IS 374 (1979): Electric ceiling type fans and regulators [ETD 5: Electric Fans]

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IS : 374 - 1979
(Reaffirmed 1999)

Indian Standard
SPECIFICATION FOR ELECTRIC CEILING TYPE FANS AND REGULATORS
(*Third Revision*)

Sixth Reprint AUGUST 2004

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 6 *March* **1980**

AMENDMENT NO. 1 JUNE 1985
TO
IS : 374 - 1979 SPECIFICATION FOR ELECTRIC CEILING TYPE FANS AND REGULATORS

(*Third Revision*)

(*Page* 5, *clause* 3) - Delete the words 'AND SPEEDS' from the title.

(*Page* 12, *clause* 8.2) - Add the following after the existing text:

'In no case air delivery and service values obtained shall be less than those specified in Table 2.'

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AMENDMENT NO. 2 SEPTEMBER 1987
TO
IS : 374-1979 SPECIFICATION FOR ELECTRIC CEILING TYPE FANS AND REGULATORS
(*Third Revision*)

(*Page* 11, *clause* 8.1) — Substitute the following for the existing clause:

'**8.1** The minimum air delivery, service value and maximum input at test voltage and at full speed shall be as given in Table 2.'

[*Page* 11, *clause* 8.2 (*see also Amendment No.* 1)] — Add the following matter in the end:

'The maximum input shall not exceed the value given in Table 2. In case a lower input is declared by the manufacturer (*see* **9.3**), the actual input shall not exceed this declared value by more than 10 percent subject to the condition that the actual input shall in no case exceed the value specified in Table 2.'

(*Page* 12, *Table* 2) — Substitute the following for the existing table:

TABLE 2 MINIMUM AIR DELIVERY, SERVICE VALUE AND MAXIMUM INPUT FOR TYPE A FANS

(*Clauses* 0.3 *and* 8.1)

FAN SIZE	TYPE	AIR DELIVERY	SERVICE VALUE	MAXIMUM INPUT
(1) mm	(2)	(3) m^3/min	(4) m^3/min/W	(5) W
900	Capacitor ac	140	3.4	42
	dc	140	3.7	38
1 050	Capacitor ac	165	3.5	48
	dc	165	3.8	44
1 200	Capacitor ac	215	4.3	50
	dc	215	5.0	44
1400	Capacitor ac	270	4.5	60
	dc	270	5.3	51
1 500	Capacitor ac	300	4.8	63
	dc	300	5.7	53

NOTE — Air delivery values are on the basis of air velocity measurement up to 9 m/min.

[*Page* **12**, *clause* **9.1** (e)] — Add the following new item and renumber the subsequent items accordingly:

' f) Air delivery;'

(ETDC 5)

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AMENDMENT NO. 3 MARCH 1988
TO
IS : 374-1979 SPECIFICATION FOR ELECTRIC CEILING TYPE FANS AND REGULATORS
(*Third Revision*)

Amendment No. 2 of September 1987—Delete.

(*Page* 11, *clause* 8.1) —Substitute the following for the existing clause:

'**8.1** The minimum air delivery, minimum service value and maximum input at test voltage and at full speed shall be as given in Table 2.

8.1.1 The observed value of input may exceed the value given in col 5 of Table 2 by not more than 10 percent provided service values are complied with (*see also* **10.9**).'

(*Page* 12, *Table* 2) — Substitute the following for the existing table :

TABLE 2 PERFORMANCE VALUES FOR FANS

(*Clauses* 8.1 *and* 8.1.1)

FAN SIZE	TYPE	AIR DELIVERY	SERVICE VALUE	INPUT
(1) mm	(2)	(3) m^3/min	(4) m^3/min/W	(5) W
900	Capacitor ac	140	3.4	42
	dc	140	3.7	38
1 050	Capacitor ac	165	3.5	48
	dc	165	3.8	44
1 200	Capacitor ac	215	4.3	50
	dc	215	5.0	44
1 400	Capacitor ac	270	4.5	60
	dc	270	5.3	51
1 500	Capacitor ac	300	4.8	63
	dc	300	5.7	53

NOTE 1 — Compliance shall be checked by the provisions of 8.1 and 8.1.1.

NOTE 2 — Air delivery values are on the basis of air velocity measurement up to 9 m/min.

[*Page* 12, *clause* 9.1(e)] — Add the following new item and renumber the subsequent items accordingly:

'f) Air delivery.'

(ETDC 5)

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AMENDMENT NO. 4 NOVEMBER 1993
TO
IS 374 : 1979 SPECIFICATION FOR ELECTRIC CEILING TYPE FANS AND REGULATORS

(*Third Revision*)

(*Page* 6, *clause* 6.4) — Substitute the following for the existing:

'**6.4 Heat Resistance** — Moulded Parts, if used shall be of such material as will withstand the maximum temperature attained in the adjacent component parts.'

[*Page* 11, *clause* 8 (*see also Amendment No.* 3)] — Substitute the following for the existing entries:

'**8. PERFORMANCE REQUIREMENTS**

8.1 The minimum air delivery, minimum service value and maximum power input at test voltage and at full speed shall be as given in Table 2.

8.2 The observed value of maximum power input may exceed the value given in col 5 of Table 2 by not more than 10 percent provided service values are complied with (*see also* **10.9**).'

