

# SAN ACE 120 "G" Series (Large Air Volume Type)

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## 1. Introduction

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Various kinds of information equipment are becoming larger in capacity and higher in speed. In addition, the dense mounting of components inside the equipment due to higher functionality and downsizing is increasing the amount of heat generated. Fans for use in cooling the equipment are therefore required to achieve higher cooling capacities.

To meet these requirements, a large-air-volume "G" series has now been added to the line-up of 120mm sq. x 38mm thick brushless DC fans. This paper gives an overview.

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## 2. Background of development

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To meet the market demand for large air volumes, Sanyo Denki has been developing products with high cooling capacities incorporating larger-size fans, such as the new series "SAN ACE 200," "SAN ACE 140" and "SAN ACE 127."

However, as the equipment becomes smaller in size and denser in mounting, demand is strong for fans of the same size but with higher cooling capacities, due to the constraints in the footprint of cooling fans. Performance has been upgraded by increasing the rotating speed.

120mm sq. x 38mm thick fans are also required to achieve larger air volumes. The authors have therefore now developed a new series: SAN ACE 120 "G" series (large air volume type).

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## 3. Features of SAN ACE 120 "G" series

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[Fig. 1](#) is an outside view of the SAN ACE 120 "G" series.

The SAN ACE 120 "G" series is based on a 120mm sq. x 38mm thick BLDC fan with newly designed impeller, frame, and motor and has been developed to increase air volume, static pressure, low noise and high reliability.

The following lists the features of this product.

- (1) Large air volume — high static pressure
- (2) Low noise
- (3) High reliability.

### 3.1 Dimensional Specifications

[Fig. 2](#) shows the dimensions of the SAN ACE 120 "G" series.

### 3.2 Characteristics

### 3.2.1 General characteristics

Table 1 shows the general characteristics of the SAN ACE 120 " G " series.

The series comes in three rated voltages (12, 24 and 48V). As for its rated rotating speed, the series offers G speed ( $3,600\text{min}^{-1}$ ) and E speed ( $3,100\text{min}^{-1}$ ), which are large-air-volume types, as well as the types equivalent to traditional models (H, F and M speeds). Five models are available in total.

### 3.2.2 Air volume – static pressure characteristic

[Fig. 3](#) shows the air volume–static pressure characteristics of the SAN ACE 120 " G " series.

### 3.2.3 Air volume – static pressure comparison

[Fig. 4](#) shows a typical comparison of the air volume – static pressure characteristics of the SAN ACE 120 " G " series (G speed) and the company's conventional model 120mm sq. x 38mm thick (highest speed). Compared to the conventional model, the SAN ACE 120 " G " series (G speed) achieves maximum air volume at least 30% higher and maximum static pressure at least double as high.

Next, [Fig. 5](#) shows a typical comparison of the air volume–static pressure characteristics of the SAN ACE 120 " G " series (G speed) and the company's 127mm sq. x 38mm thick. The SAN ACE 120 " G " series does not compare to the 127mm sq. x 38mm thick, A speed (large air volume type). But it is comparable to the S speed, which is one rank lower than the A speed, because it achieves a high maximum air volume and rotation speed, thus resulting in high noise.

