Oil Proof Fans *San Ace 40WF, San Ace 60WF, San Ace 80WF,* and *San Ace 92WF*

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1. Introduction

Servo amplifiers and controllers are used to control machine tools and industrial robots, and fans are used to cool these devices. These devices are often located in environments exposed to oil mist, therefore oil-proof fans are used due to their high reliability. As today's high-performance devices generate more heat, the oil-proof fans used in these devices are also required to have higher performance.

To meet this demand, we developed and released four high-performance Oil Proof Fan models, the *San Ace 40WF*, *San Ace 60WF*, *San Ace 80WF*, and *San Ace 92WF* 9WFA types. This article introduces the features and performance of these products.

2. Product Features

Figures 1 to 4 show the appearance of the new models. The new *San Ace 40WF*, *San Ace 60WF*, and *San Ace 92WF* offer higher airflow and higher static pressure while maintaining size and mounting compatibility with our current models. The new *San Ace 80WF* achieves higher airflow and static pressure with a thickness of just 20 mm, thinner than any of our existing 80 × 80 mm Oil Proof Fans.

Fig. 1
40 × 40 × 20 mm
San Ace 40WF
9WFA type

Fig. 2
60 × 60 × 20 mm
San Ace 60WF
9WFA type

Fig. 3
80 × 80 × 20 mm
San Ace 80WF
9WFA type

Fig. 4
92 × 92 × 32 mm
San Ace 92WF
9WFA type

Below is a summary of the new models' structural features.

(1) Figure 5 shows the coating on electrical components. Electrical components (windings and circuits) are coated by a protective material with excellent oil resistance.
(2) Compared to standard fans, a wider clearance is provided between the blade tips and inner surface of the frame to prevent the fan from locking up due to oil or dust buildup.

Fig. 5 Coating of electrical components

3. Product Overview

3.1 Dimensions

Figures 6 through 9 show the dimensions of the new models.

The fans' external dimensions and mounting hole dimensions are unchanged and compatible with our current models.

3.2 Expected life

The new models have an expected life of 40,000 hours at 60°C (survival rate of 90%, run continuously at rated voltage and normal humidity in free air).

3.3 Characteristics

3.3.1 General specifications

Tables 1 shows the general specifications for the new models. We designed them with a rated voltage of 24 V to make them suitable for use in factory automation applications, where our Oil Proof Fans are mainly used.

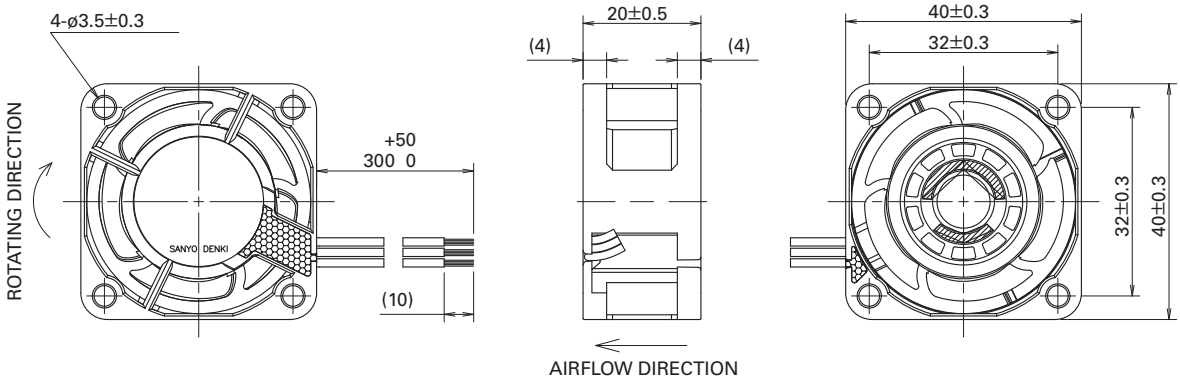

Fig. 6 Dimensions of *San Ace 40WF* (unit: mm)

