

## Unofficial Translation

In the event of any doubt or misunderstanding arising from this translation, the standard in Thai will be held to be authoritative

# **TIS 934-2533(1990)** **Thai Industrial Standard** **for** **A.C. Electric Fans : Safety Requirements**

## **1. Scope**

- 1.1 This safety standard specifies components and construction, requirements, marking and labelling, sampling and criteria for conformity, and testing of a.c. electric fans.
- 1.2 This safety standard covers only capacitor and non-capacitor, table type, wall type, pedestal type, ceiling type, double-oscillating type and ventilating type fans intended for use on single-phase a.c. circuits at voltages not exceeding 250 V for normal in-building and similar uses.

## **2. Definitions**

For the purpose of this safety standard, the following definitions apply:


- 2.1 A.C. ELECTRIC FAN, hereinafter referred to as "fan" : A fan having two or more blades directly driven by an a.c. electric motor.
- 2.2 RATED VOLTAGE : The voltage assigned to the fan by the maker and marked on it.
- 2.3 RATED VOLTAGE RANGE : The voltage range assigned to the fan by the manufacturer expressed by its upper and lower limits and marked on it
- 2.4 RATED FREQUENCY : The frequency assigned to the fan by the maker and marked on it.
- 2.5 RATED FREQUENCY RANGE : The frequency range assigned to the fan by the manufacturer expressed by its upper and lower limits and marked on it.
- 2.6 COOLING AIR TEMPERATURE : The temperature of the surrounding atmosphere in which the fan operates.

## **3. Components and construction**

- 3.1 Supply cord (for table, wall and pedestal types only)  
A flexible cord of a cross-sectional area not less than 0.5 mm<sup>2</sup>, conforming to that specified in TIS 11, *Standard for PVC-insulated cables and flexible cords*, or the equivalent shall be used. For fans intended to be earthed, a three-core cable shall be supplied with the earthed core connected to the earthing terminal or contact provided on the body of the fan. The earthed core shall be coloured green or green-yellow.  
Compliance is checked by visual inspection.
- 3.2 Guard (for table, wall, pedestal and double-oscillating types only)  
Each fan shall have a suitable robust guard of mesh type to provide adequate protection against blade loose in normal operation.  
Compliance is checked by visual inspection.
- 3.3 Enclosures (for ventilating type only)  
Motors of fans shall be of totally enclosed type.  
Compliance is checked by visual inspection.
- 3.4 Blade fixing  
The blades and blade carriers shall be securely fixed so that they do not become loose in operation.

- Compliance is checked by visual inspection.
- 3.5 Device for suspension, clamping device and mounting  
These shall be of adequate strength and provide protection against personal injury in normal use.  
Compliance is checked by visual inspection.

#### **4. Requirements**

- 4.1 Protection against electric shock  
In the case of a fan and regulator (if any) provided with an earthing terminal or contact, it shall be indelibly marked with the symbol  or the letter "E". The earthing terminal or contact shall not be used for any other purposes.  
Compliance is checked by visual inspection.
- 4.2 Cord grip (for table, wall and pedestal types only)  
The power supply cord shall be clamped or assembled in such a manner that no damage shall be caused to the cord when a tension is applied to the soldered part or connecting part of terminals.  
Compliance is checked by the test specified in clause 7.2.
- 4.3 Temperature-rise  
The permissible temperature-rise of fan motor and regulator (if any) shall not exceed the limits given in Table 1.  
Compliance is checked by the test specified in clause 7.3.

**Table 1**  
Permissible limits of temperature-rise  
(clauses 4.3 and 7.3.4)

No.	Part of motor or regulator	Temperature-rise, °C		Method of measurement
		Class A insulation	Class E insulation or above	
1	Insulated windings of motors	60	75	Change of resistance
2	Uninsulated parts of motors including cores	The temperature-rise shall in no case reach such a value that there is a risk of injury to any insulating material on adjacent parts		Thermometer or thermocouple
3	Insulated windings, if any, of regulator (with continuous running on any contact)	60	75*	Change of resistance
4	Regulator resistance unit (with continuous running on any contact)	The temperature-rise shall not reach such a value that there is a risk of injury to any insulating material on adjacent parts of the regulator		Thermometer or thermocouple
5	Enclosures of regulator**	40		Thermometer or thermocouple
6	External surface of capacitors	The temperature-rise shall not exceed the values specified for capacitors		Thermometer or thermocouple