(*Page* 12, *Table 2*) — Substitute the following for the existing table:

TABLE 2 PERFORMANCE VALUES FOR FANS
(*Clauses* 8.1 *and* 8.2)

Fan Size	Type	Minimum Air Delivery	Minimum Service Value	Maximum Power Input
(1) mm	(2)	(3) m^3/mm	(4) m^3/min/W	(5) W
900	Capacitor ac	140	3.4	42
	dc	140	3.7	38
1 050	Capacitor ac	165	3.5	48
	dc	165	3.8	44
1 200	Capacitor ac	215	4.3	50
	dc	215	5.0	44
1 400	Capacitor ac	270	4.5	60
	dc	270	5.3	51
1 500	Capacitor ac	300	4.8	63
	dc	300	5.7	53

NOTE 1 — Compliance shall be checked by the provisions of 8.1 and 8.2.

NOTE 2 — Air delivery values are on the basis of air velocity measurement up to 9 m/min.

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AMENDMENT NO. 5 SEPTEMBER 2000 TO IS 374 : 1979 SPECIFICATION FOR ELECTRIC CEILING TYPE FANS AND REGULATORS

(*Third Revision*)

(*Page* 12, *Table* 2) — Substitute the following for the existing table:

Table2 Minimum Air Delivery, Minimum Service Value and Maximum Power Input

(*Clauses* 0.3 *and* 8.1)

Fans Size	Type		Minimum Air Delivery	Minimum Service Value	Maximum Power Input
mm			m^3/min	m3/min/W	W
(1)	(2)		(3)	(4)	(5)
900	Capacitor	ac	130	3.1	42
		dc	130	3.4	38
1050	Capacitor	ac	150	3.1	43
		dc	150	3.4	44
1200	Capacitor	ac	200	4.0	50
		dc	200	4.6	44
1400	Capacitor	ac	245	4.1	80
		dc	245	4.8	81
1 500	Capacitor	ac	270	4.3	63
		dc	270	5.1	53

NOTE — Air delivery values are on the basis of air velocity measurement up to 15 m/min.

(*Page* 17, *clause* 10.3.5, *third para, last sentence*) — Substitute the following for the existing:

'The reading shall be continued until the actual velocity falls to 15 m/min.'

(ETD 05)

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AMENDMENT NO. 6 MARCH 2002
TO
IS 374 : 1979 SPECIFICATION FOR ELECTRIC CEILING TYPE FANS AND REGULATORS

(*Third Revision*)

[*Page* 12, *Table* 2 (*see also Amendment No.* 5)] — Substitute the following for the existing table:

Table 2 Minimum Air Delivery, Minimum Service Value and Maximum Power Input
(*Clauses* 0.3 *and* 8.1)

Fans Size mm	Type		Minimum Air Delivery	Minimum Service Value	Maximum Power Input
			m^3/min	m^3/min/W	W
(1)	(2)		(3)	(4)	(5)
900	Capacitor	ac	130	3.1	42
		dc	130	3.4	38
1 050	Capacitor	ac	150	3.1	48
		dc	150	3.4	44
1 200	Capacitor	ac	200	4.0	50
		dc	200	4.6	44
1 400	Capacitor	ac	245	4.1	60
		dc	245	4.8	51
1 500	Capacitor	ac	270	4.3	63
		dc	270	5.1	53

NOTE — Air delivery values are on the basis of air velocity measurement up to 15 m/min.

(ETD 05)

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Indian Standard

SPECIFICATION FOR ELECTRIC CEILING TYPE FANS AND REGULATORS

(*Third Revision*)

Electric Fans Sectional Committee, ETDC 5

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Indian Standard

SPECIFICATION FOR ELECTRIC CEILING TYPE FANS AND REGULATORS

(*Third Revision*)

0. FOREWORD

0.1 This Indian Standard (Third Revision) was adopted by the Indian Standards Institution on 29 August 1979, after the draft finalized by the Electric Fans Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 This standard was originally published in 1951 and was subsequently revised in 1960 and 1966. The present revision has been undertaken to incorporate:

a) additional safety requirements, such as leakage current, protection against electric shock, mechanical strength, etc.

b) guidance on constructional aspects affecting safety.

c) experience gained in the field since publication of the last revision.

0.3 The proposal from Fan Makers' Association for inclusion of an additional grade of fans having higher air delivery but much lower service value than that specified in Table 2 to cater to the market demand has been deferred for consideration at a later date in view of the following:

a) The fact that such fans are desired by consumers could not be established conclusively.

b) The latest proposal from Fan Makers' Association envisages for the additional grade having the same air delivery as given in Table 2 but much lower service values.

0.4 IS : 302-1979* to which references have been made in this standard for sefety requirements and test methods is a necessary adjunct to this standard. Should, however, any deviation exist between IS : 302-1979* and those of this standard, the provisions of the latter shall apply.

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*General and safety requirements for household and similar electrical appliances (*fifth revision*).

0.5 This standard contains clauses **6.6** and **9.3** which call for agreement between the purchaser and the supplier and require the manufacturer to supply certain technical information at the time of placing orders. The relevant clauses are **6.6** and **9.3**.

0.6 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard specifies the requirements and methods for tests of capacitor type ac single-phase ceiling fans as well as dc ceiling fans including the associated speed regulators.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

2.1 Ceiling Type Fan — A propeller-bladed fan, having two or more blades, driven by an electric motor and provided with a device for suspension from the ceiling of a room so that the blades rotate in a horizontal plane.

2.2 Rating — A statement of the operating characteristics assigned to the fan by the manufacturer when tested in accordance with **10.**

2.3 Rated Voltage — The voltage assigned to the fan by the manufacturer and marked on it.

2.4 Rated Voltage Range — The voltage range assigned to the fan by the manufacturer expressed by its lower and upper limits and marked on the fan.

2.5 Rated Frequency — In the case of ac fans, the frequency assigned to the fan by the manufacturer and marked on it.

2.6 Rated Frequency Range — The limits of frequency assigne to the fan by the manufacturer and marked on it.

*Rules for rounding off numerical values (*revised*).

