# High Airflow , High Static Pressure Fan "San Ace 40" GV Type

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## 1. Introduction

In servers and other data telecommunications equipment, the levels of heat generation and density are increasing steadily due to the incorporating of components with higher speeds and more powerful functions into more compact sizes. As a result, demand is high for products such as the 40mm sq. axial flow fan, which can be installed in 1U rack servers, and customers have been calling for products with even higher air flow and higher static pressure.

This led Sanyo Denki to successfully develop a new high air flow and high static pressure fan with a 40mm sq. × 28mm thick frame that provides significantly improved performance from the currently-available series.

This report presents the features and performance of this newly-developed high air flow and high static pressure "San Ace 40" GV type fan.


Fig. 1 ''San Ace 40'' GV type fan

## 2. Background to development

Sanyo Denki has continued to develop and sell 40mm sq. × 28mm thick fans with cooling performance at the top of their class. However, as mentioned before, in some cases, the extremely high requirements for higher air flow and higher static pressure were unable to be met by our current products.

In response, we redesigned the fan blades, frame, and motor to develop the 40mm sq. × 28mm thick series of high air flow and high static pressure GV type fans known as the "San Ace 40."

## 3. Features of developed product

Fig. 1 shows an external view of the "San Ace 40" GV type fan.

The features of the product are as follows:

(1) High air flow and high static pressure
(2) Low power consumption
(3) PWM control function
(4) Optimized for 1U rack (height of 44.45 mm)

"San Ace 40" GV type fan ("the newly developed product" below) has completely-redesigned fan blades, frame, and motor for realizing higher air flow, higher static pressure, and lower power consumption. Support was also provided for PWM control as a velocity control function.

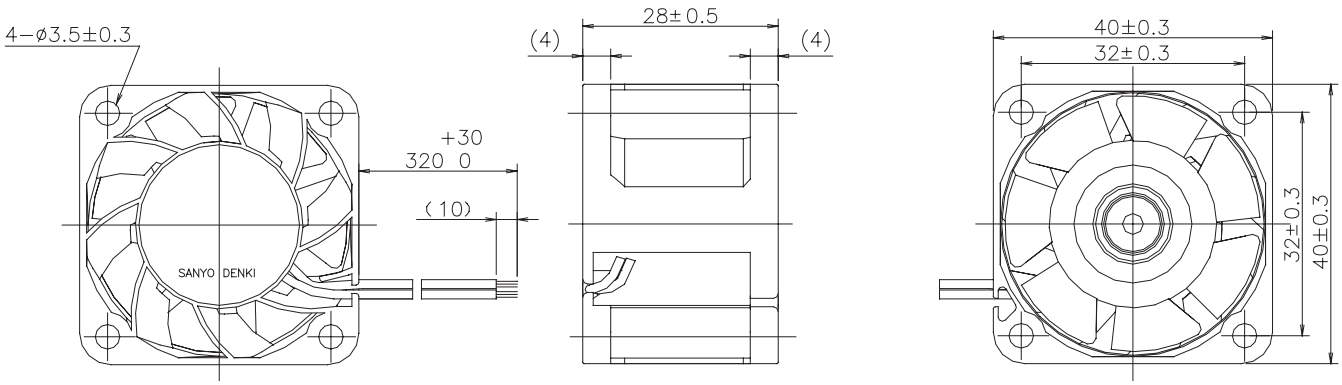


Fig. 2. Dimensional overview of ''San Ace 40'' GV type fan

Table 1. General features of ''San Ace 40'' GV type fan

| Model no. | Rated voltage | Operating voltage range | Rated current | Rated power | Rated rotational speed | Maximum air flow | | Maximum static pressure | Sound pressure | Mass level |
|---|---|---|---|---|---|---|---|---|---|---|
| | V | V | A | W | $min^{-1}$ | $m^3$/min | CFM | Pa | dB(A) | g |
| **9GV0412J302** | 12 | 10.8～13.2 | 0.60 | 7.2 | 14,700 | 0.68 | 24.0 | 330 | 55 | 50 |
| **9GV0412G302** | | | 0.47 | 5.6 | 13,000 | 0.60 | 21.1 | 260 | 52 | |

