

**भारतीय मानक**

घरेलू और समान विद्युतीय साधित्रों की सुरक्षा

भाग 2 विशेष अपेक्षाएँ

खंड 2: निर्वात मार्जक और जल मार्जक उपकरण

(पहला पुनरीक्षण)

**Indian Standard**

SAFETY OF HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES

PART 2 PARTICULAR REQUIREMENTS

SECTION 2 VACUUM CLEANERS AND WATER-SUCTION CLEANING APPLIANCES

(FIRST REVISION)

ICS 13.120; 97.080; 97.190; 97.200.50

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**B U R E A U O F I N D I A N S T A N D A R D S**  
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Electrical Appliances Sectional Committee, ETD 32

## FOREWORD

This Indian Standard (Part 2/Sec 2) (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Electrical Appliances Sectional Committee had been approved by the Electrotechnical Division Council.

This standard was first published in 1997. This first revision has been undertaken primarily to align the existing standard with the latest International Standard.

It has been assumed in the formulation of this 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 IS 732: 2019 'Code of practice for electrical wiring installations (*fourth revision*), as far as possible so that there is compatibility with the wiring rules when the appliance is connected to the supply mains. However, in case of any deviation, wiring rules take precedence.

If an appliance within the scope of this standard also incorporates functions that are covered by another Part 2 of IS 302, 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-This means that in such a case, it has been decided that for the part 2 standards, 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- 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 IS 302 series of 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, which **may** 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.

This standard is to be read in conjunction with the latest edition of IS 302-1 'Safety of household and similar electrical appliances: Part 1 General Requirements' and its amendments. This standard was formulated **based** on IS 302-1: 2008.

NOTE- **Wherever** "Part 1" is mentioned in this standard, it refers to IS 302-1.

This Part 2 supplements or modifies the corresponding clauses in IS 302-1, **wherever necessary** to convert that standard into the Indian standard: Particular requirements for Vacuum cleaners and water-suction cleaning appliances.

When a particular sub-clause of Part 1 is not mentioned in this Part 2, that sub-clause 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- The following numbering system is used:

- a) Sub-clauses, tables and figures that are numbered starting from 101 are additional to those in Part 1;
- b) Unless notes are in a new sub-clause or involve notes in Part 1, they are numbered starting from 101, including those in a replaced clause or sub-clause;
- c) Additional annexes are lettered AA, BB, etc.

This standard is based on IEC 60335-2-2 : 2009 (Ed. 6.2). As this standard refers to IS 302-1, the differences of IS 302-1 from IEC 60335-1 shall apply.

The principal changes in this revision are as follows (minor changes are not listed):

- a) Battery operated appliances and d.c. supplied appliances are included in the scope.
  - a. Battery-operated appliances and other d.c. supplied appliances including the dual supply appliances either mains-supplied or battery-operated, have been covered in this standard.
  - b. Figure 105 on the probe for measuring surface temperatures has been added
  - c. Table 101 on maximum temperature rises for specified accessible external surfaces under normal operating conditions has been added.
  - d. New definitions added

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 or analysis, shall be rounded off in accordance with IS 2:1960 'Rules for rounding off numerical values

(revised)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

*Indian Standard*

**SAFETY OF HOUSEHOLD AND SIMILAR  
ELECTRICAL APPLIANCES**

**PART 2 PARTICULAR REQUIREMENTS**

**Section 2 Vacuum Cleaners And Water-Suction Cleaning Appliances**

*(First Revision)*

**1 SCOPE**

This clause of Part 1 is replaced by the following.

This Standard deals with the safety of electric vacuum cleaners and water-suction cleaning appliances for household and similar purposes, including vacuum cleaners for animal grooming, their rated voltage being not more than 250 V. It also applies to centrally sited vacuum cleaners and automatic battery-powered cleaners.

This standard also applies to motorized cleaning heads and current-carrying hoses associated with a particular vacuum cleaner.

Battery-operated appliances and other d.c. supplied appliances are within the scope of this standard. Dual supply appliances, either mains-supplied or battery-operated, are regarded as battery-operated appliances when operated in the battery mode.

Appliances not intended for normal household use, but which nevertheless may be a source of danger to the public, such as appliances intended to be used by laymen in shops and other premises for normal housekeeping purposes, are within the scope of this standard.

NOTE 101: Examples of such appliances are appliances intended to be used for normal housekeeping purposes in hotels, offices, schools, hospitals and similar premises.

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

- a) persons (including children) whose
  - i. Physical, sensory or mental capabilities; or
  - ii. Lack of experience and knowledge

Prevents them from using the appliance safely without supervision or instruction;

- b) 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 can be necessary;

NOTE 103: This standard does not apply to

- a) appliances intended exclusively for industrial purposes;
- b) 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);
- c) wet and dry vacuum cleaners, including power brush, for commercial use (IEC 60335-2-69).

## 2 REFERENCES

This clause of Part 1 is applicable except as follows.

*Addition:*

<i>IS Number</i>	<i>Title</i>
IS 302 (Part 1): 2008	Household And Similar Electrical Appliances – Safety – Part 1 General Requirements
IS 15287(Part 2): 2003/ISO 6344-2	Coated abrasives – Grain size analysis – Part 2: Determination of grain size distribution of macrogrits P12 to P220

<i>ISO/IEC Number</i>	<i>Title</i>
IEC 60312-1	Vacuum cleaners for household use – Part 1: Dry vacuum cleaners – Methods of measuring the performance
IEC 60584-1	Thermocouples – Part 1: EMF specifications and tolerances
ISO 216	Writing paper and certain classes of printed matter – Trimmed sizes – A and B series, and indication of machine direction
ISO 7010:2011	Graphical symbols – Safety colours and safety signs – Registered safety signs
ISO 14688-1	Geotechnical investigation and testing – Identification and classification of soil – Part 1: Identification and description
IEC 60695-11-10	Fire hazard testing - Part 11-10: Test flames - 50 W horizontal and vertical flame test methods

## 3 TERMS AND DEFINITIONS

This clause of Part 1 is applicable except as follows.

### 3.1 Definitions relating to physical characteristics

#### 3.1.4 Addition:

NOTE 101:For appliances incorporating a booster setting, the rated power input corresponds to the operation of the appliance without the booster setting being used.

#### 3.1.9 Replacement:

*Normal Operation* — Operation of the appliance under the following conditions:

The appliance is supplied at rated voltage and operated continuously with the air inlet adjusted to give a power input  $P_m$  after 20 s

Three minutes later a final adjustment of the air inlet is made, if necessary.

