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PAKISTAN STANDARD

Comfort Fans and Regulators for Household and Similar Purposes – Methods for Measuring Performance

PAKISTAN STANDARDS AND QUALITY CONTROL AUTHORITY,
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Comfort Fans and Regulators for Household and Similar Purposes – Methods for Measuring Performance

1. Foreword

a) This Pakistan Standard was adopted by the authority of the Board of Directors of Pakistan Standard and Quality Control Authority after the draft prepared by the Technical Committee for "Electric Fans (TC-1)" had been approved & endorsed by the Electrotechnical National Standards Committee.

b) This Pakistan Standard Specification was revised in 1991. This was based on BS & JIS Standards. Since BSI has revised their standard, it was deemed necessary to revise our exiting standard as per latest IEC Standard in order to keep abreast with latest technological development in industry.

c) Appendix A regarding Energy star rating classification has added with the collaboration National Energy Efficiency & Conservation Authority (NEECA).

d) This Standard is subject to periodical review in order to keep pace with the changing requirements and latest development in the industry. Any suggestion for improvement will be recorded and placed before the revising committee in due course.

e) This Standard covers the technical provisions and it does not purport to include all the necessary provision of a contract.

f) This Standard is a revision of PS1 2010

g) This Standard is adapted from IEC 60879-2019

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Contents

2. Scope

This standard applies to the requirements and performance tests for the following types of electric motor directly driven fans and their associated regulators intended for use on single-phase not exceeding 230VAC and 12VDC Circuits and their rated power input being less than 125 W. It is equally applicable to fans operable by AC and DC, Fans for household and similar purposes:

- ceiling type fans
- table type fans;
- pedestal type fans;

Wherever applicable the term “fan” used in this standard includes its associated regulator, and remote control if any

This standard does not apply to the following types of fans which are covered in separate standards:

- Jet fans (see IEC Standard 60535: Jet fans and regulators);
- Ventilating fans (see IEC Standard 60665: A.C. Electric Ventilating Fans and Regulators for Household and Similar Purposes).

3. Safety Requirements

This standard does not include safety requirements for electric fans and regulators, which are covered by PS IEC 60335-1 Household and Similar Electrical Appliances – Safety – Part 1: General requirements and PS IEC 60335 Part 2-80: Household and Similar Electrical Appliances – Safety – Particular requirements for fans

All requirements and tests included in PS IEC 60335-1 and PS IEC 60335-2-80 are applicable and shall be deemed part of this standard

4. Definitions

For the purpose of this standard, in addition to given in IEC 60335 Part 2-80: Household and similar electrical appliances – Safety – Particular requirements for fans the following definitions shall apply.

a. Comfort fan
Fan primarily designed for creating air movement around or on part of a human body for personal cooling comfort, including fans that can perform additional functionalities such as lighting. A comfort fan is hereinafter referred to by the term "fan".

b. Ceiling or deck-head type fan

A propeller-bladed fan having two or more blades, and provided with a device for suspension from the ceiling of a room so that the blades rotate in a horizontal plane.

c. Table or cabin type fan

A smaller-diameter propeller-bladed fan having two or more blades, and intended for use with free inlet and outlet of air. It may be a table fan or bracket-mounted fan for wall or ceiling mounting.

d. Pedestal type fan

A propeller type fan having two or more blades mounted on a pedestal of fixed or variable height and intended for use with free inlet and outlet of air.

e. Blade sweep

The diameter of the circle traced out by the extreme tips of the fan blades.

f. Size of fan

The Blade sweep in millimeters.

g. Plane of fan blades

The middle plane of the solid of revolution traced out by the fan blades.

h. Discharge area
Area of a circle having a diameter equal to the blade tip diameter.

i. Plane of anemometer vanes

The middle plane of the solid of revolution traced out by the vanes of the anemometer.

j. Test plane

The horizontal (in the case of ceiling type fans) and vertical (in the case of table and pedestal type fans) plane containing the plane of the anemometer vanes.

k. Types of enclosure of motors and regulators

l. Totally enclosed type enclosure

An enclosure which does not provide for circulation of air between the inside and outside of the case, but not necessarily “air-tight”.

m. Ventilated type enclosure

An enclosure in which the ventilation is not materially obstructed while the live and internal rotating parts are protected mechanically against accidental or careless contact.

n. Air delivery
Quantity of air delivered in a given time under specified conditions, indicated in Cubic Meters per Minute.

o. Rated air delivery

Air delivery of the fan assigned by the manufacturer, indicated in Cubic Meters per Minute

p. Fan sound pressure level
A weighted sound pressure level of the comfort fan while providing the maximum fan flow rate, measured at the outlet side, at 1 meter from the rotating blades

q. Service value (or Fan Efficacy)
The air delivery in cubic meters per minutes divided by electrical power input to the fan in watts at the voltage and frequency specified for the test.

