

# Large Air Volume Fan "SAN ACE 120" G Type 25 mm Thickness

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## 1. Introduction

As PCs generate increasing amount of heat as a result of faster processing capabilities, PC manufacturers must insure steady, reliable performance regardless of increased thermal dissipation. As a result, cooling fans used to keep computer equipment cool are required to be more powerful and compact in order to suit smaller, more densely packed equipment.

To meet such requirements, we at Sanyo Denki developed a highly reliable new "SAN ACE 120" G Type 25, a 25.4mm thin profile fan capable of providing large volumes of air while insuring high reliability and using less power.

This article presents an overview of the "SAN ACE 120" G Type 25's advanced features.

## 2. Background of the Development

Recently, Sanyo Denki has developed cooling fans such as "SAN ACE 200" and "SAN ACE 140" 200-mm and 140-mm axial fans to provide high cooling performance, satisfying market demands for large volumes of airflow.

While these fans have more than satisfied the cooling requirements of larger electronic equipment, their larger format makes them difficult to integrate into compact electronic equipment, whose airflow requirements are also increasing. Hence, Sanyo Denki has developed The "SAN ACE 120" G Type 25 to satisfy market demand for high airflow performance in a compact, thin-profile axial fan format.

## 3. Features of "SAN ACE 120" G Type 25 Series

Fig. 1 shows the "SAN ACE 120" G Type 25, which is only 25.4 mm in thickness.



Fig. 1 "SAN ACE 120" G Type 25 Thickness

With its design derived from the "SAN ACE 120" G Type 38-mm thickness fan, the "SAN ACE 120" G Type 25mm thickness fan takes advantage of Sanyo Denki's

highly efficient "G" motor design. In addition, the "SAN ACE 120" G Type 25 utilizes a new, efficient blade and frame design which greatly enhances the fan's airflow performance while achieving low noise output, an important consideration in today's electronics equipment design. By combining a highly efficient motor and blade design in conjunction with a slim 25.4-mm thick profile, Sanyo Denki is proud to offer the "SAN ACE 120" G Type 25 to the market, to satisfy the modern needs of the compact electronics industry.

"SAN ACE 120" G Type 25 features:

- (1) Large air volume · High static pressure
- (2) Low power consumption
- (3) Low noise
- (4) High reliability

### 3.1 Dimensions

Fig. 3 shows a dimensional overview of the "SAN ACE 120" G Type 25.

### 3.2 Specifications

#### 3.2.1 General Specifications

Table 1 lists the general specifications of "SAN ACE 120" G Type 25 Thickness.

It is available in three different rated voltages (12V, 24V, and 48V), and comes in 6 different rated revolving speeds (G (4100 min<sup>-1</sup>), E (3650 min<sup>-1</sup>), A (3150 min<sup>-1</sup>), H (2850 min<sup>-1</sup>), F (2250 min<sup>-1</sup>), and M(1950 min<sup>-1</sup>).

#### 3.2.2 Air Volume vs. Static Pressure Performance

Fig. 2 displays the characteristic curve of air volume vs. static pressure performance for the G, E, A, H, F, and M speeds of the SAN ACE 120" G Type 25.

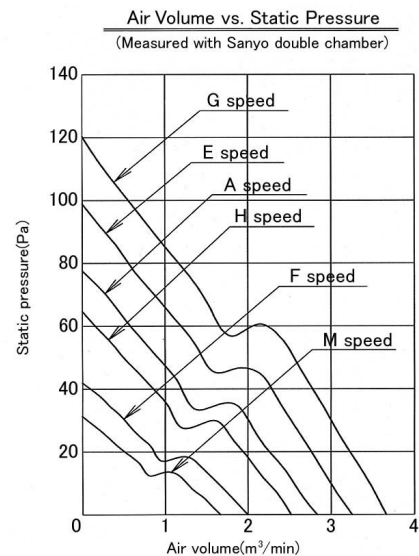


Fig. 2 Air Volumes vs. Static Pressure Performance of "SAN ACE 120" G Type 25 Thickness

