

Selecting the Correct Fan Motor

The following example is a guideline on to how to select an appropriate fan motor for cooling heat-producing equipment by forced air-cooling.

Determining the Conditions of the Device to be Cooled

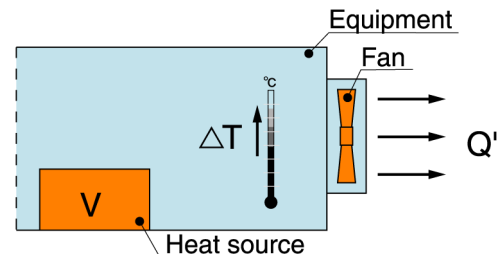
Determine the permissible temperature rise (ΔT), and the total heat generated inside the equipment (V).

■ Example

V : Total generated heat = 100 Watt

ΔT : Permissible temperature rise = 15K*

* $\Delta T = 15K$, for instance, signifies that the average airflow leaving the device may be only 15 C warmer than the ambient temperature.



Calculating the Required Air Flow

Calculate the air flow required to satisfy the above conditions by using the formula** below.

**This formula assumes that heat is dissipated by cooling air coming from the fan motor only.

■ Example (using $V = 100$ Watt, $\Delta T = 15K$)

Q' : Operating air flow ($m^3/min.$)

$$Q' = \frac{V}{20\Delta T} = \frac{100 \text{ W}}{20 \times 15K} \cong 0.33 \text{ m}^3/\text{min} \text{ (11.65 CFM)}$$

Selecting the Fan Motor

The actual air flow when the fan motor is mounted onto the device can be determined from the air flow-static pressure characteristics curve of the fan motor and the pressure loss of the electronic device. However, since the pressure loss of the device cannot be determined without using a measuring instrument, a fan with a maximum airflow capacity of 1.5 to 2 times the operating air flow should be selected as a effective starting point for fan performance trials.

■ Example (using $Q' = 0.33 \text{ m}^3/\text{min}$)

Q : Maximum air flow ($m^3/min.$)

$$Q' = Q \times 2/3$$

$$Q = Q' \times 3/2 = 0.33 \times 3/2 \cong 0.5 \text{ m}^3/\text{min} \text{ (17.66 CFM)}$$

From the above calculations, fan motors having a maximum air flow of $0.5 \text{ m}^3/\text{min}$ or more should be selected as possible candidates for performance trials . A final choice should be made after taking into account the space requirements, noise level, economy and ambient conditions of the application.

In this example, a fan of 60mm square, 25mm thickness and 12V, which meets the required maximum air flow calculated above is DC San Ace 109R0612H402 (maximum air flow = $0.53 \text{ m}^3/\text{min}.$).

Confirming the Selected Fan Motor

Calculate the temperature rise inside the device when 100 Watt of total generated heat is forcefully cooled by a 109R0612H402 fan motor.

■ Example (using the above values)

$$Q' = Q \times 2/3 = 0.53 \times 2/3 \cong 0.353 \text{ m}^3/\text{min}$$

$$\Delta T = V/20Q' = 100(W)/20 \times 0.353 \text{ m}^3/\text{min} \cong 14.2K$$

