

Development of Low Noise Fans *San Ace 60, San Ace 80, San Ace 92,* and *San Ace 120 9RA* Type

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1. Introduction

In recent years, measuring devices, amusement devices, medical equipment, and AV devices have become more compact and higher performance. As a result, these devices are generating more heat, requiring more effective cooling fans. At the same time, as these devices are often used near people, cooling fans for them are required to operate quietly.

To meet such market demands, we developed and launched the new *San Ace 60, San Ace 80, San Ace 92,* and *San Ace 120 9RA* type Low Noise Fans (hereinafter, “new models”).

This article will introduce the features and performance of the new models.

2. Product Features

Figures 1 through 4 show the appearance of the new models.

The new models generate less noise, consume less power, and offer longer service life while maintaining the size and cooling performance compared to our current models—9R type for 60 × 60 × 25 mm and 80 × 80 × 25 mm, 9A type for 92 × 92 × 25 mm, and 9G type for 120 × 120 × 25 mm.



Fig. 1 60 × 60 × 25 mm *San Ace 60 9RA* type



Fig. 2 80 × 80 × 25 mm *San Ace 80 9RA* type



Fig. 3 92 × 92 × 25 mm *San Ace 92 9RA* type



Fig. 4 120 × 120 × 25 mm *San Ace 120 9RA* type

3. Product Overview

3.1 Dimensions

Figure 5 through 8 show the dimensions of the new models.

The new models come in four sizes of 60 × 60 mm, 80 × 80 mm, 92 × 92 mm, and 120 × 120 mm with a depth of 25 mm shared by all. We have made these size variations available for customers selection to meet a wide range of requirements.

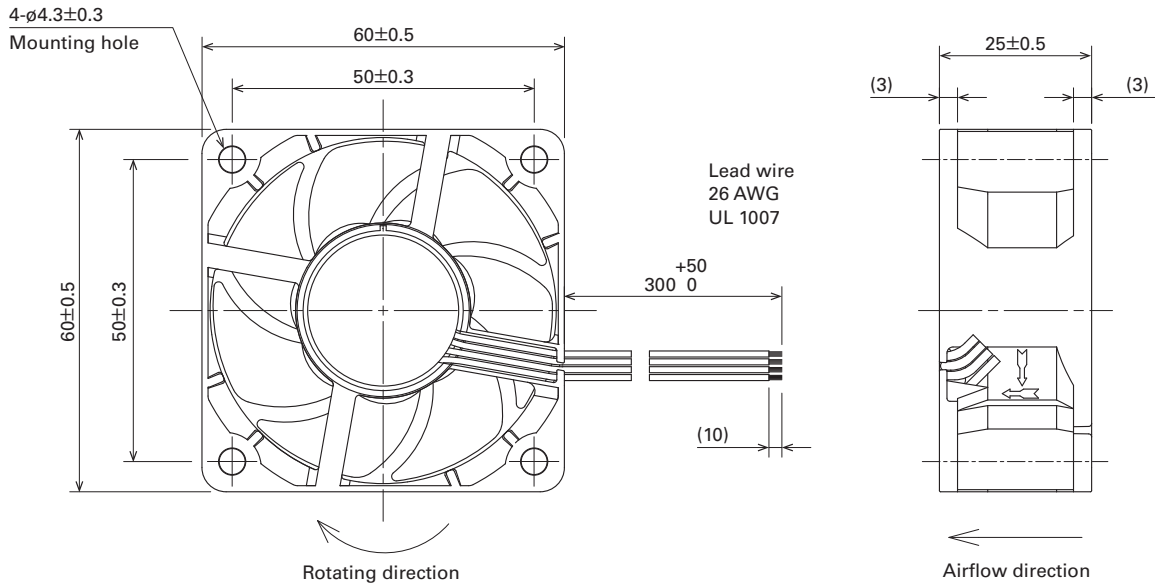


Fig. 5 Dimensions of the new *San Ace 60* (unit: mm)