$P_m$  is calculated from the formula

$$P_m = 0.5 (P_f + P_i)$$

where

$P_f$  is the power input in watts, after 3 min of operation with the air inlet unobstructed. Any device that ensures a flow of air to cool the motor in the event of a blockage of the main air inlet is allowed to operate;

$P_i$  is the power input in watts, after a further 20 s of operation with the air inlet blocked. Any device that is adjustable without the aid of a **tool**, and which ensures a flow of air to cool the motor in the event of a blockage of a main air inlet, is rendered inoperative. If  $P_i$  cannot be measured due to the appliance suction motor stopping before 20 s, the air inlet is gradually blocked to the extent that the motor stops after  $20^{+5}_{-0}$  s. In this case  $P_i$  is the maximum value of power input in the last two seconds before the motor shuts off.

If the appliance is marked with a rated voltage range, it is supplied at the mean value of the range if the difference between the limits of the range does not exceed 10 percent of the mean value. If the difference exceeds 10 percent, the supply voltage is the upper value of the range.

The measurements are made with the appliance fitted with a clean dust bag and filter, any water collection container being empty. If the appliance is intended to be used only with a hose, detachable nozzles and tubes are removed and the hose is laid out straight. If the appliance is provided with a hose as an accessory, it is operated without the hose.

Rotating brushes and similar devices are in operation but not in contact with any surface. Motorized cleaning heads are connected by means of the hose or tube and are in operation but not in contact with any surface.

Appliance outlets for other accessories are loaded with a resistive load in accordance with the marking.

Automatic battery-operated cleaners are operated with a clean dust bag or filter on the carpet meeting the construction specifications given in Table 1 in IEC TS 62885-1:2018. A frame of 1.5 m by 1.5 m is used on the carpet to limit the area of action. The air inlet is unobstructed.

### **3.5 Definitions relating to types of appliances**

#### **3.5.101 Ash Vacuum Cleaner**

Vacuum cleaner intended to vacuum cold ash from fireplaces, chimneys, ovens, ash-trays and similar places of ash accumulation

#### **3.5.102 Automatic Battery-Operated Cleaner**

Vacuum cleaner that operates without human control only within a defined perimeter, within a pre-programmed area or in an area self-controlled by the appliance.

**The cleaner consists of the mobile part and may have a docking station.**

#### **3.5.103 Centrally-Sited Vacuum Cleaner**

Vacuum cleaner that is connected to a ducting system installed in the building.

NOTE 102 During use, the nozzle and its associated hose are connected to one of the suction inlets of the ducting system.

#### **3.104 Water-Suction Cleaning Appliance**

Appliance for aspirating an aqueous solution that may contain foaming detergent.

### **3.6 Definitions relating to parts of an appliance**

#### **3.6.101 Docking Station**

Unit that may provide

- a) manual or automatic battery charging facilities,
- b) dust removal,
- c) data processing facility, and
- d) suction for the mobile part

NOTE 103 A docking station is also known as a base unit.

#### **3.6.102 Motorized Cleaning Head**

Accessory containing a motor that is supplied from the vacuum cleaner and which is attached to the end of a hose or tube

### **3.8 Definitions relating to miscellaneous matters**

#### **3.8.101 Booster Setting**



Position of a control resulting in a temporary higher power input that is automatically reduced to the power input value when the setting is not used.

#### **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.

##### **5.2 Addition:**

A new hose is used for each of the tests of 21.101 to 21.105. The test of 19.105 may be carried out on a separate appliance.

**5.101** Current-carrying hoses operating at safety extra-low voltage are not subjected to the tests of 21.101 to 21.105.

#### **6 CLASSIFICATION**

This clause of Part 1 is applicable except as follows.

##### **6.1 Modification:**

Vacuum cleaners and water-suction cleaning appliances shall be class I, class II or class III.

Vacuum cleaners for animal grooming shall be class II or class III.

Stationary parts of automatic battery-operated cleaners may be class 0 if the rated voltage does not exceed 150 V.

##### **6.2 Addition:**

Vacuum cleaners for animal grooming and water-suction cleaning appliances shall be at least IPX4.

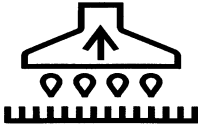
#### **7 MARKING AND INSTRUCTIONS**

This clause of Part 1 is applicable except as follows.

##### **7.1 Addition:**

The appliance shall be marked with the sum of its rated power input and the maximum load of the appliance outlet in watts (if applicable). Ash vacuum cleaners shall be marked with symbol ISO 7000-0434A (2004-01), symbol ISO 7000-0790 (2004-01) and symbol ISO 7010 W021.

##### **7.6 Addition:**



: [symbol IEC 60417-5935 (2012-09)] motorized cleaning head for water suction cleaning



: [symbol ISO 7010 W021] warning; risk of fire / flammable materials

### 7.12 Addition:

The instructions for appliances having a current-carrying hose operating at other than safety extra-low voltage shall include the substance of the following:

**CAUTION** This hose contains electrical connections.

- do not use to suck up water (for vacuum cleaners only);
- do not immerse in water for cleaning;
- the hose should be checked regularly and must not be used if damaged.

The instructions for vacuum cleaners incorporating rotating brushes or similar devices, and water-suction cleaning appliances, shall state that the plug must be removed from the socket-outlet before cleaning or maintaining the appliance.

If symbol IEC 60417-5935 (2012-09) is used, its meaning shall be explained.

#### 7.12.1 Addition:

The instructions for ash vacuum cleaners shall include the substance of the following:

This appliance is intended to pick up cold ash from fireplaces, chimneys, ovens, ash-trays, and similar places of ash accumulation.

**WARNING** : Risk of fire

- do not pick up hot, glowing or burning ash. Pick up cold ash only;
- the dust container must be emptied and cleaned before and after each use;
- do not use paper dust bags or bags made from similar flammable materials;
- do not use any other vacuum cleaner to vacuum ash;
- do not rest the ash vacuum cleaner on flammable or polymeric surfaces, including carpeting and vinyl tile.

**7.14 Addition:**

The height of symbol IEC 60417-5935 (2009-12), symbol ISO 7000-0434A (2004-01), symbol ISO 7000-0790 (2004-01) and symbol ISO 7010 W021 shall be at least 15 mm.

*Compliance is checked by measurement.*

**7.15 Addition:**

Symbol ISO 7000-0434A (2004-01) shall be located next to symbol ISO 7000-0790 (2004-01).

**7.101** Motorized cleaning heads shall be marked with

- rated voltage or rated voltage range in volts;
- rated power input in watts;
- name, trade mark or identification mark of the manufacturer or responsible vendor;
- model or type reference.

