High Static Pressure Fan “San Ace 80” CRA Type

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1. Introduction

Along with the growth and expansion of information processing and communication technology in recent years, information equipment and communications equipment have become faster and larger capacity.

With this, the inside of equipment generates more heat and has become higher density, so demands for higher static pressure to obtain even better cooling performance have increased for fans used for cooling in high density environments.

This document introduces some features and performance of the high static pressure 80 mm sq., 80 mm thick counter rotating fan “San Ace 80” CRA type that was developed to respond to these market demands.

2. Background of the Development

Sanyo Denki has produced and sold 80 mm sq., 80 mm thick counter rotating fan “San Ace 80” CR type product. However, as noted in the above background, there were increasing numbers of cases where the conventional model could not meet the cooling performance.

In order to meet these demands, the structure design and circuit design were completely reexamined to develop the 80 mm sq., 80 mm thick “San Ace 80” CRA type.

3. Product Features

Fig. 1 shows photograph of the “San Ace 80” CRA fan (hereinafter referred to as “new model”).

The features of the developed product are as follows:

(1) High static pressure
(2) Low power consumption
(3) PWM control function

With the newly designed impeller and frame, the new model realizes dramatically higher static pressure compared to the conventional model. Furthermore, with the newly designed circuit and motor, it realizes dramatically reduced power consumption compared to the conventional model at the same cooling performance.

Fig. 1: “San Ace 80” CRA type

4. Product Overview

4.1 Dimensions

Fig. 2 shows the dimensions of the new model.

The new model has same mounting dimensions as the conventional model, making it compatible.

4.2 Characteristics

4.2.1 General characteristics

There are two types of rated voltage, 12 V DC and 24 V DC, and the rated speed for both is 12,000 min^{-1} for inlet side and 11,300 min^{-1} for outlet side.

Table 1 shows the general characteristics for the new model.

4.2.2 Air flow vs. static pressure characteristics

Fig. 3 shows air flow versus static pressure characteristics for the 12 V new model, while Fig. 4 shows air flow versus static pressure characteristics for 48 V new model.

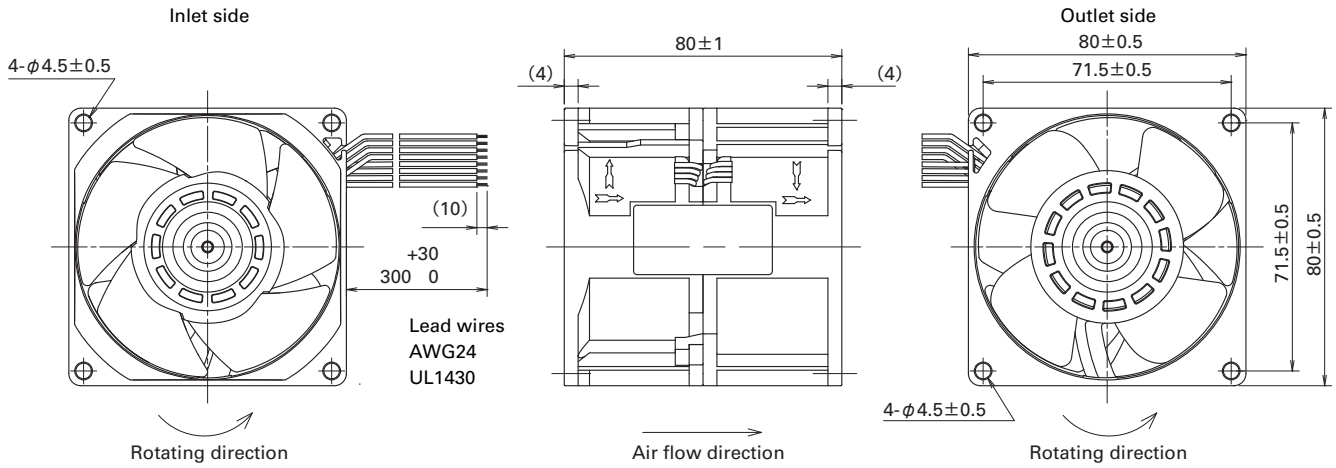

Fig. 2: “San Ace 80” CRA type dimensions (unit: mm)

Table 1: “San Ace 80” CRA type general characteristics

Model No.	Rated voltage [V]	Operating voltage [V]	PWM duty cycle (Note 1) [%]	Rated current [A]	Rated input [W]	Rated speed [min⁻¹] Inlet side	Rated speed [min⁻¹] Outlet side	Max. air flow [m³/min]	Max. air flow [CFM]	Max. static pressure [Pa]	Max. static pressure [inchH₂O]	SPL [dB(A)]	Operating temperature [°C]	Expected life (Note 2) [h]
9CRA0812P8G001	12	10.8 ～ 13.2	100	5.3	63.6	12,000	11,300	4.5	158.9	1,150	4.62	76	−10 ～ +70	40,000/60°C (70,000/40°C)
			0	0.2	2.4	2,000	1,900	0.74	26.1	31.9	0.13	30		
9CRA0848P8G001	48	40.8 ～ 55.2	100	1.32	63.4	12,000	11,300	4.5	158.9	1,150	4.62	76		
			0	0.29	13.9	5,000	4,700	1.88	66.2	200	0.80	52		

Note 1: Input PWM frequency: 25 kHz
Note 2: The expected life at 40°C is a reference value.

