

Thermal speed controlled fans with an external or built-in thermistor

External thermistor type

1. Overview

For thermal speed controlled fans with an external thermistor, just connect a specified thermistor (or a specified thermistor and a resistor) between the control wire and the negative wire indicated in Fig. 1, it will enable the fan speed to change automatically according to a predetermined temperature speed specification and according to temperature changes in an environment where the thermistor is equipped. (Please refer to Fig. 2)

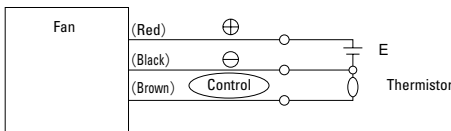


Fig. 1

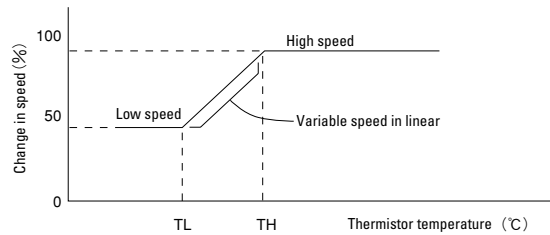


Fig. 2

A thermistor can therefore be installed at an appropriate position inside your equipment to monitor the internal temperature changes due to changes in ambient temperature and heatup status (load status) of the equipment. Automatic monitoring can then specify low speed when the thermistor detects a temperature below TL, high speed when it detects a temperature above TH, and a speed according to the temperature when it detects a temperature between TL and TH.

Thus, the fan motor detects its own operational status and determines the operating conditions.

As a result, the thermal speed controlled fan with an external thermistor is designed that temperature changes according to the ambient temperature and operational status of the equipment are detected by the thermistor to control the fan's air flow (speed), and is near-ideal particularly in designing silent equipment. The fan motor thus meets the three requirements: silence, energy-saving, and long life.

2. Setting temperatures (TL and TH) in low and high speed

The standard products listed in this catalog are designed to run at a low speed at 28°C or below and run at a high speed at 35°C or more when a recommended thermistor is connected between the control wire and the negative wire.

These temperatures (TL and TH) can be changed (as indicated in Table 1) by inserting a resistor in series with the thermistor.

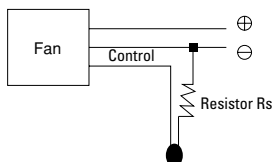


Fig. 3 Recommended thermistor

Table 1

Resistance Rs (Ω)	Temperature setting (°C)	
	TL	TH
0	28	35
0.8K	31.5	40
1.5K	35	45
2.0K	38	50
2.4K	40.5	55
2.75K	43	60

* For the resistor Rs, use a resistor rated at no less than 1/8W.
* For the thermistor, use a 159-682-86** which are manufactured

3. If you wish to obtain low or high speed in a process of testing by using a larger equipment regardless of the thermistor temperature:

- Low speed : Instead of the thermistor, connect a 10 KΩ resistor between the control wire and the negative wire.
- High speed : Connect the control wire directly to the negative wire.

4. Connecting the fan to the thermistor

Sanyo Denki recommends to use connectors, including the power lead of the fan.

Example of Typical connections :place a thermistor on the printed circuit board and connect the fan's power lead and control lead to the circuit pattern by means of connectors.

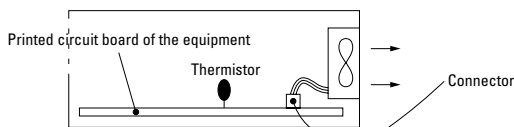


Fig. 4

Recommended connectors	
Manufacturer	Model (3-pole)
Japan Solderless Terminals	XHP-3,SMR-3V-N
Japan Aviation Electronics Industry	IL-G-3S-S3C2-SA
Japan AMP	171822-3
Molex Japan	5102-3

5. Typical applications of thermal speed controlled fans with an external thermistor

Here are typical applications of a thermal speed controlled fan with a power supply where two 109P1212H402 fans are used (Fig. 5).