Motorized cleaning heads for water-suction cleaning appliances shall be marked with symbol IEC 60417-5935 (2002-10).

NOTE 101 This symbol is an information sign and, except for the colours, the rules of IS 16449 (Part 1)/ISO 3864-1 apply.

*Compliance is checked by inspection.*

**7.102** Appliance outlets for accessories shall be marked with the maximum load in watts.

NOTE 102 This marking may be on the appliance close to the appliance outlet.

*Compliance is checked by inspection.*

## **7.103 BIS CERTIFICATION MARKING**

**7.103.1** The appliances may also be marked with the Standard Mark.

**7.103.2** The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the BIS Act, 2016 and the Rules and Regulations framed thereunder, and the product(s) may be marked with the Standard Mark.

## **8 PROTECTION AGAINST ACCESS TO LIVE PARTS**

This clause of Part 1 is applicable except as follows.

**8.1.1 Addition:**

If the instructions state that a part is to be removed when replacing a lamp or a drive belt, and a tool is required for its removal, the part is not considered to be a detachable part provided that

- an instruction to disconnect the appliance from the supply before opening is marked on the cover or is visible during its removal, and
- after removal of the cover, access to live parts is prevented by at least basic insulation.

## **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:**

The power input of motorized cleaning heads is measured separately.

NOTE 101 Appliance outlets are not loaded when measuring the rated power input.

Booster settings are not used during these measurements.

## **11 HEATING**

This clause of Part 1 is applicable except as follows.

### **11.3 Addition:**

NOTE 101:When measuring the power input to ensure that the appliance has been correctly reassembled, the power input  $P_1$  with the air-inlet blocked is measured.

Where the accessible external surfaces are suitably flat and access permits, then the test probe of Figure 105 may be used to measure the temperature rises of accessible external surfaces specified in Table 101. The probe is applied with a force of  $4 \text{ N} \pm 1 \text{ N}$  to the surface in such a way that the best possible contact between the probe and the surface is ensured. The measurement is performed after a contact period of 30 s

NOTE 102:The probe may be held in place using a laboratory stand clamp or similar device. Any measuring instrument giving the same results as the probe can be used.

### **11.5 Addition:**

Booster settings are activated as often as allowed by the construction.

Docking stations of automatic battery-powered cleaners are operated at 0.94 or 1.06 times rated voltage, whichever is the most unfavorable.

If a suction mode is incorporated in docking stations of automatic battery-powered cleaners, the test conditions of 3.1.9 are applied.

### **11.7 Addition:**

Appliances are operated until steady conditions are established.

Appliances incorporating an automatic cord reel are operated with one-third of the total length of the cord unreeled for 30 min, after which the cord is completely unreeled.

**11.8** *Addition:*

During the test, the temperature rises are monitored continuously and shall not exceed the values shown in Table 101.

The temperature rise limits in Table 3 specified for “External enclosure of motor-operated appliances except handles held in normal use” and the corresponding footnotes are not applicable.

**Table 101 – Maximum temperature rises for specified accessible external surfaces under normal operating conditions**

Surface <sup>c</sup>	Temperature rise of accessible external surfaces <sup>f</sup> K		
	Surfaces of portable appliances situated on the floor <sup>d</sup>	Surfaces of hand held appliances and other appliances <sup>e</sup>	Surfaces of centrally sited vacuum cleaners
Bare metal	38	42	48
Coated metal <sup>a</sup>	42	49	59
Glass and ceramic	51	56	65
Plastic and plastic coating > 0.4 mm <sup>b</sup>	58	62	74

<sup>a</sup> Metal is considered coated when a coating having a minimum thickness of 90 µm made by enamel or non-substantially plastic coating is used.

<sup>b</sup> The temperature rise limit of plastic also applies for plastic material having a metal finish of thickness less than 0.1 mm.

<sup>c</sup> When the thickness of the plastic coating does not exceed 0.4 mm, the temperature rise limits of the coated metal or of glass and ceramic material apply.

<sup>d</sup> Within 25 mm from air outlets the above values can be increased by 10 K.

<sup>e</sup> Within 25 mm from air outlets the above values can be increased by 5 K.

<sup>f</sup> Surfaces that are inaccessible to a 75 mm diameter probe having a hemispherical end are not measured.

## 12 Void

## 13 LEAKAGE CURRENT AND ELECTRIC STRENGTH AT OPERATING TEMPERATURE

This clause of Part 1 is applicable except as follows.

### 13.1 Addition:

NOTE 101; Booster settings are not used.

## 14 TRANSIENT OVERVOLTAGES

This clause of Part 1 is applicable.

## 15 MOISTURE RESISTANCE

This clause of Part 1 is applicable except as follows.

### 15.2 *Replacement:*

Appliances having a liquid container shall be constructed so that spillage of liquid due to overfilling, and due to overturning of appliances liable to be overturned in normal use, does not affect their electrical insulation.

Compliance is checked by the following test.

The liquid container is filled with water to half the level indicated in the instructions. The appliance is placed on a support inclined at an angle of 10 ° to the horizontal. A force of 180 N is applied to the top of the appliance in the most unfavourable horizontal direction. If the appliance overturns, it is considered to be liable to be overturned in normal use.

Appliances with type X attachment, except those having a specially prepared cord, are fitted with the lightest permissible type of flexible cord of the smallest cross-sectional area specified in Table 13.

Appliances incorporating an appliance inlet are tested with or without an appropriate connector in position, whichever is more unfavourable.

Liquid containers that are filled by hand are completely filled with water containing approximately 1 percent NaCl, and a further quantity, equal to 15 percent of the capacity of the container or 0.25 litre, whichever is the greater, is poured in steadily over a period of 1 min.

Containers of hand-held appliances and other appliances liable to be overturned in normal use are completely filled, the cover being closed. The appliance is then overturned and left in that position for 5 min, unless it returns automatically to its normal position of use.

Nozzles and motorized cleaning heads of water-suction cleaning appliances are placed in a container, the base of which is level with the surface supporting the appliance. The container is filled with a detergent solution to a level of 5 mm above its base, this level being maintained throughout the test. The solution consists of 20 g of NaCl and 1 ml of a solution of 28 % by mass of dodecyl sodium sulphate in each 8 litre of water.

The appliance is operated until its liquid container is completely full and for a further 5 min.

NOTE 101 The chemical designation of dodecyl sodium sulphate is  $C_{12}H_{25}NaSO_4$

After each of these tests, the appliance shall withstand the electric strength test of 16.3.

Inspection shall show that there is no trace of liquid on insulation that could result in a reduction of clearances or creepage distances below the values specified in Clause 29.

