

40 × 40 × 20 mm and 40 × 40 × 28 mm *San Ace 40W 9WPA* Type High-Performance Splash Proof Fans

Yuto Horiuchi

Koji Ueno

Yukihiro Nagatsuka

Masaki Kodama

Kenya Horiuchi

Sho Matsushita

Hiromitsu Kuribayashi

1. Introduction

In recent years, outdoor equipment such as base stations, quick EV chargers, and surveillance cameras is becoming more compact and sophisticated in design and increasing in density, generating more heat. This has raised demand for compact splash proof fans with better performance.

Previously, SANYO DENKI has proposed its compact splash proof fans—40 × 40 × 20 mm 9WP type and 40 × 40 × 28 mm 9WL type Splash Proof Fans—but nowadays increasingly more cases are requiring higher performance.

In response to this demand, we newly developed and launched a *San Ace 40W 9WPA* type Splash Proof Fan in 40 × 40 × 20 mm and 40 × 40 × 28 mm sizes (hereinafter, new 20 mm thick models and 28 mm thick models) offering the industry's highest⁽¹⁾ airflow and static pressure.

This article introduces the features and performance of these new models.

(1) Based on our own research as of June 28, 2022, conducted among equally-sized splash proof fans on the market.

2. Product Features

The new 20 mm and 28 mm thick models are compatible in frame size and mounting with our current 40 × 40 × 20 mm *San Ace 40W 9WP* type and 40 × 40 × 28 mm *San Ace 40W 9WL* type fans, respectively, while achieving higher airflow, higher static pressure, and lower power consumption.

Figures 1 and 2 show the new models.



Fig. 1 40 × 40 × 20 mm *San Ace 40W 9WPA* type



Fig. 2 40 × 40 × 28 mm *San Ace 40W 9WPA* type

The new models' structural features are as follows.

- (1) Electrical live parts (windings and circuits) are coated with highly water-resistant material. Figure 3 shows how it looks.
- (2) Each pair of the new and current models has compatibility in frame size and mounting, and the new models use a highly environmental durability resin material in the frame and blades.



Fig. 3 Coating of electrical live parts (New 28 mm thick model)

3. Product Overview

3.1 Dimensions

Figures 4 and 5 show the dimensions of the new models.

3.2 Characteristics

Table 1 to 4 shows the specifications of the product and Figures 6 to 13 show the airflow vs. static pressure characteristics of the new models.

Rated voltages of 12 V and 24 V are available to support operation in a wide range of applications. The new models are available in high-speed (G speed) and low-speed (H speed) models.

The G-speed models have a PWM control function. This function controls fan speed according to the heat generation inside equipment to keep the cooling performance optimized at all times, enabling low power consumption and low noise.

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).