2.7 Rated Speed — The rotational speed specified by the manufacturer at which the fan develops the specified output at the rated frequency and rated voltage.

2.8 Cooling Air Temperature — The temperature of the surrounding atmosphere in which the fan operates.

2.9 Service Value — The air delivery in m^3/min divided by electrical power input to the fan in watts at the voltage and frequency specified for the tests.

2.10 Blade Sweep — The diameter of the circle traced out by the extreme tips of the fan blades.

2.11 Size of Fan —The blade sweeps in millimetres.

2.12 Plane of Fan Blades — The middle plane of the solid of revolution traced out by the fan blades.

2.13 Plane of Anemometer Vanes — The middle plane of the solid of revolution traced out by the vanes of the anemometer.

2.14 Test Plane — The horizontal plane containing the plane of the anemometer vanes.

2.15 Types of Enclosures of Motors and Regulators

2.15.1 *Totally Enclosed Type* — An enclosure which prevents circulation of air between the inside and outside of the case, but not necessarily 'air-tight'.

2.15.2 *Ventilated Type* — An enclosure in which the ventilation is not materially obstructed while the live parts are protected mechanically against accidental or careless contact.

2.16 Insulation

2.16.1 *Basic Insulation* — Denotes the insulation applied to live parts to provide basic protection against electric shock.

NOTE 1 — Basic insulation does not necessarily include insulation used exclusively for functional purposes.

NOTE 2 — The insulating properties of lacquer, enamel, ordinary paper, cotton, oxide film on metal parts, beads and sealing compound shall not be relied upon to give the required protection against accidental contact with live parts.

2.16.2 ***Supplementary Insulation*** — Denotes an independent insulation applied in addition to the basic insulation, in order to ensure protection against electric shock in the event of a failure of the basic insulation.

2.16.3 ***Double Insulation*** — Denotes insulation comprising both basic insulation and supplementary insulation.

2.16.4 ***Reinforced Insulation*** — Denotes a single insulation system applied to live parts, which provides a degree of protection against electric shock equivalent to double insulation under the conditions specified in this standard.

NOTE — The term 'insulation system' does not imply that the insulation shall be one homogeneous piece. It may comprise several layers which cannot be tested singly as supplementary or basic insulation.

2.17 Class I Type Fans and Regulators — Denotes the one in which protection against electric shock does not rely on basic insulation only, but which includes an additional safety precaution in that accessible conductive parts are connected to the protective earthing conductor in the fixed wiring of the installation in such a way that accessible conductive parts cannot become live in the event of a failure of the basic insulation.

NOTE — Class I type may have parts with double insulation or reinforced insulation, or parts operating at safety extra-low voltage.

2.18 Canopy — A cover intended to partly or wholly conceal the hook and the shackle.

2.19 Type Tests — Tests carried out to prove conformity with the requirements of this standard. These are intended to prove general qualities and design of a given type of fan.

2.20 Routine Tests — Tests carried out on each fan to check the essential requirements which are likely to vary during production.

2.21 Acceptance Tests — Tests carried out on samples selected from a lot for the purpose of verifying the acceptability of the lot.

2.21.1 *Lot* — All fans of the same type, grade, category and rating, manufactured by the same factory during the same period, using the same process and materials.

3. SIZES AND SPEEDS

3.1 Standard sizes of ceiling fans shall be:

900, 1 050, 1 200, 1 400 and 1 500 mm.

NOTE — Sizes of fans specified above are subject to a tolerance of = 5 mm.

4. RATED VOLTAGES

4.1 The preferred voltages for ceiling fans shall be 230 and 240 V, single phase ac (*see* IS : 585-1962*) or 220 V dc.

5. RATED FREQUENCY

5.1 The rated frequency shall be the standard frequency of 50 Hz.

NOTE - Nevertheless, fans made for other frequencies shall be considered to comply with the specification provided they do so in all other relevant respects.

6. DESIGN AND GENERAL CONSTRUCTION

6.1 Enclosures

6.1.1 Motors of ceiling fans shall be of the totally enclosed type. Regulators, however, may be of the ventilated type.

6.1.2 The enclosures of all-insulated fans may form part or whole of the supplementary or reinforced insulation.

6.2 Stampings — Stampings of fan motors shall be made from electrical steel sheet (*see* IS : 648-1970†, IS : 649-1963† and IS : 3024-1965§).

6.3 Blades — Fans shall be fitted with two or more well-balanced blades made from metal or other suitable material. The blades and motor shall be securely fixed so that they do not loosen in operation.

6.4 Heat Resistance — No readily flammable material shall be used in the construction of fan and regulator. Moulded parts, if used, shall be of such materials as will withstand the maximum temperature attained in the adjacent component parts.

6.5 Moisture Resistance — Only suitable material which is resistant to moisture shall be used. The speed regulator shall be capable of withstanding the moisture resistance test specified in **10.12**.

6.6 Bearings — Instructions for the proper lubrication of bearings shall be furnished by the manufacturer.

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*Specification for voltages and frequency for ac transmission and distribution systems (*revised).*

†Specification for non-oriented electrical steel sheets for magnetic circuits (*second revision*).

‡Methods of testing steel sheets for magnetic circuits of power electrical apparatus (*revised).*

§Specifictaion for electrical steel sheets (oriented).

6.7 Protective Measures — From the point of view of protection against electric shock, electric fans shall be of either of the following two types:

a) with basic insulation only, with the accessible metal parts designed to be connected to an earthing terminal or contact; and

b) with double or reinforced insulation, with the accessible metal parts not designed to be connected to an earthing terminal or contact.