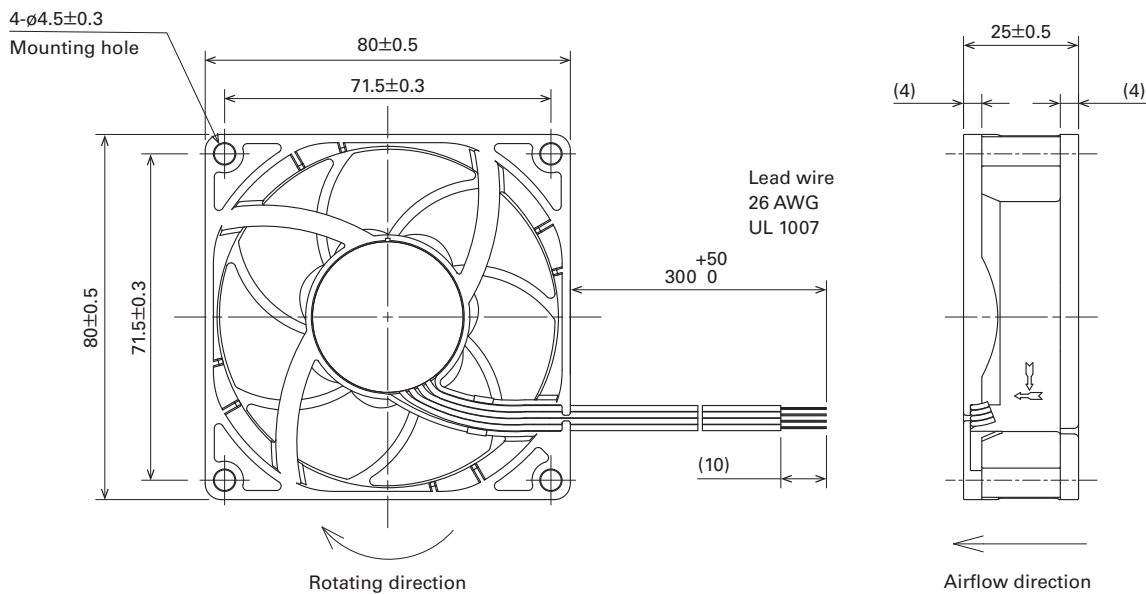


Fig. 6 Dimensions of the new *San Ace 80* (unit: mm)

