

INTERNATIONAL STANDARD



Household and similar electrical appliances – Safety –
Part 2-80: Particular requirements for fans

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Household and similar electrical appliances – Safety –
Part 2-80: Particular requirements for fans

INTERNATIONAL
ELECTROTECHNICAL
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES –
SAFETY –****Part 2-80: Particular requirements for fans****FOREWORD**

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

This part of International Standard IEC 60335 has been prepared by IEC technical committee 61: Safety of household and similar electrical appliances.

This third edition cancels and replaces the second edition published in 2002 including its Amendment 1 (2004) and its Amendment 2 (2008). It constitutes a technical revision.

The principal changes in this edition as compared with the second edition of IEC 60335-2-80 are as follows (minor changes are not listed):

- added definition for ceiling fan suspension system (3.102);
- added instructions for ceiling fan maintenance (7.12);
- added instructions for ceiling fan installation (7.12.1);
- added entrapment assessment criteria for table and pedestal fan with a fan head that oscillates in the up-down direction (20.102);
- added requirements for insulation of pre-installed internal wiring used to supply attached luminaires (22.101);
- added suspension system failure protection requirements for ceiling fans (22.102);
- added motor brush wear requirements (27.3).

The text of this standard is based on the following documents:

FDIS	Report on voting
61/4878/FDIS	61/4914/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

This part 2 is to be used in conjunction with the latest edition of IEC 60335-1 and its amendments. It was established on the basis of the fifth edition (2010) of that standard.

NOTE 1 When “Part 1” is mentioned in this standard, it refers to IEC 60335-1.

This part 2 supplements or modifies the corresponding clauses in IEC 60335-1, so as to convert that publication into the IEC standard: Safety requirements for fans.

When a particular subclause of Part 1 is not mentioned in this part 2, that subclause applies as far as is reasonable. When this standard states “addition”, “modification” or “replacement”, the relevant text in Part 1 is to be adapted accordingly.

NOTE 2 The following numbering system is used:

- subclauses, tables and figures that are numbered starting from 101 are additional to those in Part 1;
- unless notes are in a new subclause or involve notes in Part 1, they are numbered starting from 101, including those in a replaced clause or subclause;
- additional annexes are lettered AA, BB, etc.

NOTE 3 The following print types are used:

- requirements: in roman type;
- *test specifications: in italic type;*
- notes: in small roman type.

Words in **bold** in the text are defined in Clause 3. When a definition concerns an adjective, the adjective and the associated noun are also in bold.

A list of all parts of the IEC 60335 series, under the general title: *Household and similar electrical appliances – Safety*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

NOTE 4 The attention of National Committees is drawn to the fact that equipment manufacturers and testing organizations may need a transitional period following publication of a new, amended or revised IEC publication in which to make products in accordance with the new requirements and to equip themselves for conducting new or revised tests.

It is the recommendation of the committee that the content of this publication be adopted for implementation nationally not earlier than 12 months or later than 36 months from the date of publication.

The following differences exist in the countries indicated below.

- 6.2: This requirement is not applicable (USA).
- 7.1: The "T" marking is not required (USA).
- 7.12.1: Other mounting heights are specified and have to be marked on the appliance (USA).
- 19.7: The addition is not applicable (USA).
- 20.2: The requirements are different (USA).
- 21.102: The loads are different (USA).
- 22.102.1: The requirement is not applicable (USA).
- 22.102.2: The requirement is not applicable (USA).
- Figure 101 Example 1: The requirement is not applicable (China, USA).
- Figure 101 Example 2: The requirement is not applicable (China, USA).
- Figure 101 Example 3: This requirement is not applicable (MY).
- Figure 101 Example 4: This requirement is not applicable (MY).
- Figure 101 Example 5: This requirement is not applicable (MY).
- Figure 101 Example 6: This requirement is not applicable (MY).
- 23.3: Different requirements apply (USA).
- 24.101: The requirement is not applicable (USA).

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

It has been assumed in the drafting of this International Standard that the execution of its provisions is entrusted to appropriately qualified and experienced persons.

This standard recognizes the internationally accepted level of protection against hazards such as electrical, mechanical, thermal, fire and radiation of appliances when operated as in normal use taking into account the manufacturer's instructions. It also covers abnormal situations that can be expected in practice and takes into account the way in which electromagnetic phenomena can affect the safe operation of appliances.

This standard takes into account the requirements of IEC 60364 as far as possible so that there is compatibility with the wiring rules when the appliance is connected to the supply mains. However, national wiring rules may differ.

If an appliance within the scope of this standard also incorporates functions that are covered by another part 2 of IEC 60335, the relevant part 2 is applied to each function separately, as far as is reasonable. If applicable, the influence of one function on the other is taken into account.

When a part 2 standard does not include additional requirements to cover hazards dealt with in Part 1, Part 1 applies.

NOTE 1 This means that the technical committees responsible for the part 2 standards have determined that it is not necessary to specify particular requirements for the appliance in question over and above the general requirements.

This standard is a product family standard dealing with the safety of appliances and takes precedence over horizontal and generic standards covering the same subject.

NOTE 2 Horizontal and generic standards covering a hazard are not applicable since they have been taken into consideration when developing the general and particular requirements for the IEC 60335 series of standards. For example, in the case of temperature requirements for surfaces on many appliances, generic standards, such as ISO 13732-1 for hot surfaces, are not applicable in addition to Part 1 or part 2 standards.

An appliance that complies with the text of this standard will not necessarily be considered to comply with the safety principles of the standard if, when examined and tested, it is found to have other features that impair the level of safety covered by these requirements.

An appliance employing materials or having forms of construction differing from those detailed in the requirements of this standard may be examined and tested according to the intent of the requirements and, if found to be substantially equivalent, may be considered to comply with the standard.

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

Part 2-80: Particular requirements for fans

1 Scope

This clause of Part 1 is replaced by the following.

This International Standard deals with the safety of electric fans for household and similar purposes, their **rated voltage** being not more than 250 V for single-phase appliances and 480 V for other appliances.

NOTE 101 Examples of fans that are within the scope of this standard are

- ceiling fans;
- **duct fans**;
- partition fans;
- pedestal fans;
- table fans.

This standard also applies to separate controls supplied with fans.

Appliances not intended for normal household use but which nevertheless may be a source of danger to the public, such as appliances intended for use in shops, in light industry and on farms, are within the scope of this standard.

As far as is practicable, this standard deals with the common hazards presented by appliances that are encountered by all persons in and around the home. However, in general, it does not take into account

- ~~– the use of appliances by young children or infirm persons without supervision;~~
- ~~– playing with the appliance by young children.~~
- persons (including children) whose
 - physical, sensory or mental capabilities; or
 - lack of experience and knowledgeprevents them from using the appliance safely without supervision or instruction;
- children playing with the appliance.

NOTE 102 Attention is drawn to the fact that

- for appliances intended to be used in vehicles or on board ships or aircraft, additional requirements may be necessary;
- in many countries additional requirements are specified by the national health authorities, the national authorities responsible for the protection of labour and similar authorities.