In the event of the fan comprising an oscillating mechanism, the electrical input in watts is measured with the fan under normal full-speed conditions that is with the oscillating mechanism in action, whereas the air delivery is determined with the oscillating mechanism out of action.

Methods of mounting (for table / cabin and pedestal type fans)

r. Rigid mounting
The type of mounting in which direction of air flow can be changed only by changing the position of the fan.

- Semi-rigid mounting

The mounting incorporating a trunnion and / or swivel arrangement so that the direction of the air flow can be altered to suit requirements.

- Oscillating mounting

The mounting provided with a device by which the direction of the axis of the air flow air flow is changed automatically and continuously in one plane.

- Double oscillating (or gyrostatic) mounting.

The mounting provided with a device by which the direction of the axis of the air flow is changed automatically and continuously in more than one plane.

s. 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.

t. Running-in of the fan
Prior to starting the tests on a new fan, it shall run at its maximum airflow setting with unrestricted air flow and with the oscillating mechanisms and moving louvres, if any, in operation for at least 1 hour to ensure adequate running-in.

u. Tests
- Type tests: Tests carried out to prove conformity of the requirements of this standard. These are intended to prove general qualities and design of a given type of fan.

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

5. Sizes, number of speeds and types

- The preferred sizes of ceiling fans shall be: 900, 1200, 1400, 1500 and 1800 mm.

- The preferred sizes of deck-head type fans shall be: 600, 750, 900, 1050 and 1500 mm.

- The preferred sizes, minimum numbers of regulated speeds and types of table/cabin type fans shall be as given in Table I.

TABLE - I

Size of fan (mm)	Minimum number of regulated speeds	Type
200	1	Non-oscillating
250	1	Oscillating or non-oscillating
300	2	
350	3	
400	3	

- The preferred sizes, number of regulated speeds and types of pedestal type fans shall be as given in table II. The speed regulation shall be 25-100%

TABLE - II

Size of fan (mm)	Minimum number of regulated speeds	Type
300	2	Non-oscillating
400	2	Oscillating or non-oscillating
500	2	
600	2	

6. Frequency

The preferred frequency for A.C. fans shall be 50 Hz and 60 Hz. or 50/60 Hz

7. Design and General Construction

a. Enclosures

The enclosures of fan motors and regulators shall be either of ventilated or totally enclosed type.

b. Insulating Materials

With the exception of resistance wires in regulators, windings of fans and regulators shall be insulated with Class A, or with Class E or Class B insulating materials complying with limits of temperature-rise as specified in Tests

c. Blades

Fans shall be fitted with two or more well-balanced blades made from metal or other suitable material so as to be reasonably free from vibration.

d. Bearings

Manufacturer shall provide information on the type of Bearings/Bushes used.
Instructions for the proper lubrication of bearings shall be furnished by the manufacturer, if necessary.

e. Finish

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

f. Interchangeability

Components of a particular model number of fan, its associated regulator and set of blades shall be interchangeable.

8. Method of mounting (for table/ cabin and pedestal type fans)

- The mounting may be rigid, semi-rigid, oscillating or double oscillating (gyrostatic). In the case of semi-rigid mounting the minimum angle through which it is possible to rotate the fan horizontally as well as vertically without changing the position of the fan shall be 45^0 and 7^o respectively.

9. Oscillating mechanism (for table / cabin and pedestal type fans).

- The number of oscillations per minute at full speed shall be not less than four.
- Whether or not the angular movement of the mechanism is variable, an angular movement of not less than 60^o shall be available
- A device shall be provided to render the oscillating mechanism inoperative when desired. The method of operating the device shall be indicated.