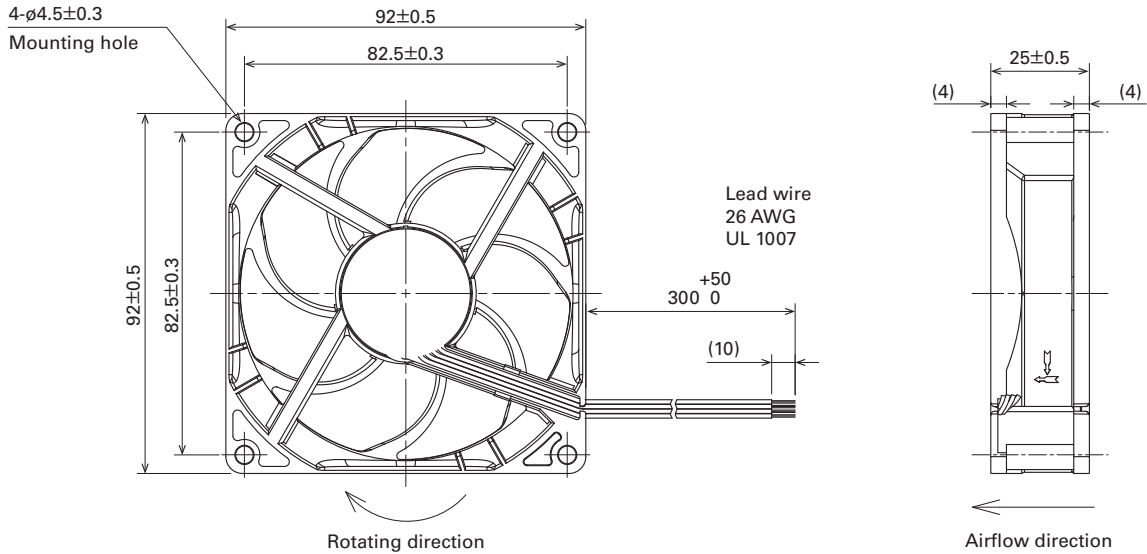


Fig. 7 Dimensions of the new *San Ace 92* (unit: mm)

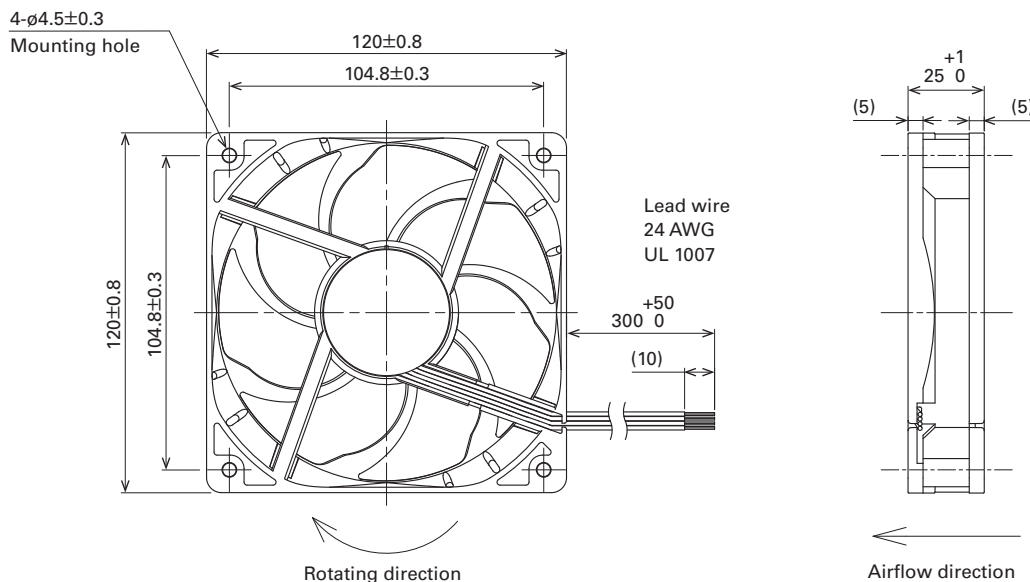


Fig. 8 Dimensions of the new *San Ace 120* (unit: mm)

3.2 Specifications

3.2.1 General specifications

Table 1 shows the general specifications of the new models.

The lineup is available in 12, 24, and 48 V rated voltage variants for each size for use in a wide range of applications and for replacement of our conventional models.

Figures 9 through 12 show the airflow vs. static pressure characteristics of the speed variant models of 12 V rated voltage model. With all the rated voltage and speed variant models counted, the lineup includes 10 models for each of the 60 and 80 mm sizes, and 13 models for each of the 92

and 120 mm sizes. The new models operate quieter than the current models with the equivalent cooling performance. There are available in a variety of sizes to allow customers to choose the one best suited to their equipment.

Also, the new models listed in Table 1 are equipped with a PWM control function for fan speed control according to the temperature within equipment, contributing to energy savings as well as quieter operation.