NOTE 103 This standard does not apply to

- appliances intended exclusively for industrial purposes;
- appliances intended to be used in locations where special conditions prevail, such as the presence of a corrosive or explosive atmosphere (dust, vapour or gas);
- fans incorporated in other appliances.

2 Normative references

This clause of Part 1 is applicable **except as follows**.

Addition:

IEC 60245-3, *Rubber insulated cables – Rated voltages up to and including 450/750 V – Part 3: Heat resistant silicone insulated cables*

3 Terms and definitions

This clause of Part 1 is applicable except as follows.

3.1.9 Replacement:

normal operation

operation of the appliance under the following conditions

Table and pedestal fans are operated with any oscillating mechanism in operation.

Ceiling fans are fixed to a ceiling.

Partition fans are installed in the centre of a suitable partition having dimensions at least four times the diameter of the air inlet.

Duct fans are installed in a duct in accordance with the installation instructions, the length of the duct being approximately four times the diameter of the fan.

3.101

duct fan

fan for installation within an enclosed airway so that the airflow is ducted on both the inlet and outlet sides

3.102

suspension system

system which is used to secure the ceiling fan unit to the ceiling

3.103

safety suspension system device

device used to secure the motor with blades of the ceiling fan to the mounting rod of the fan

4 General requirement

This clause of Part 1 is applicable.

5 General conditions for the tests

This clause of Part 1 is applicable except as follows.

5.7 Addition:

For fans intended to be used in tropical climates, the tests of Clauses 10, 11 and 13 are carried out at an ambient temperature of $40\text{ °C} \pm 2\text{ °C}$.

For fans marked with an ambient operating temperature, the tests of Clauses 10, 11 and 13 are carried out at the marked value ± 2 °C.

6 Classification

This clause of Part 1 is applicable except as follows.

6.2 Addition:

Duct fans shall be at least IPX2.

6.101 Fans shall be of one of the following classes with respect to climatic conditions:

- fans for temperate climates;
- fans for tropical climates.

Compliance is checked by inspection.

7 Marking and instructions

This clause of Part 1 is applicable except as follows.

7.1 Addition:

Fans for tropical climates shall be marked with the letter T.

Fans intended for operation in locations where the local ambient temperature exceeds 40 °C shall be marked with the ambient operating temperature.

7.12 Addition:

If the instructions state that the guard has to be removed for cleaning purposes, the instructions shall state the substance of the following:

Ensure that the fan is switched off from the supply mains before removing the guard.

The instructions for ceiling fans shall include the substance of the following warning:

WARNING: If unusual oscillating movement is observed, immediately stop using the ceiling fan and contact the manufacturer, its service agent or suitably qualified persons.

The instructions for ceiling fans shall include the substance of the following:

- the maintenance cycle and method of maintenance;
- the weight of the appliance in kilograms;
- that the replacement of parts of the safety suspension system device shall be performed by the manufacturer, its service agent or suitably qualified persons.

The instructions for fans incorporating motors containing brushes shall include the substance of the following:

If it is necessary to replace the live or neutral brushes to ensure operation of the motor then both brushes and the earth brush shall be replaced at the same time. The brushes shall only be replaced by a suitably qualified person.

7.12.1 Addition:

The ~~installation~~ instructions for ceiling fans shall include the substance of the following:

- the fixing means for attachment to the ceiling such as hooks or other devices shall be fixed with a sufficient strength to withstand 4 times the weight of the ceiling fan;
- that the mounting of the suspension system shall be performed by the manufacturer, its service agent or suitably qualified persons;
- that the fan is to be installed so that the blades are more than 2,3 m above the floor;
- the model or type reference of a luminaire that may be installed in a fan constructed for this purpose.

The instructions for other fans shall include the substance of the following:

- whether the fan is intended for mounting in outside windows or walls (for partition fans);
- that the fan is to be installed so that the blades are more than 2,3 m above the floor (for fans intended to be mounted at high level);
- that precautions must be taken to avoid the back-flow of gases into the room from the open flue of gas or other fuel-burning appliances (for duct and partition fans).

8 Protection against access to live parts

This clause of Part 1 is applicable except as follows.

8.1.1 Modification:

*Lamps are not removed. However, during insertion or removal of lamps, protection against contact with **live parts** of the lamp cap shall be ensured.*

8.2 Addition:

*After the removal of **detachable parts** for the purposes of **user maintenance**, the **basic insulation** of internal wiring may be touched provided that it is electrically equivalent to the insulation of cords complying with IEC 60227 or IEC 60245.*

9 Starting of motor-operated appliances

This clause of Part 1 is not applicable.

10 Power input and current

This clause of Part 1 is applicable except as follows.

10.1 Addition:

Appliances are tested with shutters or similar devices in the open position.

10.2 Addition:

Appliances are tested with shutters or similar devices in the open position.

11 Heating

This clause of Part 1 is applicable except as follows.

11.7 Replacement:

Appliances are operated until steady conditions are established.

11.8 Addition:

The temperature rise limits for appliances for tropical climates are reduced by 15 K.

The temperature rise limits for fans marked with an ambient operating temperature are reduced by the difference between the marked value and 25 °C.

12 Void

13 Leakage current and electric strength at operating temperature

This clause of Part 1 is applicable.

14 Transient overvoltages

This clause of Part 1 is applicable.

15 Moisture resistance

This clause of Part 1 is applicable except as follows.

15.1.1 Addition:

*The outer part of ~~appliances fans~~ intended to be ~~mounted in outside windows and walls~~ installed in the external structure of a building is subjected to the test of Subclause 14.2.4 a) of IEC 60529:1989, the part of the ~~appliance fan~~ that is not mounted on the outside ~~of the window or wall surface~~ being protected against spray from the oscillating tube. The test is carried out with the appliance in the rest position and then in operation while supplied at **rated voltage**, shutters or similar devices being in the open position.*

*~~Duct~~ Fans marked with the second numeral of the IP system are subjected to the **appropriate** test of ~~14.2.2~~ of IEC 60529 ~~while in the both at rest position~~ and in operation while supplied at **rated voltage**.*

16 Leakage current and electric strength

This clause of Part 1 is applicable.

17 Overload protection of transformers and associated circuits

This clause of Part 1 is applicable.

18 Endurance

This clause of Part 1 is not applicable.

19 Abnormal operation

This clause of Part 1 is applicable except as follows.

19.1 Addition:

Fans incorporating shutters or similar devices operated by a control are also subjected to the test of 19.101.

19.7 Addition:

Separate controls are mounted on a dull black-painted plywood board. Approximately 50 % of the area of each ventilating opening is blocked. The temperature of windings shall not exceed the values specified in Table 8 and the temperature rise of the board shall not exceed

- 50 K, for appliances with T marking;
- 65 K, for other appliances.

19.9 Not applicable.

19.101 *Fans incorporating shutters or similar devices that are operated automatically are supplied at **rated voltage** and operated with the shutters or similar devices held in the closed or open position, whichever is more unfavourable.*

20 Stability and mechanical hazards

This clause of Part 1 is applicable except as follows.