Table 1 General characteristics of SAN ACE 120 " G " series

Model No.	Rated voltage (V)	Operating voltage range (V)	Rated current (A)	Rated input (W)	Rated rotating speed ( $\text{min}^{-1}$ )	Maximum air volume ( $\text{m}^3/\text{min}$ )	Maximum static pressure (Pa)	Sound pressure level (dB[A])	Mass (g)
9G1212G102	12	10.2 to 13.8	0.98	11.8	3600	3.88	135	49	330
9G1212E102			0.61	7.32	3100	3.34	100	45.5	
9G1212H102		7 to 13.8	0.38	4.56	2600	2.80	70.4	39	
9G1212F102			0.28	3.36	2280	2.45	54.2	36	
9G1212M102			0.21	2.52	1950	2.10	39.6	32	
9G1224G102	24	20.4 to 27.6	0.50	12.0	3600	3.88	135	49	
9G1224E102			0.34	8.16	3100	3.34	100	45.5	
9G1224H102		14 to 27.6	0.22	5.28	2600	2.80	70.4	39	
9G1224F102			0.16	3.84	2280	2.45	54.2	36	
9G1224M102			0.11	2.64	1950	2.10	39.6	32	
9G1248G102	48	40.8 to 55.2	0.25	12.0	3600	3.88	135	49	
9G1248E102			0.17	8.16	3100	3.34	100	45.5	
9G1248H102			0.11	5.28	2600	2.80	70.4	39	
9G1248F102			0.09	4.32	2280	2.45	54.2	36	
9G1248M102			0.07	3.36	1950	2.10	39.6	32	

## 4. Comparison with a conventional model

[Fig. 6](#) shows a structural diagram of the SAN ACE 120 " G " series, while [Fig. 7](#) shows a structural diagram of a conventional model (120mm sq. x 38mm thick).

The most important challenge with the newly developed SAN ACE 120 " G " series is to meet the large-air-volume specifications. To meet these specifications, it is imperative to develop motors with high rotating speed and high torques.

The " G " series has a motor diameter larger than conventional models, thus increasing the windings of the motor. This has increased motor torque and increased heat radiation, thus lowering the heatup of the windings. This has enabled a rise in air volume by at least 30%. Numerical comparison with conventional models reveals that

the new series shows 12K lower in heatup of the windings while improving maximum air volume by at least 30%.

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## 5. Conclusion

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This paper has presented part of the structure and performance of the newly developed SAN ACE 120 " G " series (large air volume type).

Various kinds of information equipment are expected to grow even larger in capacity, faster, smaller in size, and higher in density, resulting in larger quantities of heat generated.

Under these circumstances, the newly developed SAN ACE 120 " G " series will hopefully attract more users of the company's fans as products higher in cooling performance, lower in noise and higher in reliability.

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Joined company in 1982

Cooling Systems Division, Design Dept.

Worked on development of uninterruptible power supply units,  
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### **Noriaki Ogawa**

Joined company in 1991

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Fig. 1 Outside view of the SAN ACE 120 " G " series