10. Noise or SPL

- SPL stands for Sound Pressure Level. The noise level during the fan's rated operation. Precautions shall be taken in the manufacture of fans and regulators to ensure a reasonable degree of silence at all speeds.
- The SPL shall be less than 35 dbA for Ceiling Fans and less than 55 dbA for table and Pedestal Fans.

11. Electronic Interference

- 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. Radio includes cellular phones.
- The Electronic Regulators shall not generate any frequency harmonics in the AC Supply system.

12. Speeds regulators

- Regulators shall be capable of reducing the speed of the fan by at least 50 % of the full speed at the voltage and frequency specified for the test, except in the case of fans of the shaded pole type where the speed reduction shall be not less than 20%. Fans shall be capable of running continuously on any of the contacts of the regulator at the rated voltage or voltages or within the whole rated voltage range, whichever is applicable.

- The regulators shall have an “off” position and be provided with at least five running positions in case of ceiling / deck-head type fans and as specified in Table I and II of Section 5 for other types of fans, with the speed stops being equal as far as possible

- 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.

13. Remote Control Unit (RCU)

A small portable battery powered device, used to control operations of a Fan. RCU shall control Fan Operations functions that may include Start/Stop, Speed variations, Reversal of rotation, AC/DC mode Selection etc. Connectivity with the Fan is achieved wirelessly through digital signal

14. Marking

Each fan shall be indelibly marked with the size of fan in addition to the information specified in IEC 60335-1 and 60335-2-80 as applicable. Separately mounted regulators shall be marked with the model / size of fans for which they are suited.

- Marking on Packing
  The following information shall be marked on the Fan Packing:
  a) Voltage and input power
  b) Power factor;
  c) Rated speed in revolutions per minute;
  d) Number of blades;
  e) Type of regulator and number of running positions;
  f) Class of insulation;
  g) Type of bearings;
  h) Rated air delivery;
  i) Service value.

- Marking on Fan Body Nameplate
  a) Voltage and input power
  b) Power factor;
  c) Rated speed in revolutions per minute;
  d) Service value

- Technical Specifications

The following Specifications/information shall be supplied to Testing Laboratory or on request shall be available from the fan Dealer:

a) Type of AC Motor
b) Type of DC Motor
c) Type of Invertor
d) Power factor,
e) AC Voltage Range (ACV)
f) DC Voltage Range (DCV)
g) Rated current AC (ACA)
h) Rated current DC (DCA)
i) Rated speed and speed at max and min setting (RPM)
j) Air delivery at rated voltage, (M^3/min)

k) Service value at rated voltage, (m^3/min/W)
l) Hall effect Sensor (For DC Motor Only) Y/N
m) Number of blades,
n) Sweep Diameter (mm)
o) Type of regulator and number of running position,
p) Class of insulation,
q) Winding Copper/Aluminum
r) Sound Pressure Level. (dB)
s) Temperature rise of winding at Test Temperature (Deg C)
t) Type of bearings
u) Instructions for lubrication of bearings.
v) Design Life of Fan (Hrs @ 40 Deg C)
w) Design Life of Fan (Hrs @ 60 Deg C)
x) Design Life of /Bearings (Years)
y) Mounting
z) Weight (kg)

15. Tests

a) General Conditions of Test

i. Test Voltage — The voltage at which the tests are conducted shall be as follows:
ii. 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, the tests shall be carried out at all voltages.
iii. Limits of voltage variation — The variation in the test voltage shall not exceed ± 1 percent of the test voltage during air delivery tests.
iv. While taking the current and watt readings during these tests, however, the voltage shall be maintained at the test voltage.
v. For AC DC Fans, Tests shall be performed in both modes of Power Supply. However, the Test Voltage shall be only AC
vi. Tests shall be conducted at an ISO 17025 certified Laboratory
vii. Detailed Test Procedures, and Formats in conformity with IEC 60335-1 and 60335-2-80 and ISO 9000 Standards shall be developed by the Testing Laboratory prior to execution of Tests

b) Limits of error of electrical measuring instruments

Ammeters, voltameters, wattmeters, Anemometers, Temperature Instruments used for tests shall have a class index 0.5 or better (see IEC 60051: Direct Acting Indicating Analogue Electrical Measuring Instruments and Their Accessories).

c) Test voltage and frequency

The voltage and frequency at which the tests are conducted shall be as follows:

- When a rated voltage is indicated on the nameplate, the tests shall be conducted at the rated voltage. If the fan is specified for two or more distinct rated voltages, the tests shall be carried out at the most unfavourable voltage.