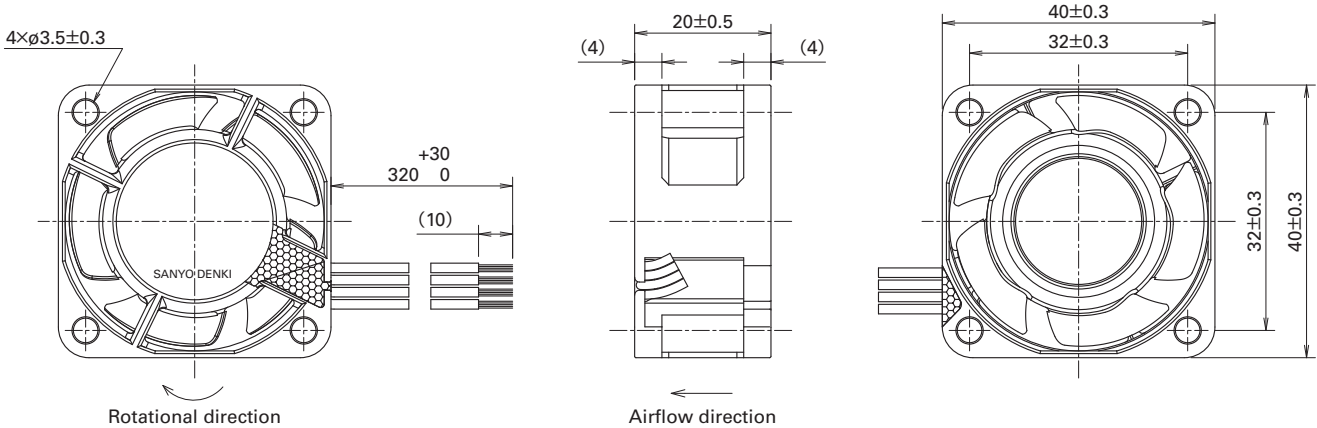


Fig. 4 Dimensions of 40 × 40 × 20 mm *San Ace 40W 9WPA* type (Unit: mm)

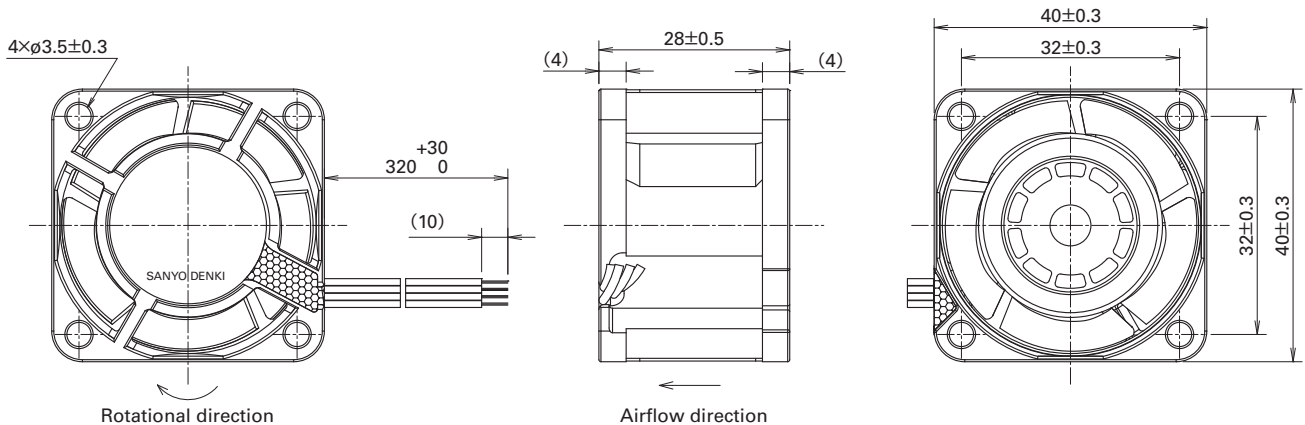


Fig. 5 Dimensions of 40 × 40 × 28 mm *San Ace 40W 9WPA* type (Unit: mm)

Table 1 General specifications of 40 × 40 × 20 mm *San Ace 40W 9WPA* type high-speed model

Model no.	Rated voltage [V]	Operating voltage range [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]			
9WPA0412P6G001	12	10.8 to 13.2	100	0.17	2.0	13700	0.38	13.4	210	0.84	44	-20 to +70	40000 at 60°C (70000 at 40°C)
			25	0.03	0.36	3000	0.07	2.5	9.8	0.04	12		
9WPA0424P6G001	24	21.6 to 26.4	100	0.09	2.0	13700	0.38	13.4	210	0.84	44		
			25	0.03	0.72	3600	0.09	3.2	15	0.06	14		

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

Table 2 General specifications of 40 × 40 × 20 mm *San Ace 40W 9WPA* type low-speed model

Model no.	Rated voltage [V]	Operating voltage range [V]	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]			
9WPA0412H6001	12	7 to 13.8	0.075	0.9	8800	0.24	8.5	81	0.33	34	-20 to +70	40000 at 60°C (70000 at 40°C)
9WPA0424H6001	24	14 to 27.6	0.038									