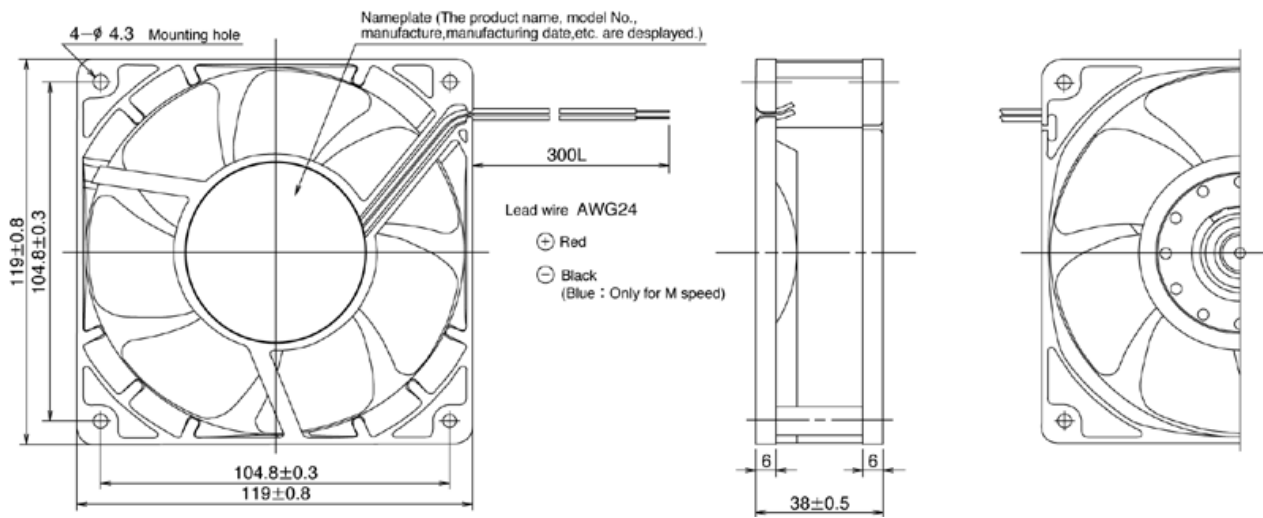


Fig. 2 Dimensional specifications of SAN ACE 120 " G " series

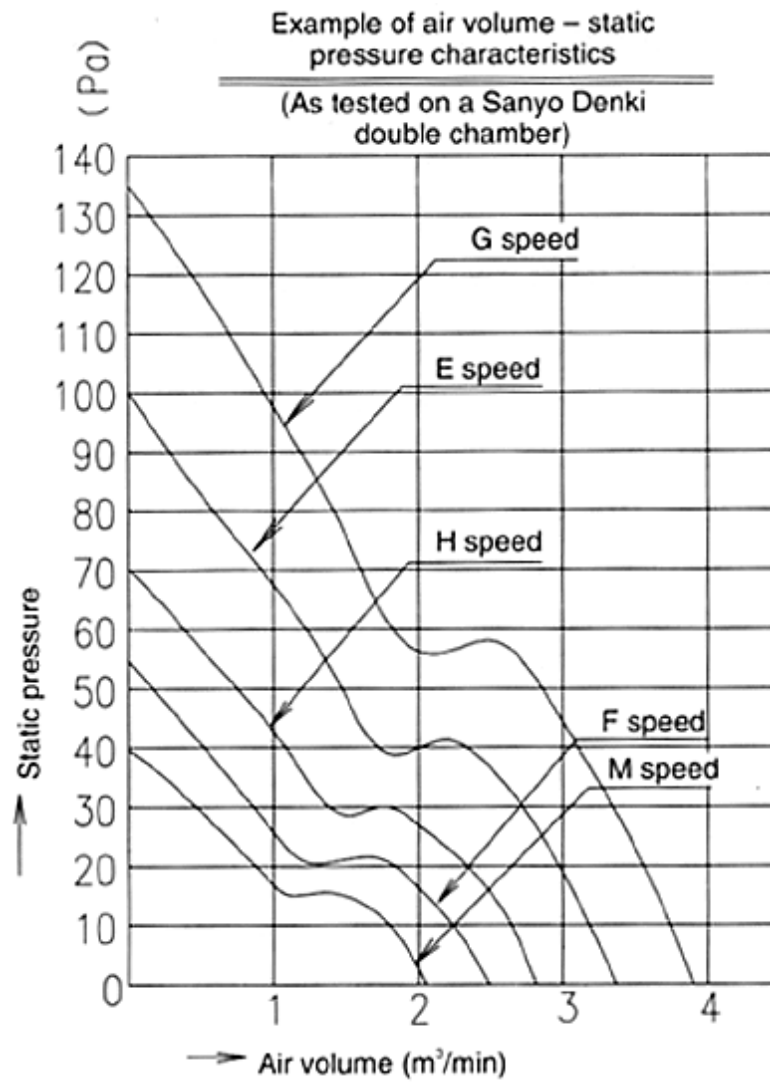


Fig. 3 Example of air volume – static pressure characteristics

