Low Power Consumption Fan "San Ace 70" 9GA Type

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1. Introduction

In recent years, to accompany the spread of the Internet, information and communication devices such as servers and storages have had high-density mounting in order to respond to the increase in data volume and high speed processing. This has led to higher heat generation within such devices.

Moreover, conservation of the global environment is an important corporate activity and also the development of energy-saving devices is an issue across all industries.

In order to respond to these demands, a fan with low power consumption and high cooling performance is required.

This document introduces the features and performance of the low power consumption "San Ace 70" 9GA type fan that was developed to meet market needs.

2. Background of the Development

To accompany advances towards high-density mounting of equipment, a demand has arisen for fans with even higher cooling performance. Sanyo Denki has produced and sold 60 mm sq. fans. However, improvement of the 60 mm sq. fan performance was difficult as it was not possible to secure enough space to install the electronic components necessary for increasing power to the fan's drive circuit.

Generally speaking, the bigger size fan generates higher cooling performance. The 80 mm sq. fan is the next size up from the 60 mm sq. fan in Sanyo Denki lineup and as it is 20 mm bigger both vertically and horizontally, sometimes it is unable to be installed in equipment with limited space. This created the demand for a fan that had higher performance than the 60 mm sq., was smaller in size than the 80 mm sq.

Moreover, among a variety of cooling needs, producing a new size fan in our lineup would contribute to a higher degree of freedom in equipment design.

According to this situation, Sanyo Denki has developed a new size fan, the "San Ace 70" 9GA type, which is 70 mm sq. 38 mm thick and offers high static pressure as well as low power consumption.

3. Product Features

Fig. 1 shows a photograph of the "San Ace 70" 9GA type fan (hereinafter referred to as the "new model").

Fig. 1: "San Ace 70" 9GA type

The features of the new model are as follows:

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

4. Product Overview

4.1 Dimensions

Fig. 2 shows the dimensions of the new model.

4.2 Characteristics

4.2.1 General characteristics

Two types have been commercialized with a rated voltage of 12 V DC and rated speed 16,500 min^{-1} (G speed) and 12,000 min^{-1} (H speed).

Table 1 shows the general characteristics for the new model.

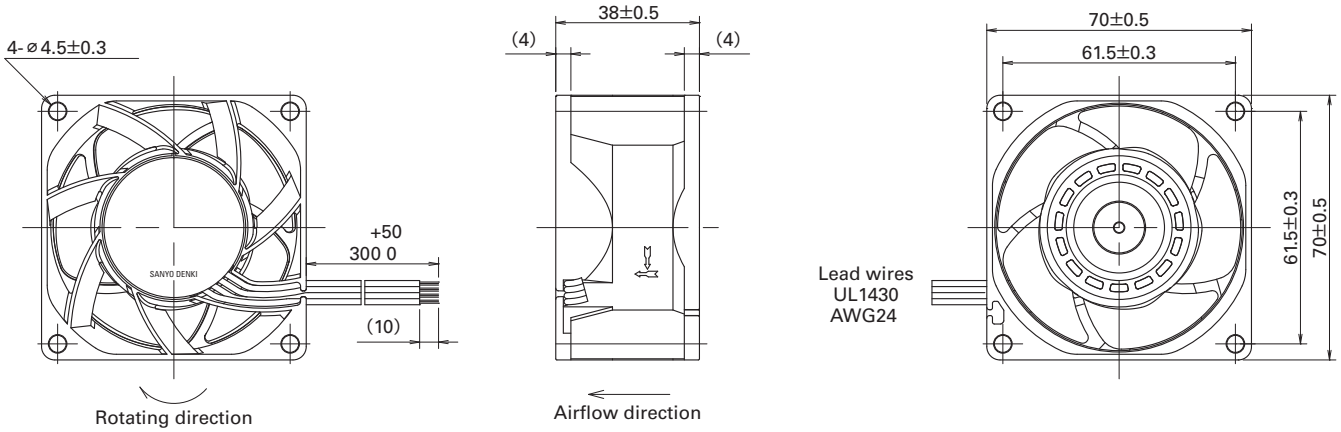

Fig. 2: Dimensions of the new model (unit: mm)

Table 1: General characteristics for the new model

Model No.	Rated voltage [V]	Operating voltage [V]	PWM duty cycle [%]	Rated current [A]	Rated input [W]	Rated speed [min^{-1}]	Max. airflow [m³/min]	Max. airflow [CFM]	Max. static pressure [Pa]	Max. static pressure [inchH₂O]	SPL [dB(A)]	Operating temperature [°C]	Expected life Note 1) [h]
9GA0712P1G001	12	10.8 to 13.2	100	2.6	31.2	16,500	2.65	93.6	860	3.45	65	-20 to +70	40,000/60°C (70,000/40°C)
			0	0.16	1.92	4,400	0.70	24.7	61	0.24	30		
9GA0712P1H001			100	1.1	13.2	12,000	1.92	67.8	455	1.83	57		
			0	0.07	0.84	2,500	0.40	14.1	20	0.08	19		

Note 1: The expected life is a reference value when ambient temperature is 40°C. *Input PWM frequency: 25 kHz

4.2.2 Airflow vs. static pressure characteristics

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

4.2.3 PWM control function

Fig. 4 shows the airflow versus static pressure characteristics at individual PWM duty cycle of the new model.