**15.101** Motorized cleaning heads of water-suction cleaning appliances shall be resistant to liquids that may come into contact with them.

Compliance is checked by the following tests.

The motorized cleaning head is subjected to an impact test as described in IEC 60068-2-75, the value of the impact being 2 J. The motorized cleaning head is rigidly supported and three blows are applied to every point of the enclosure that is likely to be weak.

It is then subjected to the test Free fall – Procedure 1 of IEC 60068-2-31. It is dropped 4 000 times from a height of 100 mm onto a steel plate having a thickness of not less than 15 mm. It is dropped

- 1 000 times on its right side;
- 1 000 times on its left side;
- 1 000 times on its front face;
- 1 000 times on its cleaning surface.

The motorized cleaning head is then subjected to the test described in 14.2.7 of IS/IEC 60529, the water containing approximately 1 percent NaCl solution.

The motorized cleaning head shall then withstand the electric strength test of 16.3, the voltage being applied between the live parts and the solution. Inspection shall show that there is no trace of saline solution on insulation that could result in a reduction of clearances or creepage distances below the values specified in Clause 29.

NOTE 101: The test is not carried out on motorized cleaning heads of class III construction having a working voltage up to 24 V.

## **16 LEAKAGE CURRENT AND ELECTRIC STRENGTH**

This clause of Part 1 is applicable except as follows.

### **16.3 Addition:**

Current-carrying hoses, except for their electrical connections, are immersed for 1 h in water containing approximately 1 % NaCl, at a temperature of 25 °C ±5 °C. While the hose is still immersed, a voltage of 2 000 V is applied for 5 min between each conductor and all the other conductors connected together. A voltage of 3 000 V is then applied for 1 min between all the conductors and the saline solution.

## **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:**

The test of 19.7 is only carried out on motorized cleaning heads vacuum cleaners with a



motorized brush or similar device and separate fan motors of centrally-sited vacuum cleaners.

Water-suction cleaning appliances having a valve are also subjected to the test of 19.101.

Appliances incorporating a booster setting that is not deactivated electronically are also subjected to the test of 19.102.

Centrally-sited vacuum cleaners are also subjected to the tests of 19.103, and 19.104 if applicable.

Vacuum cleaners that stop automatically when there is a blockage are also subject to the test of 19.4.

**19.4 Addition:**

The appliance is tested under the conditions specified in Clause 11 with the inlet blocked. Any control that is allowed to disconnect the suction motor during the Pi determination of 3.1.9 is short-circuited.

**19.7 Addition:**

Motorized cleaning heads are tested with the rotating brush or similar device locked for 30 s.

Separate fan motors of centrally-sited vacuum cleaners are operated until steady conditions are reached.

**19.9 Replacement:**

Docking stations of automatic battery-operated cleaners incorporating a suction mode are tested at rated voltage with the air inlet fully blocked until steady conditions are established.

The temperatures of the windings shall not exceed the values specified in Table 8.

**19.10 Replacement:**

Appliances incorporating series motors are supplied at 1.3 times rated voltage and operated for 30 s with the air inlet blocked, rotating brushes and similar devices being removed.

After this test, the safety of the appliance shall not have been impaired, in particular windings and connections shall not have worked loose.

**19.101** Water-suction cleaning appliances, the liquid container of which incorporates a valve or other overflow prevention device, are supplied at rated voltage. The appliance is operated with the nozzle placed in a trough containing water and with the valve or overflow prevention-device held open or otherwise rendered inoperative. The test is terminated 30 s after water starts to flow out of the appliance.

**NOTE 101** If the appliance incorporates more than one overflow prevention device, these are rendered inoperative in turn.

**19.102** The deactivating means of the booster setting is rendered inoperative and the appliance is operated under the conditions specified in Clause 11 using the booster setting.

**19.103** Centrally-sited vacuum cleaners are supplied at rated voltage and operated with the inlet for the suction hose open and then closed.

The temperatures of the windings shall not exceed the values specified in 19.9.

**19.104** Centrally-sited vacuum cleaners with separate ventilation for the motor are supplied at rated voltage and operated with the airflow through the motor blocked.

**19.105** Ash vacuum cleaners shall not cause a risk of fire or electric shock when operated under the following test conditions:

The ash vacuum cleaner is prepared for operation according to the instruction for use, but switched off.

The empty container of the ash vacuum cleaner is filled up to two-thirds of its useable volume with paper balls. Each paper ball is made out of crumpled sheets of A4 copy paper having a weight in the range 70 g/m<sup>2</sup> to 120 g/m<sup>2</sup> in accordance with ISO 216. Each paper sheet shall be crumpled to a size so that it fits into a cube having sides of 10 cm.

The paper balls are ignited with a burning paper strip positioned in the centre of the paper balls top layer. After 1 min the container is closed and kept in this position until steady conditions are reached.

During the tests, the appliance shall not emit flames or molten material.

Afterwards, this test is repeated with a new sample but with all suction motors switched on immediately after the closing of the container. If the ash vacuum cleaner has a control for air flow adjustment, the test shall be done with minimum and maximum air flow settings.

After the test the appliance shall comply with 19.13.

## **20 STABILITY AND MECHANICAL HAZARDS**

This clause of Part 1 is applicable except as follows.

### **20.1 Addition:**

NOTE 101: Motorized cleaning heads are not subjected to this test.

### **20.2 Addition:**

NOTE 101 The requirement regarding moving parts does not apply to rotating brushes and similar devices. It does not apply to parts that become accessible when changing accessories and only move when the brush or similar device is in operation.

## **21 MECHANICAL STRENGTH**

This clause of Part 1 is applicable except as follows.

**21.101** Current-carrying hoses shall be resistant to crushing.

Compliance is checked by the following test.

The hose is placed between two parallel steel plates each having a length of 100 mm, a width of 50 mm and the edges of the longer sides rounded with a radius of 1 mm. The axis of the hose is positioned at right angles to the longer sides of the plates. The plates are placed at a distance of approximately 350 mm from one end of the hose.

The steel plates are pressed together at a rate of 50 mm/min  $\pm$  5 mm/min until the applied force is 1.5 kN. The force is then released and the electric strength test of 16.3 is carried out between the conductors connected together and the saline solution.

**21.102** Current-carrying hoses shall be resistant to abrasion.

Compliance is checked by the following test.

One end of the hose is attached to the connecting rod of the crank mechanism shown in Figure 101. The crank rotates at 30 rev/min resulting in the end of the hose moving horizontally backwards and forwards over a distance of 300 mm.