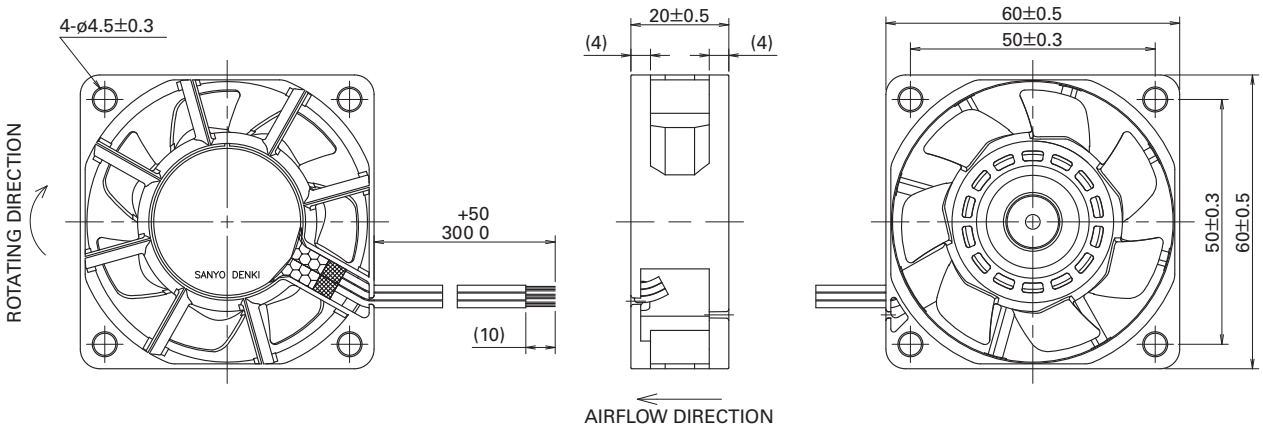

Fig. 7 Dimensions of *San Ace 60WF* (unit: mm)

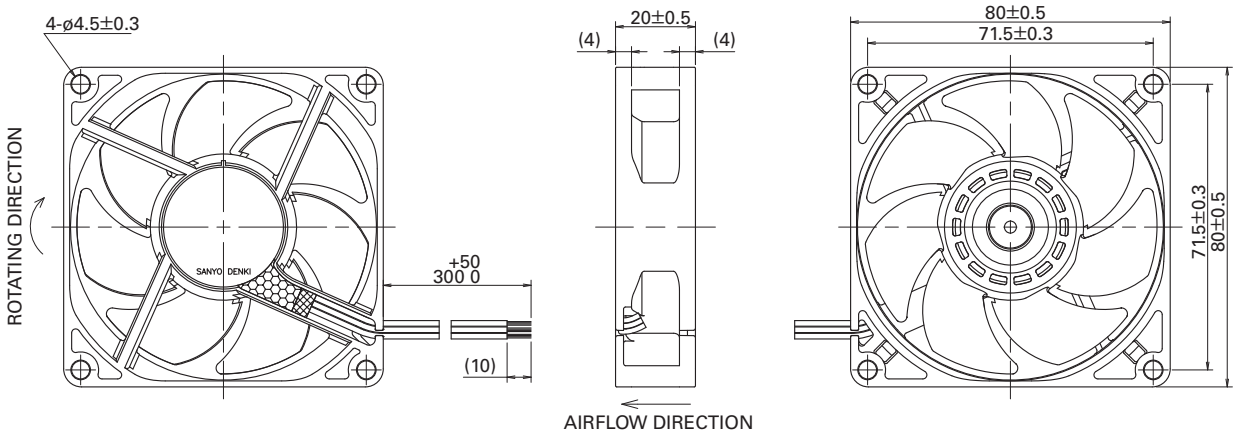

Fig. 8 Dimensions of *San Ace 80WF* (unit: mm)

