

Large Air Volume Fan “SAN ACE 92”G Type 32mm Thickness

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1. Introduction

Recently, electronic devices have been reducing in size and increasing in heat output, and this is especially true with information and communication related equipment. At the same time, cooling fan motors used with these devices are required to be smaller size and create larger air volume. Moreover, there is an even greater demand than ever for low-power consumption and noise reduction, as this equipment including the above devices comes into use in offices and homes.

The BLDC fan with the size of 92mm sq., “SAN ACE 92”G Type 32mm Thickness series was developed to satisfy such a demand, and we have successfully improved the performance from the existing series. In this document, the features of this developed fan are introduced.

2. Background of the Development

SANYO DENKI, so far, has developed two kinds of BLDC fans; 25mm thickness and 32mm thickness for 92mm sq. fan. However, the demands for producing high air volume, saving energy, and noise reduction are extremely strong as previously described, and there have been cases where the conventional products could not satisfy those demands. We have then developed the “SAN ACE 92”G Type 32mm Thickness as a high air volume fan in 92mm sq. 32mm thickness series.

3. Features of “SAN ACE 92”G Type 32mm Thickness Series

Fig.1 shows the “SAN ACE 92”G Type 32mm Thickness.



Fig.1 “SAN ACE 92”G Type 32mm Thickness

The features of this product are:

- (1) Large air volume – High static pressure
- (2) Reduced Power consumption
- (3) Low noise

The maximum air volume has improved by 1.5 times and the maximum static pressure has improved by 2.1 times compared to the same conventional SANYO DENKI product. The power consumption, when compared at the same air volume, has achieved reduction of 35% which is less than 2/3 of the conventional product for the equivalent level of output. In addition, a noise reduction of 5dB has been accomplished, which means this product has realized high air volume, high static pressure, energy reduction, and noise reduction all at the same time.

The, “noise reduction of 5dB” is especially significant. Theoretically, the 5dB reduction means the noise of one conventional fan is roughly equal to 3 of the newly developed fans running simultaneously. We can say that this truly a new level of quietness.

3.1 Dimensions

Fig.2 shows the dimensional overview of the “SAN ACE 92”G Type 32mm Thickness series (hereafter, developed product). Dimensionally, it is the same as the conventional P type 32mm Thickness series (hereafter, conventional product), and has the same compatibility.

3.2 Specifications

3.2.1 General Specifications

Table 1 shows the general specifications of the developed products: There are three types of voltages available: 12V, 24V, and 48V in four Rated Rotating Speeds: A (4300 min⁻¹), S (3500 min⁻¹), and the conventional equivalent specification products of H (2850 min⁻¹), M (2100 min⁻¹).

3.2.2 Air Volume vs. Static Pressure Performance

Fig.3 shows the characteristic curve of the air volume vs. static pressure performance for the developed product.