The hose is supported by a rotating smooth roller over which a belt of abrasive cloth moves at a speed of 0.1 m/min. The abrasive is corundum grit size P 100, as specified in IS 15287(Part 2)/ISO 6344-2. A mass of 1 kg is suspended from the other end of the hose, which is guided to avoid rotation. In the lowest position, the mass has a maximum distance of 600 mm from the centre of the roller.

The test is carried out for 100 revolutions of the crank.

After the test, basic insulation shall not be exposed, and the electric strength test of 16.3 is carried out between the conductors connected together and the saline solution.

**21.103** Current-carrying hoses shall be resistant to flexing.

Compliance is checked by the following test.

The end of the hose intended to be connected to the motorized cleaning head is attached to the pivoting arm of the test equipment shown in Figure 102. The distance between the pivot axis of the arm and the point where the hose enters the rigid part is 300 mm  $\pm$  5 mm. The arm can be raised from the horizontal position by an angle of 40°  $\pm$  1°. A mass of 5 kg is suspended from the other end of the hose or from a convenient point along the hose so that when the arm is in the horizontal position the mass is supported and there is no tension on the hose.

NOTE 101 If necessary the mass may be repositioned during the test..

The mass slides against an inclined plate so that the maximum deflection of the hose is 3°. The arm is raised and lowered by means of a crank that rotates at a speed of 10 rev/min  $\pm$  1 rev/min.

The test is carried out for 2 500 revolutions of the crank after which the fixed end of the hose is turned through 90° and the test continued for a further 2 500 revolutions. The test is repeated in each of the other two 90° positions. if the hose ruptures before 10 000 revolutions of the crank, the flexing is terminated.

After the test, the hose shall withstand the electric strength test of 16.3.

**21.104** Current-carrying hoses shall be resistant to torsion.

Compliance is checked by the following test.

One end of the hose is held in a horizontal position with the remainder of the hose freely suspended. The free end is rotated in cycles, each cycle consisting of five turns in one direction and five turns in the opposite direction, at a rate of 10 turns per minute.

The test is carried out for 2 000 cycles.

After the test, the hose shall withstand the electric strength test of 16.3 and shall not be damaged to such an extent that compliance with this standard is impaired.

**21.105** Current-carrying hoses shall be resistant to cold conditions.

Compliance is checked by the following test.

A 600 mm length of hose is bent as shown in Figure 103 and the ends are tied together over a length of 25 mm. The hose is then placed for 2 h in a cabinet having a temperature of  $-15\text{ °C} \pm 2\text{ °C}$ . Immediately after, the hose is removed from the cabinet it is flexed three times, as shown in Figure 104, at a rate of one flexing per second.

The test is carried out three times.

There shall be no cracks or breaks in the hose and it shall withstand the electric strength test of 16.3.

**NOTE 101** Any discoloration is neglected.

**21.106** A handle intended for carrying an appliance shall be constructed to withstand the weight of the appliance without damage. This requirement is not applicable to hand-held vacuum cleaners or automatic battery operated cleaners.

Compliance is checked by the following test.

The load, consisting of the weight of the appliance with its dust receptacle filled with dry medium grade sand according to ISO 14688-1 shall be uniformly applied over a 75 mm width at the centre of the handle without clamping. If the receptacle is marked with a maximum dust level then the sand is added to this level. The load shall be started at zero and gradually increased so that the test value is reached in 5 s to 10 s and shall be maintained for 1 min.

When more than one handle is furnished on an appliance, and the appliance is unable to be carried by one handle, the force shall be distributed between the handles. The distribution of force shall be determined by measuring the percentage of the appliance weight sustained by each handle with the appliance in the normal carrying position.

When an appliance is furnished with more than one handle and can be carried by only one handle, each handle shall sustain the total force. A water-suction cleaning appliance that is completely supported in the hand or by the body during use shall be filled to maximum normal capacity with water when determining the weight of the appliance and during the

test. For an appliance with separate tanks for clean solution and recovery, only the largest tank shall be filled to maximum.

After the test, there shall be no damage to the handle, its securing means, or that portion of the appliance to which the handle is attached. Damage to the finish, small dents and small chips are ignored.

## **22 CONSTRUCTION**

This clause of Part 1 is applicable except as follows.

### **22.32 Addition:**

Vacuum cleaners shall be constructed so that the internal parts of the motors and electrical connections are not subjected to deposition of dust due to the passage of air.

NOTE 101 This requirement is met if the air passes through the dust bag before it passes through the motor.

NOTE 102 For water-suction cleaning appliances, compliance with the requirement concerning protection against deposition of pollution has been adequately checked by the test of 15.2.

**22.101** Motorized cleaning heads for use with appliances that have a water-suction cleaning mode, except those of class III construction having a working voltage up to 24 V, shall be motorized cleaning heads for water-suction cleaning appliances.

Compliance is checked by inspection of the marking and the tests for motorized cleaning heads for water-suction cleaning appliances.

**22.102** Ash vacuum cleaners shall be equipped with a finely woven metal pre-filter or a pre-filter manufactured using flame retardant material with a GWFI as specified in 30.2.101. All parts including accessories in direct contact with ash located before the pre filter shall be made out of metal or made of a non-metallic material complying with 30.2.102. Metal containers shall have a minimum wall thickness of 0.35 mm.

Compliance is checked by inspection, by measurement, by the tests of 30.2.101 and 30.2.102 if applicable and by the following test.

Test probe C from IS 1401 shall not penetrate the finely woven metal pre-filter when applied with a force of 3 N.

**22.103** The length of hoses supplied with ash vacuum cleaners shall be limited.

Compliance is checked by measuring the length of the hose between the part normally held in the hand and where it enters the ash container.

The fully extended length shall not exceed 2 m.

## **23 INTERNAL WIRING**

This clause of Part 1 is applicable.

## 24 COMPONENTS

This clause of Part 1 is applicable except as follows.

### 24.1.3 Addition:

Switches incorporated in vacuum cleaners, other than those for household use only, are tested for 50 000 cycles of operation.

## 25 SUPPLY CONNECTION AND EXTERNAL FLEXIBLE CORDS

This clause of Part 1 is applicable except as follows.

### 25.1 Addition:

Vacuum cleaners for animal grooming and water-suction cleaning appliances shall not incorporate an appliance inlet.