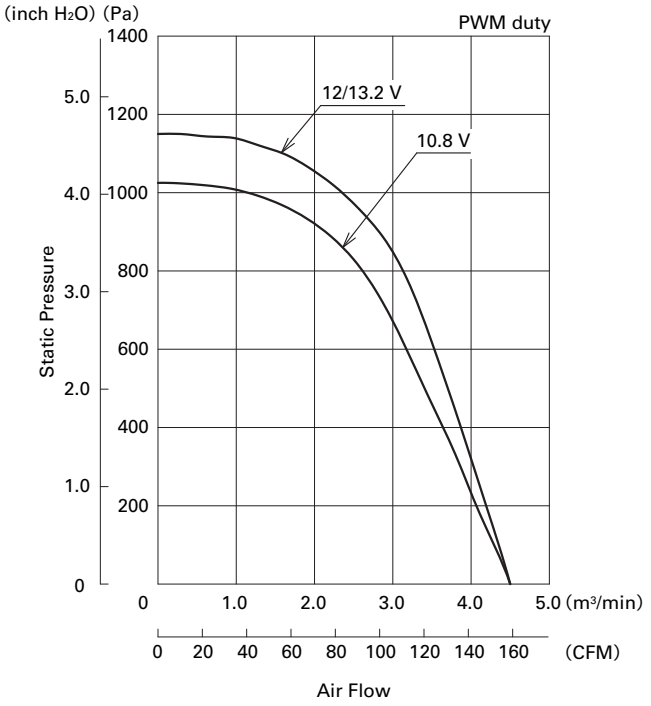

Fig. 3: Air flow - static pressure characteristics (9CRA0812P8G001)

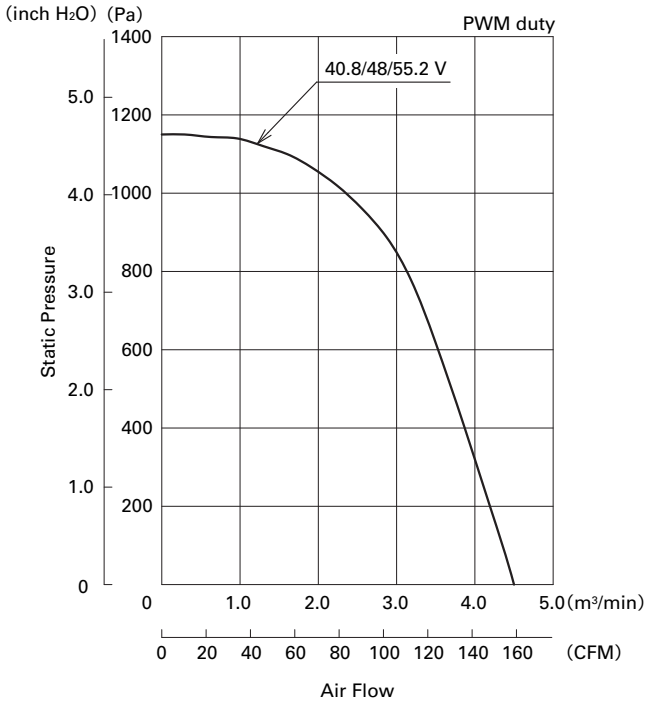

Fig. 4: Air flow - static pressure characteristics (9CRA0848P8G001)

4.2.3 PWM control function

The new model has PWM control function that can control speed of cooling fan from external source.

The demands for cooling fans with PWM speed control functions have become extremely large in recent years. By controlling speed of the cooling fan depending on heat generation of equipment instead of always running the fan at full speed, the equipment as a whole can realize even lower power consumption and SPL (sound pressure level).

Fig. 5 shows the air flow versus static pressure characteristics at individual PWM duty cycle of the new model 9CRA0812P8G001.