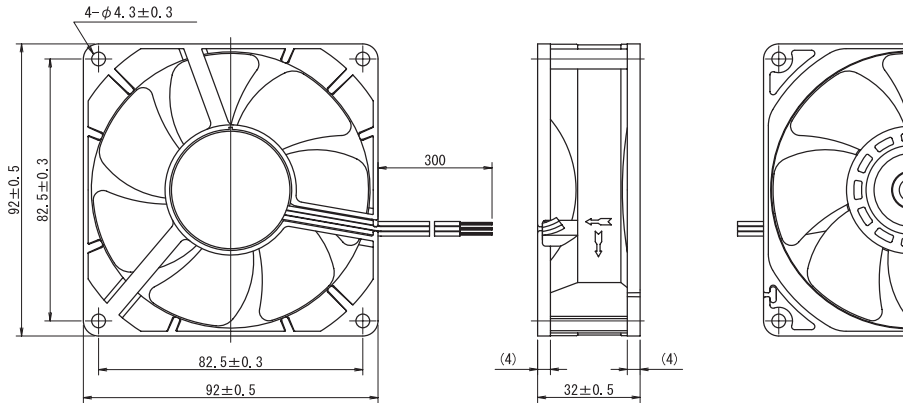


Fig.2 Dimensions of "SAN ACE 92"G Type 32mm Thickness Series

Table 1 General Specifications of "SAN ACE 92"G Type 32mm Thickness Series

Model	Rated Voltage [V]	Operating Voltage Range [V]	Rated Current [A]	Rated Input [W]	Rated Rotating Speed [min^{-1}]	Maximum Air Volume [m^3/min { CFM }]	Maximum Static Pressure [Pa { mmH ₂ O }]	Sound Pressure Level [dB(A)]	Mass [g]
9G0912A201	12	10.2~13.8	0.58	6.96	4300	2.50 { 88.3 }	115 { 11.7 }	44	170
9G0912S201			0.38	4.56	3500	2.00 { 70.7 }	77 { 7.9 }	38	170
9G0912H201			0.23	2.76	2850	1.59 { 56.2 }	51 { 5.2 }	32	170
9G0912M201			0.13	1.56	2100	1.20 { 42.4 }	27 { 2.8 }	25	170
9G0924A201	24	20.4~27.6	0.30	7.20	4300	2.50 { 88.3 }	115 { 11.7 }	44	170
9G0924S201			0.19	4.56	3500	2.00 { 70.7 }	77 { 7.9 }	38	170
9G0924H201			0.12	2.88	2850	1.59 { 56.2 }	51 { 5.2 }	32	170
9G0924M201			0.08	1.92	2100	1.20 { 42.4 }	27 { 2.8 }	25	170
9G0948A201	48	40.8~55.2	0.16	7.68	4300	2.50 { 88.3 }	115 { 11.7 }	44	170
9G0948S201			0.11	5.28	3500	2.00 { 70.7 }	77 { 7.9 }	38	170
9G0948H201			0.08	3.84	2850	1.59 { 56.2 }	51 { 5.2 }	32	170
9G0948M201			0.05	2.40	2100	1.20 { 42.4 }	27 { 2.8 }	25	170

Air Volume vs. Static Pressure Performance

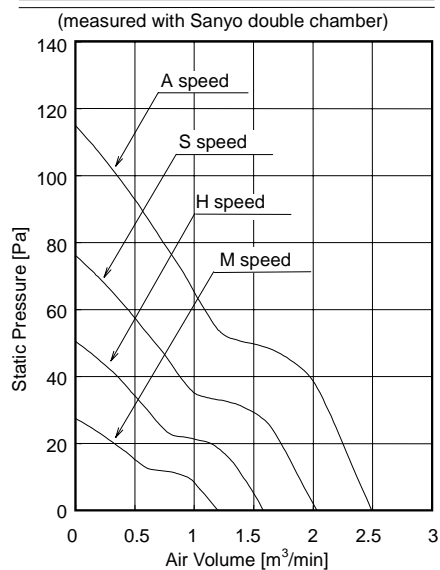


Fig.3 Air volume vs. Static Pressure of "SAN ACE 92"G Type 32mm Thickness Series

4. Comparison with the Conventional Models

The Making of a high air volume fan motor usually requires a trade-off with size, energy usage and noise levels. For instance, if the aim is only to produce high air volume, we should just enlarge the diameter of the fan blades and increase rotation speed, but this would just increase the size of the fan, power consumption and sound pressure level. So really, it is necessary to balance all of these factors in the fan motor.

We pursued the performance improvement of individual component of the fan motor as well as optimization of the whole product in this development. To be clear, we strived for the improvement of aerodynamics and noise performance by the redesign of blade and frame (venturi) shape, and also for the improvement of motor performance and the circuit structure, ultimately looking for the best combination of all of these conditions. As a result, we succeeded in improving the maximum rpm which went from 3200 min^{-1} in conventional product up to 4300 min^{-1} . Also we were able to obtain the same volume of air and the same overall dimension as that of the conventional

product but at 10% less rpm than the conventional product. The examples of specification comparison with conventional product are shown as follows.

4.1 Comparison of Air Volume vs. Static Pressure Performance

Fig.4 shows the comparison example of Air Volume vs. Static Pressure Performance. There is a 1.5 times efficiency improvement of maximum air volume and 2.1 times improvement in maximum static pressure of the developed product vs. the conventional product.

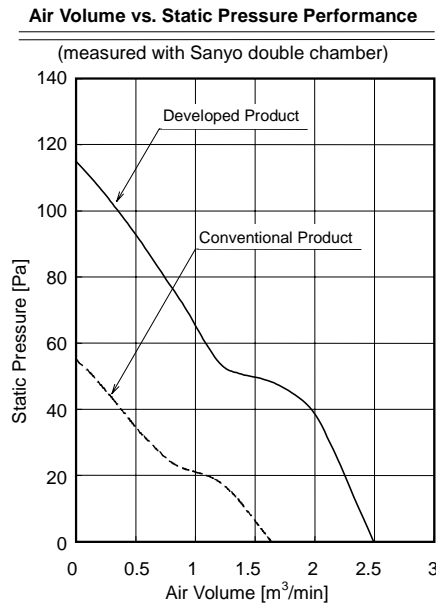


Fig.4 Comparison of Air Volume vs. Static Pressure Performance

The maximum performances of the conventional product are an air volume of 1.6 m³/min, and a static pressure of 55Pa (rotating speed at 3200m⁻¹). The developed product accomplished the maximum air volume of 2.5 m³/min, and a maximum static pressure of 115 Pa (rpm 4300 min⁻¹)

4.2 Comparison of Power Consumption and Sound Pressure Level

Fig.5 shows the comparison examples of power consumption and sound pressure level with conventional product. The power consumption was decreased by 35% and the sound pressure level was decreased 5dB when compared with the same air volume as the conventional product.