- (1) The fan selected was a 109P1212T4H12 thermal speed controlled fan having a performance equal to that of conventional fans at high speed.
- (2) The relationship between the temperatures of important components and those of the cooling fin can be measured with varied loads on the equipment and varied air flows of the fan. Since a correlation was determined, the thermistor can then be placed on the cooling fin, one of the important components.
- (3) Next, in view of the thermal design conditions of the equipment, the fan is set to high speed at an ambient temperature of 30°C and an equipment load of 100%.

(4) At an ambient temperature of 30°C and an equipment load of 100%, the temperature of the cooling fin was 48°C and the surface temperature of the thermistor placed on the cooling fin was 45°C when the fan was running at high speed. It was therefore decided to add a 1.5 KΩ resistor in series with the thermistor according to Table 1. In this case, the thermistor temperature is 35°C and the fan runs at low (see Table 1 and Fig. 6).

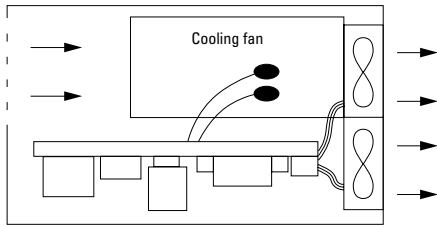
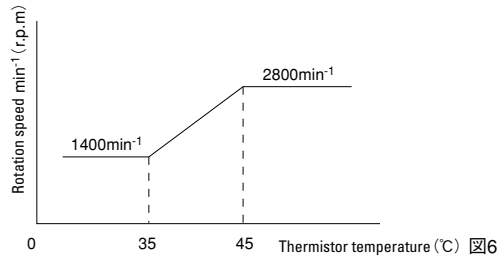


Fig. 5



(5) Test results as installed on equipment: The thermal speed controlled fan displayed its full effect, thus being greatly advantageous in noise reduction. The ambient temperature during the test was 29°C.

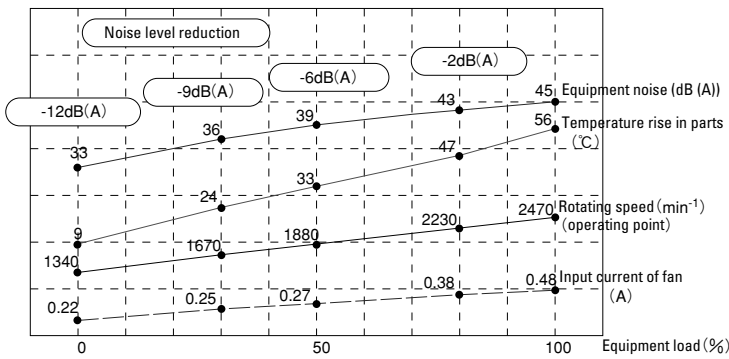


Fig. 7

- * An ideal drop in the fan noise level was achieved according to the equipment load. When the equipment load was 0, the noise was 12dB (A) lower than in the case of conventional models.
- * The current consumption of the fan was 54% lower than in the case of conventional models when the equipment load was 0.
- * The noise level is expected to decline further at lower ambient temperatures.

built-in thermistor type

1. Overview

Thermal speed controlled fans with a built-in thermistor are designed that the fan itself contains a thermistor as indicated in Fig. 8. As illustrated in Fig. 9, the temperature of the air flowing through the fan motor is detected and the fan's speed changes automatically according to changes in that temperature.



Fig. 8

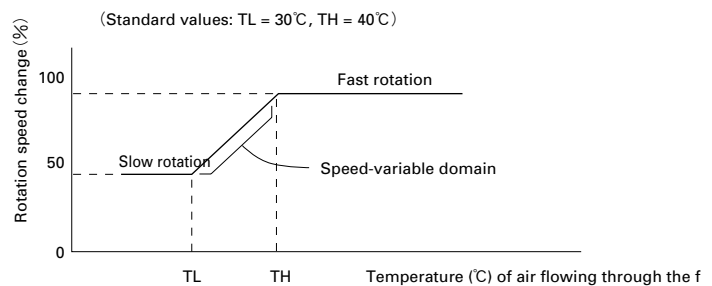


Fig. 9

2. Typical applications of thermal speed controlled fans with a built-in thermistor

Fig. 11 indicates measurements taken when a 109R0812T4H122 fan is mounted on equipment (a PC) is tested in the state as illustrated in Fig. 10.