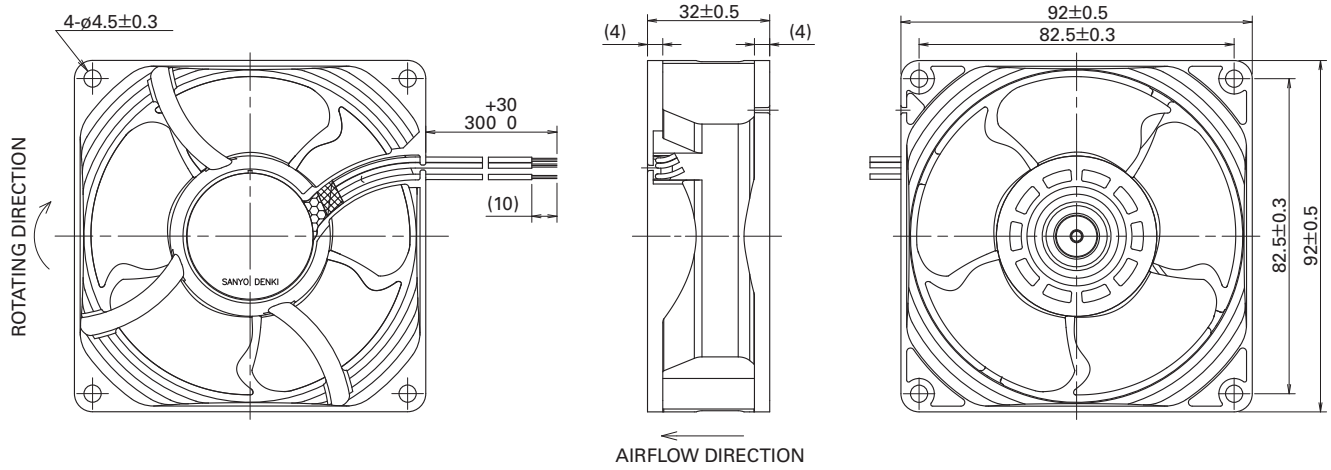

Fig. 9 Dimensions of *San Ace 92WF* (unit: mm)

Table 1 General specifications for the new models

Model no.	Rated voltage [V]	Operating voltage range [V]	Rated current [A]	Rated input [W]	Rated speed [min^{-1}]	Max. airflow		Max. static pressure		SPL [dB(A)]	Operating temperature [°C]	Expected life [h]
						[m^3/min]	[CFM]	[Pa]	[inchH_2O]			
9WFA0424G6001	24	20.4 to 27.6	0.11	2.6	17,000	0.31	10.9	170	0.68	48	-20 to +70	40000 at 60°C (70000 at 40°C)
9WFA0624G6001		15 to 27.6	0.16	3.8	7,700	0.79	27.9	158	0.63	48		
9WFA0824G6001		15 to 27.6	0.15	3.6	6,000	1.44	50.8	105	0.42	48		
9WFA0924G2001		12 to 27.6	0.58	13.9	9,600	3.1	109.5	380	1.53	63		

Note: The expected life at an ambient temperature of 40°C is for reference purposes only.

3.3.2 Airflow vs. static pressure characteristics

The airflow vs. static pressure characteristics for the new models in Figures 10 through 13 show the respective upper and lower limits of their rated voltage and operating voltage range.