Table 1 General specifications of new models

Model no.	Size	Rated voltage [V]	PWM duty cycle* [%]	Rated current [A]	Rated input [W]	Rated speed [min ⁻¹]	Max. airflow		Max. static pressure		Sound pressure level [dB(A)]	Operating temperature range [°C]	Expected life [h]
							[m ³ /min]	[CFM]	[Pa]	[inchH ₂ O]			
9RA0612P4J001	60 × 60 × 25 mm	12	100	0.35	4.2	7,700	1.1	38.8	130	0.52	41	-20 to +70	60,000 at 60°C (90,000 at 40°C)
30			0.05	0.6	1,900	0.27	9.5	8.1	0.03	13			
9RA0624P4J001		24	100	0.18	4.32	7,700	1.1	38.8	130	0.52	41		
			20	0.03	0.72	1,700	0.24	8.5	6.5	0.02	11		
9RA0648P4J001		48	100	0.1	4.8	7,700	1.1	38.8	130	0.52	41		
			20	0.03	1.44	1,800	0.25	8.8	7.1	0.03	12		
9RA0812P4G001	80 × 80 × 25 mm	12	100	0.22	2.64	5,000	1.4	49.4	83	0.33	37		
30			0.03	0.36	1,100	0.3	10.6	4	0.01	11			
9RA0824P4G001		24	100	0.11	2.64	5,000	1.4	49.4	83	0.33	37		
			20	0.02	0.48	1,000	0.28	9.8	3.3	0.01	10		
9RA0848P4G001		48	100	0.07	3.36	5,000	1.4	49.4	83	0.33	37		
			20	0.02	0.96	1,700	0.47	16.5	9.6	0.04	14		
9RA0912P4G001	92 × 92 × 25 mm	12	100	0.22	2.64	4,200	1.8	63.5	73.5	0.29	37		
30			0.03	0.36	1,000	0.42	14.8	4.1	0.016	11			
9RA0924P4G001		24	100	0.13	3.12	4,200	1.8	63.5	73.5	0.29	37		
			20	0.03	0.72	1,000	0.42	14.8	4.1	0.016	11		
9RA0948P4G001		48	100	0.07	3.36	4,200	1.8	63.5	73.5	0.29	37		
			20	0.03	1.44	1,400	0.6	21.2	8.1	0.033	14		
9RA1212P4G001	120 × 120 × 25 mm	12	100	0.55	6.6	4,500	3.68	130	120	0.48	47		
20			0.06	0.72	1,250	1.02	36	9.2	0.037	15			
9RA1224P4G001		24	100	0.28	6.72	4,500	3.68	130	120	0.48	47		
			20	0.05	1.2	1,750	1.43	50.5	18.1	0.073	22		
9RA1248P4G001		48	100	0.15	7.2	4,500	3.68	130	120	0.48	47		
			20	0.03	1.44	1,650	1.34	47.3	16.1	0.065	21		

* Input PWM frequency: 25 kHz. Speed is 0 min⁻¹ at 0% PWM duty cycle.