20.1 Addition:

Portable pedestal fans having a height exceeding 1,7 m and a mass exceeding 10 kg are placed on a horizontal surface. A force of 40 N is applied to the appliance at a height of 1,5 m in the most unfavourable horizontal direction.

The appliance shall not overturn.

NOTE 101 Suitable means ~~may~~ **can** be used to prevent the appliance from sliding.

20.101 Fan blades, other than those of fans for mounting at high level, shall be guarded unless their leading edges and tips are rounded **with a radius of not less than 0,5 mm** and

- they have a hardness less than D 60 Shore, or
- they have a peripheral speed less than 15 m/s when the fan is supplied at **rated voltage**, or
- the fan has a power output not exceeding 2 W when supplied at **rated voltage**.

~~NOTE — An edge with a radius of not less than 0,5 mm is considered to be rounded.~~

Compliance is checked by inspection and by measurement.

20.102 *There shall be no risk of entrapment or injury caused by movement of the oscillating head of pedestal fans or table fans.*

Compliance is checked by the following test.

*Unless the entrapment point is guarded so that it cannot be touched by test probe 18 of IEC 61032, the appliance is operated at **rated voltage** and test probe 18 is placed at the entrapment point across the width and height of its opening.*

If test probe 18 is touched by the moving part, it shall not be subjected to a force exceeding 15 N.

21 Mechanical strength

This clause of Part 1 is applicable except as follows.

21.1 Addition:

Appliances are also subjected to the test of 21.101.

21.101 Fan guards are subjected to a push force and a pull force of 20 N applied along the axis of the fan motor. After the test, it shall not be possible to touch dangerous moving parts with a test probe that is similar to test probe B of IEC 61032, but having a circular stop face with a diameter of 50 mm instead of the non-circular face. *The test probe is applied with a force not exceeding 5 N.*

21.102 Ceiling fans shall have adequate strength.

Compliance is checked by the following test.

Ceiling fans are mounted in accordance with the installation instructions. A load equal to four times the mass of the fan is suspended from the body of the fan for 1 min.

A torque of 1 Nm is then applied to the fixed body of the fan for 1 min. The test is repeated with the torque applied in the reverse direction.

*The **suspension system** including any **safety suspension system device** shall not break and the fan shall not be damaged to such an extent that compliance with 8.1, 16.3 and Clause 29 is impaired.*

NOTE The intent is to test the parts of the ceiling fan and not the capability of the ceiling materials.

22 Construction

This clause of Part 1 is applicable except as follows.

22.1 Addition:

NOTE 101 The enclosure defined in IEC 60529 does not include guards for fan blades.

22.11 Modification:

The 50 N force is not applied to clips used to fasten fan guards. Instead, a force of 15 N is applied in any direction to the clips in an attempt to release them.

22.101 Appliances having provision for attaching a luminaire shall incorporate appropriate terminals and internal wiring. *The internal wiring associated with the luminaire shall have insulation at least equivalent to silicone rubber compound type IE2 complying with IEC 60245-3. This requirement is not applicable to fans incorporating a luminaire that cannot be replaced without breaking the appliance.*

Compliance is checked by inspection.

22.102 The ceiling fan shall be constructed so that a failure of the fixing device of the motor to the mounting rod could not give rise to risk of injury to the user or surroundings.

Compliance is checked by the requirement and inspection or test of 22.102.1, 22.102.2, 22.102.3, 22.102.4 or 22.102.5, as appropriate for the design. After the test, the ceiling fan shall not be damaged to such an extent that compliance with Clause 8.1, 16.3, 29.1 and 29.2 are impaired.

22.102.1 The ceiling fan shall incorporate a device that disconnects the fan from the supply before the **suspension system** fails. An example of this construction is shown in Figure 101.

Compliance is checked by the following test.

The bolt that connects the down rod to the motor is replaced with the specially prepared test pin shown in Figure 102 that simulates wear on the bolt. The pin is fully inserted so that it connects the down rod to the motor.

*The fan is supplied at **rated voltage** and operated at maximum speed. The pin is then partially withdrawn so that the motor is connected to the down rod by that part of the pin having diameter b.*

The supply to the ceiling fan shall be automatically disconnected and the fan shall not be capable of operation without replacing the worn bolt.

22.102.2 The ceiling fan shall be constructed so that the fan motor and blades do not fall more than 300 mm after failure of the **suspension system** and the fan shall be disconnected from the supply. An example of this construction is shown in Figure 103.

Compliance is checked by the following test.

The ceiling fan is installed in accordance with the manufacturer's instructions.

A load equal to two times the mass of the ceiling fan is suspended from its body.

*The fan is supplied at **rated voltage** and operated at maximum speed.*

*The **suspension system** is then simulated to fail by disconnecting the motor from the down rod.*

The motor and fan blades shall not drop more than 300 mm from their original position and the supply to the ceiling fan shall be automatically disconnected.

22.102.3 The ceiling fan shall be constructed so that the fan blades and motor are connected to the **suspension system** via a threaded down rod that is locked by means of one or more setscrews. An example of this construction is shown in Figure 104.

Compliance is checked by inspection.

22.102.4 The ceiling fan shall be constructed so that an additional through bolt, lock washer and nut, or the like limits the distance of drop by no more than 75 mm in case of the **suspension system** failure. An example of this construction is shown in Figure 105.

Compliance is checked by inspection and measurement

22.102.5 The ceiling fan shall be constructed so that all components required to prevent the failure of the **suspension system** are treated or coated to resist corrosion. Any fixing bolts shall have a minimum diameter of 5 mm and a minimum tensile strength of 200 MPa. Any such bolts shall have provision to prevent them working loose due to vibration. An example of this construction is shown in Figure 106.

Compliance is checked by inspection and measurement.

23 Internal wiring

This clause of Part 1 is applicable except as follows.

23.3 Modification:

Instead of moving the movable part backwards and forwards, fans with an oscillating mechanism are tested as follows.

*Fans are supplied at **rated voltage** and operated under **normal operation**, the angle of oscillation being the maximum allowed by the construction. The test is carried out for 100 000 cycles of oscillation.*

24 Components

This clause of Part 1 is applicable except as follows.

24.2 Addition:

Appliances having a **rated power input** not exceeding 25 W may be fitted with a switch in the **supply cord**.

24.101 Thermal cut-outs incorporated in **duct fans** in order to comply with Clause 19 shall not be self-resetting.

Compliance is checked by inspection.

25 Supply connection and external flexible cords

This clause of Part 1 is applicable except as follows.

25.5 Addition:

Type Z attachment is allowed for portable fans.

26 Terminals for external conductors

This clause of Part 1 is applicable.

27 Provision for earthing

This clause of Part 1 is applicable **except as follows**.

27.3 Addition:

The allowed travel of the live and neutral brushes due to wear shall be less than the allowed travel of the earth brush so that the earthing circuit is maintained even after the appliance ceases to operate due to live and neutral brush wear.

