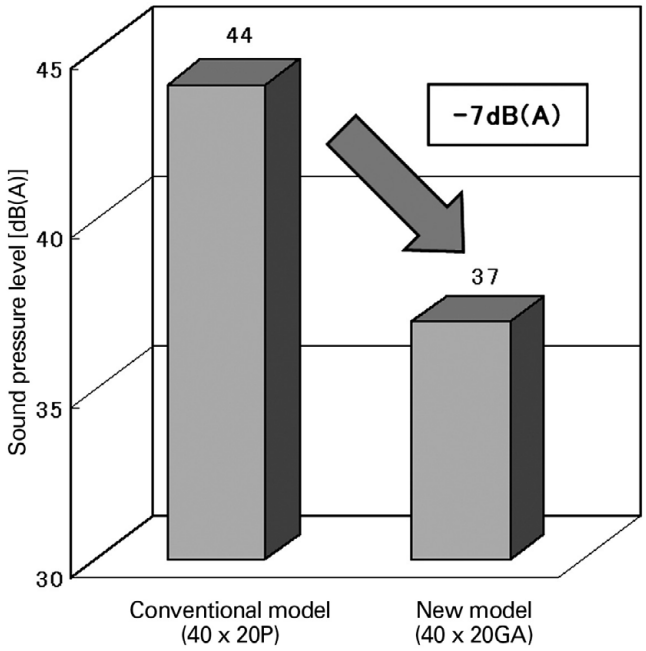

Fig. 9: Comparison of sound pressure level at free air

6. Conclusion

This document introduced some of the features and advantages of the newly developed high air flow and low power consumption “San Ace 40” GA type fan.

The new model has greatly reduced power consumption and sound pressure level compared with our conventional model while also achieving increased cooling performance in the assumed operating range. Also, this model has the top performance in the market for 40 mm sq., 20 mm thick fans.

By replacing conventional 40 mm sq., 28 mm thick size products that are used in system with the new model, the new model can greatly contribute to space-saving and energy conservation designs of equipment by reducing the fan size in electronic equipment and communication equipment.

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