INTERNATIONAL STANDARD

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Edition 3.2

2007-03

Edition 3:2002 consolidated with amendments 1:2005 and 2:2007

Household and similar electrical appliances – Safety –

Part 2-68: Particular requirements for spray extraction appliances, for industrial and commercial use



Reference number
IEC 60335-2-68:2002+A1:2005+A2:2007(E)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

Part 2-68: Particular requirements for spray extraction appliances, for industrial and commercial use

FOREWORD

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This part of International Standard IEC 60335 has been prepared by sub-committee 61J: Electrical motor-operated cleaning appliances for industrial use, of IEC technical committee 61: Safety of household and similar electrical appliances.

This consolidated version of IEC 60335-2-68 is based on the third edition (2002) [documents 61J/129/FDIS and 61J/134/RVD], its amendment 1 (2005) [documents 61J/197/FDIS and 61J/210/RVD] and its amendment 2 (2006) [documents 61J/228/CDV and 61J/242/RVC].

It bears the edition number 3.2.

A vertical line in the margin shows where the base publication has been modified by amendments 1 and 2.

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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 fourth edition (2001) 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 electric spray extraction appliances, for industrial and commercial use.

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.

The following differences exist in the countries indicated below.

- 3.1.9 A different type of carpet is specified (USA);
- 7.1 Different markings are required (USA);
- 7.12 No requirements for sound marking exist (USA);
- 25.14 The test is not carried out (USA).

The committee has decided that the contents of the base publication and its amendments will remain unchanged until the maintenance result 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
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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.

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.

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 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.

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HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

Part 2-68: Particular requirements for spray extraction appliances, for industrial and commercial use

1 Scope

This clause of Part 1 is replaced by the following.

This International Standard deals with the safety of electrical **portable, motor-operated spray extraction appliances** and electrical attachments intended for industrial and commercial use, their **rated voltage** being not more than 250 V for single-phase appliances and 480 V for other appliances. These appliances employ water-based **cleaning agents** and are used for cleaning fabrics, upholstery, carpets, floor coverings or hard surfaces

NOTE 101 Commercial uses are for example for use in hotels, schools, hospitals, factories, shops and offices for other than normal housekeeping purposes, and in the rental business.

Machines with or without electrical heating elements and with or without attachments are within the scope of this standard.

This standard covers appliances in which the pressure of the **cleaning agent** is positive and not more than 2,5 MPa, or in which the product of the pressure (in MPa) and the flow of cleaning agent (in litres per minute) does not exceed 100, and in which the temperature of the **cleaning agent** at the spray nozzle outlet does not exceed 85 ºC.

This standard also applies to machines handling hazardous dust such as asbestos or liquids for which additional national requirements might apply.

It is also applicable to appliances making use of other forms of energy for the motor; but it is necessary that their influence is taken into consideration.

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, the national water supply authorities and similar authorities.

NOTE 103 This standard does not apply to

– appliances exclusively designed to handle hazardous solvents, such as flammable or explosive liquids;

– appliances solely designed for household use;

– appliances intended to be used in locations where special conditions prevail, such as the presence of a corrosive or explosive atmosphere (vapour or gas);

– audio, video and similar electronic apparatus (IEC 60065);

– appliances for medical purposes (IEC 60601);

– hand-held motor-operated electric tools (IEC 60745);

– personal computers and similar equipment (IEC 60950);

– transportable motor-operated electric tools (IEC 61029).

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2 Normative references

This clause of Part 1 is applicable except as follows.

Addition:

IEC 60312: 1998, *Vacuum cleaners for household use – Methods of measuring the performance*

IEC 60704-2-1, *Household and similar electrical appliances – Test code for the determination of airborne acoustical noise – Part 2-1: Particular requirements for vacuum cleaners*

ISO 6344-2, *Coated abrasives – Grain size analysis – Part 2: Determination of grain size distribution of macrogrits P12 to P220*

3 Definitions

This clause of Part 1 is applicable except as follows.

3.1.9 *Replacement:*

normal operation
operation of the appliance as specified in 3.1.9.101 to 3.1.9.102.

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

3.1.9.101 The appliance is operated with the spray extraction pump with the nozzle giving the highest load, the vacuum motor, the device for agitating the carpet pile (if any), the **cleaning agent heater** (if any) and the soiled water discharge pump (if any) all in use. Any marking of short time intermittent operation of the pumps shall be observed.