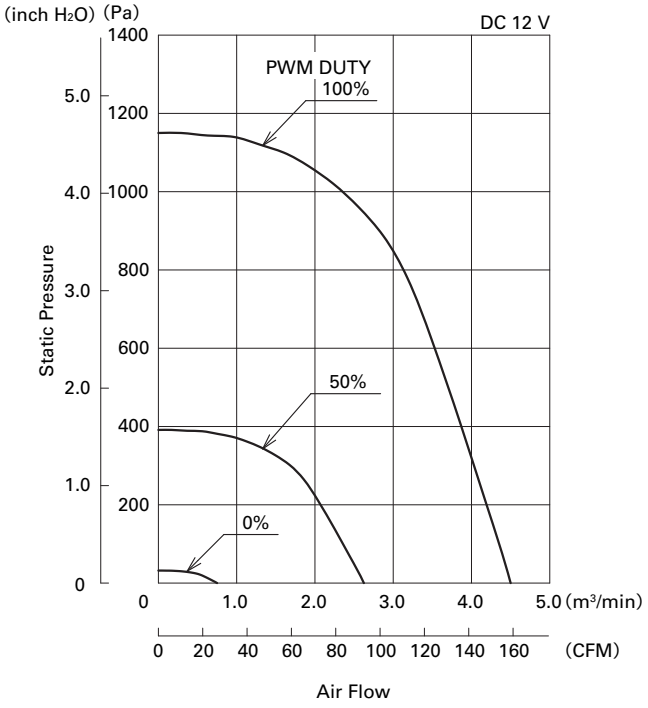

Fig. 5: Air flow - static pressure characteristics at individual PWM duty cycle

4.3 Expected life

The new model has expected life of 40,000 hours at 60 °C (survival rate of 90% with continuous operation at the rated voltage under free air conditions and at normal humidity).

5. Comparisons with our Conventional Model

The new model has new design impellers, frame, motor, and circuits to realize dramatically higher static pressure compared to conventional model. Furthermore, as fans are often used in series operation, the new model still realizes dramatically higher static pressure compared to two of conventional 80 mm sq., 38 mm thick product operated in series.

In addition, it dramatically reduces power consumption when operated at the same cooling performance as conventional model.

The below introduces the differences between the new model and our conventional model.

5.1 Comparison of air flow versus static pressure

5.1.1 Comparison to the conventional model 80 mm sq., 80 mm thick CR type

Fig. 6 shows comparison of air flow versus static pressure characteristics between the fastest conventional model 9CR0812S801 for 80 mm sq., 80 mm thick CR type and new model 9CRA0812P8G001.

The new structural design and motor/circuit design realized higher speed that could not be achieved in the conventional model. Furthermore, newly designing the impellers and frame achieved higher static pressure. With these effects, the new model maintains the same power when operating at maximum air flow while achieving maximum static pressure that is 2.2 times higher than the conventional model.

	Maximum air flow [m³/min]	Maximum static pressure [Pa]	Power consumption [W]
New model	4.5	1,150	64
Conventional model	4.53	520	66

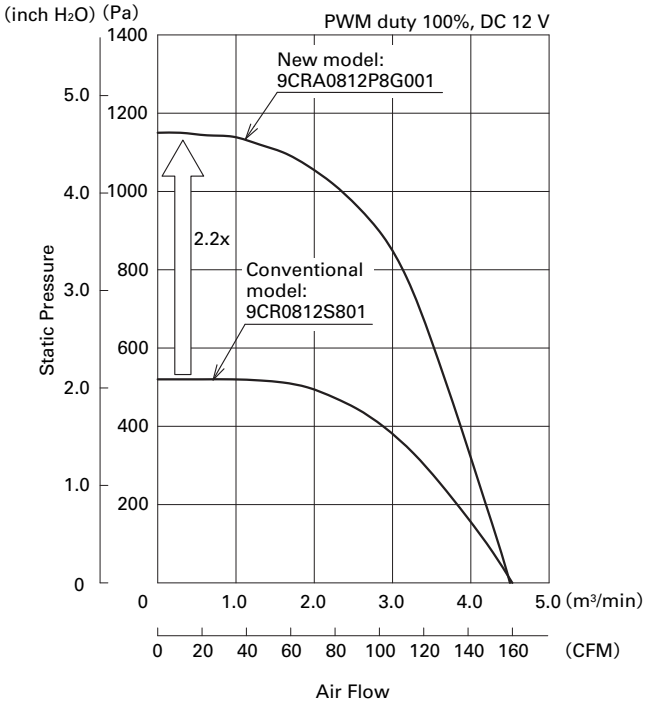

Fig. 6: Air flow - static pressure characteristics (comparison with the conventional model)

5.1.2 Comparison with the conventional model 80 mm sq., 38 mm thick in series operation

General method to obtain high static pressure operates fans in series, but even when the new model is compared to this usage, the new model is verified to be superior.