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

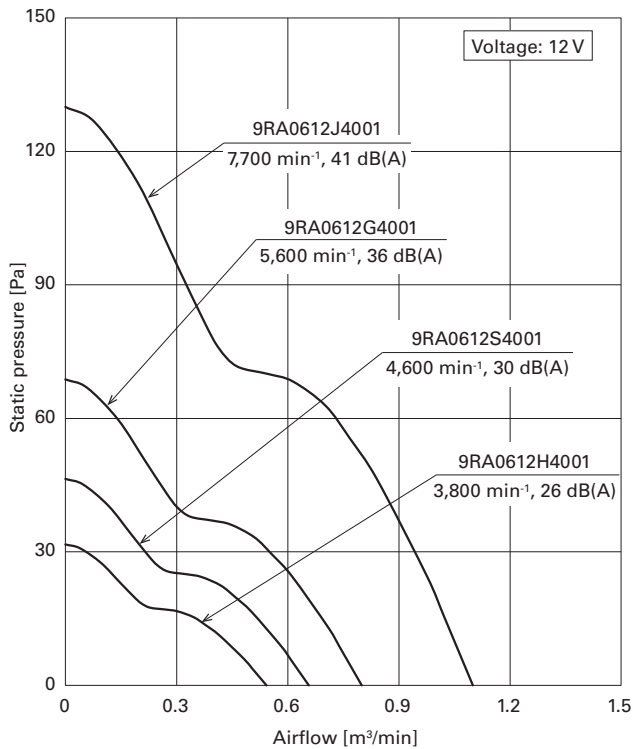


Fig. 9 Airflow vs. static pressure characteristics of the new *San Ace 60*

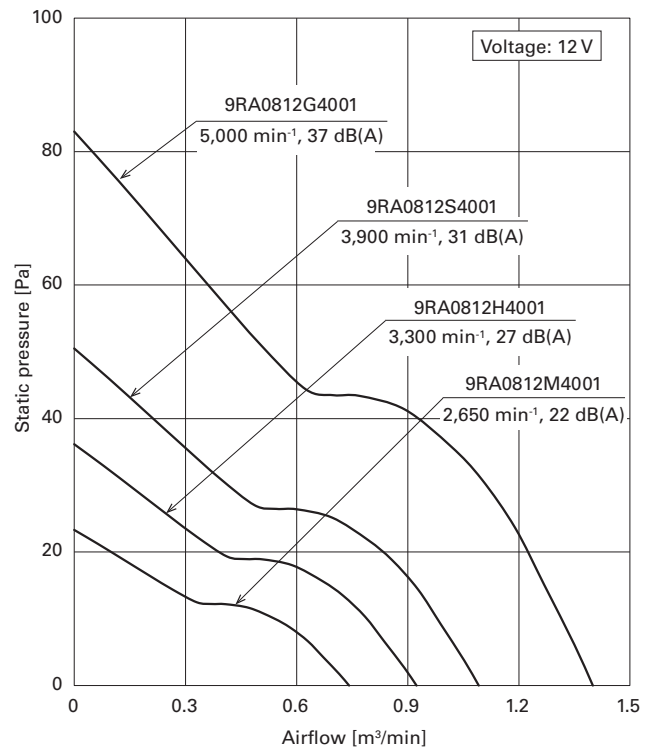


Fig. 10 Airflow vs. static pressure characteristics of the new *San Ace 80*

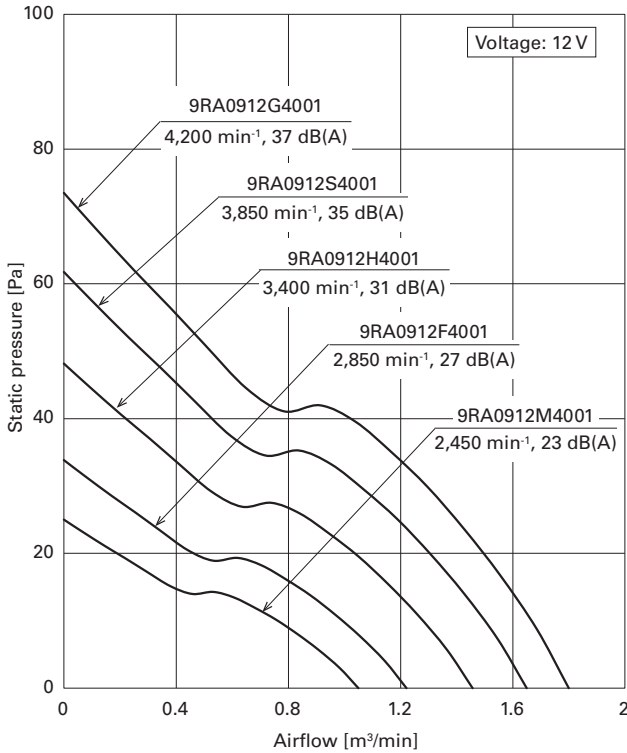


Fig. 11 Airflow vs. static pressure characteristics of the new *San Ace 92*

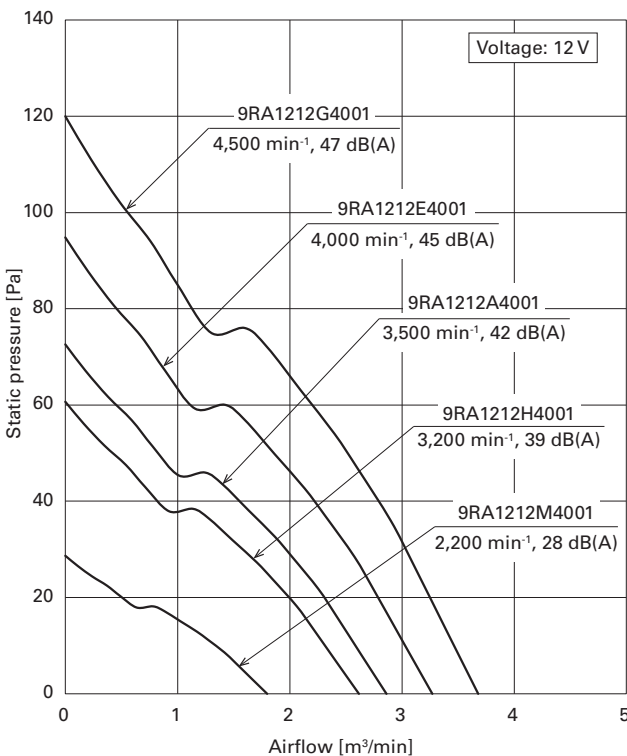


Fig. 12 Airflow vs. static pressure characteristics of the new *San Ace 120*

4. Key Points of Development

The new models, when compared to the current models, achieve lower noise, lower power consumption, and longer service life with cooling performance maintained.

The key points of development are explained below.

4.1 Motor and circuit

We used highly efficient compact motors for the new 60 × 60 mm and 120 × 120 mm models. We also designed a new circuit and changed the drive system for the new models including the 80 × 80 mm and 92 × 92 mm models, reducing the power consumption from the current models.

This drive system change also reduced the heat generation inside the fan by the motor and electronic components, which suppressed the temperature rise in bearings, resulting in longer fan service life compared with the current models.

4.2 Impeller and frame

Figure 13 compares the shape of fan impellers and frames of the current and new models, using the *San Ace 60* as an example.

We used compact motors in the new models to increase the design flexibility for the impeller. This allowed us to do simulations with increased the number of conditions, such as impeller shape and blade installation angle. We conducted simulations and actual evaluations combining various frame shapes and numbers of spokes so that we could determine the ideal shape.



Fig. 13 Shape comparison between the new and current *San Ace 60* models

5. Comparison of New and Current Models

5.1 Comparison of the airflow vs. static pressure characteristics and noise levels between new and current models

Figures 14 through 17 compare the airflow vs. static pressure vs. power consumption characteristics and the noise level characteristics of the fastest new and current models for each size. The figures show that the new models consume 26% to 44% less power while maintaining the airflow vs. static pressure characteristics compared to the current models. The figures also show significant noise

