Low Power Consumption Fan “San Ace 80” GA Type

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1. Introduction

In recent years, information and communication equipment such as computer servers, IP routers, and RAID devices has become high speed and large capacity, which has led to trend for higher heat generation. Also, high density inside equipment has made it difficult to take countermeasures against heat. In addition, lower energy consumption is required for these types of equipment in order to protect the global environment and to address energy problems.

With this background, the cooling fans used to cool information and communication equipment are required to consume less power.

This document introduces the features and performance of the newly developed low power consumption “San Ace 80” GA type fan.

2. Background of the Development

Sanyo Denki has produced and sold 80 mm sq., 20 mm thick DC fan “San Ace 80” P type product. However, as noted in the previous section, demand increased for cooling fans with high cooling performance and lower power consumption.

To meet these demands, we developed the “San Ace 80” GA type fan with high air flow and low power consumption. The new model achieved the top performance in the industry (according to a Sanyo Denki research as of October 2012).

3. Product Features

Fig. 1 shows the appearance of the “San Ace 80” GA type.

The features of the developed product are as follows:

(1) Low power consumption
(2) Low SPL (Sound Pressure Level)
(3) High air flow
(4) PWM control function

The impeller, frame, and circuits were newly designed and the motor was optimized for the “San Ace 80” GA type (hereinafter called new model).

Fig. 1: “San Ace 80” GA type

4. Product Overview

4.1 Dimensions

Fig. 2 shows the dimensions of the new model. It keeps compatibility with the conventional model in terms of the fan size and mounting dimensions.

4.2 Characteristics

4.2.1 General characteristics

Two types, G speed (5,850 min^{-1}) and M speed (2,900 min^{-1}), were put in the market.

Table 1 shows the general characteristics for the new model.

4.2.2 Air flow vs. static pressure characteristics

Fig. 3 shows an example of the air flow versus static pressure characteristics at each speed of 12/24 V 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 external source.

By controlling the speed of the cooling fan depending on the heat from the equipment instead of always running the fan at full speed, whole equipment can realize even lower power consumption and SPL. Therefore, the demand has increased for cooling fans with a PWM control function.

As an example, Fig. 4 shows the air flow versus static pressure characteristics at individual PWM duty for the G speed (12/24 V) of the 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).

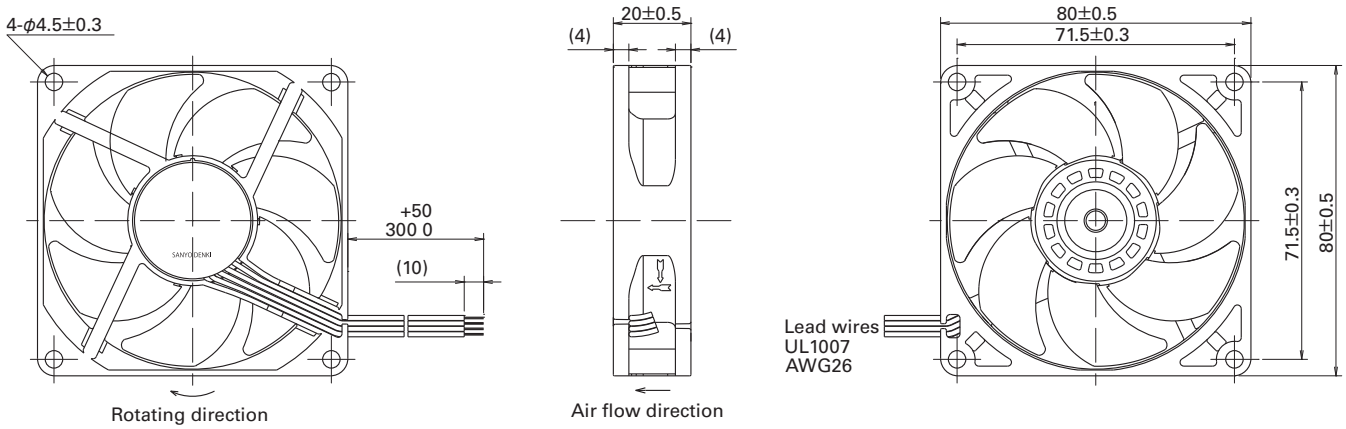

Fig. 2: “San Ace 80” GA type dimensions (unit: mm)

