High Air Flow Fan “San Ace 60” G Type

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1. Introduction

Along with the growth and expansion of information processing and communication technology in recent years, demands for higher performance and space-saving in information devices and telecommunications devices have continued to grow. However, these demands also tend to increase the amount of power consumption for these devices. On the other hand, customers have also demanded decreased power consumption in devices due to heightened environmental awareness.

With this in mind, a reduction in power consumption has become a necessary feature along with demands for better than ever cooling performance for the cooling fans used in information devices and communication devices.

This document introduces the features and performance of the high air flow and low power consumption 60 mm sq., 25 mm thick fan “San Ace 60” G type that was developed to respond to these market demands.

2. Background of the Development

Sanyo Denki has produced and sold a 60 mm sq., 25 mm thick DC fan “San Ace 60” product. However, as noted in the previous section, demand increased for fans with improved cooling performance (higher air flow) and lower power consumption.

To meet these demands, we developed the new “San Ace 60” G type.

This fan retains compatibility with the conventional model, including size and mounting holes, and it greatly improves the cooling performance while realizing some of the lowest power consumption in the industry.

3. Product Features

Fig. 1 shows the appearance of the “San Ace 60” G type.

The features of this new model are as follows:

(1) High air flow
(2) Low power consumption
(3) PWM control function

The impeller, frame, and circuit were newly designed and the motor was optimized for the “San Ace 60” G type (hereinafter called new model) in order to achieve high air flow, low power consumption, and low SPL (Sound Pressure Level).

Fig. 1: “San Ace 60” G type

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

Two models were developed with different speeds: S speed (11,000 min^{-1}) model and H speed (9,500 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 12 V / 24 V S speed new model, while Fig. 4 shows the air flow versus static pressure characteristics for 48 V S speed new model.

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

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

Fig. 5 shows the air flow versus static pressure characteristics at individual PWM duty for 12 V / 24 V S speed new model.

4.3 Expected life

The new model has 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).

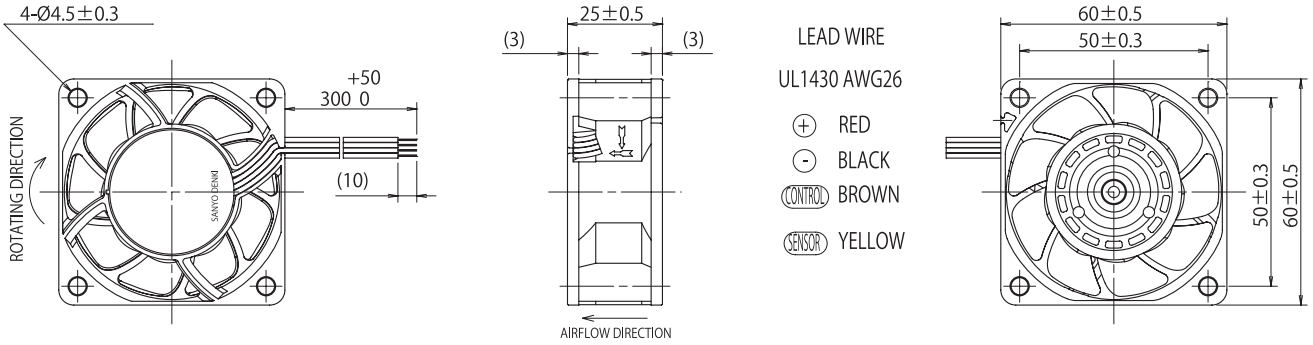

Fig. 2: “San Ace 60” G type dimensions (unit: mm)