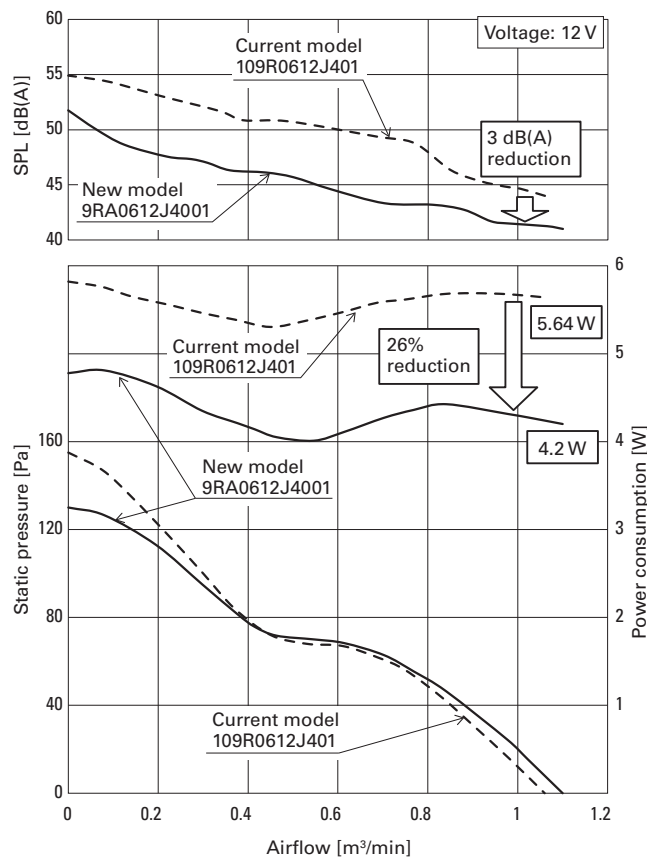


Fig. 14 Comparison of the new and current *San Ace 60* models

reductions, a 3 dB (A) reduction for the 60 × 60 mm and 80 × 80 mm models and 4 dB(A) reduction for the 92 × 92 mm and 120 × 120 mm models. A 3 dB(A) difference in noise means that the noise level from two units of a new model in operation is equal to that from one unit of a current model in operation.

5.2 Comparison of expected life

The new models have an expected life of 60,000 hours at 60°C (survival rate of 90%, run continuously at rated voltage and normal humidity in free air). The expected life of the current models is from 30,000 to 40,000 hours, so the new models have 1.5 to 2 times longer expected lives.