Table 3 General specifications of 40 × 40 × 28mm *San Ace 40W 9WPA* type high-speed model

Model no.	Rated voltage [V]	Operating voltage range [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]			
9WPA0412P3G001	12	10.8 to 13.2	100	0.50	6.0	22200	0.63	22.2	555	2.22	53	-20 to +70	40000 at 60°C (70000 at 40°C)
			20	0.06	0.72	5000	0.14	4.9	28.1	0.11	21		
9WPA0424P3G001	24	21.6 to 26.4	100	0.25	6.0	22200	0.63	22.2	555	2.22	53		
			20	0.06	1.44	9200	0.26	9.1	95	0.38	34		

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

Table 4 General specifications of 40 × 40 × 28 mm *San Ace 40W 9WPA* type low-speed model

Model no.	Rated voltage [V]	Operating voltage range [V]	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]			
9WPA0412H3001	12	7 to 13.8	0.34	4.1	18500	0.52	18.3	375	1.51	48	-20 to +70	40000 at 60°C (70000 at 40°C)
9WPA0424H3001	24	14 to 27.6	0.17									

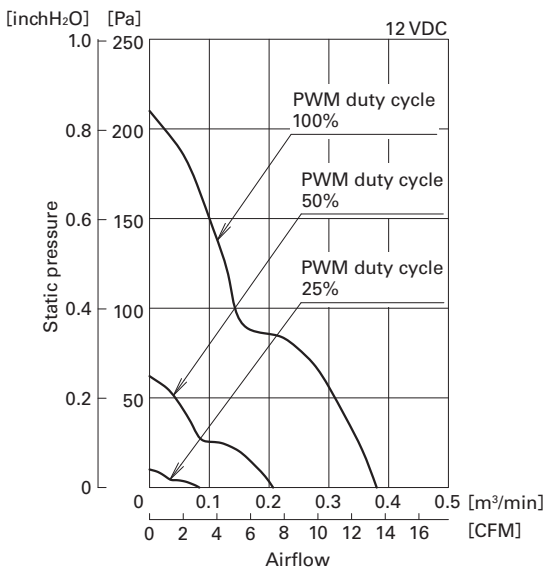


Fig. 6 Airflow vs. static pressure characteristics of 40 × 40 × 20 mm *San Ace 40W 9WPA* type 12 V, high-speed model

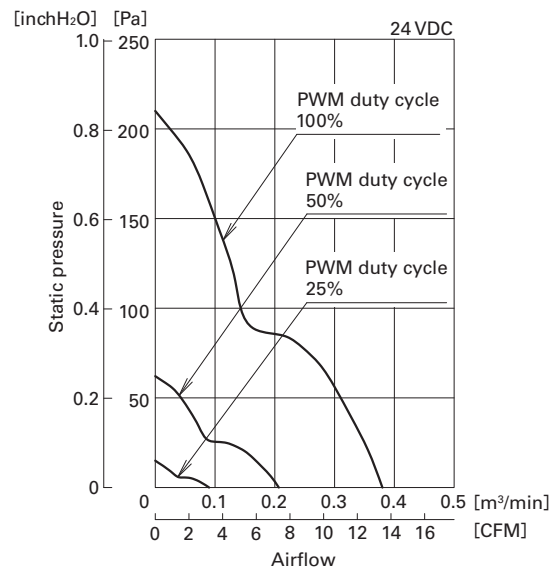


Fig. 7 Airflow vs. static pressure characteristics of 40 × 40 × 20 mm *San Ace 40W 9WPA* type 24 V, high-speed model