6.7.1 All fans and regulators with basic insulation only shall be provided with an earthing terminal or contact, which shall be indelibly marked with the symbol '/≡ ' The earthing terminal or contact shall not be used for any other purpose. The earthing terminal may be provided on the suspension system provided the provision of **10.10** is complied with.

6.8 Protection Against Direct Contact — In the assembled fan and regulator, live parts shall not be accessible to the standard test finger (*see* IS : 1401-1970*). In the case of a double insulated fan, both basically insulated parts and live parts shall not be accessible to the standard test finger.

6.9 Capacitors — Capacitors shall be easily replaceable and placed at sufficient distance from the windings, so that its maximum safe working temperature is not exceeded. Capacitors shall be clearly marked with the maximum safe working temperature, and the corresponding voltage and capacitance. Capacitors shall comply with IS : 1709-1960†.

6.10 Suspension System — The suspension system of the ceiling fans shall be of adequate strength but maybe of the rigid or the non-rigid type, and shall comply with the test (*see* **10.14**).

NOTE — The suspension system shall be either bolted or screwed at the motor end and the suspension end. In case it is screwed, the threads shall be such as to tend the joints to tighten when the fan is in motion. The joints shall be further secured by the use of locknut or split pin.

6.11 Components which may require replacement, such as capacitor shall be suitably fixed to enable easy replacement when necessary.

6.12 It shall not be possible to remove parts which ensure required degree of protection against moisture without the aid of a tool.

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*Specification for accessibility test probes (*first revision*).
†Specification for fixed capacitors for fans.

6.13 Current carrying parts and other metal parts, the corrosion of which might result in hazard shall be resistant to corrosion under normal conditions of use.

NOTE — Attention shall be paid to the compatibility of the materials of terminals and terminations and to the effect of heating. Stainless steel and similar corrosion-resistant alloys and plated steel are considered to be satisfactory for the purpose of the requirement.

6.14 Radio and television interference suppressors, if any, shall be so fitted that they are adequately protected against mechanical damage when the fan is in its normal position of use,

7. GENERAL AND SAFETY REQUIREMENTS

7.1 Protection Against Electric Shock

7.1.1 Fans and regulators shall be so constructed and enclosed that there is adequate protection against accidental contact with live parts. This requirement is applicable for all positions in the normal use.

7.2 Electrical insulation under normal operating conditions.

7.2.1 When measured according to the method specified in **10.7** the insulation resistance shall not be less than 2 megohms.

7.2.2 *Leakage current* (*see* **10.5**)—For Class I type fans and regulators the leakage current which may flow from the live parts to the accessible parts and metal foil on external insulating material connected together shall not exceed 750 µA (peak).

7.2.3 The insulation is subjected for one minute to a voltage of substantially sine-wave-form having a frequency of 50 Hz as given in **10.6.3.**

7.3 Temperature-Rise

7.3.1 The fan motor and regulator when tested at any cooling air temperature not exceeding 40°C, the temperature-rise shall not exceed the values shown in Table 1.

7.4 Mechanical Strength

7.4.1 Fan regulators shall have adequate mechanical strength and be so constructed as to withstand such rough handling as may be expected in normal use.

TABLE 1 PERMISSIBLE LIMITS OF TEMPERATURE-RISE

(*Clause* 7.3.1)

SL No.	PART OF MOTOR OR REGULATOR	TEMPERATURE-RISE			METHOD OF MEASURE-MENT
		Class A Insula-tion	Class E Insula-tion	Class B Insula-tion	
(1)	(2)	(3)	(4)	(5)	(6)
i)	Insulated windings of motors	60 deg	75 deg	85 deg	Change of resistanc
ii)	Insulated windings, if any, of regulator (with continuous running on any contact)	60 deg	75 deg	85 deg	Change of resistanc
iii)	Frame enclosing regulator	40 deg	40 deg	40 deg	Thermo-meter
iv)	External surface of capacitors	45 deg	45 deg	45 deg	Thermo-meter

NOTE 1 — The thermocouples, if used, should be applied only to external surfaces which can be reached by an ordinary thermometer.

NOTE 2 — The temperature-rise values given above are for fans normally made to this specification to work in cooling air temperatures not exceeding 40°C. Nevertheless, fans made to work in higher cooling air temperatures can be regarded as complying with this specification, provided the temperature-rise values are reduced corresponding to the increase in cooling air temperature. Such fans shall be specially marked.

7.5 Abnormal Operation — (Under consideration).

7.6 Creepage Distances atnd Clearances — The relevant provisions of 29 of IS : 302-1979* shall apply.

NOTE — These provisions shall not be applicable to motor-winding.

7.7 Finish

7.7.1 All the surfaces of both fan motor with blades and regulator, if any, shall be of corrosion resisting material or shall be suitably and durably protected against corrosion.

7.8 Insulating Materials

7.8.1 With the exception of resistance wires in regulators, windings of fans and regulators shall be insulated with Class A, or with Class E or

*General and safety requirements for household and similar electrical appliances (*fifth revision*).

Class B insulating materials complying with limits of temperature-rise specified in **7.3.1.** These insulating materials are detailed in IS : 1271-1958*.

7.9 Speed Regulators

7.9.1 Regulators including electronic type of speed regulators shall be capable of reducing the speed of the fan at least 50 percent of the full speed at the test voltage. Fans shall be capable of running on all the running positions of the regulator at the rated voltage or voltages (*see* **2.3**) or within the whole rated voltage range (*see* **2.4**) whichever is applicable.

7.9.2 The regulator shall have an ' off ' position preferably next to the lowest speed contact, and shall be provided with not less than five running positions except in case of continuously variable speed regulators. The speed difference at any running position shall not deviate by more than ± 50 percent from the ideal speed difference calculated on the basis of maximum and minimum speeds divided by the number of steps provided in the speed regulator.