Table 1: “San Ace 80” GA type general characteristics

Model No.	Rated voltage [V]	Operating voltage [V]	PWM duty cycle (Note 1) [%]	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 (Note 2) [h]
9GA0812P6G001	12	10.2 to 13.8	100	0.3	3.6	5,850	1.72	60.78	110	0.44	45	-10 to +70	40,000/60˚C (70,000/40˚C)
9GA0812P6M001				0.06	0.72	2,900	0.84	29.68	27	0.11	26.5		60,000/60˚C
9GA0824P6G001	24	20.4 to 27.6	100	0.15	3.6	5,850	1.72	60.78	110	0.44	45		40,000/60˚C (70,000/40˚C)
9GA0824P6M001				0.03	0.72	2,900	0.84	29.68	27	0.11	26.5		60,000/60˚C

Note 1: Speed is 0 min^{-1} at 0% PWM duty cycle
Note 2: The reference value shows the expected life at operating temperature of 40˚C.
*Input PWM frequency: 25 kHz

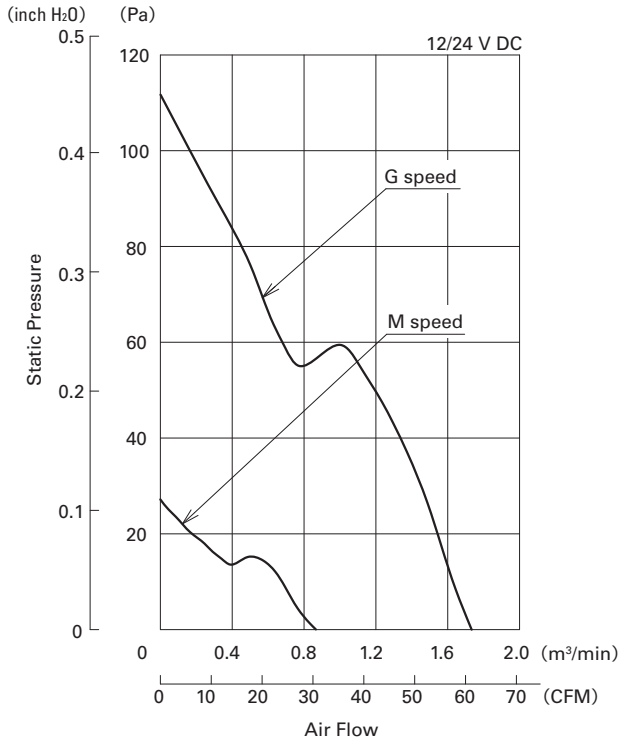

Fig. 3: Air flow vs static pressure characteristics

5. Comparisons with Our Conventional Model

The new model has realized dramatically higher performance and lower power consumption and SPL than the conventional model.

The following introduces the specific comparison between the new model "San Ace 80" GA type and our conventional model "San Ace 80" 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 highest conventional model 109P0812C601 (3,700 min^{-1}) for the 80mm sq., 20 mm thick P type and the speed new model 9GA0812P6G001 (5,850 min^{-1}). As a result of newly designing the impeller, frame and circuit, and optimizing the motor, the characteristics have been greatly improved by 1.6 times for the maximum air flow and 2.2 times for the maximum static pressure.