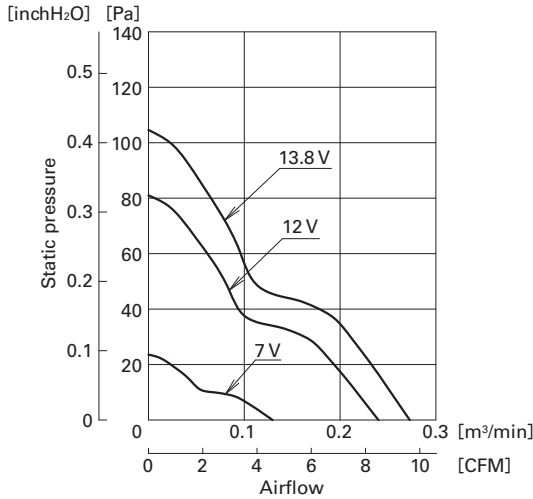


Fig. 8 Airflow vs. static pressure characteristics of 40 × 40 × 20 mm San Ace 40W 9WPA type 12 V, low-speed model

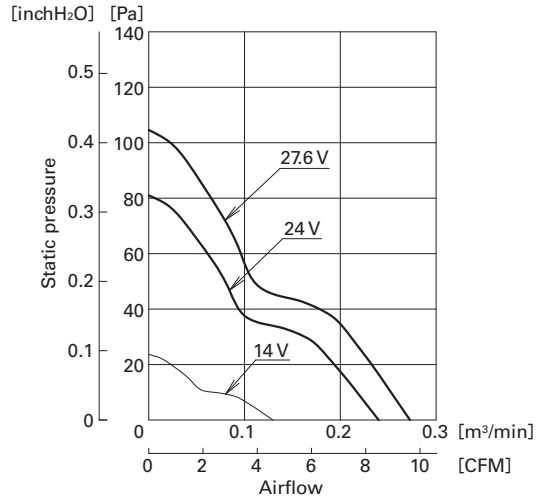


Fig. 9 Airflow vs. static pressure characteristics of 40 × 40 × 20 mm San Ace 40W 9WPA type 24 V, low-speed model

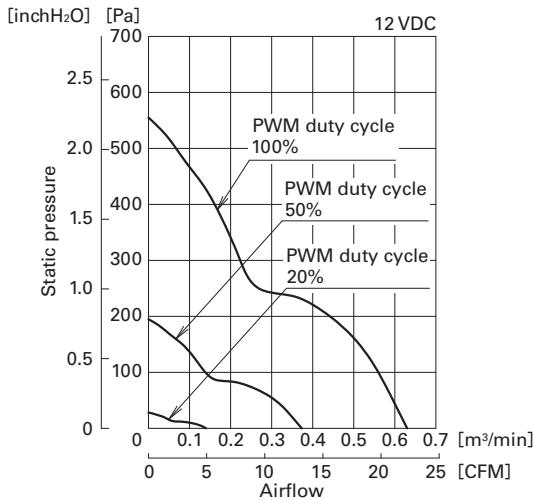


Fig. 10 Airflow vs. static pressure characteristics of 40 × 40 × 28 mm San Ace 40W 9WPA type 12 V, high-speed model

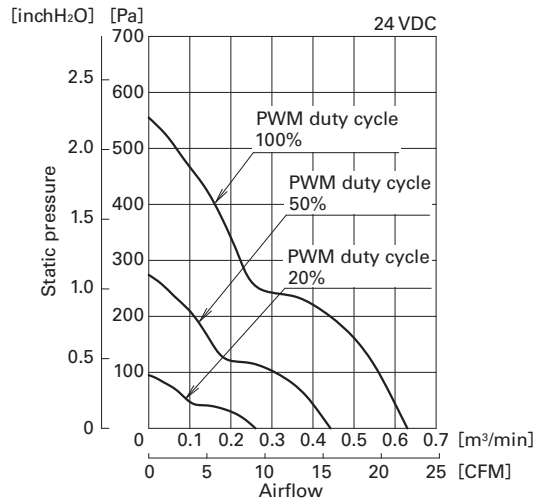


Fig. 11 Airflow vs. static pressure characteristics of 40 × 40 × 28 mm San Ace 40W 9WPA type 24 V, high-speed model