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).

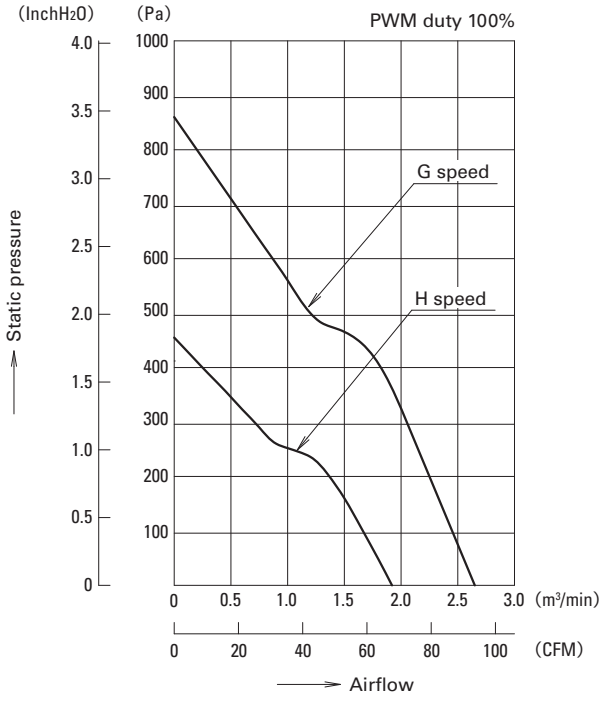

Fig. 3: Airflow vs. static pressure characteristics of the new model

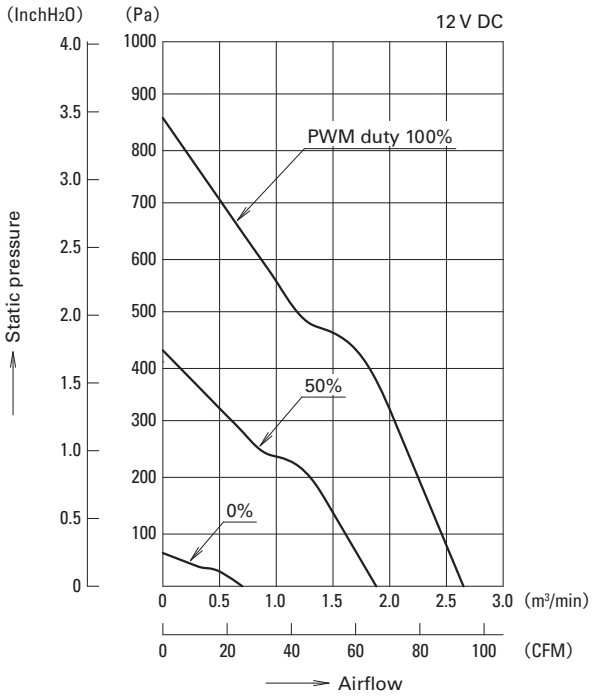

Fig. 4: Airflow vs. static pressure characteristics against PWM duty cycle (9GA0712P1G001)

5. Comparison with the Conventional Model (60 mm sq., 80 mm sq. fan)

5.1 Key things for the development

We focused on higher static pressure than the 60 mm sq. fan and lower power consumption in order to make up airflow versus static pressure characteristics between the 60 and 80 mm sq. fans.

(1) Optimization of impeller/frame shape

We achieved higher static pressure than the 60 mm sq. fan by optimizing the impeller shape, moving blade and static blade combination and frame shape.

(2) Optimization of motor size

Compared to the 70 mm sq. fan, the motor for the existing 60 mm sq. fan does not have enough drive torque for the increase in impeller load. Meanwhile, the diameter of the motor for the 80 mm sq. fan is too big and it is not possible to secure sufficient ventilation area. As such, we selected the optimal motor size by considering the balance between fan size and ventilation area.

Moreover, we achieved low power consumption by optimizing the motor output against impeller load through measures such as increasing the winding space factor of the motor coil, etc.

5.2 Comparison of airflow versus static pressure

Fig. 5 shows the airflow versus static pressure characteristics for the conventional model and the new model. Essentially the 70 mm sq. fan has characteristics in-between the 60 and 80 mm sq. fans, however exceeds the performance of some models of the 80 mm sq. fan (9GV and 9GA types) in the high impedance area.