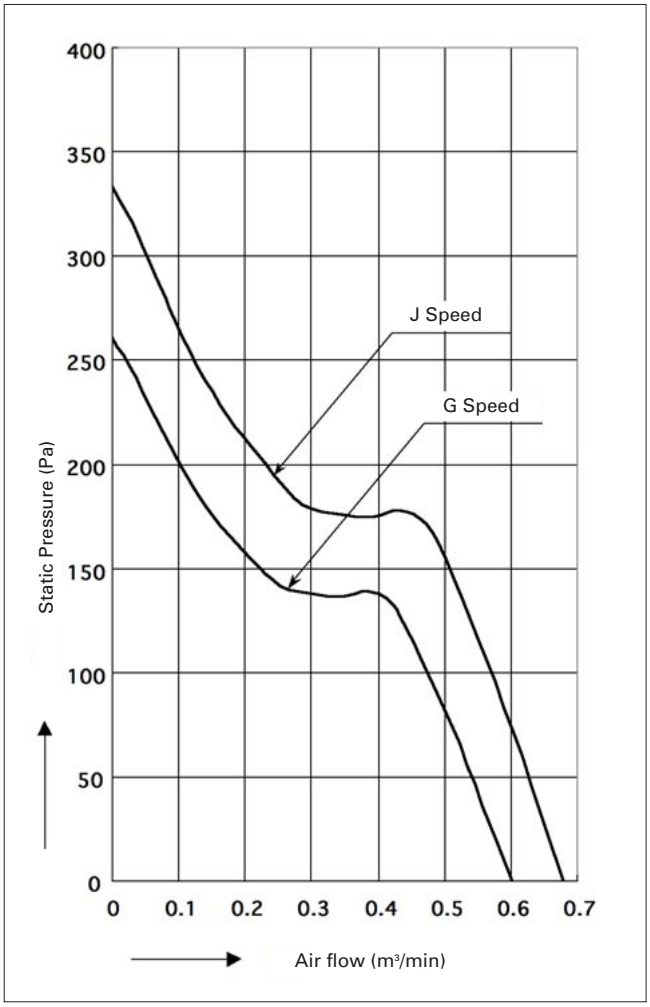


Fig. 3. Sample air flow-static pressure features

## 4. Product overview

### 4.1 Dimensional overview

The newly developed product maintains compatibility and has the same installation dimensions as current models. It is shaped so that the fan body and lead wires do not obstruct the 1U rack cabinet. In addition to a product with a ribbed frame, a ribless frame is also available so that anti-vibration rubber and other parts can be attached to it.

Fig. 2 shows the dimensional overview of the newly developed product.

### 4.2 Features

#### 4.2.1 General features

The rated voltage uses 12V specifications, which is in high demand for 1U servers. The product is available at two rated speeds: the J speed (14,700 $min^{-1}$) high air flow specification and the G speed (13,000 $min^{-1}$) specification which is equivalent to the currently-available specification.

The general features of the newly developed product are shown in Table 1.

#### 4.2.2 Air flow-static pressure features

A sample of the air flow-static pressure features of the newly developed product is shown in Fig. 3.

### 4.3 Expected Life span of products

The expected life of the newly developed product in an ambient temperature of 60℃ is 40,000 hours (survival rate 90%, continuous operation at rated voltage, free air state, ordinary humidity).

## 5. Comparison with conventional products

In comparison to conventional products, the newly developed product provides higher air flow and high static pressure with reduced power consumption. It also has PWM control as a speed control function.

This development successfully achieved higher fluid efficiency in the fan blade and frame shapes for enabling high air flow and high static pressure. Also, the motor unit was redesigned for increasing motor efficiency and providing lower power consumption.

Specific differences from the conventional fan with the highest performance (109P0412K3023) are presented below.