- When a voltage range is indicated on the nameplate, the test voltage shall be:

- the highest and the lowest values of the range when voltage range is in excess of 10 % of the mean of the range;
- the mean of the upper and lower limits when the voltage range is 10 % or less of the mean of the range.
- For AC/DC Fans Tests shall be conducted at both Voltages

- Fans shall be tested at rated frequency, if marked.
- For a fan with a range of frequencies, the tests shall be made at the frequency which gives the most unfavourable results.
- For a fan not marked with rated frequency the tests shall be made either at 50 Hz or 60 Hz whichever is more unfavourable.

d) Limits of voltage variation

The variation in the voltage shall not exceed + 1 % of the test voltage during air performance tests. While taking the current and wattage readings during these tests, however, the voltage shall be the test voltage.

16. Insulation Test (Type Test)

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.

17. Test for Air Performance (Acceptance Test)

The method for determining the air performance shall be as follows. The test shall be carried out at an ambient Test temperature of 20 $\pm$ 5 ^{0}C.

I. Ceiling type fans

a) Test chamber
The fan shall be tested in a test chamber having the following dimensions, length: 4.50 m, width: 4.50 m, height: 3 m (see Figures 2 and 3).
The top of the test chamber shall be covered except for a centrally situated circular opening (top-opening), the diameter of which shall be between 1.1 and 1.2 times the blade sweep. The central diaphragm in which the top opening is located shall be not more than 6 mm thick.

The observer shall take readings from a position between the chamber and outer screen, and a small shelf for electrical instruments may be provided in this space. Except for these, the space between the chamber and the outer screen and the space inside the test chamber shall be clear of all obstructions, and there shall be no heating or cooling apparatus anywhere in the system.

The room in which the test chamber and the outer screen are erected shall be suitably protected from extraneous draughts.

b) Height of fan

The fan shall be placed at such a height that the plane of the fan blades is 3 m (tolerance + 10 mm) 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 1 m above the top opening that is not less than 4 m from the ground level at this point.

c) Testing instrument

The air movement shall be measured by means of a rotating vane anemometer having an internal diameter not exceeding 100 mm.

d) 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 (tolerance + 10 mm) 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.

e) Procedure for test

Before taking any steps towards testing a fan according to this standard, it is essential that it should have been “run-in” to steady conditions at the test voltage. A period of 2 h is considered adequate for this purpose.

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

Air velocity 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 velocity falls below 9.0 m per min.

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 2 min; the reading shall then consist of the time taken by a movement of some convenient and readable quantity of air requiring approximately 2 min.

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 shall be taken as the measured air delivery of the fan for the purposes of this standard.

No correction is made for relative humidity and pressure.

II. Table / Cabin and Pedestal type fans

a) Test chamber
The fan shall be tested in a test chamber having the following dimensions, length: 4.50 m for table and cabin type fans, 6 m for pedestal type fans, width: 4.50 m, height: 3 m. This chamber shall be suitably protected from extraneous draughts.

The test chamber shall be free from obstructions other than the stand on which the fan is kept. Any table or shelf for electrical instruments shall be on the intake side of the fan, beyond a distance of 0.90 m from the plane of the fan blades. No heating or cooling apparatus shall be used in the test room while the test is in progress.

The table/ cabin type fan shall be mounted with the blade centre 1.20 m from the floor and with the front of the blades at least 1.20 m from the back wall and at least 1.80 m from the side walls and the wall in front.

The pedestal type fan shall be so situated that the blade centre is 1.50 m from the floor and the front of the blades is at least 1.20 m from the back wall, 1.80 from the side walls and 4 m from the wall in front.
The test chamber of dimensions mentioned above may not be suitable for fans having impeller diameter exceeding 600 mm.

b) Testing instrument

The air movement shall be measured by means of a rotating vane anemometer having an internal diameter not exceeding 100 mm suitable for the range of velocities to be measured.

c) Arrangement of apparatus

The arrangement of the apparatus (see Figures 4 and 5, pages 23 and 24) shall be such as to permit the anemometer being moved in a horizontal plane containing the axis of the fan, the movement being at right angles to the axis and extendable in both directions. The anemometer shall be supported in such a manner as to offer as little obstruction as possible to the air flow. The axis of the anemometer vane shall always be parallel to the axis of the fan blades.
The distance between the test plane and the plane of the fan blades shall be equal to three times the size of the fan.

d) Procedure for test

Before taking any steps towards testing a fan according to this standard, it is essential that it should have been “run-in” to steady conditions at the test voltage. A period of 2 h is considered adequate for this purpose.