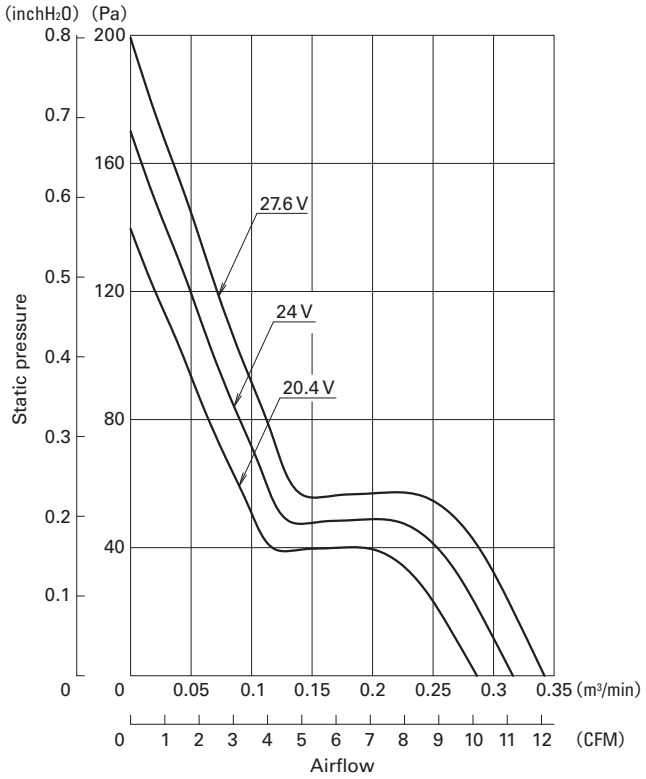

Fig. 10 Airflow vs. static pressure characteristics of *San Ace 40WF*

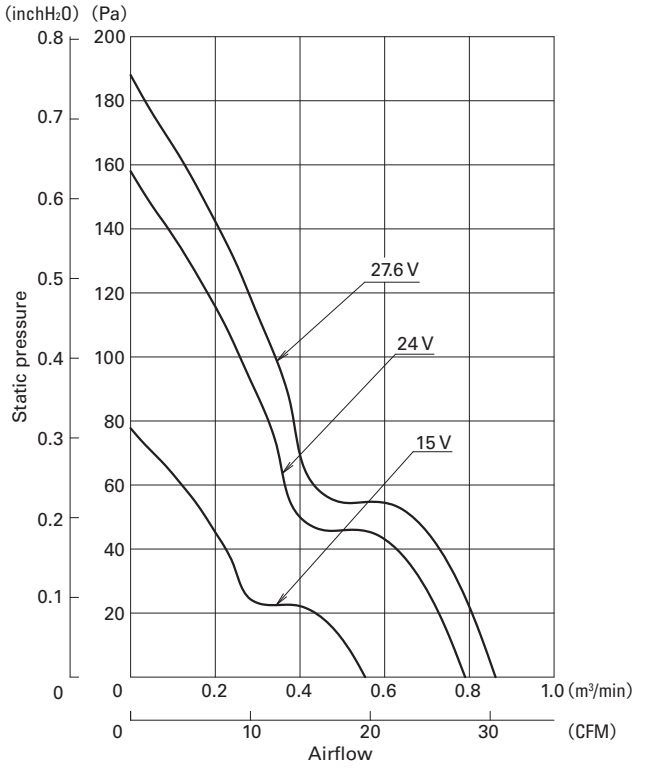

Fig. 11 Airflow vs. static pressure characteristics of *San Ace 60WF*

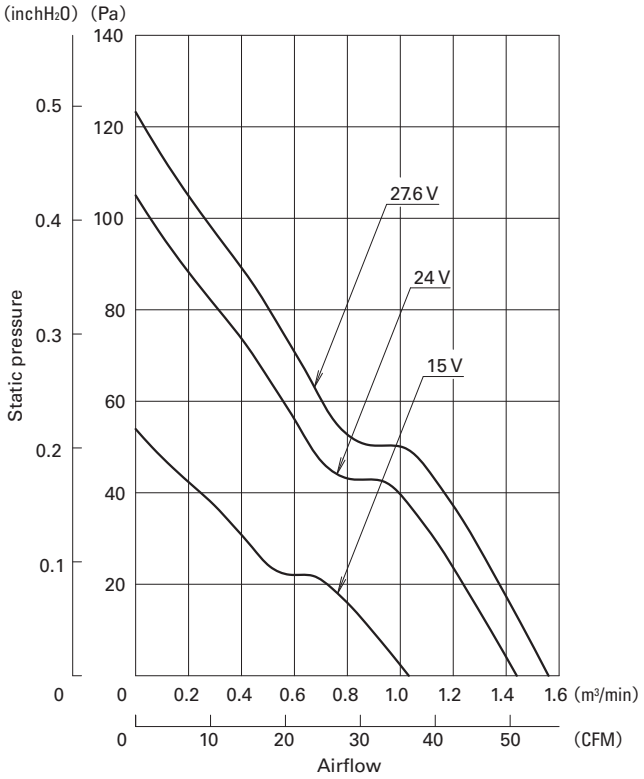

Fig. 12 Airflow vs. static pressure characteristics of *San Ace 80WF*

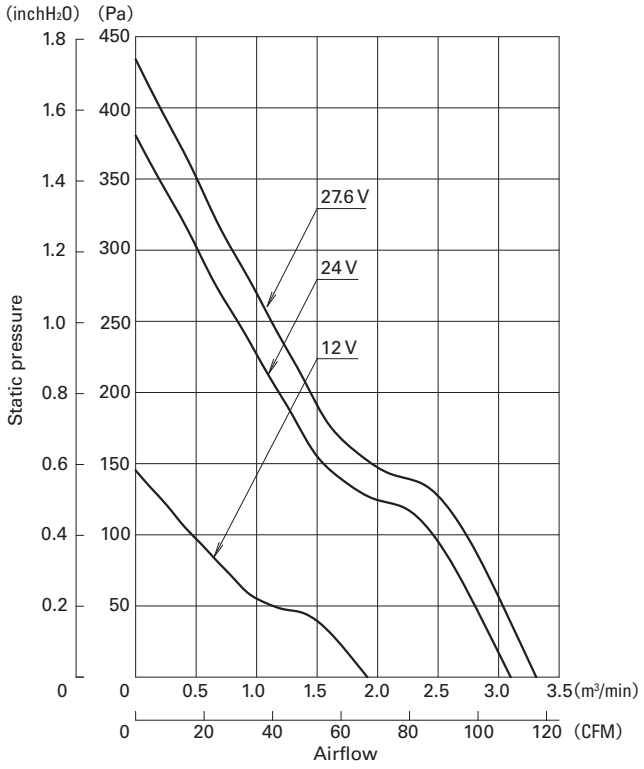

Fig. 13 Airflow vs. static pressure characteristics of *San Ace 92WF*

4. Comparison with Current Models