### 25.7 Modification:

Supply cords shall be not lighter than the following:

for hand-held appliances having a mass not exceeding 1.5 kg when fitted with the heaviest accessory, but excluding the supply cord,

- a) if rubber insulated, ordinary tough rubber sheathed flexible cord (IS 9968 (Part 1):1988);
- b) if polyvinyl chloride insulated, light polyvinyl chloride sheathed flexible cord IS 694:2010;

for appliances for animal grooming,

- a) ordinary polychloroprene sheathed flexible cord {IS 9968 (Part 1):1988};
- b) if polyvinyl chloride insulated, flat twin flexible cord IS 694:2010;

for other appliances,

- a) if rubber insulated, ordinary tough rubber sheathed flexible cord (IS 9968 (Part 1):1988);
- b) if polyvinyl chloride insulated, ordinary polyvinyl chloride sheathed flexible cord IS 694:2010.

### 25.23 Addition:

Live conductors in a flexible hose shall have an insulation and sheath thickness at least equivalent to that specified for a IS 694:2010 cord of  $2 \times 0.75 \text{ mm}^2$ .

## 26 TERMINALS FOR EXTERNAL CONDUCTORS

This clause of Part 1 is applicable.

## 27 PROVISION FOR EARTHING

This clause of Part 1 is applicable.

## **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.

## **30 RESISTANCE TO HEAT AND FIRE**

This clause of Part 1 is applicable except as follows.

### **30.2 Addition:**

For centrally-sited vacuum cleaners, 30.2.3 is applicable. For other appliances, 30.2.2 is applicable.

**30.2.101** The container and filters of ash vacuum cleaners shall have a glow-wire flammability index (GWFI) of at least 850 °C according to IEC 60695-2-12, the test samples used for the classification shall be not thicker than the relevant part of the ash vacuum cleaner.

As an alternative, the container and filters of ash vacuum cleaners shall have a glow-wire ignition temperature (GWIT) of at least 875 °C according to IEC 60695-2-13, the test samples used for the classification shall be not thicker than the relevant part of the ash vacuum cleaner.

As an alternative the container and filters of ash vacuum cleaners are subjected to the glow wire test of IEC 60695-2-11 with a test severity of 850 °C. The value of  $t_e - t_i$  shall not exceed 2 s.

**30.2.102** All nozzles, deflectors and connectors located upstream of the pre-filter made out of non-metallic material are subjected to the needle flame test in accordance of Annex E. The needle flame test is not applicable to parts that comprise material classified as V-0 or V-1 according to IEC 60695-11-10 provided that the test sample used for the classification was no thicker than the relevant part of the ash vacuum cleaner.

## **31 Resistance to rusting**

This clause of Part 1 is applicable.

## **32 Radiation, toxicity and similar hazards**

This clause of Part 1 is applicable.

## **101 TESTS**

### **101.0 Categories of Tests**

Tests are classified as type, acceptance and routine tests.

## 101.1 Type Test

The tests specified in Table 102 shall constitute the type tests and shall be carried out on two samples of the same type and rating selected preferably at random from a regular production lot. Before commencement of the tests, the vacuum cleaners and water suction cleaning appliances shall be visually examined and inspected for obvious visual defects in respect of components, parts and their assembly, construction mechanical hazards, markings, provision of suitable terminals for supply connections, earthing and the effectiveness of screw s and connections. The external surface finish shall be even and free from finishing defects.

### 101.1.1 *Criteria of Acceptance*

Both samples shall successfully pass all the type tests for proving conformity with the requirements of the standard. If any of the samples fails in any of the type tests, the testing authority at its discretion, may call for fresh samples not exceeding twice the original number and subject them again to all tests or to the test(s) in which failure(s) had occurred. No failure should be permitted in the repeat test(s).

**Table 102 Schedule of Type Tests**  
( *Clause 101.1* )

Sl. No	Test	Clause Reference
i)	Protection against access to live parts	8
ii)	Power Input and Current	10
iii)	Heating	11
iv)	Leakage current and electric strength at operating temperature	13
v)	Transient over voltages	14
vi)	Moisture resistance	15
vii)	Leakage current and electric strength	16
viii)	Overload protection of transformers and associated circuits	17
ix)	Abnormal operation	19
x)	Stability and mechanical hazards	20
xi)	Mechanical strength	21
xii)	Construction	22
xiii)	Internal wiring	23
xiv)	Components	24
xv)	Supply connection and external flexible cords	25



xvi)	Terminals for external conductors	26
xvii)	Provision for earthing	27
xviii)	Screws and connections	28
xix)	Clearances, creepage distances and solid insulation	29
xx)	Resistance to heat and fire	30
xxi)	Resistance to rusting	31

### 101.2 Acceptance Tests

The following shall constitute the acceptance tests:

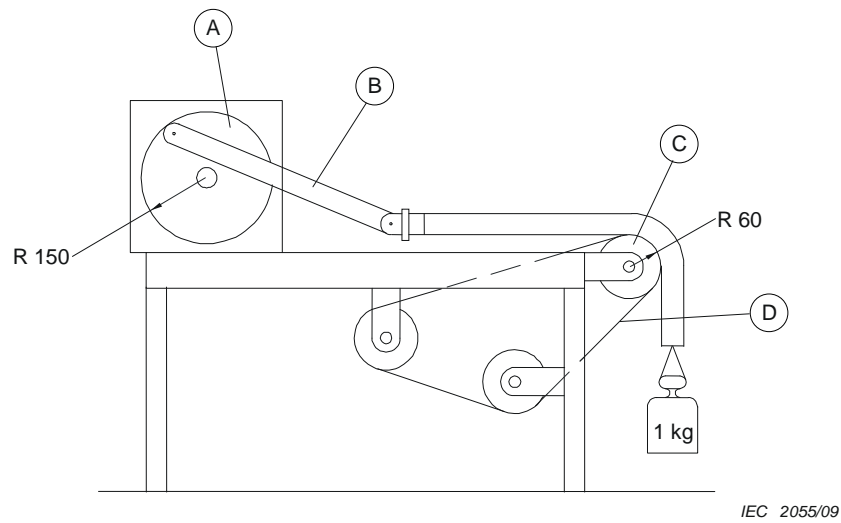
Sl. No	Test	Clause Reference
(1)	(2)	(3)
i)	Protection against access to live parts	8
ii)	Power input and current	10
iii)	Heating	11
iv)	Leakage current and electric strength at operating temperature	13
v)	Moisture resistance	15
vi)	Leakage current and electric strength	16
vii)	Provision for earthing	27

NOTE — For the purpose of acceptance tests, the humidity treatment shall be done for 24 h while conducting the test for moisture resistance (see 15).

### 101.3 Routine Tests

Annex A of Part 1 shall be applicable for this clause.