NOTE — The following example illustrates the significance of this clause:

Let the maximum speed of the fan be 400 rev/min and the minimum speed be 200 rev/min.

Then the ideal speed difference will be 200/4 = 50 rev/min.

The speed difference between any two running positions should be between 75 and 25 rev/min.

7.9.3 Where a regulator is provided with a capacitor not permanently connected across the motor terminals, provision shall be made so that the capacitor is discharged when the regulator is in the ' Off ' position.

7.9.4 The regulator handle or knob shall either be of insulating material or, if of metal, shall be adequately insulated electrically and thermally so that its temperature-rise above ambient is limited to 20°C. All metallic parts associated with it shall be protected from accidental contact.

7.9.5 The mechanism of the regulator shall be so designed as to ensure positive contact at each running position. In the case of inductance type regulator, it is essential that no portion of the inductive winding should remain permanently short-circuited in any of the running positions.

*Classification of insulating materials for electrical machinery and apparatus in relation to their thermal stability in service.

7.9.6 Adequate precautions shall be taken to prevent accidental contact of moving current carrying parts with the metallic body of the regulator.

7.9.7 Electronic type regulators shall be provided with radio and television interference suppressing devices, so as to ensure that there is no appreciable noise/disturbance on radio/television when operated outside a radius of 2 m from the regulator.

7.9.8 The voltage drop across the electronic type regulator at the maximum speed position shall not exceed 2 percent of the rated voltage of the fan.

7.10 Starting

7.10.1 The fan shall be capable of starting up from rest with the regulator, if any, at the lowest speed step when 85 percent of the rated voltage or 85 percent of the lowest voltage in the voltage range is applied.

7.11 Interchangeability

7.11.1 The motor of the fan of a particular size and model and its associated regulator and set of blades shall be interchangeable such that the performance of the fan keeps within limits specified in this standard.

7.12 Silent Operation

7.12.1 Precautions shall be taken in the manufacture of fans and regulators to ensure a reasonable degree of silence at all speeds.

NOTE — The need for specifying limits of noise levels (acoustical) of the fan is recognized. However, it has not been found possible to specify these limits at present on account of:

a) dependency of these limits on the actual location of the fans,

b) lack of data on the acceptable noise levels for different applications, and

c) lack of agreed definition of noise level and method of evaluating the same.

The criterion of noise level may, therefore, be subject to an agreement between the manufacturer and the purchaser.

8. PERFORMANCE REQUIREMENTS

8.1 The minimum air delivery and service value at test voltage and at full speed shall be as given in Table 2.

8.2 For compliance with the requirements of this standard, the values of air delivery and service value shall not be less than those specified in Table 2. In case higher values of air delivery and service value are

declared by the manufacturer (*see* **9.3**), the observed results, expressed as percentage of the values declared by the manufacturer shall not be less than 90 percent of the declared values.

TABLE 2 MINIMUM AIR DELIVERY AND SERVICE VALUE FOR TYPE A FANS

(*Clauses* 0.3 *and* 8.1)

FAN SIZE	TYPE	AIR DELIVERY	SERVICE VALUE
(1) mm	(2)	(3) m^3/min	(4) m^3/min/W
900	Capacitor ac	140	3.4
	dc	140	3.7
1 050	Capacitor ac	165	3.5
	dc	165	3.8
1 200	Capacitor ac	215	4.3
	dc	215	5.0
1 400	Capacitor ac	270	4.5
	dc	270	5.3
1 500	Capacitor ac	300	4.8
	dc	300	5.7

NOTE — Air delivery values are on the basis of air velocity measurement up to 9m/min.

9. MARKING

9.1 Each fan shall be indelibly marked with at least the following information:

a) Manufacturer's name, trade-name of fan (if any) and number;

b) Rated voltage(s) or voltage range;

c) Type of fan, ac or dc;

d) Frequency or frequency range of power supply, if of ac;

e) Input in watts;

f) Size of fan; and

g) Country of manufacture.

NOTE 1 — The trade-name, voltage and the size of the fan shall be marked on the associated regulator also.

NOTE 2 — Items (a) and (g) may not be marked if specifically desired by the purchaser.

9.2 In the case of a fan provided with an earthing terminal or contact, it shall be indelibly marked with the symbol '⏚.'

9.3 For additional information that the manufacturer may be requested to supply (*see* Appendix A).

9.3.1 Ceiling type fans may also be marked with the ISI Certification Mark

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

10. TESTS

10.1 Categories of Tests

10.1.1 *Type Test* — The tests specified below shall constitute type tests and shall be carried out on three samples of the same type and rating selected preferably at random from a regular production lot:

a) Air delivery (**10.3**),
b) Temperature-rise (**10.4**),
c) Leakage current (**10.5**),
d) High voltage (**10.6),**
e) Insulation resistance (**10.7**),
f) Starting (**10.8**),
g) Fan speed and input (**10.9**),
h) Earthing connections (**10.10**),
j) Protection against electric shock (for regulators) (**10.11**),
k) Moisture resistance (for regulators only) (**10.12**),
m) Mechanical strength (for regulators only) (**10.13**),
n) Suspension system (**10.14**),
p) Creepage distances and clearances (**10.15**), and
q) Mechanical endurance (for regulators only) (**10.16).**

10.1.2 *Acceptance Tests* — The following shall constitute the acceptance tests:

a) Starting (**10.8**),
b) Fan speed and input (**10.9**),

c) Earthing connections (**10.10**),

d) Leakage current (**10.5**), and

e) High voltage (**10.6).**

10.1.2.1 A recommended sampling plan for acceptance tests is given in Appendix B.

10.1.3 *Routine Tests* — The following shall comprise the routine tests:

a) Flash test (**10.6.5**);

b) Insulation resistance (**10.7.2**);

c) A simple running test to determine that fan is in working order.