The measurements shall be carried out with the fan running at full speed at the test voltage, with the guard in position, if normally provided and with the oscillating mechanism, if any, disconnected.

Air velocity readings shall be commenced at a point 20 mm from the axis of the fan blades, and shall progress along the horizontal line in each direction, by increments of 40 mm wide. Readings shall be continued in each direction until the true air velocity falls below 24 m/min.

Each readings 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 2 min; the readings shall then consist of the time taken by a movement of some convenient and readable quantity of air requiring approximately 2 min. In no case should the duration of the reading be less than 1 min.

The average air velocity over any annulus shall be the mean of the readings on either side of the axis of the fan blades 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 shall be taken as the measured air delivery of the fan for the purposes of this standard.
No correction is made for relative humidity and pressure.

e) Measurement of rotational speed of the fan

The speed measurement shall be recorded at a minimum of one-second intervals through a 120-second period of test and the mean of the measured values reported. Speed shall be measured with a revolution counter and chronometer, a stroboscope and chronometer, a precision instantaneous tachometer, etc which has a demonstrated accuracy of ± 0.5% of the value being measured.

The speed of rotation of the fan shall be determined by running the fan at the test voltage and at its rated frequency (if a.c.). The method of measurement shall be such that the speed of the fan is not affected. The regulator, if any, shall be at the highest speed position and the oscillating mechanism, if any, shall be disconnected.
The rotational speed shall be measured by a non- contact Tachometer, at a range selection of twice the measured speed. Accuracy shall be not worse than 1%

f) Measurement of power factor (for A.C. fans only) and Power Input

The fan shall be connected to the supply at the test voltage and frequency. Capacitors, if any, associated with the fan shall be retained in the circuit. The regulator, if provided, shall be set at the highest speed position and the oscillating mechanism, if any, shall be disconnected.in action. Power input (W) shall be noted and power factor of the fan shall be either measured directly with the help of a power factor meter or calculated from the readings of ammeter, voltmeter and wattmeter.

18. Temperature Rise Test (Type Test)

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

Permissible Values of Temperature Rise

Item	Class A Insulation	Class B Insulation	Class E Insulation
Motor Winding	60 Deg C	75 Deg C	85 Deg C

Note 1 Temperature Measurement by RTD (Resistance Temperature Detector) embedded in winding
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 Test Chamber Temperature

19. Starting Test (Acceptance Test)

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. The fan should be capable of starting. The test is repeated 10 times. Test to be conducted in both AC and DC modes. Test to be conducted from RCU if equipped,

20. Fan Speed and Input Test

The fan is connected to 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.

21. Test of Remote Control Operation

In this test the Fan if equipped with RCU is operated through the RCU. All functions of Start/Stop, Speed variations, Reversal of rotation, AC/DC mode Selection etc are verified. The tests are repeated 10 times and are individually checked in both DC and AC modes.

22. Tolerance on Ratings

Please refer appendix APPENDIX-A.