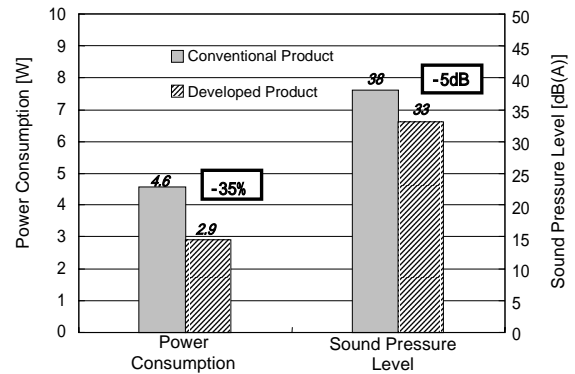


Fig. 5 Comparison of Power Consumption and Sound Pressure Level

The conventional 32mm thickness produced the power consumption of 4.6W and sound pressure of 38dB(A) at the maximum air volume of 1.6 m³/min. The developed product at the same air volume achieved the power consumption of 2.9W and the sound pressure of 33dB(A).

4.3 Comparison of Load Noise Characteristics

Fig.6 shows the load noise properties when the conventional product and the developed product are run at the same air volume. The changes in the rotating speed are plotted as well.

The sound pressure level of the developed product is 5dB lower than that of the conventional product at the same maximum air volume as shown in Fig.6. In addition, the sound pressure level of the developed product is reduced throughout the whole area excluding the area above the air volume of 1.0 m³/min. Moreover, the air volume to static pressure curve of the developed product is exceeding that of the conventional product throughout the whole area, which shows the advantage of the developed product. In other words, the developed product has higher air volume and lower noise than the conventional product in all applications.

The rotation speed can be controlled as well by the improvements and the optimization of the performance of motor and the aerodynamic performance of blades and frame. This also contributes to reduced power consumption.

Comparison of Air Volume vs. Static Pressure, Rotating Speed, Load Noise Performance

(Sound pressure level: with Sanyo's load noise measurement equipment. Distance: 1m)

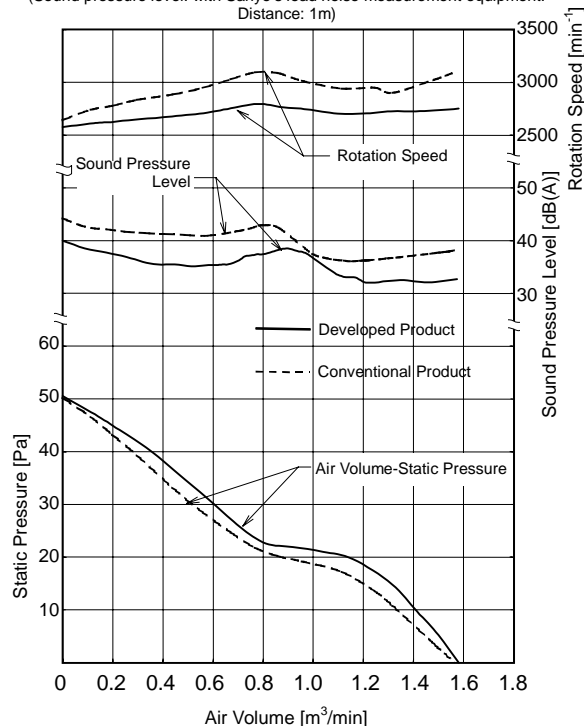


Fig.6 Comparison of Load Noise Performance



ECO PRODUCTS

Fig.7 Symbol Mark for Environment Compatible Design Certified Product



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5. Conclusion

This document introduced the features of the "SAN ACE 92"G Type 32mm Thickness series developed to satisfy the demands for compact size, high air volume, low power consumption, and noise reduction.

This developed product accomplished the following performance improvements over our conventional products of the same size.

The maximum air volume increased by 1.5 times.

The maximum static pressure increased by 2.1 times.

The power consumption reduced by 35%.

The sound pressure level reduced by 5dB.

We think that this developed product can greatly contribute to miniaturization, performance improvement, energy savings and noise reduction in most applications, in particular, information communication products.

This developed product has been certified as an environmentally compatible design product (ECO PRODUCTS) viewed in the light of contributing to the preservation of the earth environment through power savings and the improvement of the performance per volume and mass. (Fig.7)