6. Application to 2U Unit

6.1 Considerations regarding application to 2U unit

Regarding servers is used for data centers, etc., 1U or 2U units are used so that they can be stored in 19 inch racks. In the 2U unit, it is common for six 60 mm sq. fans to be used in parallel. Fig. 6 shows installation of a 60 mm sq. and a 70 mm sq. fan in the 2U unit. In case of six 60 mm sq. fans, there is too much room on the top however five 70 mm sq. fans would effectively fill in the space in the 2U unit and reduce the number of fans.

6.1.1 Comparison of airflow versus static pressure

Fig. 7 shows the airflow versus static pressure characteristics for the conventional model and the new model.

Assuming use on the 2U unit, we compare five new models and six conventional models (60 mm sq. fans), in parallel.

Compared with six of the conventional models (9GV0612P1G03) in parallel, five of the new models with the highest airflow (9GA0712P1G001) put in parallel had a maximum of 26% higher static pressure in the assumed operating area.

6.1.2 Comparison of power consumption

Compared with six of the conventional models (9GV0612P1G03) in parallel, five of the new models (9GA0712P1G001) put in parallel achieved lower power consumption from 9 to 18% in the assumed operating area.

6.1.3 Comparison of SPL

Fig. 8 shows a SPL comparison of the new model and conventional model. Compared with six of the conventional models (9GV0612P1G03) in parallel, five of the new models (9GA0712P1G001) put in parallel achieved 2 dB (A) reduction and a maximum of 4 dB (A) reduction in the assumed operating area.