Figures 14 through 17 compare the airflow vs. static pressure characteristics of the new and current models. Compared to the current models, the new models have greater maximum airflow and maximum static pressure. Despite its 5 mm thinner frame size than the current 80 × 80 × 25 mm Oil Proof Fan, the new *San Ace 80WF* model has both greater maximum airflow and maximum static pressure.

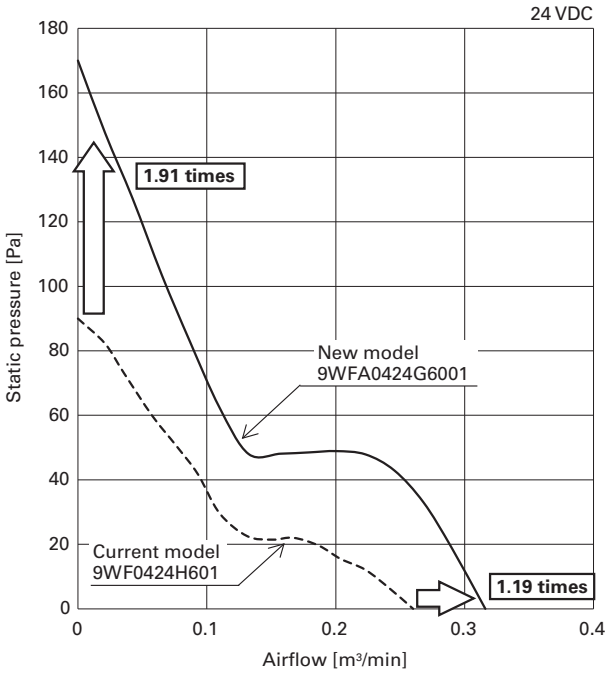

Fig. 14 Comparison of the airflow vs. static pressure characteristics for the new and current *San Ace 40WF* models