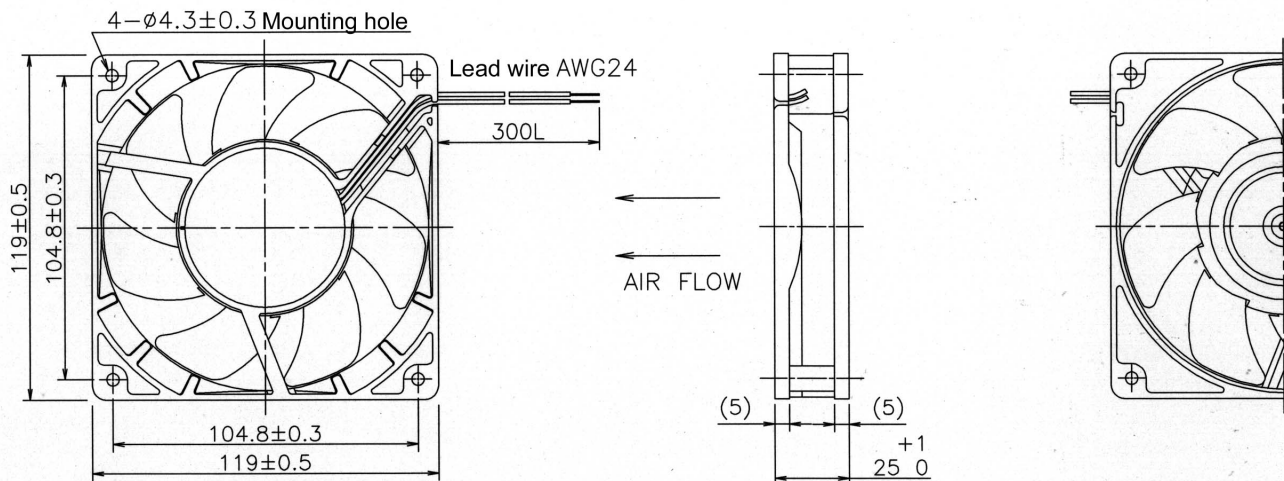


Fig. 3 Dimensions of "SAN ACE 120" G Type 25 Thickness

Table 1 General Specifications of "SAN ACE 120" G Type 25 Thickness

Model No	Rated Voltage (V)	Operating Voltage Range (V)	Rated Current (A)	Rated Input (W)	Rated Rotation Speed (min <sup>-1</sup> )	Max. Air Volume (m <sup>3</sup> /min)	Max. Static Pressure (Pa)	Sound Pressure Level (dB[A])	Weight (g)
9G1212G402	12	10.2 - 13.8	0.90	10.80	4,100	3.68	120	51	240
9G1212E402			0.58	6.96	3,650	3.25	98	48	
9G1212A402			0.40	4.80	3,150	2.83	77	44	
9G1212H402			0.31	3.72	2,850	2.50	64	40	
9G1212F402			0.19	2.28	2,250	1.98	42	35	
9G1212M402			0.14	1.68	1,950	1.66	31	29	
9G1224G402	24	20.4 - 27.6	0.47	11.28	4,100	3.68	120	51	
9G1224E402			0.37	8.88	3,650	3.25	98	48	
9G1224A402			0.21	5.04	3,150	2.83	77	44	
9G1224H402			0.17	4.08	2,850	2.50	64	40	
9G1224F402			0.10	2.40	2,250	1.98	42	35	
9G1224M402			0.08	1.92	1,950	1.66	31	29	
9G1248G402	48	40.8 - 55.2	0.23	11.04	4,100	3.68	120	51	
9G1248E402			0.16	7.68	3,650	3.25	98	48	
9G1248A402			0.13	6.24	3,150	2.83	77	44	
9G1248H402			0.10	4.80	2,850	2.50	64	40	
9G1248F402			0.06	2.88	2,250	1.98	42	35	
9G1248M402			0.05	2.40	1,950	1.66	31	29	

## 4. Comparison with Conventional Models

### 4.1 Design Comparison

Fig. 4 and 5 show a structural comparison of the SAN ACE 120" G Type 25, and the conventional 120 mm sq. 25-thickness, respectively. The core of the 2-phase 4-pole brushless DC motor developed for the "SAN ACE 120" G 38-mm thickness type has been further optimized and refined for use in the Type 25. Taking into consideration the motor and bearing's thermal dissipation, the bearing seat, integral to the motor's durability, is constructed of brass similar to our conventional models. Significant increases in the G motor's efficiency and heat dispersion characteristics have resulted in a smaller rise in coil temperature.

For example, when compared to Sanyo Denki's conventional 120 mm sq. 25-thickness H Speed Model, the new H speed fan based on the G motor design exhibits coil and ball bearing temperature increases that are 1/6<sup>th</sup> of the conventional model. As a result, the "SAN ACE 120" G Type 25 series possesses an expected life of more than 40,000 hours continuous operation (at ambient temp. 60 C, survival rate 90%) at its rated voltage.