Compliance is checked by inspection.

28 Screws and connections

This clause of Part 1 is applicable.

29 Clearances, creepage distances and solid insulation

This clause of Part 1 is applicable except as follows.

29.2 Addition:

The microenvironment is pollution degree 3 unless the insulation is enclosed or located so that it is unlikely to be exposed to pollution during normal use of the appliance.

30 Resistance to heat and fire

This clause of Part 1 is applicable except as follows.

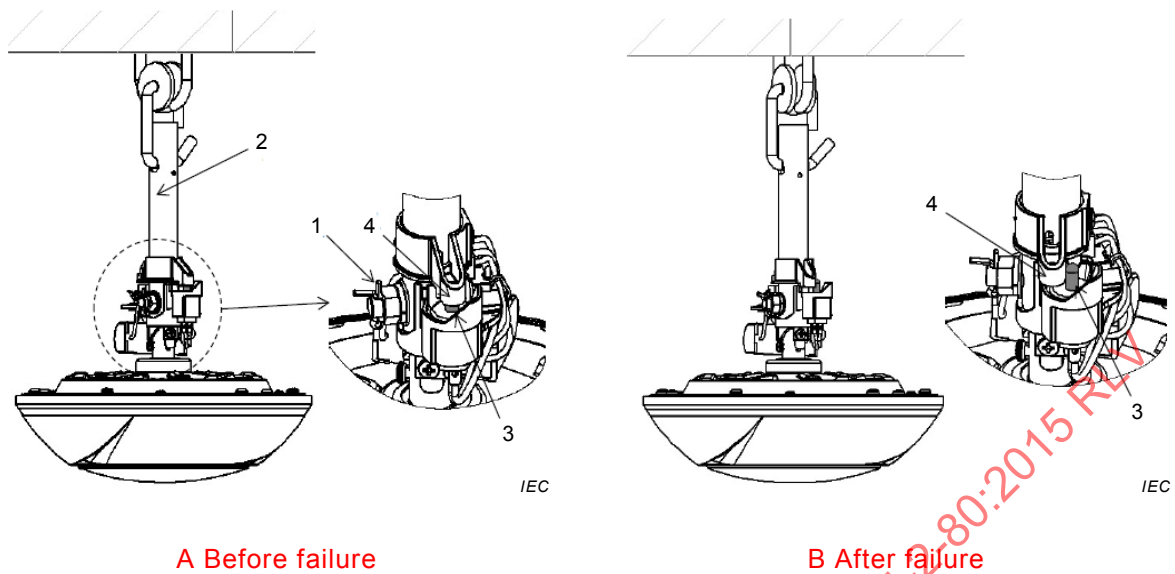
30.2.2 Not applicable.

31 Resistance to rusting

This clause of Part 1 is applicable.

32 Radiation, toxicity and similar hazards

This clause of Part 1 is applicable.



Key

A. Suspension system Definition 3.102

1 connecting bolt

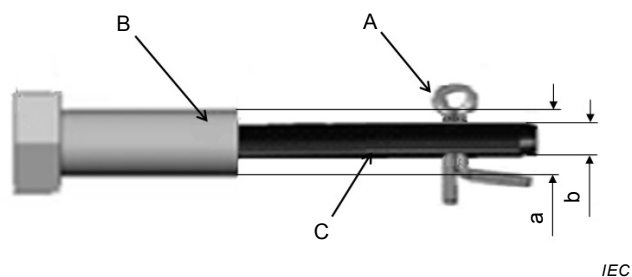
2 mounting rod

B. Device that disconnects the fan from the supply before the suspension system fails

3 electrical safety device (safety switch) fixed on the motor unit to disconnect the power supply before failure of the connecting bolt

4 stopper fixed on the mounting rod to initially keep safety switch in On position

Figure 101 – Subclause 22.102.1 – Example

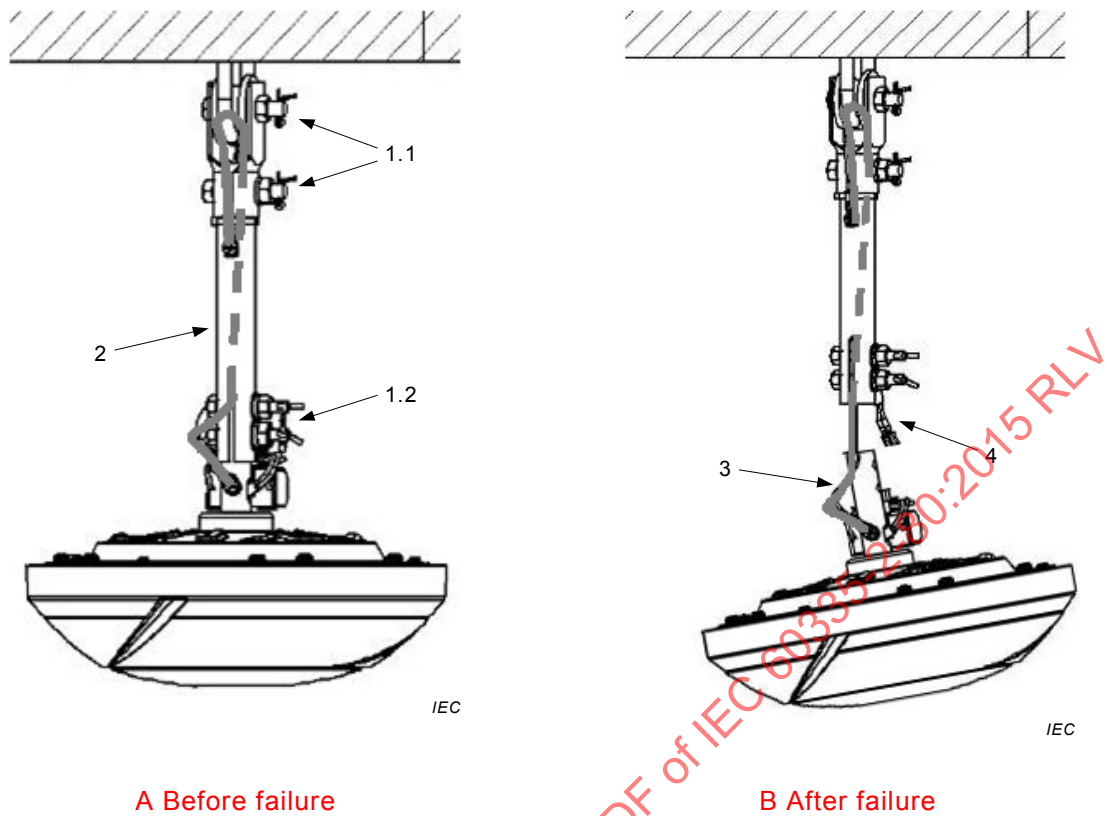


Key

- A stopper pin
- B full thickness section with length at least equal to that of the original bolt
- C reduced thickness section with length at least equal to that of the original bolt
- a diameter same as the original bolt that connects the down rod to the motor
- b diameter 50 % "a"

