SELECTING A FAN

Forced convection cooling is an effective solution to dissipate heat in electronic equipment. This technical guide will help you to determine the performance of the required fan for your application.

BASIC REQUIREMENTS

VOLTAGE: The first step is to determine the nominal voltage; this can be AC or DC. ETRI fans cover all voltage ranges from 5V to 240V.
DIMENSIONS: Optimising performance within the available space envelope is the most important criteria. ETRI offers a complete range of fans and blowers from 25 x 25 x 10mm up to Ø172mm.

DETERMINING NECESSARY AIRFLOW

Dissipated power has to be determined first. If this value is unknown, the estimation can be done by taking the power consumed by the equipment and the efficiency (which is approximately 75 % for electronics equipment).
Example :
Consumed power = 500 W
Power to be dissipated : 500x25% = 125W

The graph below shows how to calculate the airflow according to the dissipated power, using the formula:

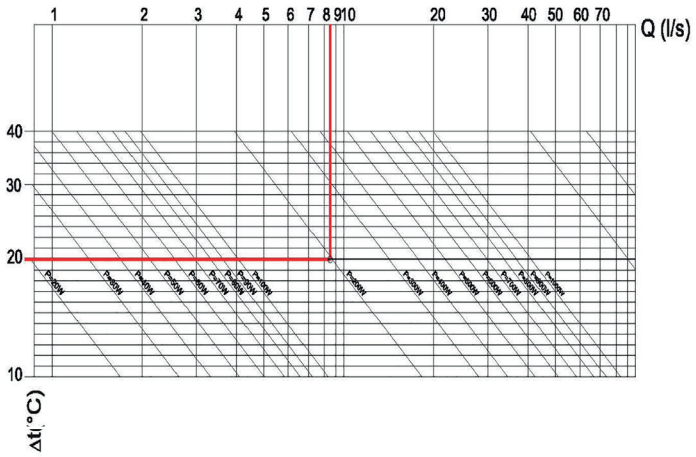
$$\text{Airflow (l/s)} = \frac{P(W)}{1{,}2 \times \Delta t}$$

This calculation does not take into consideration pressure drop, which has a direct impact on the airflow. Pressure drop is defined in the next paragraph.

P : power to be dissipated (in watts)
Dt : represents the temperature difference between internal temperature of the equipment and ambient temperature
Q : fan airflow:

$$A \text{ (in l/s)} = \frac{P(W)}{1{,}2 \times \Delta t}$$

THE AIRFLOW IS DETERMINED BY THE PROJECTION ON THE GRAPH BELOW FROM THE INTERSECTION POINT OF THE LINES W AND ΔT ON THE AIRFLOW SCALE
Example : power to be dissipated: 200W
Δt : 20°C
fan airflow: 8,5l/s



CALCULATING NECESSARY STATIC PRESSURE

Each component mounted in the equipment opposes a resistance to air circulation. These accumulated resistances are called “pressure drop”. The pressure drop is balanced by the fan static pressure which is expressed in mmH_2O or in Pa.
The necessary airflow of the fan must be specified at a certain static pressure.

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03/05/17

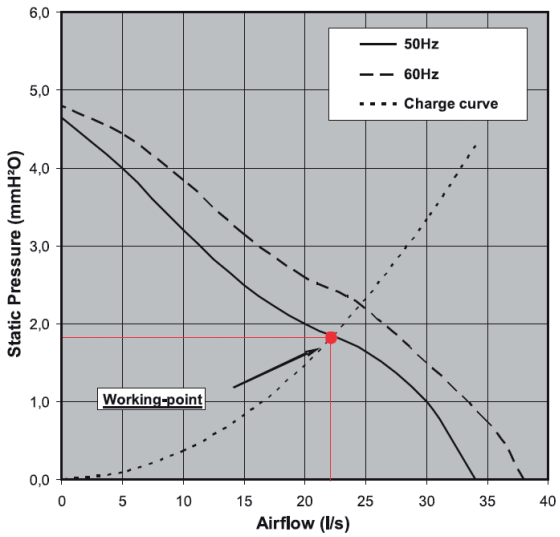
Pressure drop is not easily calculable, especially in complex equipment. In cooling applications, pressure drop can be calculated according to duct diameter, length, bends or other deviations. Here is one basic principle to calculate pressure drop:
A specified fan, which air performance is known, is mounted on the equipment. The air speed can be measured at the outlet of the equipment with an anemometer. The airflow is calculated as follows:

$$\text{Airflow (l/s)} = \frac{\text{Air Speed (m/s) x Outlet section (m}^2\text{)}}{1000}$$

The static pressure, corresponding to the measured airflow, can therefore be read on the fan performance

CHOOSING THE APPROPRIATE FAN OR BLOWER WITH THE WORKING POINT

The combination of necessary airflow and static pressure gives a value which is called working point. It is now very easy to choose the appropriate fan or blower, by selecting a model in the catalogue, which curve meets the working point



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