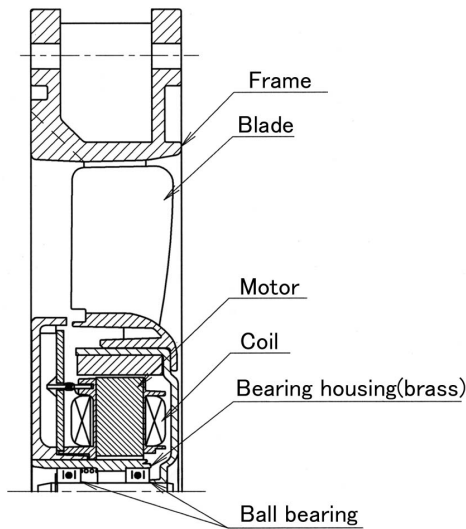


Fig. 4 Structure of New "SAN ACE 120" G Type 25 Thickness

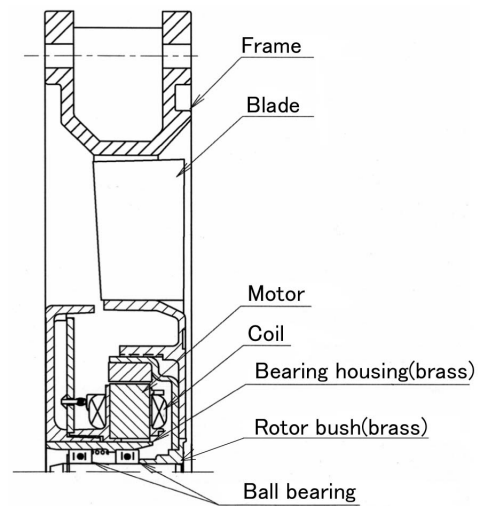


Fig. 5 Structure of Conventional "SAN ACE 120" 25 Thickness

#### 4.2 Air Volume vs. Static Pressure Performance Comparison

Fig. 6 shows the air volume vs. static pressure performance of the highest speed conventional 120 mm sq. 25-thickness versus the new G speed type, while Fig. 7 compares their maximum air volumes. The maximum air volume provided by the new G type is 1.5 times that provided by the conventional 120mm sq. 25-thickness type, and its maximum static pressure capability is 2.2 times that of the conventional model. Taking into consideration these characteristics, the new 120 G type 25 is the best performing 120 × 25 mm fan in the industry in terms of overall air volume vs. static pressure performance.