Figure 102 – Test pin

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Key

A. Suspension system Definition 3.102

1.1 connecting hook/bolt

1.2 connecting bolt

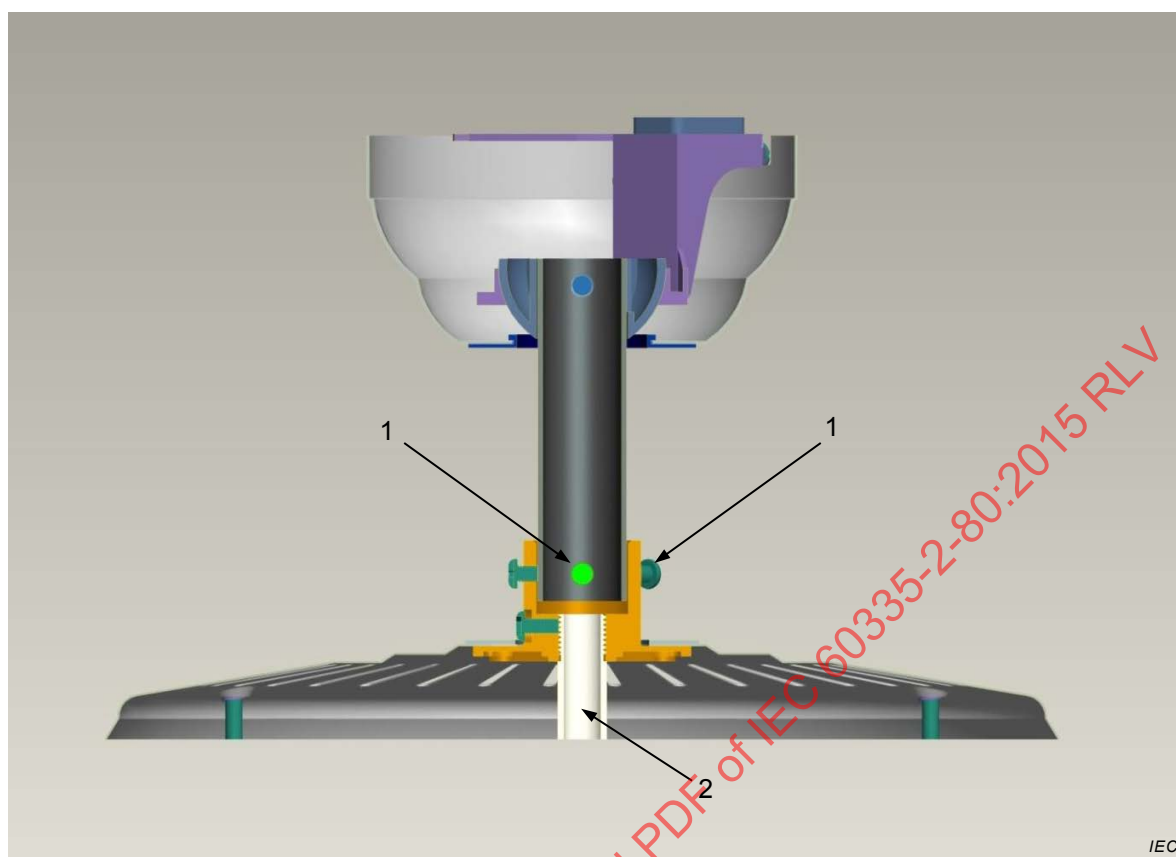
2 mounting rod

B. Safety suspension system Definition 3.103 after failure of the suspension system

3 mechanical safety suspension system device (safety wire) suspend the ceiling fan motor unit

4 terminal to disconnect the supply after suspension system failure

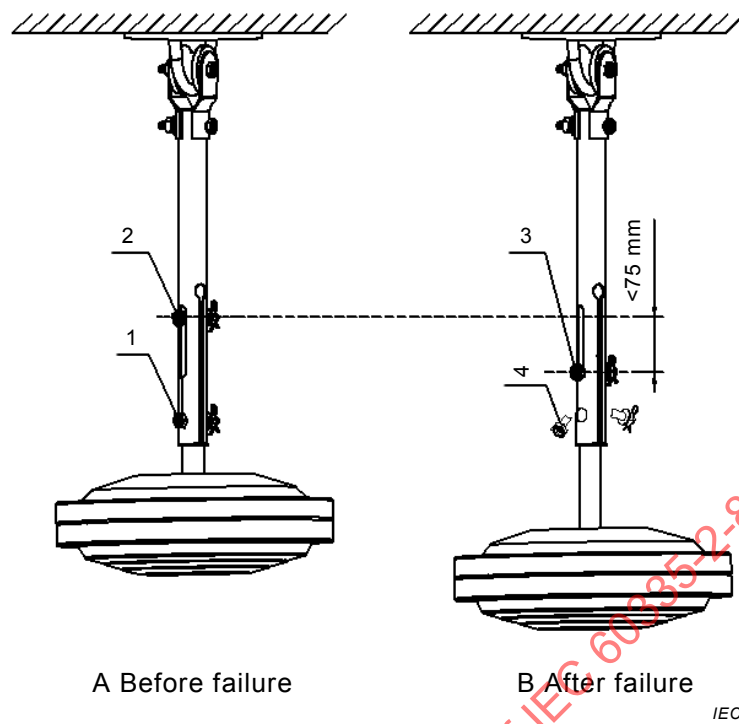
Figure 103 – Subclause 22.102.2 – Example



Key

- 1 set screws
- 2 threaded down rod

Figure 104 – Subclause 22.102.3 – Example



Key

A. Suspension system Definition 3.102 (fixing bolt)

1 fixing bolt

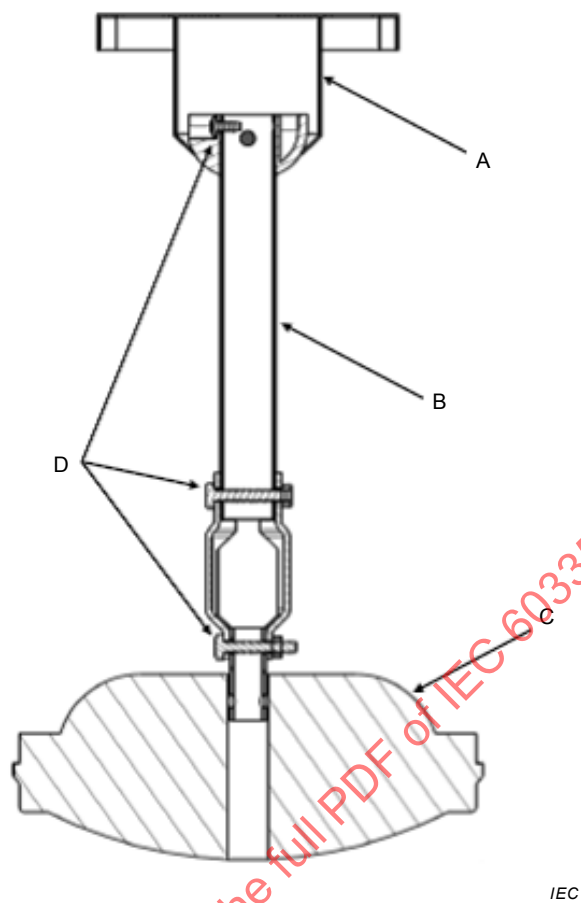
2 additional through bolt

B. Safety suspension system Definition 3.103 (additional through bolt) after failure of the suspension system

3 additional through bolt limits distance of drop

4 fixing bolt failed

Figure 105 – Subclause 22.102.4 – Example



Key

- A mounting bracket
- B mounting rod
- C ceiling fan motor unit
- D suspension bolts

Figure 106 – Subclause 22.102.5 – Example 1

Annexes

The annexes of Part 1 are applicable.