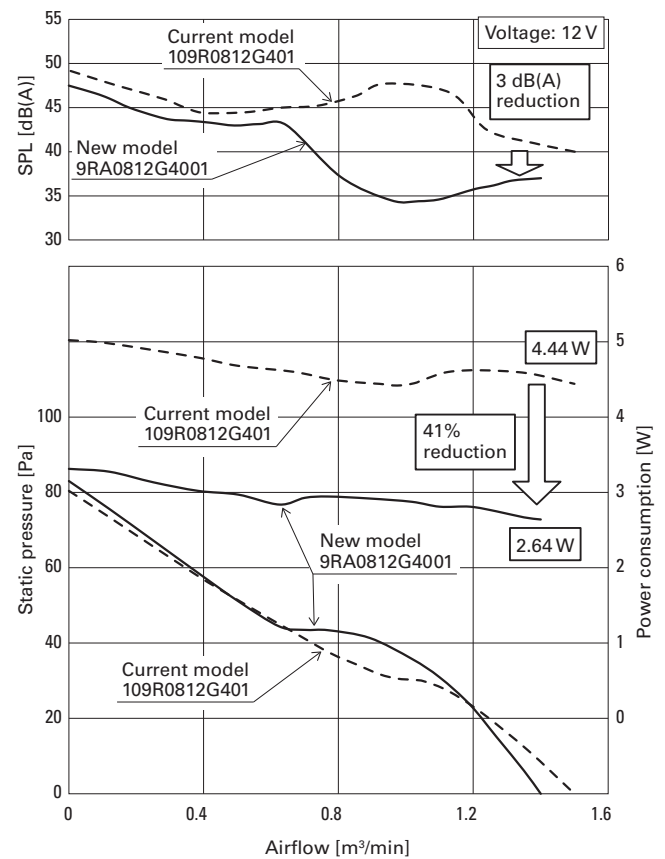


Fig. 15 Comparison of the new and current *San Ace 80* models

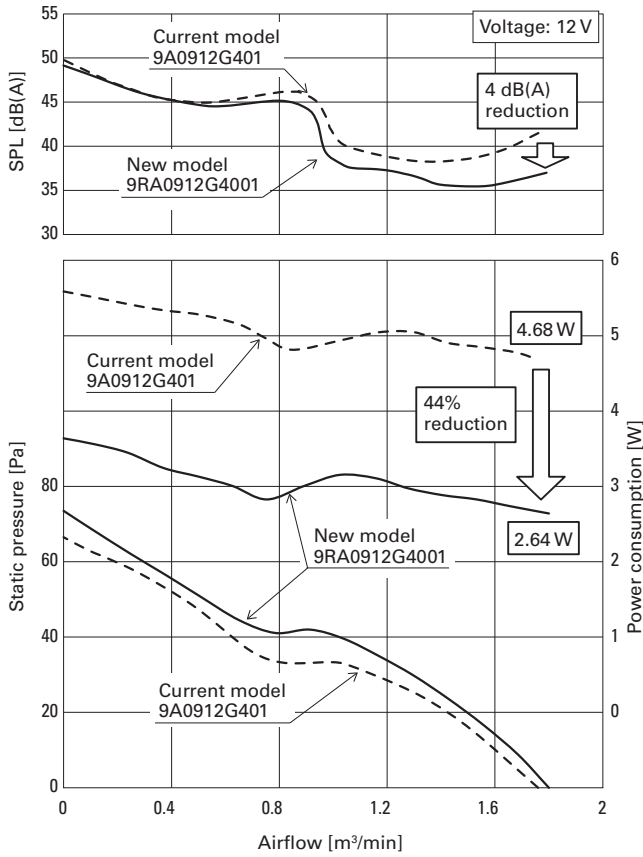


Fig. 16 Comparison of the new and current *San Ace 92* models

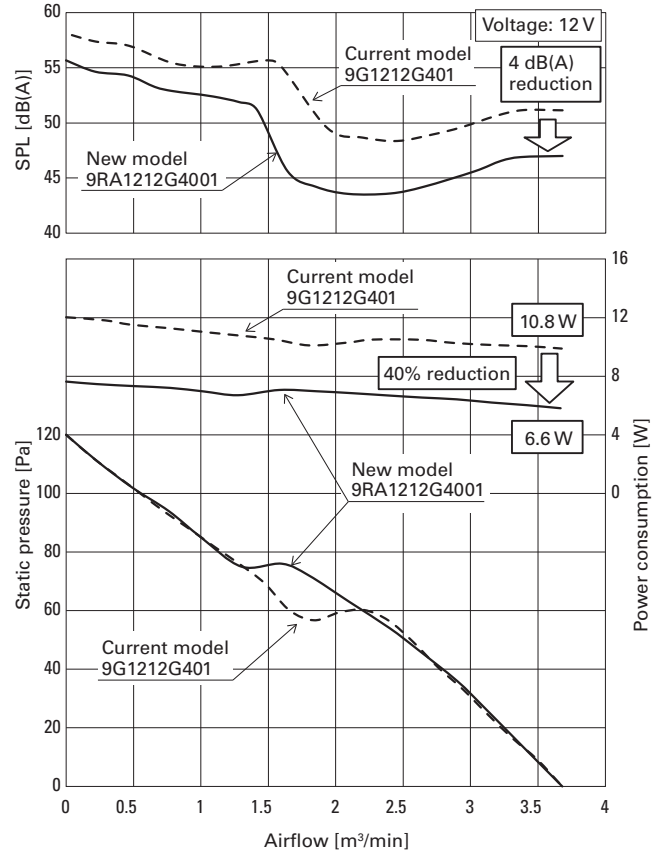


Fig. 17 Comparison of the new and current *San Ace 120* models

6. Conclusion

This article introduced the features and performance of the *San Ace 60*, *San Ace 80*, *San Ace 92*, and *San Ace 120 9RA* type Low Noise Fans.

The new models achieve lower noise and power consumption while maintaining the cooling performance compared to the current models. We believe that these fans will help reduce noise and save energy in measuring devices,

amusement devices, medical equipment, and AV devices that are used nearby people.

The new models offer a longer expected life than the current models, and we believe that this will help increase the maintainability and extend the expected life of equipment.

We will continue developing products quickly responding to and meeting market needs to provide products that can help our customers create new value.

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