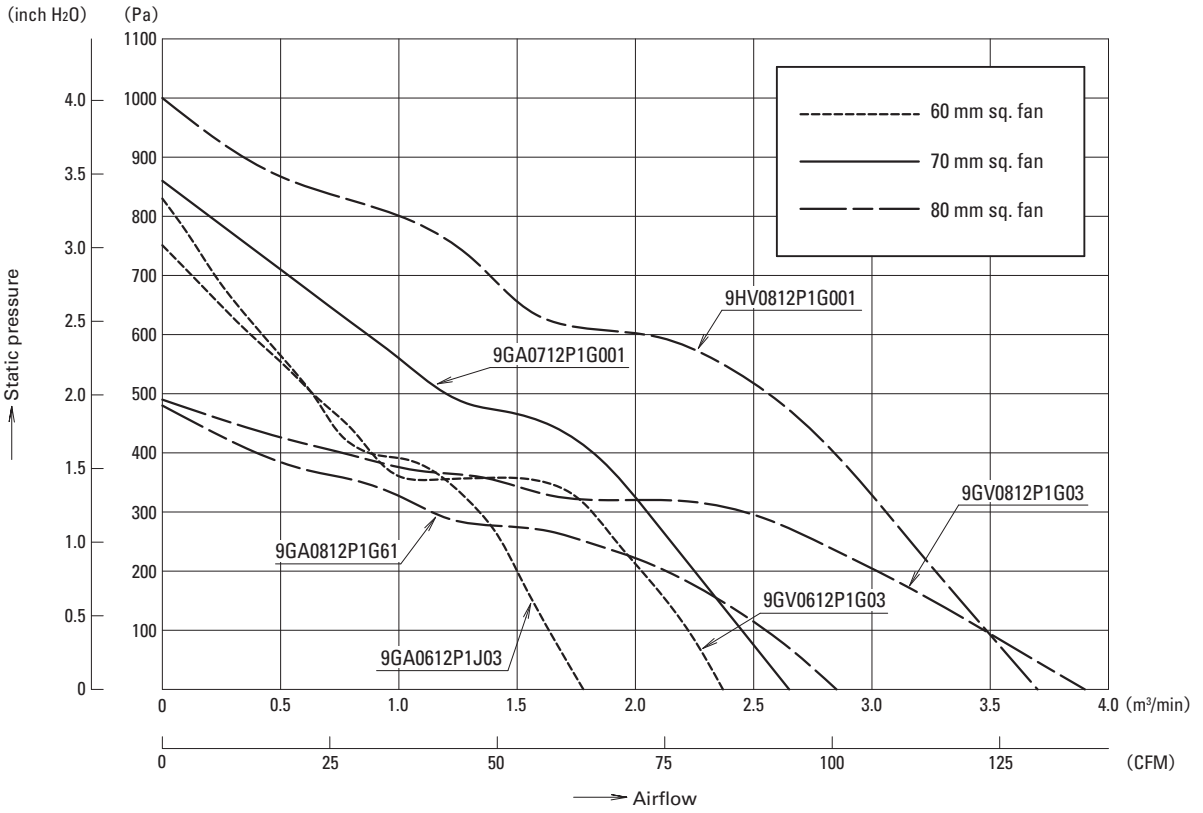

Fig. 5: Comparison of airflow vs. static pressure characteristics

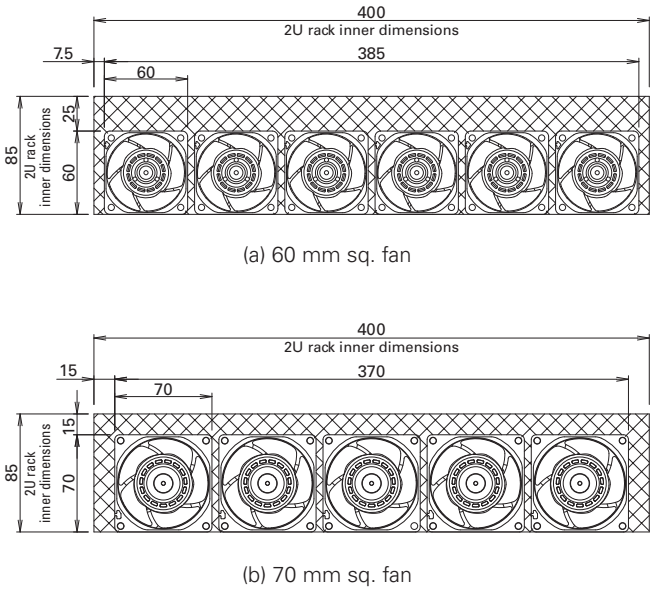

Fig. 6: Installation on a 2U unit

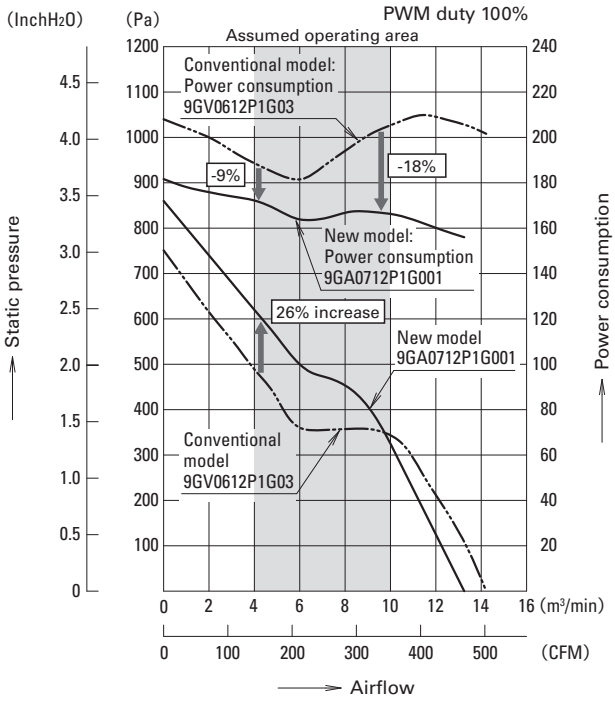

Fig 7: Airflow vs. static pressure characteristics of the conventional and new models (Six 9GV0612P1G03 units or five 9GA0712P1G001 units in parallel)

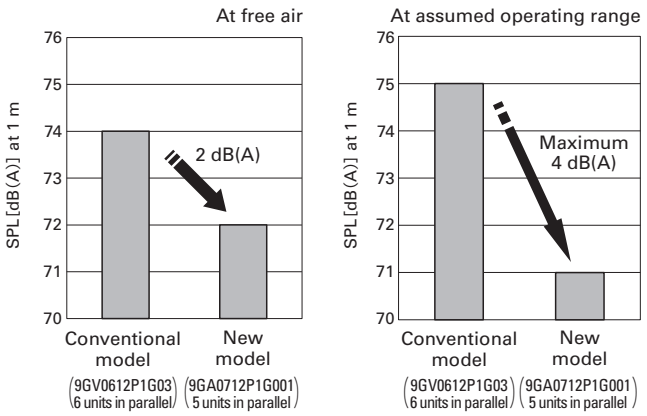

Fig. 8: Comparison of SPL

7. Conclusion

This document introduced some of the features and performances of the newly developed low power consumption “San Ace 70” 9GA type fan.

The new model is a 70 mm sq. fan that is suitable to 2U units which has achieved higher static pressure and low power consumption than the conventional 60 mm sq. fan. Through this achievement, it is now possible to obtain a cooling performance supporting information and communication devices with increased heat generation due to high-density mounting.

By enriching our lineup with the new 70 mm sq. size fan, Sanyo Denki has increased the options of fans to suit equipment space and expected to find new markets and applications.

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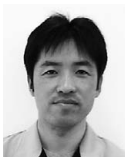

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