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Bibliography

The bibliography of Part 1 is applicable.

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INTERNATIONAL STANDARD



**Household and similar electrical appliances – Safety –
Part 2-80: Particular requirements for fans**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES –
SAFETY –****Part 2-80: Particular requirements for fans****FOREWORD**

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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This part of International Standard IEC 60335 has been prepared by IEC technical committee 61: Safety of household and similar electrical appliances.

This third edition cancels and replaces the second edition published in 2002 including its Amendment 1 (2004) and its Amendment 2 (2008). It constitutes a technical revision.

The principal changes in this edition as compared with the second edition of IEC 60335-2-80 are as follows (minor changes are not listed):

- added definition for ceiling fan suspension system (3.102);
- added instructions for ceiling fan maintenance (7.12);
- added instructions for ceiling fan installation (7.12.1);
- added entrapment assessment criteria for table and pedestal fan with a fan head that oscillates in the up-down direction (20.102);

- added requirements for insulation of pre-installed internal wiring used to supply attached luminaires (22.101);
- added suspension system failure protection requirements for ceiling fans (22.102);
- added motor brush wear requirements (27.3).

The text of this standard is based on the following documents:

FDIS	Report on voting
61/4878/FDIS	61/4914/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

This part 2 is to be used in conjunction with the latest edition of IEC 60335-1 and its amendments. It was established on the basis of the fifth edition (2010) of that standard.

NOTE 1 When "Part 1" is mentioned in this standard, it refers to IEC 60335-1.

This part 2 supplements or modifies the corresponding clauses in IEC 60335-1, so as to convert that publication into the IEC standard: Safety requirements for fans.

When a particular subclause of Part 1 is not mentioned in this part 2, that subclause applies as far as is reasonable. When this standard states "addition", "modification" or "replacement", the relevant text in Part 1 is to be adapted accordingly.

NOTE 2 The following numbering system is used:

- subclauses, tables and figures that are numbered starting from 101 are additional to those in Part 1;
- unless notes are in a new subclause or involve notes in Part 1, they are numbered starting from 101, including those in a replaced clause or subclause;
- additional annexes are lettered AA, BB, etc.

NOTE 3 The following print types are used:

- requirements: in roman type;
- *test specifications: in italic type;*
- notes: in small roman type.

Words in **bold** in the text are defined in Clause 3. When a definition concerns an adjective, the adjective and the associated noun are also in bold.

A list of all parts of the IEC 60335 series, under the general title: *Household and similar electrical appliances – Safety*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

NOTE 4 The attention of National Committees is drawn to the fact that equipment manufacturers and testing organizations may need a transitional period following publication of a new, amended or revised IEC publication in which to make products in accordance with the new requirements and to equip themselves for conducting new or revised tests.

It is the recommendation of the committee that the content of this publication be adopted for implementation nationally not earlier than 12 months or later than 36 months from the date of publication.

The following differences exist in the countries indicated below.

- 6.2: This requirement is not applicable (USA).
- 7.1: The "T" marking is not required (USA).
- 7.12.1: Other mounting heights are specified and have to be marked on the appliance (USA).
- 19.7: The addition is not applicable (USA).
- 20.2: The requirements are different (USA).
- 21.102: The loads are different (USA).
- 22.102.1: The requirement is not applicable (USA).
- 22.102.2: The requirement is not applicable (USA).
- Figure 101 Example 1: The requirement is not applicable (China, USA).
- Figure 101 Example 2: The requirement is not applicable (China, USA).
- Figure 101 Example 3: This requirement is not applicable (MY).
- Figure 101 Example 4: This requirement is not applicable (MY).
- Figure 101 Example 5: This requirement is not applicable (MY).
- Figure 101 Example 6: This requirement is not applicable (MY).
- 23.3: Different requirements apply (USA).
- 24.101: The requirement is not applicable (USA).

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

It has been assumed in the drafting of this International Standard that the execution of its provisions is entrusted to appropriately qualified and experienced persons.

This standard recognizes the internationally accepted level of protection against hazards such as electrical, mechanical, thermal, fire and radiation of appliances when operated as in normal use taking into account the manufacturer's instructions. It also covers abnormal situations that can be expected in practice and takes into account the way in which electromagnetic phenomena can affect the safe operation of appliances.

This standard takes into account the requirements of IEC 60364 as far as possible so that there is compatibility with the wiring rules when the appliance is connected to the supply mains. However, national wiring rules may differ.

If an appliance within the scope of this standard also incorporates functions that are covered by another part 2 of IEC 60335, the relevant part 2 is applied to each function separately, as far as is reasonable. If applicable, the influence of one function on the other is taken into account.

When a part 2 standard does not include additional requirements to cover hazards dealt with in Part 1, Part 1 applies.

NOTE 1 This means that the technical committees responsible for the part 2 standards have determined that it is not necessary to specify particular requirements for the appliance in question over and above the general requirements.

This standard is a product family standard dealing with the safety of appliances and takes precedence over horizontal and generic standards covering the same subject.

NOTE 2 Horizontal and generic standards covering a hazard are not applicable since they have been taken into consideration when developing the general and particular requirements for the IEC 60335 series of standards. For example, in the case of temperature requirements for surfaces on many appliances, generic standards, such as ISO 13732-1 for hot surfaces, are not applicable in addition to Part 1 or part 2 standards.

An appliance that complies with the text of this standard will not necessarily be considered to comply with the safety principles of the standard if, when examined and tested, it is found to have other features that impair the level of safety covered by these requirements.

An appliance employing materials or having forms of construction differing from those detailed in the requirements of this standard may be examined and tested according to the intent of the requirements and, if found to be substantially equivalent, may be considered to comply with the standard.

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

Part 2-80: Particular requirements for fans

1 Scope

This clause of Part 1 is replaced by the following.

This International Standard deals with the safety of electric fans for household and similar purposes, their **rated voltage** being not more than 250 V for single-phase appliances and 480 V for other appliances.

NOTE 101 Examples of fans that are within the scope of this standard are

- ceiling fans;
- **duct fans**;
- partition fans;
- pedestal fans;
- table fans.

This standard also applies to separate controls supplied with fans.

Appliances not intended for normal household use but which nevertheless may be a source of danger to the public, such as appliances intended for use in shops, in light industry and on farms, are within the scope of this standard.