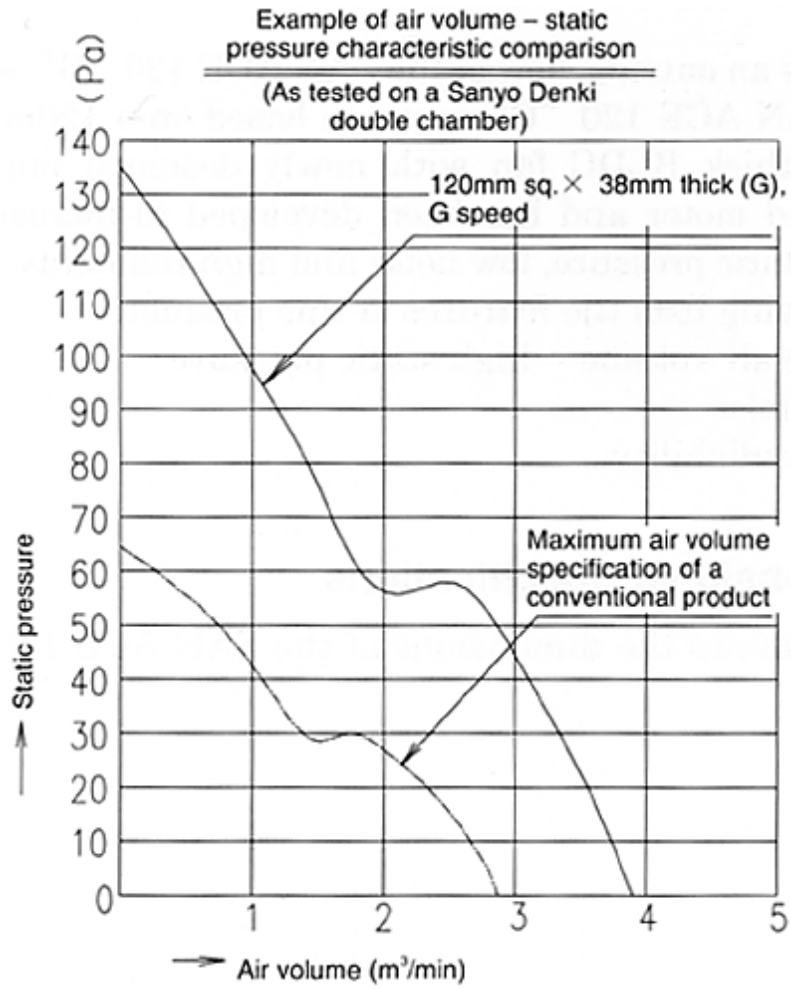


Fig. 4 Example of air volume – static pressure comparison of SAN ACE 120 " G " series

Example of air volume – static pressure characteristic comparison  
 (As tested on a Sanyo Denki double chamber)