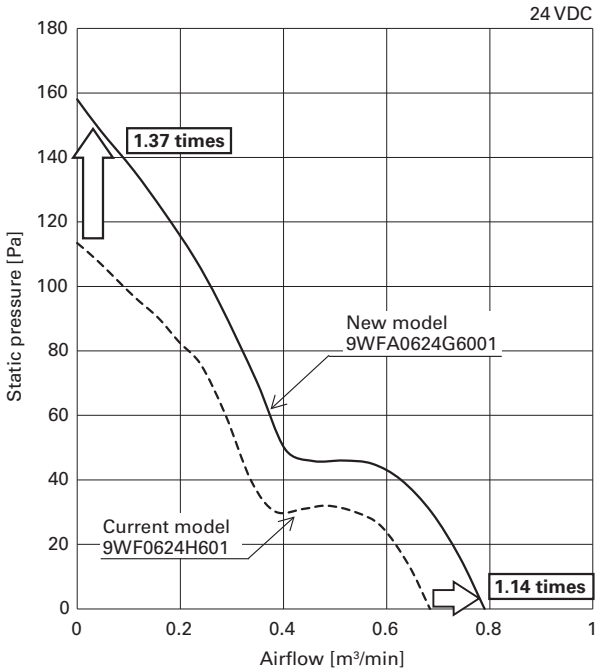

Fig. 15 Comparison of the airflow vs. static pressure characteristics for the new and current *San Ace 60WF* models

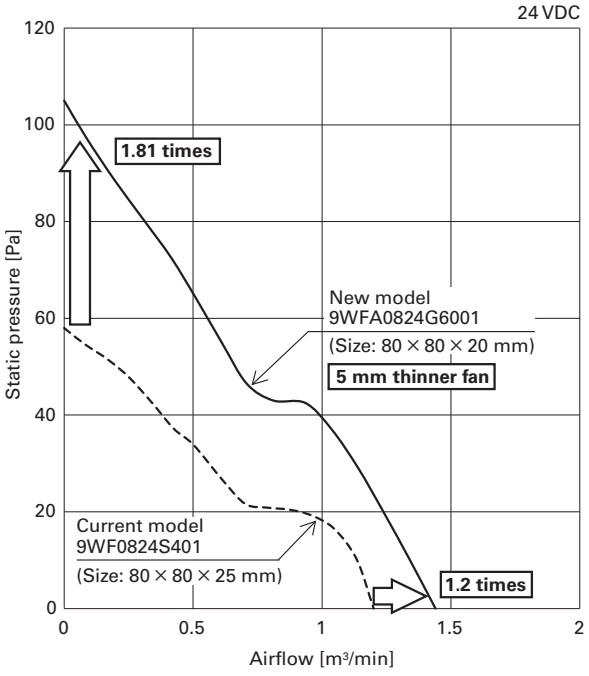

Fig. 16 Comparison of the airflow vs. static pressure characteristics for the new and current *San Ace 80WF* models

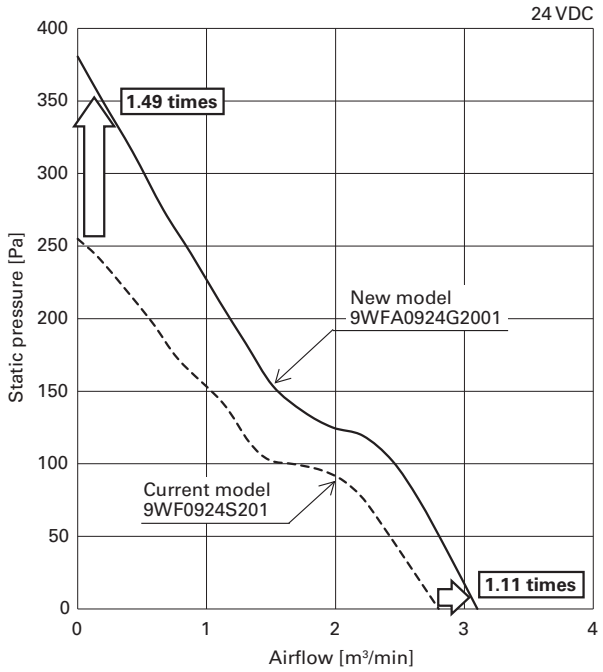

Fig. 17 Comparison of the airflow vs. static pressure characteristics for the new and current *San Ace 92WF* models