As far as is practicable, this standard deals with the common hazards presented by appliances that are encountered by all persons in and around the home. However, in general, it does not take into account

- persons (including children) whose
 - physical, sensory or mental capabilities; or
 - lack of experience and knowledgeprevents them from using the appliance safely without supervision or instruction;
- children playing with the appliance.

NOTE 102 Attention is drawn to the fact that

- for appliances intended to be used in vehicles or on board ships or aircraft, additional requirements may be necessary;
- in many countries additional requirements are specified by the national health authorities, the national authorities responsible for the protection of labour and similar authorities.

NOTE 103 This standard does not apply to

- appliances intended exclusively for industrial purposes;
- appliances intended to be used in locations where special conditions prevail, such as the presence of a corrosive or explosive atmosphere (dust, vapour or gas);
- fans incorporated in other appliances.

2 Normative references

This clause of Part 1 is applicable except as follows.

Addition:

IEC 60245-3, *Rubber insulated cables – Rated voltages up to and including 450/750 V – Part 3: Heat resistant silicone insulated cables*

3 Terms and definitions

This clause of Part 1 is applicable except as follows.

3.1.9 *Replacement:*

normal operation

operation of the appliance under the following conditions

Table and pedestal fans are operated with any oscillating mechanism in operation.

Ceiling fans are fixed to a ceiling.

Partition fans are installed in the centre of a suitable partition having dimensions at least four times the diameter of the air inlet.

Duct fans are installed in a duct in accordance with the installation instructions, the length of the duct being approximately four times the diameter of the fan.

3.101

duct fan

fan for installation within an enclosed airway so that the airflow is ducted on both the inlet and outlet sides

3.102

suspension system

system which is used to secure the ceiling fan unit to the ceiling

3.103

safety suspension system device

device used to secure the motor with blades of the ceiling fan to the mounting rod of the fan

4 General requirement

This clause of Part 1 is applicable.

5 General conditions for the tests

This clause of Part 1 is applicable except as follows.

5.7 *Addition:*

For fans intended to be used in tropical climates, the tests of Clauses 10, 11 and 13 are carried out at an ambient temperature of $40\text{ °C} \pm 2\text{ °C}$.

For fans marked with an ambient operating temperature, the tests of Clauses 10, 11 and 13 are carried out at the marked value ± 2 °C.

6 Classification

This clause of Part 1 is applicable except as follows.

6.2 Addition:

Duct fans shall be at least IPX2.

6.101 Fans shall be of one of the following classes with respect to climatic conditions:

- fans for temperate climates;
- fans for tropical climates.

Compliance is checked by inspection.

7 Marking and instructions

This clause of Part 1 is applicable except as follows.

7.1 Addition:

Fans for tropical climates shall be marked with the letter T.

Fans intended for operation in locations where the local ambient temperature exceeds 40 °C shall be marked with the ambient operating temperature.

7.12 Addition:

If the instructions state that the guard has to be removed for cleaning purposes, the instructions shall state the substance of the following:

Ensure that the fan is switched off from the supply mains before removing the guard.

The instructions for ceiling fans shall include the substance of the following warning:

WARNING: If unusual oscillating movement is observed, immediately stop using the ceiling fan and contact the manufacturer, its service agent or suitably qualified persons.

The instructions for ceiling fans shall include the substance of the following:

- the maintenance cycle and method of maintenance;
- the weight of the appliance in kilograms;
- that the replacement of parts of the safety suspension system device shall be performed by the manufacturer, its service agent or suitably qualified persons.

The instructions for fans incorporating motors containing brushes shall include the substance of the following:

If it is necessary to replace the live or neutral brushes to ensure operation of the motor then both brushes and the earth brush shall be replaced at the same time. The brushes shall only be replaced by a suitably qualified person.

7.12.1 Addition:

The instructions for ceiling fans shall include the substance of the following:

- the fixing means for attachment to the ceiling such as hooks or other devices shall be fixed with a sufficient strength to withstand 4 times the weight of the ceiling fan;
- that the mounting of the suspension system shall be performed by the manufacturer, its service agent or suitably qualified persons;
- that the fan is to be installed so that the blades are more than 2,3 m above the floor;
- the model or type reference of a luminaire that may be installed in a fan constructed for this purpose.

The instructions for other fans shall include the substance of the following:

- whether the fan is intended for mounting in outside windows or walls (for partition fans);
- that the fan is to be installed so that the blades are more than 2,3 m above the floor (for fans intended to be mounted at high level);
- that precautions must be taken to avoid the back-flow of gases into the room from the open flue of gas or other fuel-burning appliances (for duct and partition fans).

8 Protection against access to live parts

This clause of Part 1 is applicable except as follows.

8.1.1 Modification:

*Lamps are not removed. However, during insertion or removal of lamps, protection against contact with **live parts** of the lamp cap shall be ensured.*

8.2 Addition:

*After the removal of **detachable parts** for the purposes of **user maintenance**, the **basic insulation** of internal wiring may be touched provided that it is electrically equivalent to the insulation of cords complying with IEC 60227 or IEC 60245.*

9 Starting of motor-operated appliances

This clause of Part 1 is not applicable.

10 Power input and current

This clause of Part 1 is applicable except as follows.

10.1 Addition:

Appliances are tested with shutters or similar devices in the open position.

10.2 Addition:

Appliances are tested with shutters or similar devices in the open position.

11 Heating

This clause of Part 1 is applicable except as follows.

11.7 Replacement:

Appliances are operated until steady conditions are established.

11.8 Addition:

The temperature rise limits for appliances for tropical climates are reduced by 15 K.

The temperature rise limits for fans marked with an ambient operating temperature are reduced by the difference between the marked value and 25 °C.

12 Void

13 Leakage current and electric strength at operating temperature

This clause of Part 1 is applicable.

14 Transient overvoltages

This clause of Part 1 is applicable.

15 Moisture resistance

This clause of Part 1 is applicable except as follows.

15.1.1 Addition:

*The outer part of fans intended to be installed in the external structure of a building is subjected to the test of Subclause 14.2.4 a) of IEC 60529:1989, the part of the fan not mounted on the outside surface being protected against spray from the oscillating tube. The test is carried out with the appliance in the rest position and then in operation while supplied at **rated voltage**, shutters or similar devices being in the open position.*

*Fans marked with the second numeral of the IP system are subjected to the appropriate test of IEC 60529 both at rest and in operation while supplied at **rated voltage**.*

16 Leakage current and electric strength

This clause of Part 1 is applicable.

17 Overload protection of transformers and associated circuits

This clause of Part 1 is applicable.

18 Endurance

This clause of Part 1 is not applicable.

19 Abnormal operation

This clause of Part 1 is applicable except as follows.

19.1 Addition:

Fans incorporating shutters or similar devices operated by a control are also subjected to the test of 19.101.

19.7 Addition:

Separate controls are mounted on a dull black-painted plywood board. Approximately 50 % of the area of each ventilating opening is blocked. The temperature of windings shall not exceed the values specified in Table 8 and the temperature rise of the board shall not exceed

- 50 K, for appliances with T marking;
- 65 K, for other appliances.