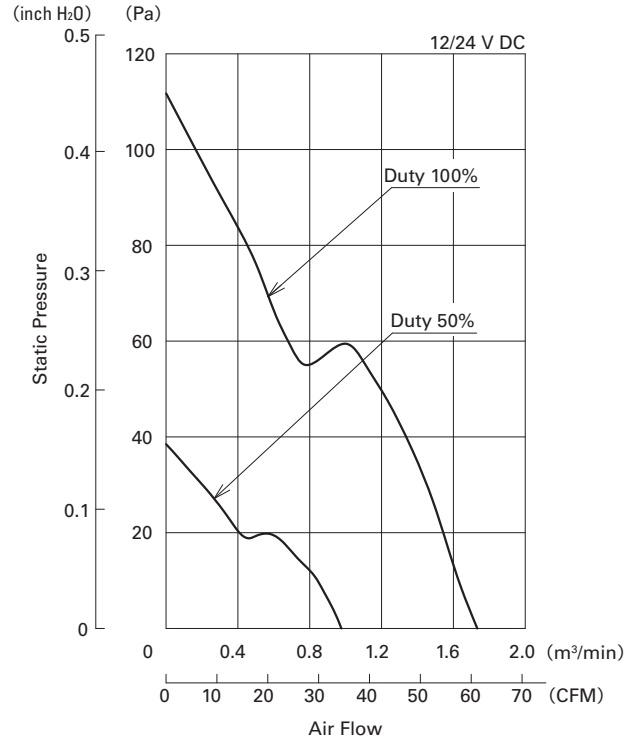

Fig. 4: Air flow vs static pressure characteristics at individual PWM duty cycle

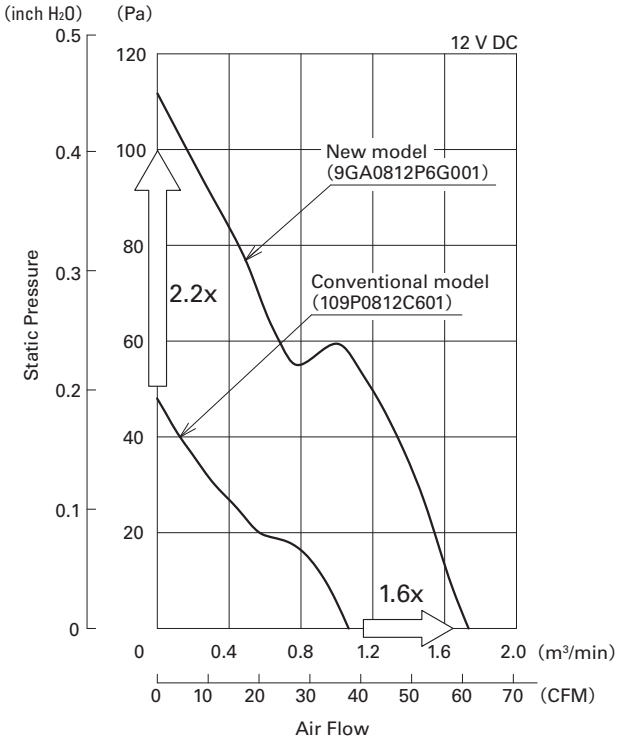

Fig. 5: Air flow vs static pressure characteristics between our conventional model and the new model

5.2 Comparison of power consumption

Fig. 6 and Fig. 7 show comparison of power consumption characteristics for the conventional model 109P0812H601 (2,900 min^{-1}) and the new model 9GA0812P6M001 (2,900 min^{-1}) with similar air flow versus static pressure characteristics.

As shown in Fig. 6, the power consumption of the new model is approximately 68% lower than that of the conventional model (with air flow 0.55 m^3/min).

Fig. 7 shows comparison of power consumption during free air condition.

The power consumption of the new model is 71% lower than that of the conventional model.