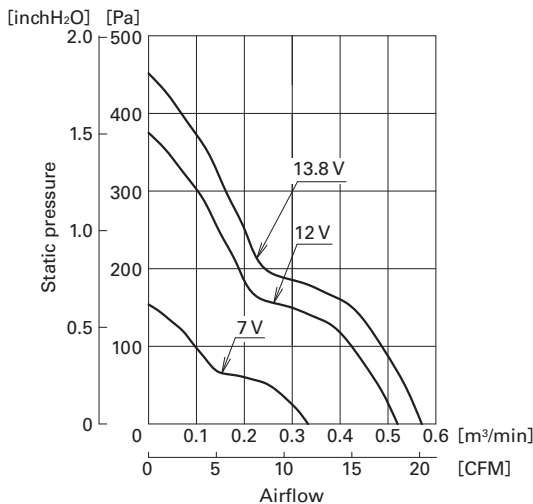


Fig. 12 Airflow vs. static pressure characteristics of 40 × 40 × 28 mm San Ace 40W 9WPA type 12 V, low-speed model

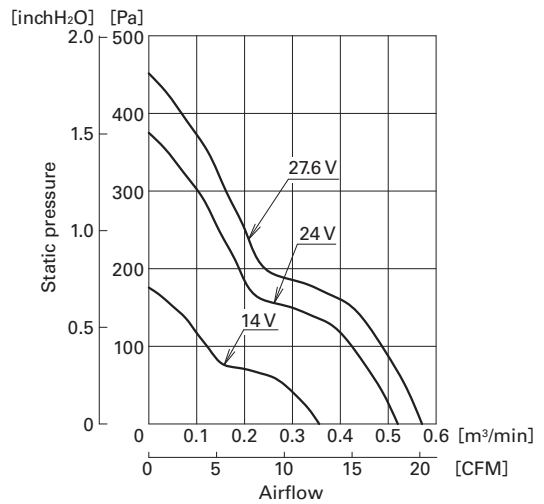


Fig. 13 Airflow vs. static pressure characteristics of 40 × 40 × 28 mm San Ace 40W 9WPA type 24 V, low-speed model

4. Comparison of New and Current Models

4.1 Comparison of airflow vs. static pressure characteristics

Figures 14 and 15 show a comparison of airflow vs. static pressure characteristics for the new and current models.

Compared to the current 9WP type model, the new 20 mm thick model achieves 69% higher maximum airflow and 220% higher maximum static pressure.

Compared to the current 9WL type model, the new 28 mm thick model achieves higher static pressure across all operating ranges and 38% higher maximum static pressure.

5. Key Points of Development

The new models use a high-efficiency motor for faster speed, and frame and blades are newly designed and thereby achieve significantly higher airflow, higher static pressure, and lower power consumption than the current models. The new models also feature high IP68-rated water and dust protection.⁽²⁾ From the early phase of development, the design team put an effort in making manufacturing productivity as high as possible in addition to improving fan performance and reliability.

The key points of development are described below.

(2) IP68 ingress protection rating

The degree of protection (IP code) is defined by IEC (International Electrotechnical Commission) 60529 "Degrees of Protection Provided by Enclosures (IP Code)."

5.1 Structural design

The resin material most suitable for the product specifications was selected for the frame, and the frame shape was designed to deliver faster speed.

The fan blades were made strong enough for faster speeds and designed to achieve high airflow and high static pressure.

To achieve water and dust protection, all electrical live parts were covered with a highly water-resistant resin coating. Moreover, both reliability and productivity were secured by devising the optimal coating shape and thickness.