*Dimensions in millimetres*

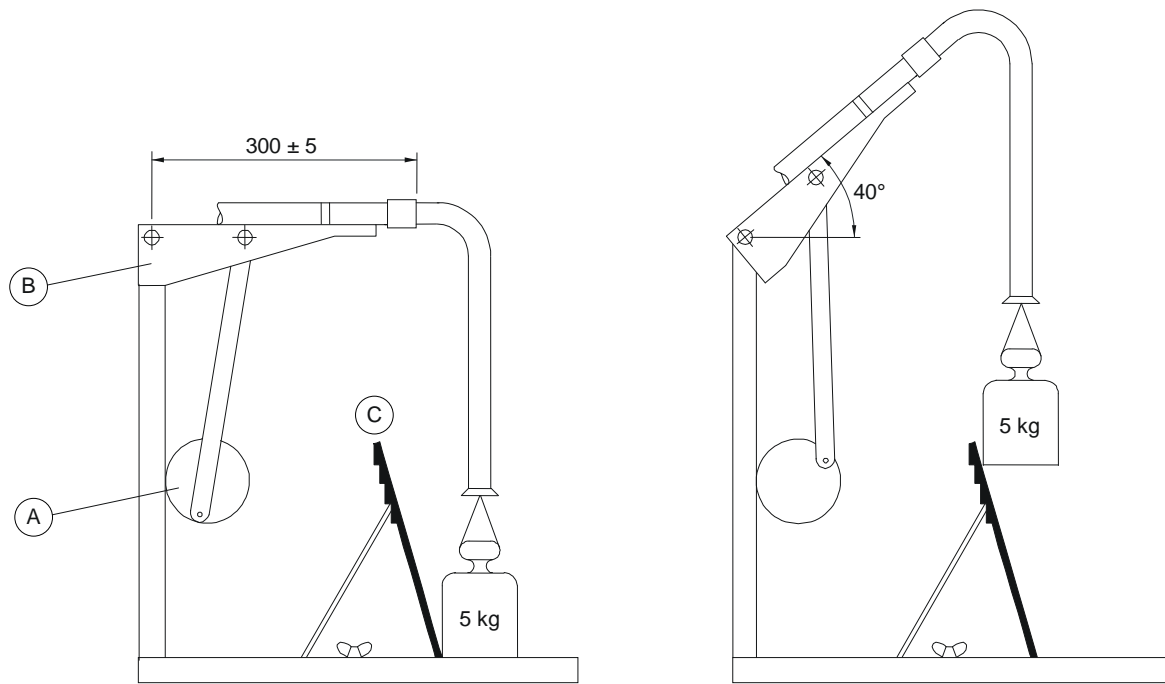


**Key**

- A crank mechanism
- B connecting rod
- C roller, diameter 120 mm
- D abrasive cloth belt

**FIGURE 101 – APPARATUS FOR TESTING THE ABRASION RESISTANCE OF CURRENT-CARRYING HOSES**

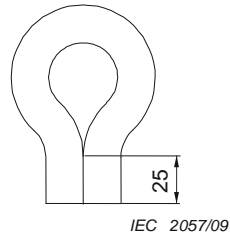
*Dimensions in millimetres*



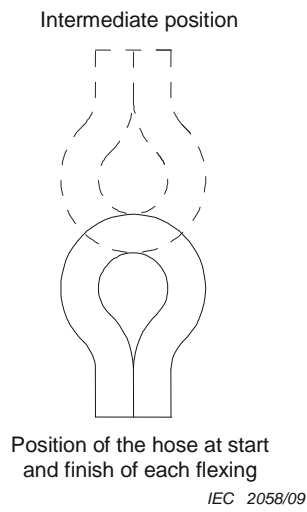
**Key**

- A crank mechanism
- B arm
- C inclined plane

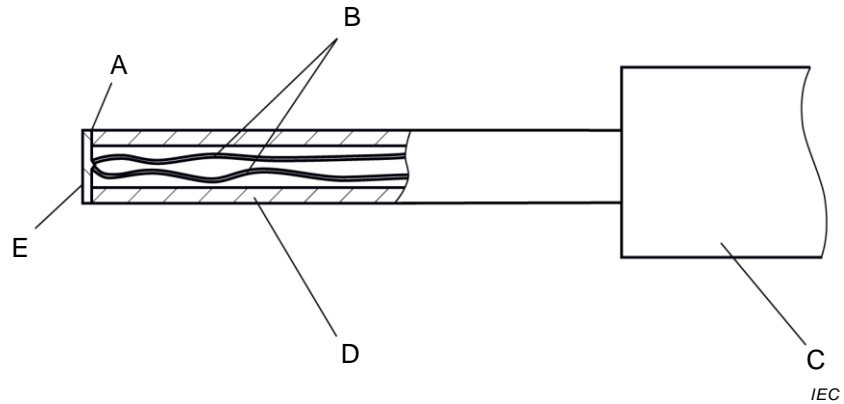
**FIGURE 102 – APPARATUS FOR TESTING THE RESISTANCE TO FLEXING  
OF CURRENT-CARRYING HOSES**



**FIGURE 103 – CONFIGURATION OF THE HOSE FOR THE FREEZING TREATMENT**



**FIGURE 104 – FLEXING POSITIONS FOR THE HOSE AFTER REMOVAL FROM THE FREEZING CABINET**



**Key**

- A adhesive
- B thermocouple wires 0,3 mm diameter to IEC 60584-1 Type K (chrome alumel)
- C handle arrangement permitting a contact force of  $4 \text{ N} \pm 1 \text{ N}$
- D polycarbonate tube: inside diameter 3 mm, outside diameter 5 mm
- E tinned copper disc with flat contact face: 5 mm diameter, 0,5 mm thick

**FIGURE 105 – PROBE FOR MEASURING SURFACE TEMPERATURES**

## ANNEXES

The annexes of Part 1 are applicable except as follows.

### ANNEX B (normative)

#### **APPLIANCES POWERED BY RECHARGEABLE BATTERIES that are recharged in the appliance**

This annex of Part 1 is applicable except as follows.

NOTE Additional sub-clauses in this annex are numbered starting with 201.

#### **6 CLASSIFICATION**

**6.1** Mobile parts of automatic battery-powered cleaners shall be class II or class III.

#### **7 MARKING AND INSTRUCTIONS**

##### **7.1** *Addition:*

The mobile part of an automatic battery-operated cleaner shall be marked with the

- name, trademark or identification mark of the manufacturer or responsible vendor;
- the model or type reference of the docking station with which the mobile part is intended to be used.

##### **7.12** *Addition:*

Automatic battery-operated cleaners shall also be provided with cautionary instructions for room preparation and constant care.

##### **11.7** *Addition:*

For mobile parts of automatic battery-operated cleaners, the test ends when the cleaning operation is stopped due to the discharging of the battery.