10.2 General Conditions of Test

10.2.1 *Test Voltage* — The voltage at which the tests are conducted shall be as follows.

10.2.1.1 When a rated voltage is indicated on the name-plate, the test shall be conducted at the rated voltage. If the fan is specified for two or more distinct rated voltages with three or more supply terminals, the tests shall be carried out at all voltages.

10.2.1.2 When a voltage range is indicated on the name-plate, the test voltage shall be as given in the table below:

Sl No.	*Test*	*Test Voltage*	
		When the Voltage Range is in Excess of 10 Percent of the Lowest Voltage	When the Voltage Range is Less Than 10 Percent of the Lowest Voltage
1	Temperature-rise	Highest value of range	Mean of the upper and lower limits
2	Starting	85 percent of the lowest value of range (*see* **7.10**)	
3	Air delivery and service value	Highest and lowest values of range	
4	Power factor and speed	Highest and lowest values of range	

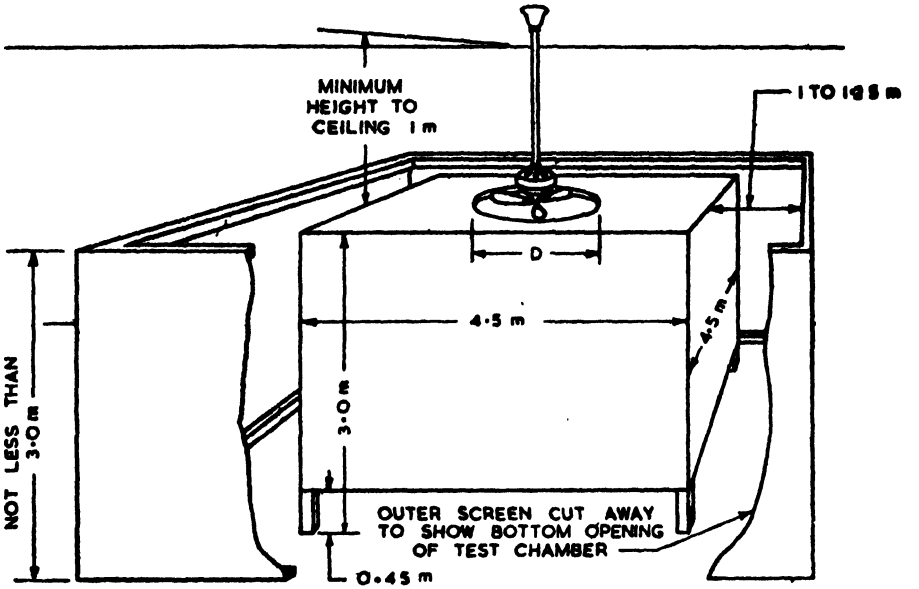
For a fan marked with a range of frequency, the test shall be made at the frequency which gives the most unfavourable result.

10.2.1.3 *Limits of voltage variation* — The variation in the test voltage shall not exceed ± 1 percent of the test voltage during air delivery tests. While taking the current and watt readings during these tests, however, the voltage shall be maintained at the test voltage.

10.2.2 *Limits of Error of Electrical Instruments* — The error in the indicated value of ammeters, voltmeters and wattmeters shall not exceed 0.5 percent of full scale value for instruments used for type tests. For routine and acceptance tests, industrial class instruments (*see* IS : 1248-1968*) may be used.

10.3 Air Delivery Test

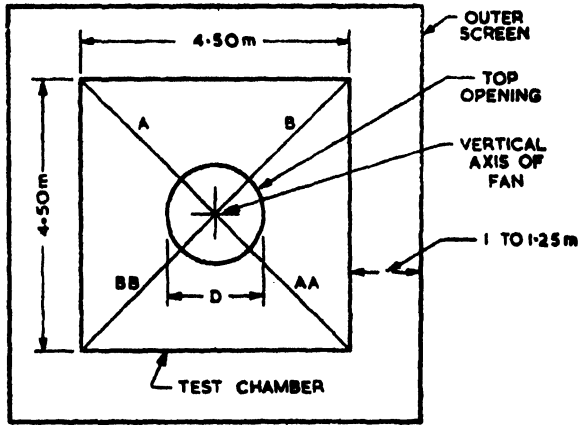
10.3.1 *Test Chamber* — The fan shall be tested in a test chamber measuring 4.5 X 4.5 X 3.0 m (*see* Fig, 1 and 2). The top of the test chamber shall be covered except for a centrally situated circular opening (top opening), the diameter of which shall be greater than the blade sweep of the fan by not more than 20 percent and not less than 10 percent. The central diaphragm in which the top opening is located shall be not more than 6 mm thick.



For dimension *D*, *see* **10.3.1.**

FIG. 1 ARRANGEMENT OF TEST CHAMBER AND SCREEN

*Specification for direct acting electrical indicating instruments (*first revision*).



For dimension *D*, *see* **10.3.1.**

FIG. 2 PLAN OF TEST CHAMBER AND SCREEN

The bottom of the chamber shall be cut away all round to a height of 450 mm from the ground level to provide adequate outlet for the air.

The outer chamber shall be provided at a uniform distance of 1 to 1.25 m laterally round the test chamber and reaching from the ground level to a height of not less than 3 m. One or more walls of a room may be utilized as sides of the outer chamber provided they comply with all the necessary conditions.