5.2 Motor and circuit

By optimizing the motor and its drive system for individual voltages and speeds, we successfully developed a high-efficiency motor with reduced heat generation from the motor and its circuit. As a result, the new 20 mm and

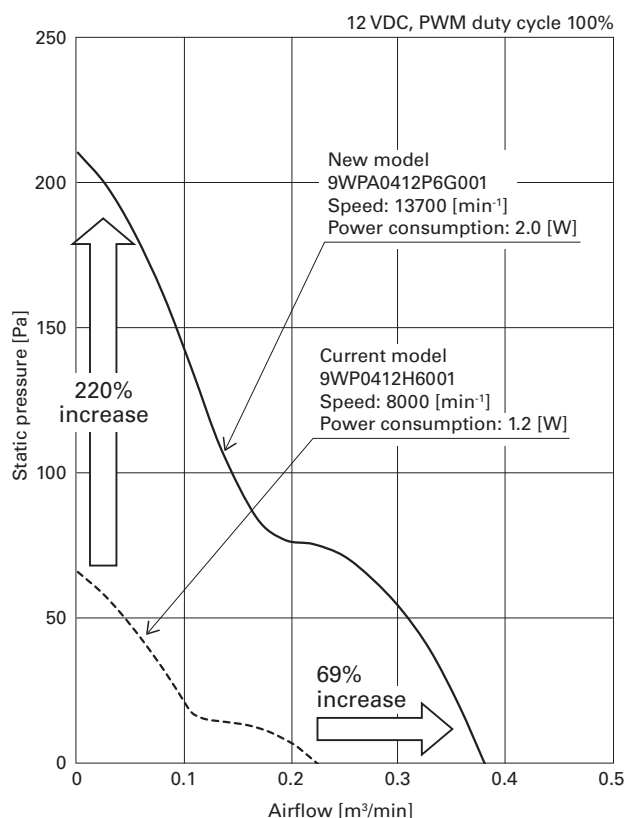


Fig. 14 Comparison of new 40 × 40 × 20 mm San Ace 40W 9WPA type with current model

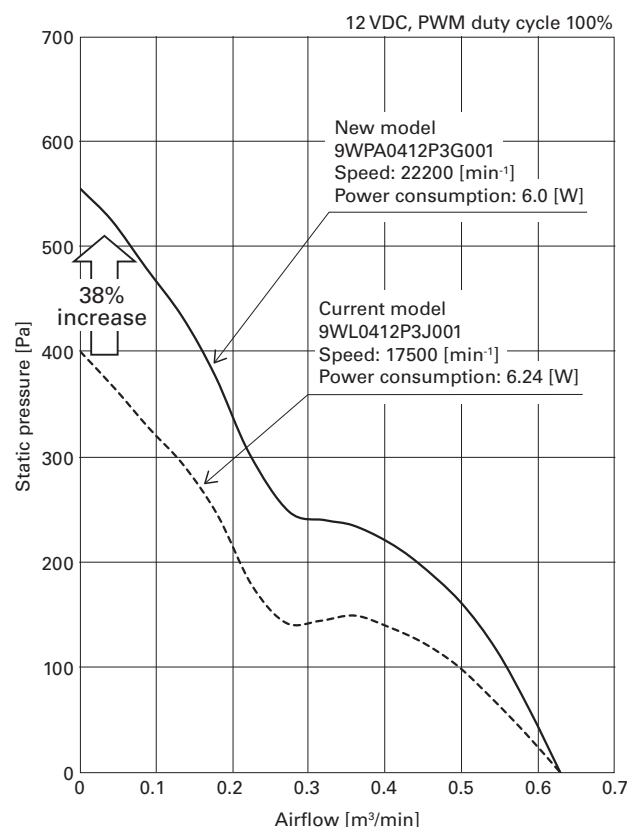


Fig. 15 Comparison of new 40 × 40 × 28 mm San Ace 40W 9WPA type with current model

28 mm thick models are 1.5 times and 1.3 times faster than the current models, respectively, and both achieve reduced power consumption.

As an example, Figure 16 provides a comparison of power consumption for new and current 40 × 40 × 20 mm models at equivalent cooling performance. Compared to the current model, the new model boasts 37% lower power consumption.