#### **19 ABNORMAL OPERATION**

##### **19.1** *Addition:*

Mobile parts of automatic battery-operated cleaners are subjected to the test of 19.7 while they are being supplied by their battery.

**19.7** On mobile parts of automatic battery-operated cleaners, the rotor is locked.

#### **21 MECHANICAL STRENGTH**

**21.201** Mobile parts of automatic battery-operated cleaners shall have sufficient mechanical strength.

Compliance is checked by the following test.

An evenly distributed load of 60 kg is placed on top of the mobile part for 60 s. During this test, no short circuit shall occur. After the test, there shall be no visible damage that could impair compliance with this standard.

## 22 CONSTRUCTION

**22.40** Mobile parts of automatic battery-operated cleaners shall be fitted with a switch to turn the appliance off.

Compliance is checked by inspection.

If compliance relies on the operation of an electronic circuit, the electromagnetic phenomena tests of Sub-clause 19.11.4.1 and 19.11.4.2 have to be applied. During the tests, the motor which moves the mobile part shall not start.

**22.201** Mobile parts of automatic battery-operated cleaners shall be equipped with

- a) a device to stop movement within 1 s of accessible hazardous moving parts when they lose contact with the surface being cleaned, and
- b) a device to protect the appliance from dropping off the cleaning surface (e.g. stairways, etc.). When the mobile part senses that it has reached a critical edge, it shall
  - i) stop; or
  - ii) reverse and move away from the edge of the cleaning surface and then continue to operate normally.

Compliance is checked by inspection and test.

~~NOTE 101~~ The test can be carried out on a testing bed with rollers.

If compliance relies on the operation of an electronic circuit, the test is repeated under the following conditions applied separately:

- i) the fault conditions in a) to f) of 19.11.2 applied one at a time to the electronic circuit;
- ii) the electromagnetic phenomena test of 19.11.4.1 and 19.11.4.2 applied to the appliance.

If the **electronic circuit** is programmable, the software shall contain measures to control the fault/error conditions specified in Table R.1 and is evaluated in accordance with the relevant requirements of Annex R.

**22.202** When operating on a sloping surface, the speed of the mobile part shall not be excessive.

Compliance is checked by the following test.

The speed of the mobile part is measured during the test of Clause 11.

The mobile part is then directed to move down a glass surface inclined at 10° to the horizontal and its speed is again measured. The measured speed shall not exceed the speed initially measured by more than 10 %.

## **24 COMPONENTS**

**24.201** Thermal cut-outs and protective electronic circuits incorporated in automatic battery-operated cleaners for compliance with 19.7 shall be non-self-resetting.

*Compliance is checked by inspection.*

## **30 RESISTANCE TO HEAT AND FIRE**

### **30.2 Addition:**

For automatic battery-operated cleaners, 30.2.3 is applicable.



**ANNEX C**  
(normative)

**AGEING TEST ON MOTORS**

*Modification:*

The value of  $p$  in Table C.1 is 2 000.

**Annex R**

**(normative)**

**Software evaluation**

**R.2.2.5 Modification:**

For programmable electronic circuits with functions requiring software incorporating measures to control the fault/error conditions specified in Table R.1, detection of a fault/error shall occur before compliance with Clause 19 and 22.201 of Annex B or Annex S is impaired.

**R.2.2.9 Modification:**

The software and safety-related hardware under its control shall be initialized and shall terminate before compliance with Clause 19 and 22.201 of Annex B or Annex S is impaired.

**Annex S**  
**(normative)**

**Battery-operated appliances powered by batteries that are non-rechargeable or not recharged in the appliance**

This annex of Part 1 is applicable except as follows.

NOTE Additional subclauses in this annex are numbered starting with 201.

Addition:

**6 Classification**

**6.1 Addition:**

Mobile parts of automatic battery-operated cleaners shall be class II or class III.

**7 Marking and instructions**

**7.1 Addition:**

The mobile part of an automatic battery-operated cleaner shall be marked with the model or type reference of the docking station with which the mobile part is intended to be used, if any.

**7.12 Addition:**

Automatic battery-operated cleaners shall also be provided with cautionary instructions for room preparation and constant care.

**19 Abnormal operation**

Addition:

**19.7 Addition:**

On mobile parts of automatic battery-operated cleaners, the rotor is locked.

Addition:

**21 Mechanical strength**

21.201 Mobile parts of automatic battery-operated cleaners shall have sufficient mechanical strength. Compliance is checked by the following test. An evenly distributed load of 60 kg is placed on top of the mobile part for 60 s. During this test,

no short circuit shall occur. After the test, there shall be no visible damage that could impair compliance with this standard.

Addition:

## **22 Construction**

### **22.40 Addition:**

Mobile parts of automatic battery-operated cleaners shall be fitted with a switch to turn the appliance off. Compliance is checked by inspection. If compliance relies on the operation of an electronic circuit, the electromagnetic phenomena tests of Subclause 19.11.4.1 and 19.11.4.2 have to be applied. During the tests, the motor which moves the mobile part shall not start.

22.201 Mobile parts of automatic battery-operated cleaners shall be equipped with – a device to stop movement within 1 s of accessible hazardous moving parts when they lose contact with the surface being cleaned; and – a device to protect the appliance from dropping off the cleaning surface (e.g. stairways, etc.). When the mobile part senses that it has reached a critical edge, it shall • stop; or • reverse and move away from the edge of the cleaning surface and then continue to operate normally. Compliance is checked by inspection and test.

NOTE The test can be carried out on a testing bed with rollers.

If compliance relies on the operation of an electronic circuit, the test is repeated under the following conditions applied separately: – the fault conditions in a) to g) of 19.11.2 applied one at a time to the electronic circuit;– the electromagnetic phenomena test of 19.11.4.1 and 19.11.4.2 applied to the appliance. If the electronic circuit is programmable, the software shall contain measures to control the fault/error conditions specified in Table R.1 and is evaluated in accordance with the relevant requirements of Annex R.

22.202 When operating on a sloping surface, the speed of the mobile part shall not be excessive. Compliance is checked by the following test. The speed of the mobile part is measured during the test of Clause 11. The mobile part is then directed to move down

a glass surface inclined at 10° to the horizontal and its speed is again measured. The measured speed shall not exceed the speed initially measured by more than 10 %.

Addition:

## **24 Components**

24.201 Thermal cut-outs and protective electronic circuits incorporated in automatic battery-operated cleaners for compliance with 19.7 shall be non-self-resetting. Compliance is checked by inspection.

## **30 Resistance to heat and fire**

Addition:

### **30.2 Addition:**

For automatic battery-operated cleaners, 30.2.3 is applicable.