The observer shall take readings from a position between the chamber and the outer chamber and a small shelf for electrical instruments may be provided in the space. Except for these, the space between the chamber and the outer chamber and the space inside the test chamber shall be clear of all obstructions, and there shall be no direct heating or cooling apparatus anywhere in the test chamber, which is likely to interfere with the test results.

The room in which the test chamber and the outer chamber are erected shall be reasonably free from extraneous draughts while the test is being carried out.

10.3.2 *Height of Fan* — The fan shall be placed at such a height that the plane of the fan blades is 3 m from the ground level and lies in the plane of the top edge of the diaphragm containing the top opening in the roof of the test chamber.

Any ceiling external to the test chamber or any projecting beam which might interfere with the air flow shall be not less than one metre above the top opening, that is, not less than 4 m from the ground level at that point.

10.3.3 *Testing Instrument* — The air movement shall be measured by means of a rotating vane anemometer having an internal diameter not exceeding 100 mm. It is recommended that the anemometer be calibrated frequently.

10.3.4 *Arrangement of Apparatus* — The arrangement of the apparatus shall be such as to permit the anemometer being moved in either direction along both diagonals of the test chamber in a test plane 1.50 m below the plane of the fan blades. The anemometer shall be supported in such a manner as to offer as little obstruction as possible to the air flow.

10.3.5 *Procedure for Test* — Before taking any steps towards testing a fan in accordance with this standard, it is essential that it should have been 'run-in' to steady conditions. A period of two hours is considered adequate for the purpose.

The measurements shall be carried out with the fan running at full speed at the test voltage.

Readings shall be taken along each of the four semi-diagonals of the test chamber commencing at a point 40 mm from the vertical axis of the fan motor by increments of 80 mm so that each reading represents an air velocity at the mean radius of an annulus 80 mm wide. The readings shall be continued until the actual velocity falls below 9.0 m per minute.

Each reading shall consist of the time taken by an air movement of 300 m measured by the anemometer, except when such air movement takes more than two minutes, in that case the reading shall consist of the time taken by a movement of some convenient and readable quantity of air requiring approximately two minutes.

The average air velocity over any annulus shall be the mean of the readings on the four semi-diagonals at each mean radius of annulus.

The average velocity so obtained, multiplied by the area of the corresponding annulus shall be taken as the total air delivery through that annulus.

The sum of the air deliveries through all such annuli up to the limit of readings mentioned above shall be taken as the measured air delivery of the fan for the purposes of this specification.

Air-conditions (temperature, relative humidity, pressure) obtained at the test chamber during tests shall be recorded with the test result.

NOTE — No correction is to be made until an agreement is available on correction factor.

10.4 Temperature-Rise Test

10.4.1 *Measurement of Cooling Air Temperature During Tests* — The cooling air temperature shall be measured by means of several thermometers placed at different points around the fan motor at a distance of one to two metres and protected from all heat radiations and extraneous draughts. The thermometers used for this test shall be accurate to ± 0.5 deg.

The value to be adopted for the temperature of the cooling air during a test shall be the mean of the readings of the thermometers taken at equal intervals of time during the last quarter of the duration of the test.

10.4.2 *Measurement of Temperature-Rise* — The temperature-rise measurements shall be carried out by the method indicated in Table 1, immediately after the air delivery test or after the fan has been run long enough to ensure that the temperature-rise has reached a constant value.

All temperature-rise to be measured by thermometer method [Items (iii) and (iv) 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.

The method of measurement of temperature-rise by change in resistance for copper conductors is given below:

The temperature-rise $t_2 — t_1$ may be obtained from the ratio of the resistances by the formula:

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

where

R_2 = resistance of the winding at temperature t_2 (°C) at the end of the test, and

R_1 = initial resistance of the winding at temperature t_1 (°C) (cold).

From the above, the hot temperature (t_2) may be expressed as:

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

NOTE — The necessary correction to the final temperature t_2°C as indicated by any initial variation between t_1°C and the ambient temperature when hot resistance is measured may have to be made.

10.5 Leakage Current Test — The test shall be carried out according to **13.2** of IS : 302-1979*.

10.6 High Voltage Test (Type and Acceptance Test)

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

10.6.2 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.

10.6.3 An ac test voltage at a frequency of approximately 50 Hz and sine wave-form shall be applied and maintained for one minute without showing any kind of breakdown or flashover.

The test voltage shall be applied as follows:

a) *For fan motors* :

1) Between live parts and body in the case of motors intended to be earthed	1 500 volts
2) Between live parts and other inaccessible metal parts (that is, over the basic insulation) in the case of double insulated motors	1 500 volts
3) Between the inaccessible metal parts and the body (that is, over the supplementary insulation) in the case of double insulated motors	2 500 volts
4) Between live parts and body (that is, over the reinforced insulation) for reinforced insulated motors	4 000 volts

*General and safety requirements for household and similar electrical appliance *(fifth revision)*.

b) *Fan regulators :*

1) Between any terminal and the body	1 500 volts
2) Between the terminals with the regulator in the 'Off' position	1 500 volts

10.6.4 At the end of one minute, the test voltage shall be removed and the insulation-resistance test conducted as in **10.7.1.**

10.6.5 *Flash Test* (*Routine Test*) — Every fan and regulator shall withstand the voltage specified in **10.6.3** for one second when it is applied instantaneously.

10.7 Insulation Resistance (Type Test)

10.7.1 When conducted as a type test for fans and regulators, this test shall follow the moisture resistance test (**10.12**). The insulation resistance of the fan and regulator shall be measured with dc voltage of approximately 500 V, the measurement being made 1 minute after the application of the voltage. The insulation resistance shall not be less than 2 megohms.