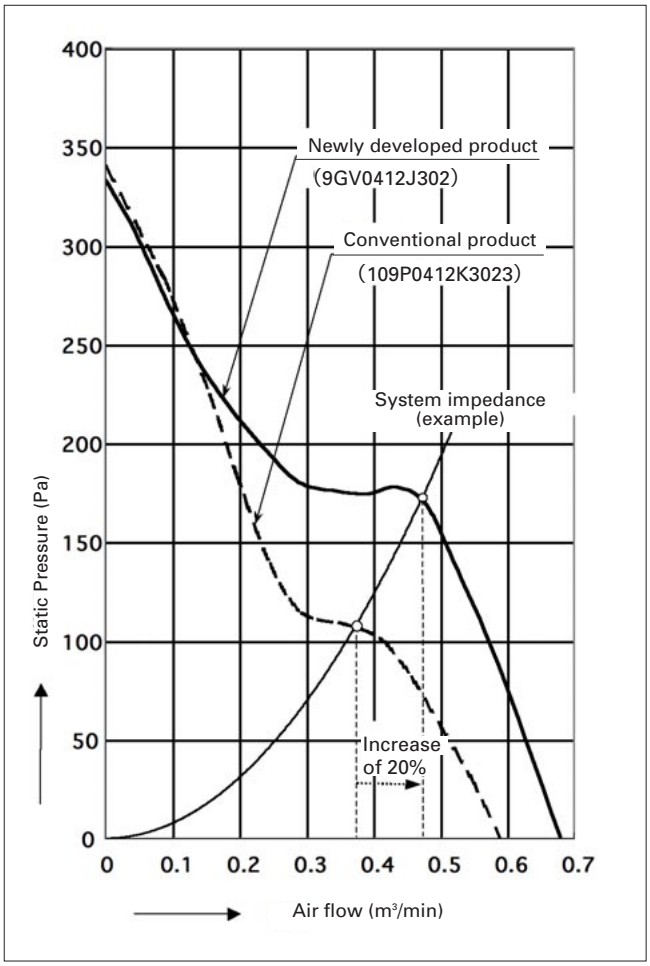


Fig. 4. Sample comparison of air flow-static pressure features

### 5.1 Higher air flow

Fig. 4 shows a sample comparison of the air flow- static pressure features of the newly developed product as compared to the conventional fan with the highest performance.

For this development, 3D CAD modeling and molded prototypes were used to find the fan blade and frame shapes with optimal fluid efficiency. As a result, the same air flow was achieved at a rotation speed 16% less than the conventional product. In addition, the motor and driving circuits were redesigned to reach higher speeds and boost the maximum air flow by 15%. For example, if a system impedance device is used as shown in Fig. 4, the operating airflow would be about 20% higher than the conventional product. In other words, cooling performance is improved from the conventional product.

### 5.2 Low Power Consumption

Because of the development product's high air flow capability, the motor and driving circuits were redesigned for higher efficiency. This resulted in a product design that uses 14.5% less power at the same air flow (0.60m³/min) compared to the conventional product.

## 6. Conclusion

This report has presented some of the features and performance of the newly developed "San Ace 40" GV type fan.

This newly developed product, a fan with enhanced capabilities, realizes a higher air flow, higher static pressure, and lower power consumption than the conventional product. This product can be valuable as a cooling fan for 1U server and data telecommunications equipment which are incorporating designs with higher levels of heat generation and mounting density. Because the product's enhanced power saving ability and the improvements in its functions in relation to its size and mass make a contribution to global environmental


Fig. 5. Symbol mark for products certified with environmentally compatible designs

conservation, it has been certified as one of our ECO PRODUCTS, which have been designed to be environmentally compatible (Fig. 5).

**References**
(1) Honami Osawa et al.: ''San Ace 40'' Counter Rotating Fan, SANYO DENKI Technical Report, No. 16 (2003-11)
(2) Yoshihiko Aizawa: Cooling System Technologies that Change the Conventional Trend, SANYO DENKI Technical Report, No. 16 (2003-11)

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