Table 1: “San Ace 60” G 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 [m^3/min]	Max. Air Flow [CFM]	Max. Static Pressure [Pa]	Max. Static Pressure [inchH_2O]	SPL [dB(A)]	Operating temperature [°C]	Expected life [h]
9G0612P4S001 (9G0612P4S0011)	12	10.2 to 13.8	100	0.67	8.04	11000	1.4	49.4	300	1.20	53	-10 to 70	40,000/60°C (70,000/40°C)
			0	0.07	0.84	3300	0.42	14.8	27	0.11	19		
9G0612P4H001 (9G0612P4H0011)			100	0.50	6.00	9500	1.21	42.7	224	0.90	49		
			0	0.06	0.72	2850	0.36	12.7	20.2	0.08	18		
9G0624P4S001 (9G0624P4S0011)	24	20.4 to 27.6	100	0.34	8.16	11000	1.4	49.4	300	1.20	53		
			0	0.04	0.96	3300	0.42	14.8	27	0.11	19		
9G0624P4H001 (9G0624P4H0011)			100	0.25	6.00	9500	1.21	42.7	224	0.90	49		
			0	0.04	0.96	2850	0.36	12.7	20.2	0.08	18		
9G0648P4S001 (9G0648P4S0011)	48	36 to 72	100	0.18	8.64	11000	1.4	49.4	305	1.22	53		
			0	0.02	0.96	3300	0.42	14.8	27.4	0.11	19		

Ribless model is in ( ).

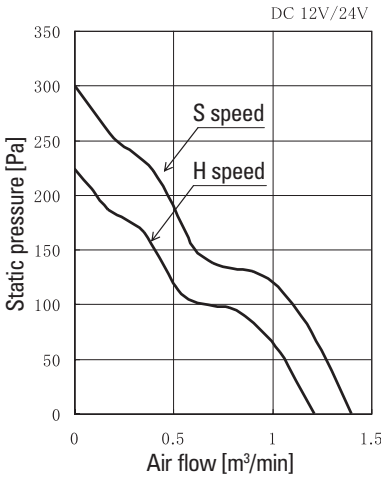

Fig. 3: Air flow - static pressure characteristics

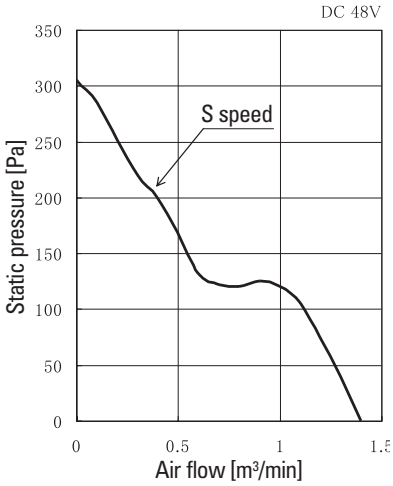

Fig. 4: Air flow - static pressure characteristics

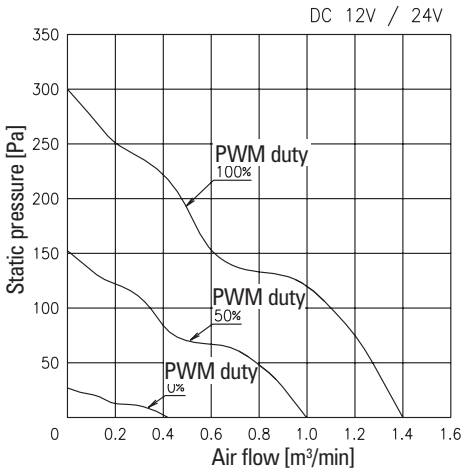

Fig. 5: Air flow vs. static pressure at individual PWM duty

5. Comparisons with our Conventional Model

The new model uses newly designed impeller and frame, and an optimized motor in order to realize massive improvements in cooling performance and reductions in the power consumption compared to our conventional model.

The following introduces the specific differences between the new model “San Ace 60” G type and our conventional model “San Ace 60” R type.

5.1 Comparison of air flow versus static pressure

Fig. 6 shows a comparison of the air flow versus static pressure characteristics between the fastest conventional model 109R0612J401 (7,600 min^{-1}) for the 60 mm sq., 25 mm thick R type and the fastest new model 9G0612P4S001 (11,000 min^{-1}). The conventional model could not raise the speed above 7,600 min^{-1} due to circuit and mechanical limitations, but the fastest speed for the new model can be raised up to 11,000 min^{-1}. As a result, when combined with the effects of the newly designed impeller and frame, the characteristics have been greatly improved by 1.3 times for the maximum air flow and 1.9 times for the maximum static pressure.

