

Fan Sizing Calculations

Selecting a Fan

This section describes basic methods of selecting typical ventilation and cooling products based on their use.

● Device specifications and conditions

Determine the devices required internal temperature.

● Heat generation within the device

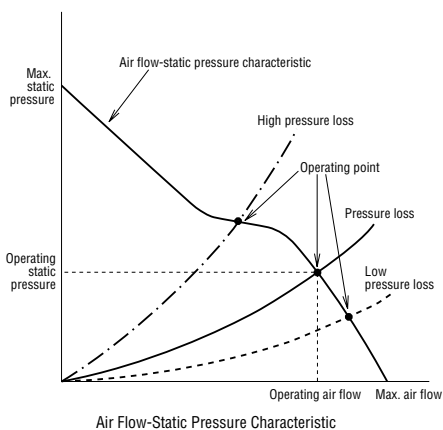
Determine the amount of heat generated internally by the device.

● Calculate required air flow

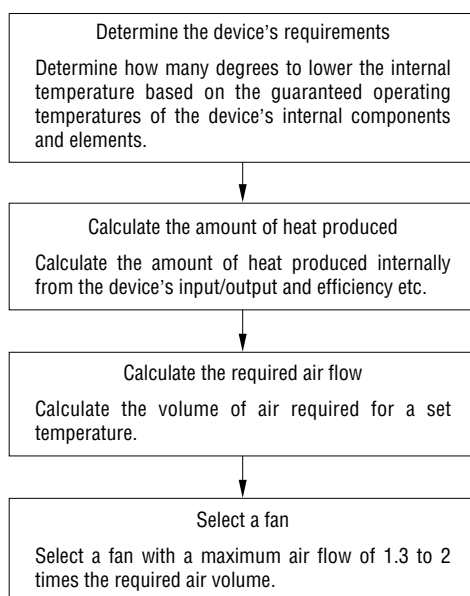
Once you have determined the amount of heat generated, the number of degrees the temperature must be lowered and what the ambient temperature should be, calculate the air flow required.

● Selecting a fan

Select a fan using the required air flow. The air flow of a mounted fan can be found from the fan's air flow vs. static pressure characteristics and the pressure loss of the object to be cooled. It is difficult to calculate the device's pressure loss, so an estimation for the maximum air flow of 1.3 to 2 times the required air flow may be used.



Fan Selection Flowchart



Fan Selection Details

Cabinet Specifications

| Item | Letter | Specifications |
|-----------------------------------|--------------|---|
| Installation Conditions | | Factory Floor |
| Cabinet | Size | W H D Width 0.48 m Height 1.44 m Depth 0.36 m |
| | Surface Area | S 2.42 m ² * |
| | Material | Steel |
| Overall Heat Transfer Coefficient | U | 5 W |
| Target Temperature Rise | ΔT | 10 °C Ambient Temperature T ₁ 25°C Max. temperature inside of cabinet T ₂ 35°C |
| Total Heat Generation | Q | 1200 W |
| Safety Factor | Sf | 2 Internal pressure loss must be considered when calculating the required airflow. In general, pressure loss inside the control panel is not known. Therefore, the airflow at the operation point is assumed as 50% of the maximum airflow and a safety factor (Sf) of 2 is applied. |
| Power Source | | 50 Hz 230 VAC |

[Specification of Cabinet]

*Calculated by the equation below (assuming that all periphery is open):

$$\text{Surface of Cabinet} = \text{Side Area} + \text{Top Area} \\ = 1.8 \times H \times (W + D) + 1.4 \times W \times D$$

① Required Air Flow

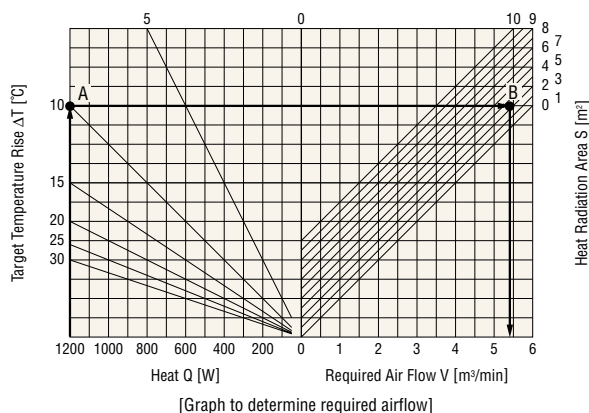
The following explains a simple calculation method.

◇ Determine Required Air Flow Using Calculations

$$V = 1 \div 20 \times (Q \div \Delta T - U \times S) \times Sf \\ = 1 \div 20 \times (1200 \div 10 - 5 \times 2.42) \times 2 \\ = 10.8 \text{ [m}^3\text{/min]}$$

◇ Determine Required Air Flow Using a Graph

- Search for the cross point A between output of heat Q (1200 W) and target temperature rise ΔT (10 °C).
- Draw a line parallel with the x axis from point A.
- Search for the cross point B between the parallel line and surface area S [2.42 m²] line.
- Draw a line to the x axis from point B, required airflow is approx. 5.4 (m³/min).
- Use a safety factor of Sf = 2, Required airflow will be 10.8 (m³/min).



② Applicable Fans

Based on the air flow requirement, the **MRS18-ETM** is the best match.

| Voltage | Frequency | Input | Current | Speed | Max. Air Flow | Max. Static Pressure | Noise |
|---------|-----------|-------|---------|-------|---------------------|----------------------|-------|
| VAC | Hz | W | A | r/min | m ³ /min | Pa | dB(A) |
| 230 | 50 | 75 | 0.4 | 2850 | 11.0 | 196 | 56 |

MRS18-ETM Specifications