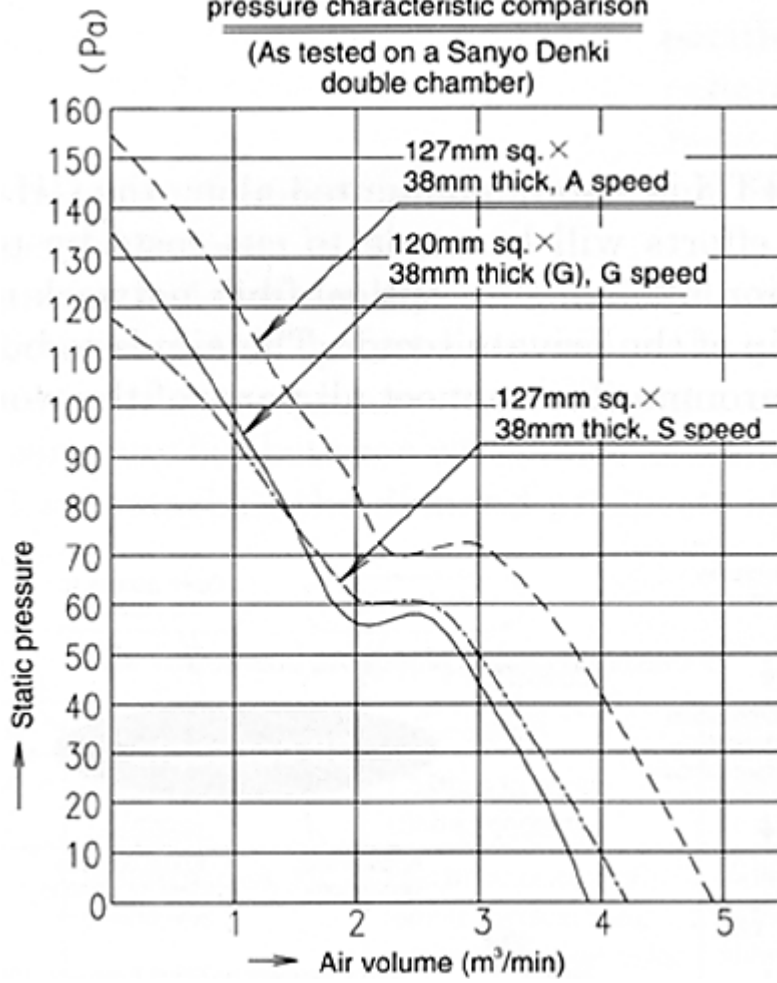


Fig. 5 Example of air volume – static pressure comparison of SAN ACE 120 " G " series



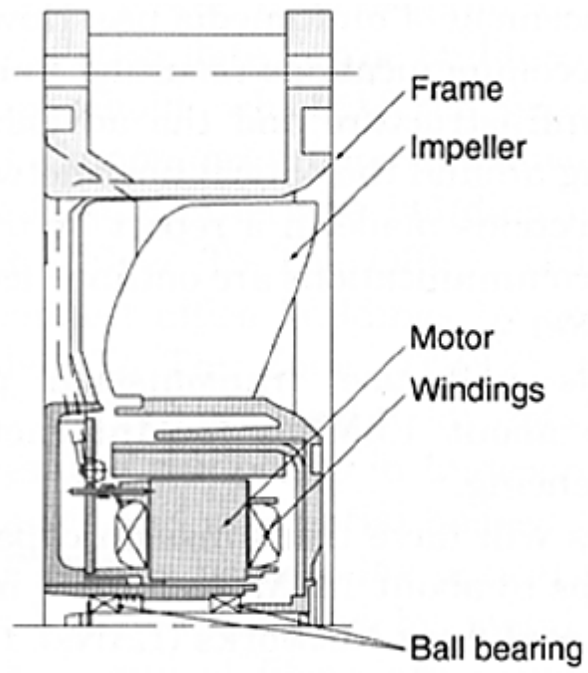


Fig. 6 Structural diagram of SAN ACE 120 " G " series

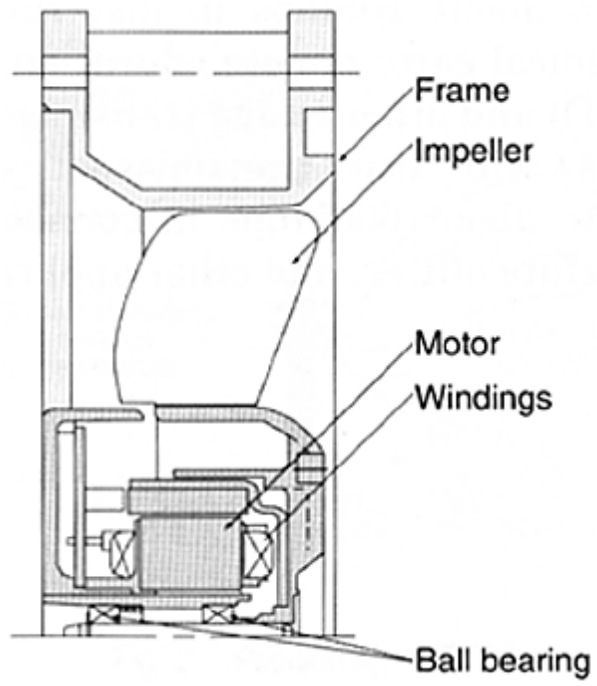


Fig. 7 Structural diagram of a conventional model  
(120mm sq. × 38mm thick)