- NOTES
1. The thermocouples, if used, should be applied only to external surfaces which can be reached by an ordinary thermometer.
  2. The temperature-rise values given above are for fans normally made to work in ambient temperatures not exceeding 40°C. Nevertheless, fans made to work in higher ambient temperatures can be regarded as complying with this standard, provided the temperature-rise values are reduced corresponding to the increase in ambient temperature.
  3. \*For ventilating fans, the temperature rise shall not exceed 65°C.
  4. \*\*For enclosure of regulator separated from the body only.

#### 4.4 Moisture resistance

The fans shall be moistureproof. They shall withstand the electric strength test specified in 7.4 for 1 min and the insulation resistance shall not be less than 2 MΩ.

#### 4.5 Leakage current

The leakage current shall not exceed 0.30 mA under test conditions or 3.5 mA in case that earthing is provide.

Compliance is checked by the test specified in clause 7.5.

#### 4.6 High voltage resistance

The fans shall withstand the test voltage for 1 min without showing any breakdown.

Compliance is checked by the test specified in clause 7.6.

#### 4.7 Insulation resistance

The insulation resistance shall not be less than 2 MΩ.

Compliance is checked by the test specified in clause 7.7.

#### 4.8 Earthing provision (if any)

For the fans intended to be earthed, the resistance value measured between the accessible metal part excluding rotating parts supported by metal bearings and the earthing terminal shall not exceed 0.1  $\Omega$ .

Compliance is checked by the test specified in clause 7.8.

#### 4.9 Protection against direct contact

After the test specified in clause 7.9,

4.9.1 live parts in the assembled fan and regulator (if any) shall not be accessible to the standard test finger;

4.9.2 functionally insulated parts, in the case of a fan with double or reinforced insulation, shall not be accessible to the standard test finger.

### **5. Marking and labelling**

5.1 Each fan shall bear at least number, letter or mark indicating legibly, clearly and durably the following information :

(1) Rated voltage or rated voltage range in V

(2) Maximum rated current in A

(3) Rated input in W

(4) Rated frequency or rated frequency range in Hz

(5) Model or reference code

(6) Class of insulating material of winding and regulator (if any)

(7) Name of manufacturer, factory, registered trademark or distributor

(8) Country of manufacture

In case a foreign language is used, the meaning shall correspond to that in Thai specified above.

5.2 Any person who manufactures the products complying with this safety standard may use the Standards Mark in connection with his product only after having received a licence from the Industrial Product only after having received a licence from the Industrial Product Standards Council.

### **6. Sampling and criteria for conformity**

6.1 Lot. Fans of the same model and size, manufactured from the same factory at the same period of time, and belonging to any single delivery or transaction.

6.2 Sampling and criteria for conformity shall comply with the following sampling plan or its technical equivalent.

#### 6.2.1 Sampling

Samples shall be taken at random from a lot in accordance with the numbers specified in Table 2.

#### 6.2.2 Criteria for conformity

6.2.2.1 Provided that the number of failures in clauses 3, 4 and 5 of group 1 samples is equal to the corresponding acceptance number in Table 2, the lot shall be deemed as complying with this safety standard.

6.2.2.2 Provided that the number of failures in clauses 3, 4 and 5 of group 1 samples is equal to or exceeds the corresponding rejection number in Table 2, the lot shall be rejected.

6.2.2.3 Provided that the number of failures in clauses 3, 4 and 5 of group 1 samples is in between the acceptance and rejection numbers, the tests shall be repeated on group 2. If the total number of failures in clauses 3, 4 and 5 of both groups is less than the corresponding rejection number, the lot shall be accepted.

**Table 2**  
Sampling plan  
(clauses 6.2.1 and 6.2.2)

Lot size, No. of fans	Sample size, Group 1, No. of fans	Sample size, Group 2, No. of fans	Acceptance number	Rejection number
Up to 50	2	-	0	1
51 to 500	5	5	0	2
501 to 3 200	8	8	0	4

## 7. Testing

### 7.1 General notes

#### 7.1.1 Sequence of tests

The samples shall be tested in sequence of items specified in this standard.