The **normal operation** P_m of the vacuum motor is obtained at the following power input:

$$P_m = 0{,}5\ (P_f + P_i)$$

where

P_f is the input, in watts, when the appliance has been operated for 3 min, fitted with the nozzle and hose supplied by the manufacturer giving the highest input;

P_i is the input, in watts, when the appliance has been operated for 20 s with the nozzle sealed, immediately following the 3-minute-period with the nozzle open. Any valve or similar device used to ensure a flow of air to cool the motor in the event of a blockage of a main air inlet is rendered ineffective.

P_f and P_i are measured with the supply voltage adjusted to **rated voltage**, or to a voltage equal to the mean value of the **rated voltage range** if the difference between the limits of the **rated voltage range** does not exceed 10 % of the mean value of the range. If the difference between the limits of the **rated voltage range** exceeds 10 % of the mean value, the tests are carried out with the supply voltage set to the upper limit of the range.

The hose is laid out straight. If the appliance is provided with a hose as an optional accessory, it is operated without the hose.

Electrically driven devices for agitating the carpet, if any, are in operation but are not in contact with the floor or any other surface or with the means used to seal the air inlet.

The adjustment of the air inlet is not altered when it is specified that the appliance is operated under normal load, irrespective of the supply voltages specified in the test. Where optional filtration systems are supplied with the spray extraction appliance, the filtration system giving the least air resistance (maximum flow) is fitted.

The normal load is equal to the mean load P_r for the electrically driven agitating device such as a motor driven brush determined in accordance with the following:

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- the agitating device operates on a carpet as specified in IEC 60312;
- the mean load P_r is determined when using the device in the following way:

After setting the device according to the manufacturer's instructions the device shall be moved twice over a distance of 5 m in the direction giving the highest load;

- the motor responsible for the airflow operates under the same conditions as determining P_f, i. e. no airflow restrictions, and measurements are taken after 3 min;
- the device is adjusted to the carpet pile height in accordance with the recommendations of the manufacturer;
- it is necessary to move the agitating device slowly across the carpet in the usual manner to avoid carpet damage.

3.1.9.102 Soiled water discharge pumps are normally operated as follows.

The pump delivers a continuous flow of water without any soiled water discharge hose attached to the soiled water outlet of the machines unless the discharge hose is permanently attached to the machine. The vacuum motor shall work during the test, unless an interlock device is provided to prevent combined operation of both motors.

3.101
cleaning agent pre-heater
an electric heating element which can be used only when the spray extraction functions of the appliances are switched off and which is intended to raise the temperature of the **cleaning agent** to operating temperature before the cleaning operation

NOTE If this element or part of it can function at lower power when the spray extraction functions of the appliance are in operation, it is considered as a **cleaning agent heater** whilst so functioning.

3.102
cleaning agent heater
an electric heater which can be used only when the spray extraction functions of the appliances are in operation, and which is intended to maintain the cleaning agent at the correct temperature for effective operation

3.103
cleaning agent
water with or without the addition of a soluble chemical

3.104
spray extraction appliance
an appliance for cleaning purposes, with or without heating elements and with or without attachments, by which a **cleaning agent** under pressure is sprayed into or onto the surface to be cleaned and the resultant soiled liquid is removed by suction in the same operation.

3.105
soiled water discharge pump
a pump for discharging the soiled water from the appliance.

3.106
maximum rated operating pressure
the maximum pressure generated by the pump when operated at **rated voltage** immediately before any pressure relief valve or sensing device operates, or the pressure at which the relief or sensing device is operating, whichever is the higher.

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3.107
conditions of adequate heat dissipation
a) for the **cleaning agent pre-heater**: the conditions that apply when the heating element is operated, starting with the complete appliance at ambient temperature.
b) for the cleaning agent heater: the conditions that apply when the heating element is operated as during normal use of the spray extraction appliance.

3.108
water-suction cleaning appliance
appliance for aspirating an aqueous solution that may contain foaming detergent

3.109
motorized cleaning head
accessory containing a motor that is supplied from the appliance and which is attached to the end of a hand-held hose or tube

NOTE The main cleaning head permanently attached is not regarded as a **motorized cleaning head**.

4 General requirement

This clause of Part 1 is applicable.

5 General conditions for the tests

This clause of Part 1 is applicable.

6 Classification

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

6.1 *Replacement:*

Spray extraction appliances and their attachments shall be of **class I**, **class II** or **class III** with respect to their protection against electric shock.

Compliance is checked by inspection and by the relevant tests.

6.2 *Addition:*

Spray extraction appliances shall be at least IPX4.