New model Current model

Fig. 18 Shape comparison of the new and current *San Ace 80WF* models

The new models offer higher airflow and higher static pressure than the current models while featuring good oil proof performance.

We redesigned the impeller and frame to achieve higher performance, and used a high-efficiency motor and drive method to reduce power consumption while increasing fan speed compared to the current models.

The key points of development are explained below.

4.1 Impeller and frame

When redesigning the impellers and frames of each new model, we conducted numerous simulations and practical evaluations for various combinations of parameters such as the number, length, and angle of blades, and the number and shape of frame spokes. In this way, we determined the optimal design for excellent airflow efficiency. Moreover, we increased the frame strength over the current models to suppress the increase in vibration caused by higher speeds.

The example in Figure 18 compares the shapes of the impellers and frames for the current and new *San Ace 80WF* models.

4.2 Motor and circuit

Regarding the motors of the new models, we reviewed the stator shape and used a motor core with greater efficiency than that of the current models, and revised the circuit components. This resulted in reduced power consumption and increased speed.

Figure 19 compares the power consumption and the airflow vs. static pressure characteristics between the new and current *San Ace 80* models at the same maximum airflow. This graph makes the comparison with the speed of the new model reduced to the point of equal maximum airflow. It demonstrates that static pressure is higher in most ranges and power consumption is lower in all ranges than the current model.

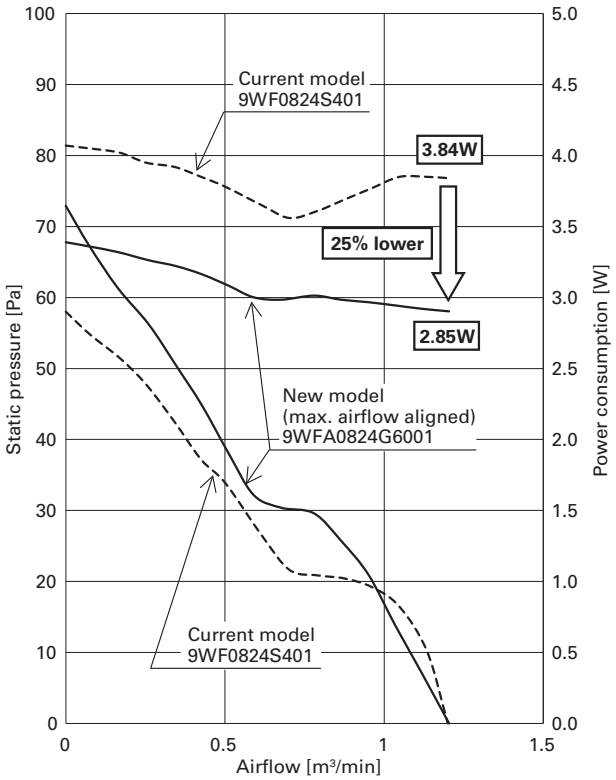

Fig. 19 Airflow vs. static pressure characteristics and power consumption comparison of the new and current *San Ace 80WF* models

5. Conclusion

This article introduced the features and performance of four new models of high-performance Oil Proof Fans: the *San Ace 40WF*, *San Ace 60WF*, *San Ace 80WF*, and *San Ace 92WF* 9WFA types.

Compared with our current models, the four new models offer higher airflow and higher static pressure. As such, we believe they can contribute to the cooling of today's high-performance, heat-generating equipment such as servo amplifiers and controllers.

We wish to continue developing products that meet market needs and contribute to the creation of our customers' new value, and help customers achieve happiness and make their dreams come true.

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