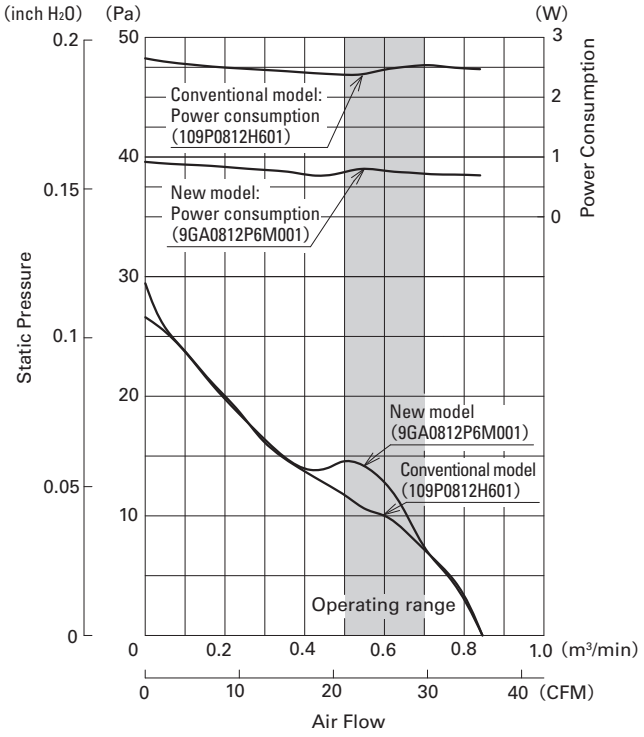

Fig. 6: Comparison of air flow vs static pressure vs power characteristics

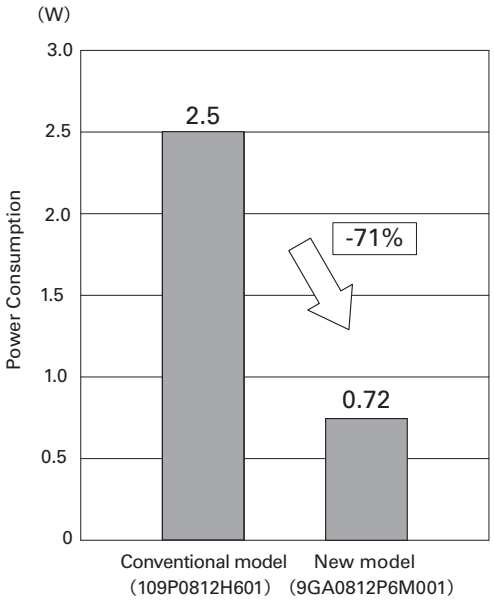

Fig. 7: Comparison of power consumption at free air

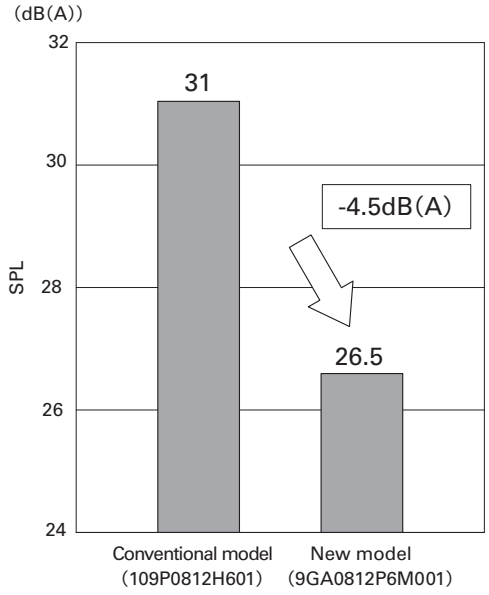

Fig. 8: Comparison of SPL during free air conditions

5.3 Comparison of SPL

Just like in the previous section, Fig. 8 shows a comparison of SPL for the conventional model 109P0812H601 and the new model 9GA0812P6M001 with equivalent characteristics.

By improving shape of the impeller and frame, the conventional model’s 31 dB(A) SPL at free air conditions was lowered 4.5 dB(A) to 26.5 dB(A) of the new model.

6. Conclusion

This document introduced some of features and capabilities of the newly developed low power consumption “San Ace 80” GA type fan.

The new model has achieved dramatically lower power consumption, lower SPL, and higher air flow compared to the conventional model.

We will continue to develop products that meet market demands, and supply products that suitable cooling requirements of equipment.

By utilizing the superior basic performance and PWM speed control function in the new model, we believe that we can greatly contribute to even lower power consumption and lower SPL for equipment in the future.

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