7 Marking and instructions

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

7.1 *Addition:*

- maximum rated operating pressure in MPa;
- maximum outlet temperature of the spraying liquid in °C, if above 50 °C;

NOTE The use of bar on the nameplate to designate the maximum rated operating pressure is allowed

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7.6 *Addition:*

 [symbol IEC 60417-5935 (DB:2002-10)]	**motorized cleaning head** for water-suction cleaning

7.9 *Addition:*

The operation of the vacuum motor is deemed to be an adequate indication of the position of the switch which exclusively controls the vacuum motor.

7.12 *Addition:*

The front cover of the instruction manual shall include the substance of the following:

CAUTION Read the instruction manual before using the appliance.

This wording may be replaced by symbols ISO 7000-0434 (DB:2004-01) and ISO 7000-1641 (DB 2004-01). If these symbols are used, their meaning is to be explained in the instructions for use.

The instruction manual shall give details regarding the following, as applicable:

– the precautions to be taken when using the appliance under specific conditions such as handling flammable liquids or dust, and dust hazardous to health;

– a statement that the appliance is to be disconnected from its power source during cleaning or maintenance and when replacing parts or converting the appliance to another function,

  - for mains operated appliances, the plug is to be removed from the socket-outlet,
  - for battery operated appliances, the key of the supply switch is to be removed or an equivalent disconnection is to be made;

The instruction manual shall state the A-weighted sound pressure level L_{PA} in dB(A) emitted by the appliance, measured in accordance with IEC 60704-2-1. If the A-weighted sound pressure level exceeds 85 dB(A), it shall also state the sound power level L_{WA} in dB(A) and that appropriate ear protection has to be used.

The instruction manual shall include the substance of the following:

This appliance is suitable for commercial use, for example in hotels, schools, hospitals, factories, shops, offices and rental businesses.

The instruction manual for mains operated appliances shall include the substance of the following:

– do not allow the rotating brushes to come into contact with the supply cord;

– regularly examine the supply cord for damage, such as cracking or ageing. If damage is found, replace the cord before further use;

– only replace the supply cord with the type specified in the instruction manual;

– only use the socket outlet on the appliance for purposes specified in the instruction manual.

The instruction manual shall state the substance of the following:

– CAUTION If foam or liquid escapes from the appliance, switch off immediately;

– regularly clean the water level limiting device in accordance with the instructions and examine it for signs of damage.

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If the symbol specified in 7.6, indicating that the **motorized cleaning head** can be used for water suction, is marked on the appliance its meaning shall be explained.

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 collect water;
- do not immerse in water for cleaning;
- the hose should be checked regularly and must not be used if damaged.

If symbol IEC 60417-5935 (DB:2002-10) is used, its meaning shall be explained.

7.14 *Addition:*

The height of symbol IEC 60417-5935 shall be at least 15 mm.

Compliance is checked by measurement.

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**, except those of **class III construction** having a working voltage up to 24 V shall be marked with symbol IEC 60417-5935.

NOTE This symbol is an information sign and, except for the colours, the rules of 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 This marking may be on the appliance close to the appliance outlet.

Compliance is checked by inspection.

8 Protection against access to live parts

This clause of Part 1 is applicable except as follows.

8.1 *Addition:*

NOTE 101 **Cleaning agents** and the soiled liquid picked up by the appliance are considered to be conductive.

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8.1.4 *Addition:*

Isolated battery systems of 18 to 24 cells of either acid or alkaline electrochemistry, including gel batteries, shall be regarded as **Class III** provided that

– the maximum voltage per cell on charge does not exceed 2,7 V;
– there are no earthed parts (see clause 27);
– conductive parts cannot fall on to and thereby bridge **live parts** of opposite polarity (see clause 22).

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.

11 Heating

This clause of Part 1 is applicable except as follows.

11.3 *Addition:*

If it is necessary to dismantle the appliance for fitting thermocouples or other wiring, the input shall be measured before and after fitting at the lowest possible load, for example, with closed suction openings, to check that the assembling has been accomplished properly.

11.4 *Addition:*

If filling with warm water or continuously supplying with warm water is prescribed by the instructions for use, the temperature of the filling or of the supplied water shall not exceed the temperature rating and/or maximum temperature of 80 ºC.

11.7 *Addition:*

Appliances are operated until steady conditions are established.

12 Void

13 Leakage current and dielectric strength at operating temperature

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

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13.2 *Addition:*

*For **class I appliances** where several motors operate at the same time, the leakage current shall not exceed 3,5 mA*

14 Transient overvoltages

This clause of Part 1 is applicable.