Also, compared to the current model, the new model offers higher static pressure and consumes less power across all operating ranges.

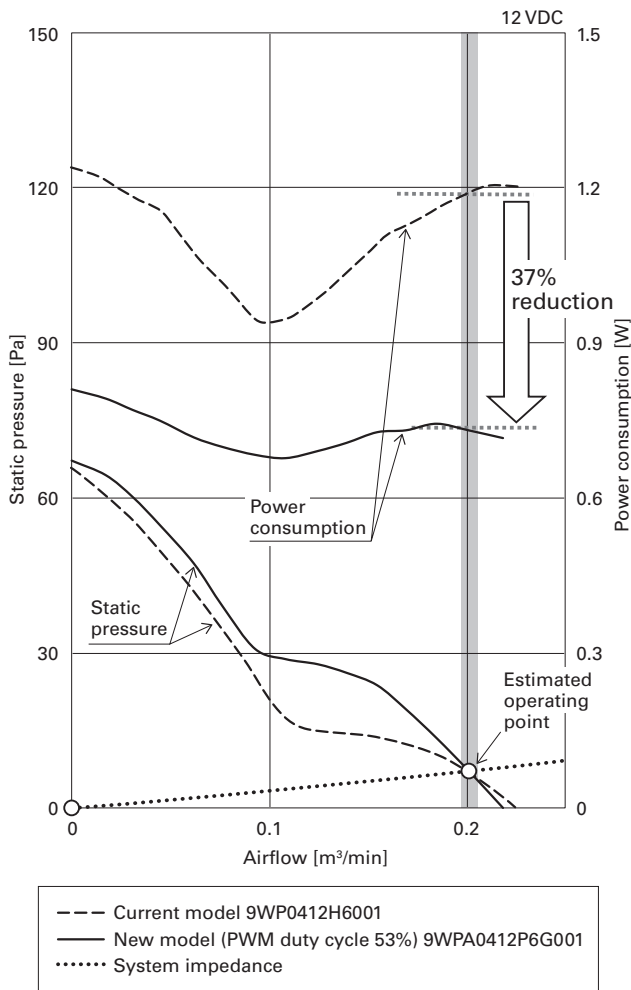


Fig. 16 Comparison of new 40 × 40 × 20 mm San Ace 40W 9WPA type with current model at equivalent performance

6. Conclusion

This article introduced the features and performance of the 40 × 40 × 20 mm and 40 × 40 × 28 mm San Ace 40W 9WPA type high-performance Splash Proof Fans offering the industry’s highest⁽³⁾ airflow and static pressure.

Compared with the current models, the new models achieve remarkably higher airflow, higher static pressure,

and lower power consumption. With these features, we believe that the new models will greatly contribute to outdoor equipment such as base stations, quick EV chargers, and surveillance cameras which requires higher cooling performance and energy efficiency than ever before.

We will continue developing products in response to various market needs. In particular, we plan to continue offering products in a timely manner which contribute to the creation of new value for our customers to help make their dreams come true.

(3) Based on our own research as of June 28, 2022, conducted among equally-sized water-resistant fans on the market.

Author

Yuto Horiuchi
Design Dept., Cooling Systems Div.
Works on the development and design of cooling fans.

Koji Ueno
Design Dept., Cooling Systems Div.
Works on the development and design of cooling fans.

Yukihiro Nagatsuka
Design Department, SANYO DENKI TAIWAN CO. LTD.
Works on the development and design of cooling fans.

Masaki Kodama
Design Dept., Cooling Systems Div.
Works on the development and design of cooling fans.

Kenya Horiuchi
Design Dept., Cooling Systems Div.
Works on the development and design of cooling fans.

Sho Matsushita
Design Dept., Cooling Systems Div.
Works on the development and design of cooling fans.

Hiromitsu Kuribayashi
Design Dept., Cooling Systems Div.
Works on the development and design of cooling fans.