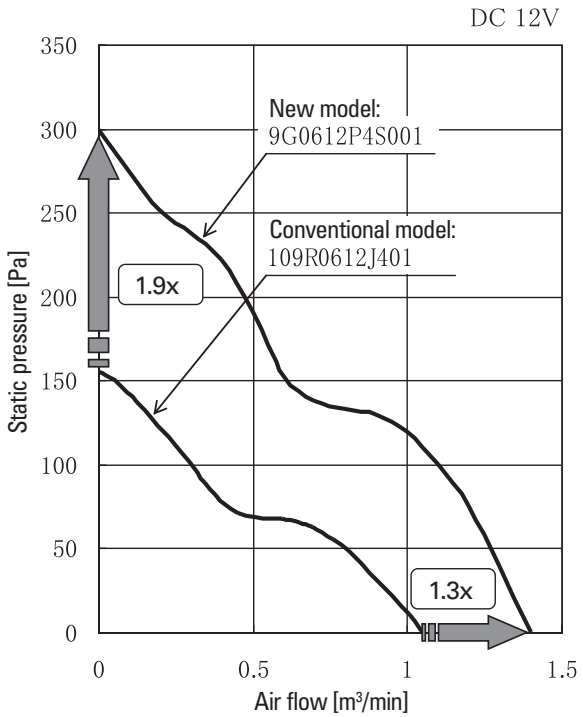

Fig. 6: Air flow - static pressure characteristics

5.2 Comparison of power consumption

Fig. 7 and Fig. 8 show a comparison of power characteristics between the new model and our conventional model in expected operating area when speed of the new model is adjusted so that it has the same air flow and static pressure as our conventional model.

The power at the operating point is reduced from 5.2W in the conventional model to 3.6W in the new model for a reduction of 30%.