Fig. 7 shows comparison of air flow versus static pressure characteristics between two of the fastest conventional models 9GV0812P1G03 for the 80 mm sq., 38 mm thick GV type operated in series and the new model 9CRA0812P8G001.

The new model obtains superior performance compared to the conventional model operated in series for air flow versus static pressure, SPL, and power consumption. In particular, the new model achieves characteristics approximately 2 times higher in the assumed operating range.

	Maximum air flow [m^3/min]	Maximum static pressure [Pa]	SPL [dB(A)]	Power consumption [W]
New model	4.5	1,150	76	64
Conventional model	4.1	940	77	68

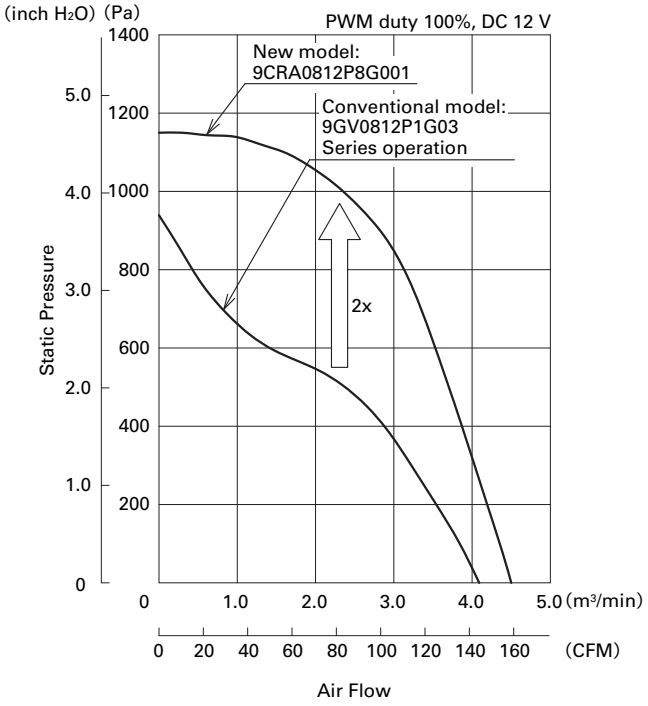

Fig. 7: Air flow - static pressure characteristics (Comparison with two conventional models in series operation)

5.2 Comparison of power consumption

Fig. 8 shows a comparison of air flow versus static pressure characteristics between the new model 9CRA0812P8G001 and the conventional model 9CR0812S801 at the operation points with the assumed system impedance.

The new structural design and motor/circuit design reduced power consumption approximately 24% compared to the conventional model at the operation points with the assumed system impedance.

	Maximum air flow [m^3/min]	Maximum static pressure [Pa]	SPL [dB(A)]	Power consumption [W]
New model	3.8	800	70	47
Conventional model	4.53	520	72	62

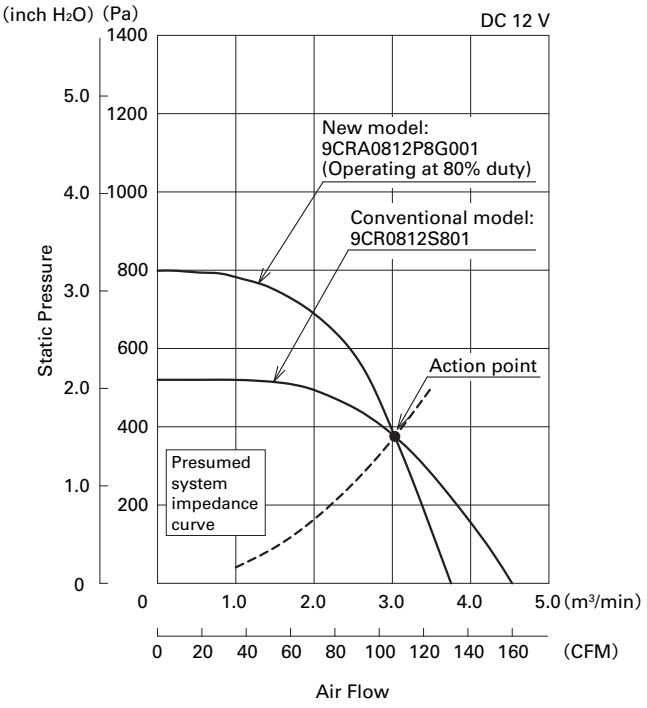

Fig. 8: Air flow - static pressure characteristics (Comparison at assumed operation points)

6. Conclusion

This document introduced some of the features and capabilities of the newly developed high static pressure “San Ace 80” CRA type fan.

The new model realizes dramatically higher static pressure compared to the conventional model, therefore it can greatly contribute as a solution to increasing heat generation and higher density in the future.

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