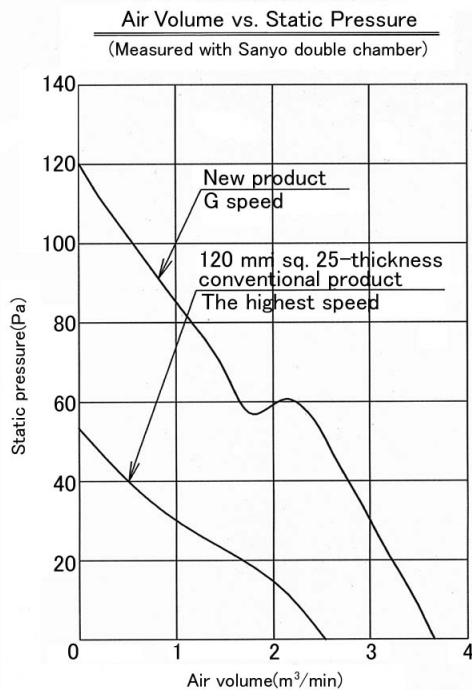


Fig. 6 Comparison of Air Volume vs. Static Pressure Performance

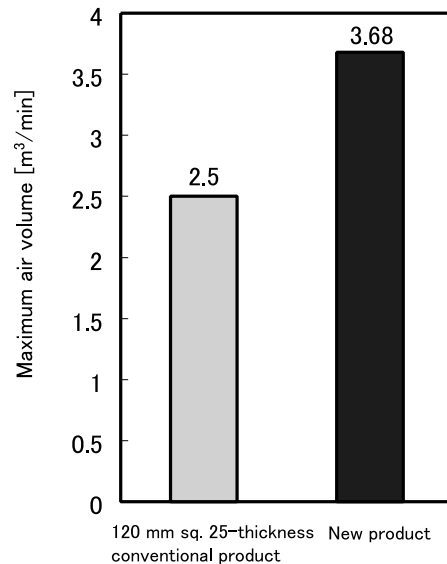


Fig. 7 Comparison of Maximum Air Volume

#### 4.3 Power Consumption Comparison

Fig. 9 compares the conventional 120mm sq. 25-thickness type to the new G type in terms of power consumption at equivalent air volumes. It was found that power consumption with the 120mm sq. 25-thickness 12V H Speed type was 5.4 Watts as compared to 3.72 Watts from the new G-type 12V H speed fan, representing a 31% reduction in power consumption over the conventional model. We, at Sanyo Denki, have developed our own in-house criteria by which to check if adequate environmental consideration is reflected in newly developed products. Those newly developed products that satisfy these criteria, especially those proved to be energy-saving, are certified as Environment Compatibility Design Products (ECO Product)



ECO PRODUCTS

Fig. 8 Symbol Mark for Environment Compatibility Design Certified

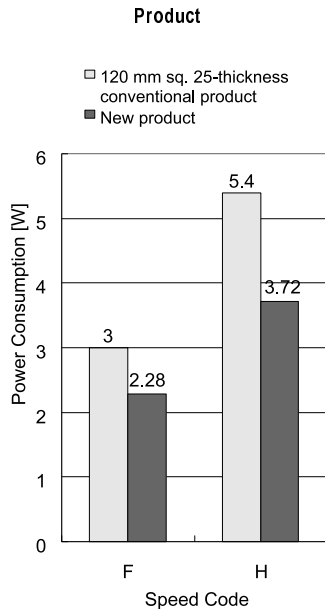


Fig. 9 Comparison of Power Consumption (12V type, free air, at equivalent air volume)

#### 4.4 Load Noise Characteristics Comparison

Fig. 10 compares the load noise characteristics of the conventional 120 sq. 25-thickness model and the new model at equivalent air volumes (H speed).

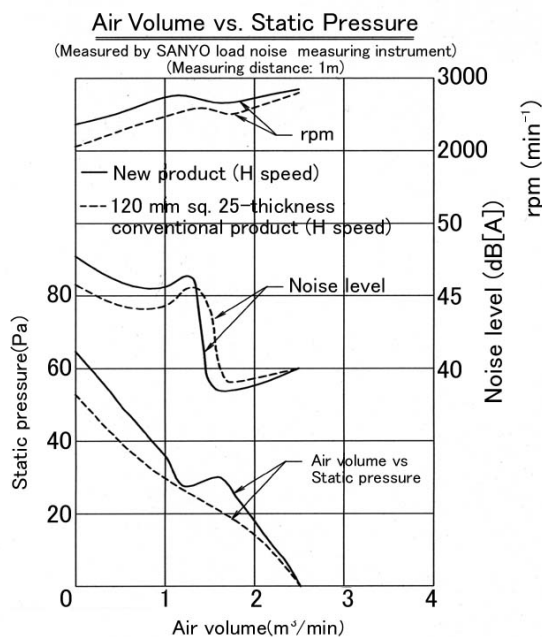


Fig. 10 Comparison of Load Noise Characteristics

Our results indicate the conventional model can operate with low noise if the pressure loss is less than 20 Pa within the product under test, while the new model can operate with low noise until the pressure loss within the product under test is under 30 Pa. The new model, with its wider low-noise range, is advantageous in reducing the noise level of the equipment.

## 5. Conclusion

In summary, we have presented an overview of the design and performance of the newly developed "SAN ACE 120 G" Type 25 Thickness series (large air volume type). The "SAN ACE 120" G Type 25's performance makes it the industry benchmark, while its efficient use of energy contributes greatly to the improvement of the environment. The "SAN ACE 120" G Type 25 is a compilation of Sanyo Denki's technical prowess and knowledge, a result of years of experience in developing innovative cooling solutions products. The "SAN ACE 120" G Type 25 offers high air flow, high reliability, and energy efficiency encompassed within a compact 25.4-mm profile package. Sanyo Denki is pleased to offer this product, the highest performance axial fan in the 120 × 25 mm format, to the market.

Finally, we, Sanyo Denki, wish to extend our heartfelt gratitude to all those concerned for their advice and assistance during the development of this product.

#### References

- (1) SAN ACE 120 G Series (Large air volume type) by Fujimaki, et. al SANYO DENKI Technical Report No.10, p.22 · p.24 (Nov. 2000)
- (2) "Thermal Design Handbook" (Asakura Shoten) by Oshima, et. al., pp.215·222.



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