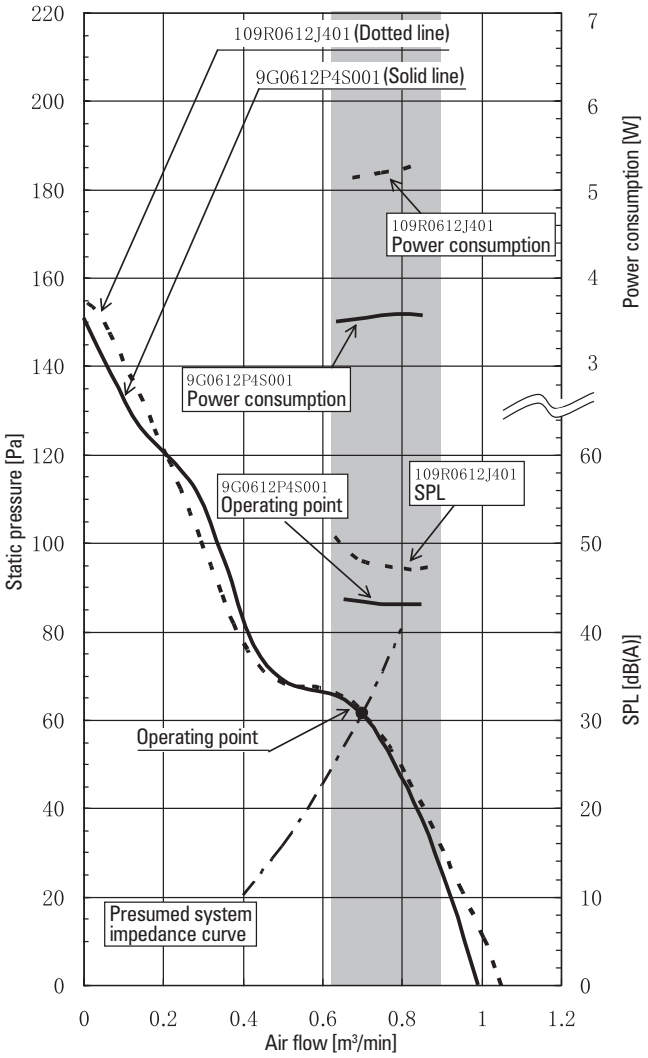

Fig. 7: Air flow - static pressure characteristics

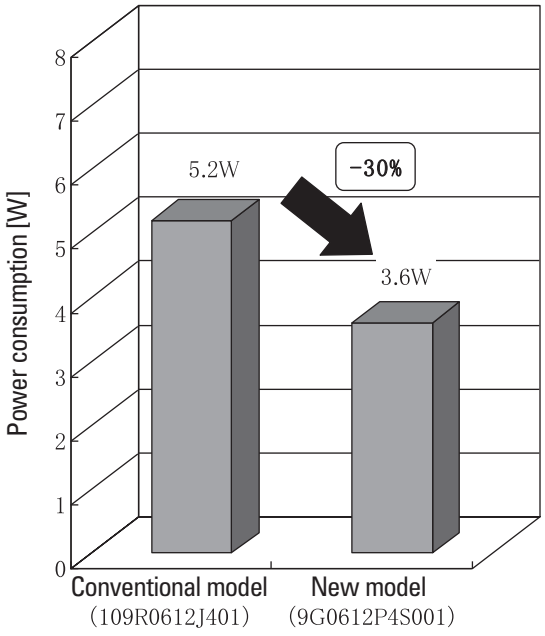

Fig. 8: Comparison of power consumption at operating range

5.3 Comparison of SPL

Fig. 7 and Fig. 9 show a comparison of the SPL between the new model and our conventional model when operation at the same cooling performance as described in the previous section.

The SPL at the operating point is reduced from 47 dB(A) in the conventional model to 43 dB(A) in the new model for a reduction of 4 dB(A).

In order to achieve high speed, measures, such as increasing the number of spokes on the frame, were taken on each part, but this was a disadvantage from an SPL standpoint. However, adjustments to the impeller and frame shape successfully reduced the SPL from the level of the conventional model.

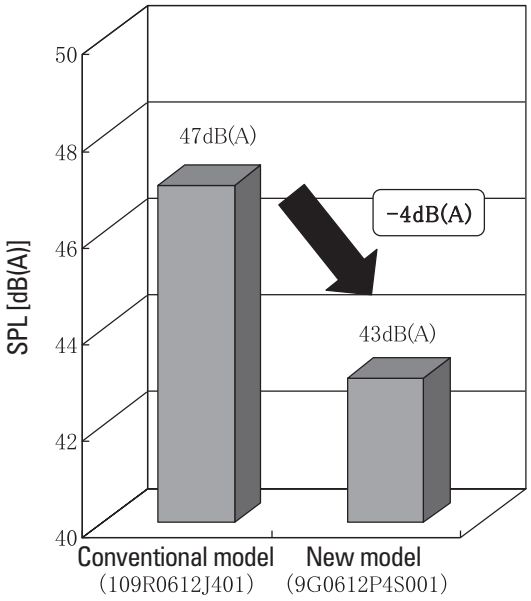

Fig. 9: Comparison of power consumption at operating range

6. Conclusion

This document introduced some of the features and abilities of the newly developed high air flow and low power consumption “San Ace 60” G type fan.

The new model realizes greatly increased air flow and static pressure compared to the Sanyo Denki conventional model, and we think that they can contribute to higher speeds and higher performance in information and communication devices, which are expected to become even higher heat generation and higher density in future. Furthermore, by using the PWM control function, we think that they can contribute to lower power consumption and lower SPL in devices. By replacing conventional fans that are used in devices with new models that are one size smaller, the new model can greatly contribute to the increasing low space-saving and energy conservation designs of equipment by reducing the fan size in electronic equipment and communication equipment.

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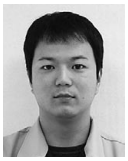

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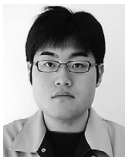

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