#### 7.1.2 Measuring instruments

Wattmeter, voltmeter and ammeter with a tolerance up to 0.5 % of their full scales shall be used.

7.1.3 In the case of fans of double oscillating types, the fans shall be tested in the direction where more power is consumed.

### 7.2 Cord gripping test

The flexible cord shall be subjected to a torque of 3 times the fan weight or 100 N whichever is less for 15 s. Then, the soldered part or the connecting part of terminals shall be inspected visually.

### 7.3 Temperature-rise test

7.3.1 The test voltage shall comply with Table 3 and shall not change more than 1 % of its initial value during the test.

**Table 3**  
Voltages for temperature-rise test  
(clause 7.3.1)

Test voltage			
When the voltage range is not less than 10 % of the lowest voltage	When the voltage range is less than 10 % of the lowest voltage	When only one rated voltage is specified	When two or more distinct rated voltages with three or more supply terminals are specified
Highest value of range	Mean of the upper and lower limits	Rated voltage	Rated voltage which gives the most unfavourable result

NOTE For a fan with a range of frequency, the test shall be made at the frequency which gives the most unfavourable result.

7.3.2 The permissible temperature-rise of the fan motor and regulator shall be tested at any cooling air temperature not exceeding 40°C.

7.3.3 The cooling air temperature during and after the test shall be measured by means of several thermometers placed at different points around the fan motor at a distance of 1-2 m, and protected from all heat radiations and extraneous draughts. The thermometers used for this test shall be accurate to  $\pm 0.5^\circ\text{C}$ . The value to be adopted for the temperature of the cooling air during a test, maintained within  $\pm 2^\circ\text{C}$ , shall be the mean of the readings

of the thermometers taken at equal intervals of time during to last quarter of the duration of the test.

7.3.4 The temperature-rise measurements shall be carried out by the method indicated in Table 1. After the fan has run long enough to ensure that temperature-rise has reached a constant value, the test shall be as follows.

7.3.4.1 All temperature-rises to be measured by thermometer or thermocouple method (items 2, 4 5 and 6 of Table 1) shall be taken at the hottest accessible surface of the part, as also on the parts which are likely to cause injury to any adjacent insulating material.

7.3.4.2 The temperature-rise (items 1 and 3 of Table 1) shall be calculated to obtain first the  $t_2$  value by change in resistance for copper conductors by the following formula

$$t_2 = \frac{R_2}{R_1} (t_1 + 235) - 235$$

When  $t_1$  is the initial cooling air temperature in °C;

$t_2$  is the final cooling air temperature, in °C, obtained by change in resistance;

$R_1$  is the initial resistance of the winding at temperature  $t_1$ °C in ohms;

$R_2$  is the resistance of the winding at temperature  $t_2$ °C, in ohms; at the end of the test.

From the above, the temperature-rise ( $\Delta t$ ) may be expressed as :

$$\Delta t = t_2 - t_1$$

#### 7.4 Moistureproofness test

The fan shall be placed for a period of 24 h without current being passed through the motor and regulator (if any), in a closed receptacle in which relative humidity is maintained at 90 to 95 % at any temperature chosen in the range of 40° to 50°C. (Whatever temperature is chosen for this test, it shall be maintained constant to within  $\pm 2$ °C.) The fan shall then be subjected immediately to high voltage test (clause 7.6) and insulation resistance test (clause 7.7).

#### 7.5 Leakage test

The fan shall be made to rest on a base well insulated from earth and a single-pole change-over shall be arranged as shown in Figure 1 to connect a multirange milliammeter between frame and each live part of the fan (in turn). To avoid risk to the milliammeter a suitable high resistance with a shunting switch may be used in series with the meter. (The resistance of the measuring circuit shall be  $2\,000 \pm 100 \Omega$ .)

If interference suppression devices are fitted to the fan, they shall be disconnected during the test.

Provided that normal earthing connections are made, the fan shall be supplied through an isolating transformer; otherwise it shall not be insulated from earth.

The test shall be made with a.c. The milliammeter used to measure the leakage current should have an impedance small in comparison with that of the circuit under test and be of a type not appreciably affected by current wave-forms.

The fan shall be connected to 1.1 times the rated voltage or to 1.1 times the upper limit of the rated voltage range, and operated as in normal use for a period of at least 10 min.