10.7.2 *Insulation Resistance* (*Routine Test*) — The insulation resistance test shall be carried out on fans and regulators immediately after conducting the flash test.

10.8 Starting

10.8.1 The fan is connected to 85 percent of its test voltage/lower limit of the voltage range, if any, with regulator at its lowest speed step. The fan should be capable of starting. The test is repeated 10 times.

10.9 Fan Speed and Inpnt

10.9.1 The fan is connected to the supply at the test voltage and at the highest speed setting of the regulator with the associated capacitor, if any, in circuit. The power factor under the above conditions shall not be less than 0.90. The input under the above conditions is measured and it shall not exceed the marked input by more than 10 percent. The rated speed is also measured and it shall not differ from the declared value by ± 10 percent.

10.10 Earthing Connections

10.10.1 A current derived from an ac source having a no load voltage not exceeding 12 V, and equal to 1.5 times the rated current of the appliance or 25 A, whichever is greater, is passed between the earthing terminal or earthing contact and each of the accessible metal parts in turn. The voltage drop between the earthing terminal of the fan and the accessible metal part is measured and the resistance is calculated from the voltage drop and the current. The resistance value shall not exceed 0.1 Ω. Care is taken that the contact resistance between the tip of the measuring probe and the metal part under test does not influence the test results.

10.10.2 This provision does not apply to rotating parts supported by metal bearings.

10.11 Protection Against Electric Shock (for Regulators Only)

10.11.1 The test shall be conducted according to **8** of IS : 302-1979*.

10.12 Moisture Resistance (for Regulators Only)

10.12.1 The humidity treatment is carried out in a humidity cabinet containing air with a relative humidity of not less than 95 percent. The temperature of the air at all places where samples can be located is maintained at any convenient temperature in the range 40 ± 5°C for a period of 48 hours.

10.13 Mechanical Strength (for Regulators Only)

10.13.1 The test shall be carried out either by spring hammer or by the impact test apparatus and in accordance with **21** of IS : 302-1979*.

10.14 Suspension System

10.14.1 The suspension of the ceiling fan shall withstand a tensile load of 1 000 kg without breakage and a torsion load of 500 kg cm without breakage.

10.15 Creepage Distances and Clearances

10.15.1 The test shall be conducted according to the relevant provisions of **29** of IS : 302-1979*.

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*General and safety requirements for household and similar electrical appliances (*fifth revision*).

10.16 Mechanical Endurance Test (for Regulators Only)

10.16.1 The regulator shall continue to function satisfactorily after being subjected to a test of 2 500 operations of the regulator switch when connected to a fan with locked rotor or an electrical load of an equivalent impedance supplied at the maximum rated voltage. One operation includes a full cycle of movement from the 'Off' position to the 'Full Speed' position (or to the other extreme position) and back to 'Off'. The test shall be made approximately at the rate of 6 operations per minute.

APPENDIX A

(*Clause* 9.3)

ADDITIONAL INFORMATION TO BE SUPPLIED BY THE MANUFACTURER

A-1. The following additional information in respect of a ceiling fan shall be supplied by the manufacturer on request:

a) Power factor,
b) Rated speed in rev/min,
c) Air delivery at test voltage,
d) Service value at rated voltage,
e) Number of blades,
f) Type of regulator and number of running position,
g) Class of insulation,
h) Type of bearings, and
j) Instructions for lubrication of bearings.

APPENDIX B

(*Clause* 10.1.2.1)

RECOMMENDED SAMPLING PLAN

B-1. SCALE OF SAMPLING

B-1.1 Lot — All fans along with associated regulator of the same type, grade, category and rating manufactured under similar conditions of production shall be grouped together to constitute a lot.

B-1.2 The number to be selected from the lot shall depend upon the size of the lot and shall be in accordance with Table 3.

TABLE 3 SAMPE SIZE AND CRITERIA FOR CONFORMITY

LOT SIZE	STAGE	SAMPLE SIZE	CUMULATIVE SAMPLE SIZE	ACCEPTANCE NUMBER	REJECTION NUMBER
(1)	(2)	(3)	(4)	(5)	(6)
Up to 15	First	3	3	0	1
16 to 200	First	5	5	0	2
	Second	10	15	1	2
201 and above	First	7	7	0	2
	Second	14	21	2	3

NOTE — For lot size up to 15, decision regarding acceptance or rejection shall be taken at the first stage only.

B-1.2.1 These fans shall be selected from the lot at random. In order to ensure randomness of selection, procedures given in IS : 4905-1968* may be followed.

B-2. NUMBER OF TESTS AND CRITERIA FOR CONFORMITY

B-2.1 The fans at the first stage, selected at random according to col 1 and 3 of Table 3 shall be subjected to the acceptance tests specified in **10.1.2.1**. A fan failing to satisfy any of the acceptance tests, shall be considered as defective. The lot shall be considered as conforming to the requirements if the number of defectives found in the sample is less than or equal to the acceptance number (*see* col 5 of Table 3) and shall be rejected if it is greater than or equal to the rejection number (*see* col 6 of Table 3). If the number of defectives lies between the acceptance number and rejection number, the second sample of the same size shall be chosen at random and tested. If the number of defectives found in the combined samples is greater than or equal to the rejection number the lot shall be rejected, otherwise the lot shall be accepted.

*Methods for random sampling.

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002

Telephones: 23230131, 23233375, 23239402 **Fax:** 91+011 23239399, 23239382

E - Mail : bis@vsnl.com website : http://www.bis.org.in

Central Laboratory:	***Telephone***
Plot No. 20/9, Site IV, Sahibabad Industrial Area, SAHIBABAD 201010	27700 32

Regional Offices:	
Central: Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002	2323 76 17
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