23. Figures

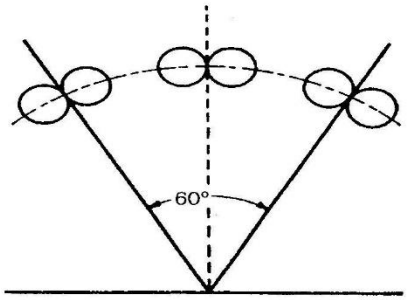
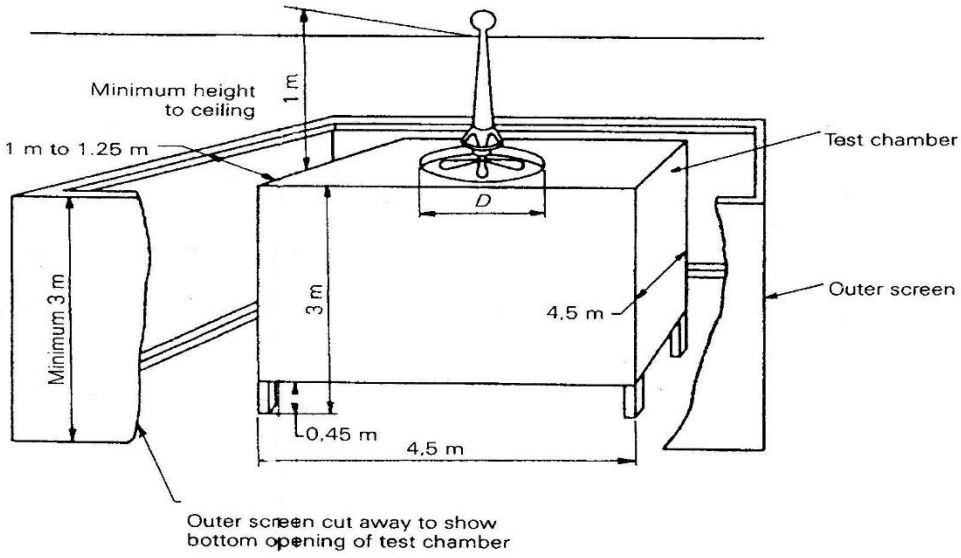
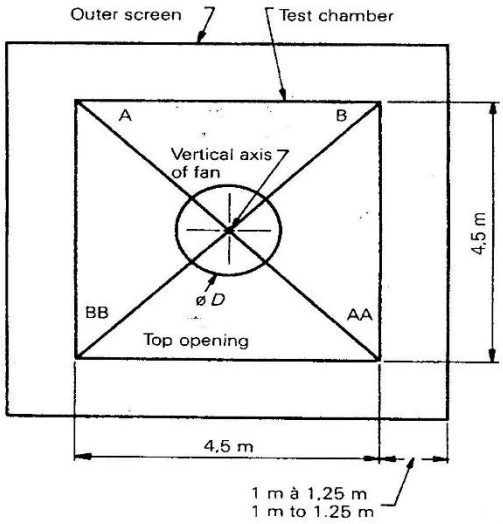


FIG. 1. — Angular movement of oscillation.



Note. — For dimension *D*, see Sub-clause 9.4.1. *a)*

FIG. 2. — Arrangement of test chamber and screen.



Note. —
For dimension *D*, see Sub-clause 9.4.1. *a)*

FIG. 3. —
Plan of test chamber and screen.

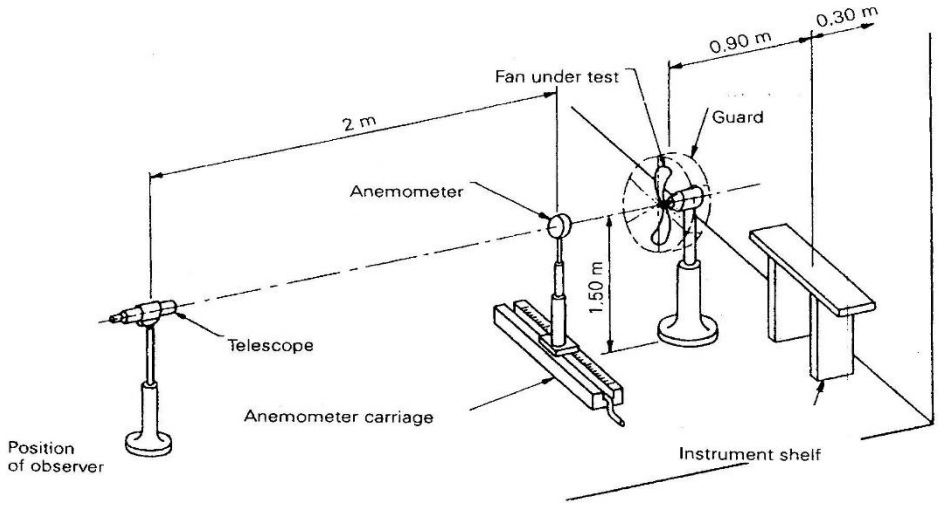


FIG. 4. —
Arrangement for air delivery test for pedestal type fans.