19.9 Not applicable.

19.101 *Fans incorporating shutters or similar devices that are operated automatically are supplied at **rated voltage** and operated with the shutters or similar devices held in the closed or open position, whichever is more unfavourable.*

20 Stability and mechanical hazards

This clause of Part 1 is applicable except as follows.

20.1 Addition:

Portable pedestal fans having a height exceeding 1,7 m and a mass exceeding 10 kg are placed on a horizontal surface. A force of 40 N is applied to the appliance at a height of 1,5 m in the most unfavourable horizontal direction.

The appliance shall not overturn.

NOTE 101 Suitable means can be used to prevent the appliance from sliding.

20.101 Fan blades, other than those of fans for mounting at high level, shall be guarded unless their leading edges and tips are rounded with a radius of not less than 0,5 mm and

- they have a hardness less than D 60 Shore, or
- they have a peripheral speed less than 15 m/s when the fan is supplied at **rated voltage**, or
- the fan has a power output not exceeding 2 W when supplied at **rated voltage**.

Compliance is checked by inspection and by measurement.

20.102 There shall be no risk of entrapment or injury caused by movement of the oscillating head of pedestal fans or table fans.

Compliance is checked by the following test.

*Unless the entrapment point is guarded so that it cannot be touched by test probe 18 of IEC 61032, the appliance is operated at **rated voltage** and test probe 18 is placed at the entrapment point across the width and height of its opening.*

If test probe 18 is touched by the moving part, it shall not be subjected to a force exceeding 15 N.

21 Mechanical strength

This clause of Part 1 is applicable except as follows.

21.1 Addition:

Appliances are also subjected to the test of 21.101.

21.101 *Fan guards are subjected to a push force and a pull force of 20 N applied along the axis of the fan motor. After the test, it shall not be possible to touch dangerous moving parts with a test probe that is similar to test probe B of IEC 61032, but having a circular stop face with a diameter of 50 mm instead of the non-circular face. The test probe is applied with a force not exceeding 5 N.*

21.102 Ceiling fans shall have adequate strength.

Compliance is checked by the following test.

Ceiling fans are mounted in accordance with the installation instructions. A load equal to four times the mass of the fan is suspended from the body of the fan for 1 min.

A torque of 1 Nm is then applied to the fixed body of the fan for 1 min. The test is repeated with the torque applied in the reverse direction.

*The **suspension system** including any **safety suspension system device** shall not break and the fan shall not be damaged to such an extent that compliance with 8.1, 16.3 and Clause 29 is impaired.*

NOTE The intent is to test the parts of the ceiling fan and not the capability of the ceiling materials.

22 Construction

This clause of Part 1 is applicable except as follows.

22.1 Addition:

NOTE 101 The enclosure defined in IEC 60529 does not include guards for fan blades.

22.11 Modification:

The 50 N force is not applied to clips used to fasten fan guards. Instead, a force of 15 N is applied in any direction to the clips in an attempt to release them.

22.101 Appliances having provision for attaching a luminaire shall incorporate appropriate terminals and internal wiring. The internal wiring associated with the luminaire shall have insulation at least equivalent to silicone rubber compound type IE2 complying with IEC 60245-3. This requirement is not applicable to fans incorporating a luminaire that cannot be replaced without breaking the appliance.

Compliance is checked by inspection.

22.102 The ceiling fan shall be constructed so that a failure of the fixing device of the motor to the mounting rod could not give rise to risk of injury to the user or surroundings.

Compliance is checked by the requirement and inspection or test of 22.102.1, 22.102.2, 22.102.3, 22.102.4 or 22.102.5, as appropriate for the design. After the test, the ceiling fan shall not be damaged to such an extent that compliance with Clause 8.1, 16.3, 29.1 and 29.2 are impaired.

22.102.1 The ceiling fan shall incorporate a device that disconnects the fan from the supply before the **suspension system** fails. An example of this construction is shown in Figure 101.

Compliance is checked by the following test.

The bolt that connects the down rod to the motor is replaced with the specially prepared test pin shown in Figure 102 that simulates wear on the bolt. The pin is fully inserted so that it connects the down rod to the motor.

*The fan is supplied at **rated voltage** and operated at maximum speed. The pin is then partially withdrawn so that the motor is connected to the down rod by that part of the pin having diameter b.*

The supply to the ceiling fan shall be automatically disconnected and the fan shall not be capable of operation without replacing the worn bolt.

22.102.2 The ceiling fan shall be constructed so that the fan motor and blades do not fall more than 300 mm after failure of the **suspension system** and the fan shall be disconnected from the supply. An example of this construction is shown in Figure 103.

Compliance is checked by the following test.

The ceiling fan is installed in accordance with the manufacturer's instructions.

A load equal to two times the mass of the ceiling fan is suspended from its body.

*The fan is supplied at **rated voltage** and operated at maximum speed.*

*The **suspension system** is then simulated to fail by disconnecting the motor from the down rod.*

The motor and fan blades shall not drop more than 300 mm from their original position and the supply to the ceiling fan shall be automatically disconnected.

22.102.3 The ceiling fan shall be constructed so that the fan blades and motor are connected to the **suspension system** via a threaded down rod that is locked by means of one or more setscrews. An example of this construction is shown in Figure 104.

Compliance is checked by inspection.

22.102.4 The ceiling fan shall be constructed so that an additional through bolt, lock washer and nut, or the like limits the distance of drop by no more than 75 mm in case of the **suspension system** failure. An example of this construction is shown in Figure 105.

Compliance is checked by inspection and measurement

22.102.5 The ceiling fan shall be constructed so that all components required to prevent the failure of the **suspension system** are treated or coated to resist corrosion. Any fixing bolts shall have a minimum diameter of 5 mm and a minimum tensile strength of 200 MPa. Any such bolts shall have provision to prevent them working loose due to vibration. An example of this construction is shown in Figure 106.

Compliance is checked by inspection and measurement.

23 Internal wiring

This clause of Part 1 is applicable except as follows.

23.3 Modification:

Instead of moving the movable part backwards and forwards, fans with an oscillating mechanism are tested as follows.

*Fans are supplied at **rated voltage** and operated under **normal operation**, the angle of oscillation being the maximum allowed by the construction. The test is carried out for 100 000 cycles of oscillation.*

24 Components

This clause of Part 1 is applicable except as follows.

24.2 Addition:

Appliances having a **rated power input** not exceeding 25 W may be fitted with a switch in the **supply cord**.

24.101 Thermal cut-outs incorporated in **duct fans** in order to comply with Clause 19 shall not be self-resetting.

Compliance is checked by inspection.

25 Supply connection and external flexible cords

This clause of Part 1 is applicable except as follows.

25.5 Addition:

Type Z attachment is allowed for portable fans.

26 Terminals for external conductors

This clause of Part 1 is applicable.

27 Provision for earthing

This clause of Part 1 is applicable except as follows.