The leakage current which may flow from any pole of the supply mains to the accessible metal parts and metal foil on external parts of insulating material, or to the metal parts between the functional insulation of Class 2 fans (which have double insulation and/or reinforced insulation throughout without any earthing terminal) shall be measured.

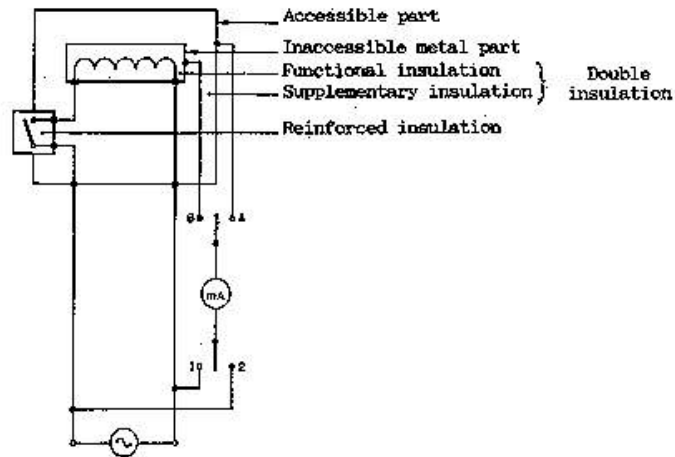


Figure 1 Connections for the measurement  
Of leakage current  
(clause 7.5)

## 7.6 High voltage test

7.6.1 The source of supply for high voltage test shall not be less than 500 VA.

7.6.2 The high voltage test shall be applied to all new and completed fan motors and regulators in normal working conditions with all parts in place except the capacitors which should be disconnected.

7.6.3 Not more than half of an initial a.c. test voltage of clause 7.6.4 or 7.6.5 at a frequency of approximately 50 Hz and sine-wave form shall be applied and increased rapidly until the specified value is reached. This value shall be maintained for 1 min.

7.6.4 1 500 V shall be applied between live parts and accessible metal part.

7.6.5 The test voltage for separate regulator shall be as follows.

7.6.5.1 1 500 V between terminal and accessible metal part.

7.6.5.2 1 500 V between terminals of regulator when the switch is disconnected.

7.6.6 At the end of 1 min, the test voltage shall be removed and the insulation resistance test conducted as in 7.7.

## 7.7 Insulation resistance

The insulation resistance of the fan and regulator (if any) shall be measured with d.c. voltage of approximately 500 V applying at the place of high voltage test. The test shall be carried out immediately after the test of clause 7.6.

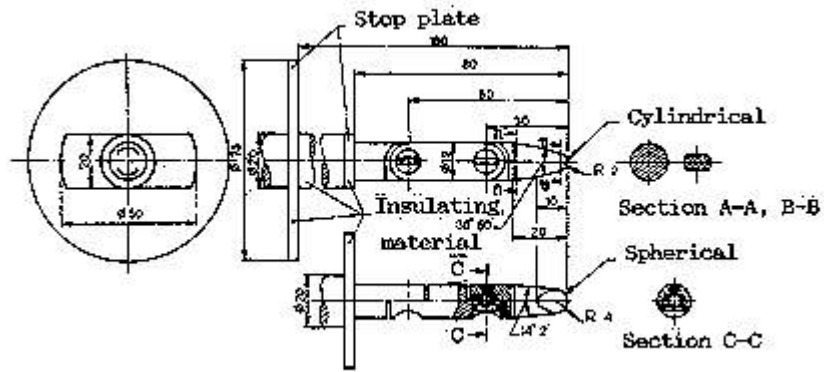
## 7.8 Earthing connection

The resistance is calculated when the rated current of 25 A derived from an a.c. source having a no load voltage not exceeding 6 V is passed between the earthing terminal and each of the accessible metal parts.

## 7.9 Protection against direct contact

A test finger, as illustrated in Figure 2 and made of copper or copper alloy, shall be applied, without appreciable force, to explore all openings into which it shall be easily inserted in every possible position.

The test finger shall not touch any bare live parts.



Units in mm

- NOTE. Tolerances
- on angles  $\pm 5'$
  - on linear dimensions :
 

: up to 25 mm	0	mm
	-0.05	
: over 25 mm	$\pm 0.2$	mm

Figure 2 Standard test finger  
(clause 7.9)