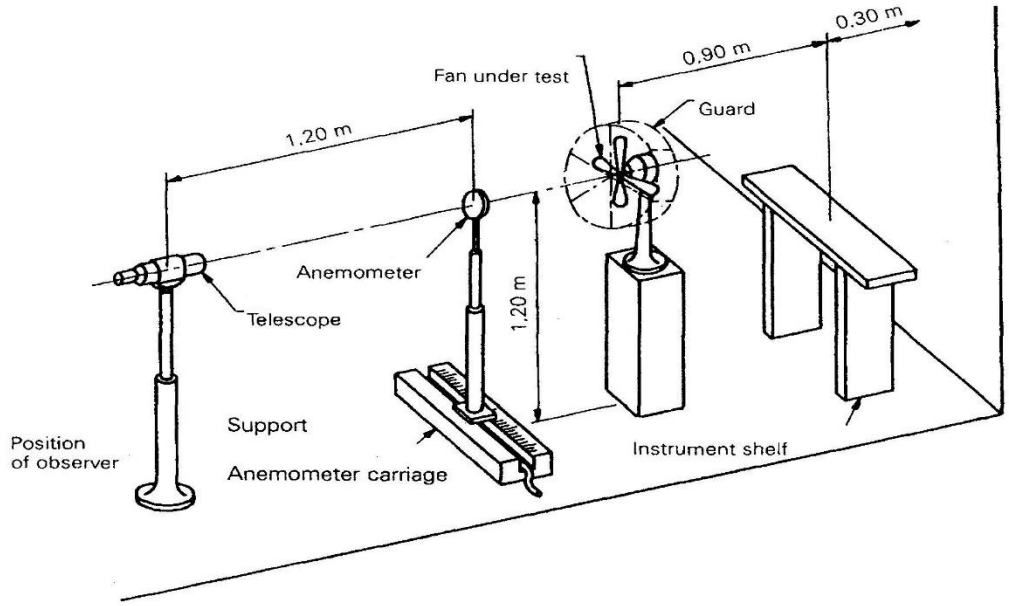


FIG. 5. —
Arrangement for air delivery test for table and cabin type fans.

APPENDIX – A

PERFORMANCE & RATINGS OF ELECTRIC FANS

Rated Voltage = **Single Phase 230 Volts**

Rated Frequency = **50 Hz**

Power Factor = **Not less than 0.9**

Product Type	Sweep (mm)	Maximum Rated Power Input (Watts)	Minimum Rated Air Delivery (m^3 / min.)	Service Value [m^3 / min/W] based Star Rating for Grant of NEECA's Pakistan Energy Label				
				1 Star*	2 Stars	3 Stars	4 Stars	5 Stars
Table/Desk, Wall/Bracket, Box/Exhaust, and Pedestal/Floor Fans	200	28.0	14	0.54	0.60	0.71	1.25	1.35
	250	30.8	20	0.74	0.79	0.91	1.42	1.52
	300	40.0	30	0.80	0.86	0.98	1.42	1.55
	350	48.0	35	0.90	0.95	1.08	1.42	1.55
	400	55.0	45	1.00	1.06	1.25	1.45	1.75
	450	65.0	70	1.10	1.19	1.42	1.46	1.80
	500	90.0	100	1.13	1.25	1.45	1.50	1.81
	600	125.0	170	1.30	1.43	1.65	1.70	1.82
Ceiling Fans	900	55.0	110	2.75	2.87	2.95	4.25	5.00
	1050	60	150	2.79	2.93	3.10	4.10	5.10
	1200	70.0	190	2.93	3.08	3.22	4.20	5.13
	1400	80.0	230-250**	3.15	3.32	3.45	4.45	5.15
	1500	90.0	300	3.33	3.52	3.68	4.50	5.25

	1800	105.0	360	3.47	3.67	3.81	4.70	5.30

***** MEPS 1 Star Rating and allied parameters shall be treated equivalent to the National Standard i.e. Pakistan Standard PS1/2021.

**** Star Rating Minimum Airflow Requirements for 1400mm Sweep Fan**

Star Rating	**Minimum Air Flow (m^3/min)** 1
230	
2	235
3	240
4	245
5	250

For sweep size exceeding the specific given dimensions the corresponding parameters in the table related to the next highest sweep size will apply.