15 Moisture resistance

This clause of Part 1 is applicable except as follows.

15.1.2 *Addition:*

Wet suction appliances shall be operated for 10 min on a level surface wetted by a detergent solution as specified in 15.2.

NOTE 101 In practice, the pick-up consists largely of air such that there is no overloading of the suction motor; the input load should be observed to avoid overloading.

15.2 *Replacement:*

Appliances shall be so constructed that spillage of liquid due to overfilling and, for unstable appliances and **hand-held appliances**, overturning, does not affect their electrical insulation.

Compliance is checked by the following tests:

*Appliances provided with an appliance inlet are fitted with an appropriate connector and flexible cable or cord; appliances with **type X attachment** are fitted with the lightest cross-sectional area specified in Table 11.Other appliances are tested as delivered.*

The liquid container of the appliance is completely filled with water containing approximately 1 % NaCl and a further quantity, equal to 15 % of the capacity of the container or 0,25 l, whichever is the greater, is poured in steadily over a period of 1 min.

***Hand-held appliances** and appliances which are unstable are then, with the container completely filled and with the cover or lid in place, overturned from the most unfavourable of the normal positions of use, and are left in that position for 5 min unless the appliance returns automatically to its normal position of use.*

NOTE 101 Appliances are considered to be unstable if they overturn when applying a force of 180 N at the top of the appliance in the most unfavourable horizontal direction while they are placed in the most unfavourable of the normal positions of use on a support inclined at an angle of 10° to the horizontal, the liquid container being filled to half the level indicated in the manufacturer's instructions.

*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 l of water.

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

NOTE 102 The solution is to be stored in a cool atmosphere and used within seven days of its preparation.

NOTE 103 The chemical designation of dodecyl sodium sulphate is $C_{12}H_{25}NaSO_4$.

NOTE 104 If it is not possible to overfill the container for soiled liquid owing to the construction of the appliance, the test specified in 19.101 is considered to be adequate.

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.*

NOTE 105 The appliance is allowed to stand in normal test room atmosphere for 24h before being subjected to the test of 15.3

15.3 *Modification:*

The relative humidity shall be 93 % ± 6 %.

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 free fall test procedure 1 of IEC 60068-2-32. 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 IEC 60529, the water containing approximately 1% NaCl.*

*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, and inspection shall show that there is no trace of saline solution on insulation which could result in a reduction of **clearances** and **creepage distances** below the values specified in Clause 29.*

NOTE 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 20 °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.

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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:*

Appliances are also subjected to the tests of 19.101 and 19.102.

19.2 *Addition:*

The appliance is tested without liquid in the container.

NOTE 101 The term restricted heat dissipation means without liquid in the container.

19.7 *Addition:*

Agitating devices are not regarded as parts liable to be jammed.

Fan blades of water suction systems are not regarded as parts liable to be jammed.

Pressure pumps are not regarded as parts liable to be jammed, provided they are fitted with a filter.

***Soiled water discharge pumps** are liable to be jammed.*

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

19.9 Not applicable.

19.10 *Addition:*

NOTE 101 For this test the lowest possible load is obtained with the air inlet sealed. In the case of agitating devices driving a brush or agitator, the belt is removed.

19.101 *Appliances having containers which are provided with shut-off device(s) or valve(s) are again subjected to the test of 15.2.*

Stop valves or other fluid shut-off devices shall be made inoperative. If two or more independent shut-off devices are provided, only one of them is made inoperative at a time, provided that they have passed the test of operating 3 000 times satisfactorily. Otherwise all that failed shall be made inoperative.

NOTE 101 Care should be taken to suck-up an air-liquid mixture to prevent overloading of the motor of the suction unit. The input power should be observed to avoid overloading.

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After this test, the appliance shall be subjected to the electrical strength test of 16.4. Inspection shall show that water has not entered the appliance to any dangerous extent. In particular, there shall be no trace of water on the electrical insulation that would result in the reduction of ***clearance and creepage distances*** *below the limits specified in Clause 29.*

19.102 *If the pressure pump has a pressure operated switch or unloading device, that has failed the test of 20.101 and the failure may allow pressures to be created in excess of 1,5 times* ***maximum rated operating pressure****, then the switch or unloading device shall be made inoperative.*

After this test, the appliance shall be subjected to the electrical strength test of 16.4. Inspection shall show that water has not entered the appliance to any dangerous extent. In particular, there shall be no trace of water on the electrical insulation that would result in the reduction of ***clearance and creepage distances*** *below the limits specified in Clause 29.*

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.

20.101 Cleaning agent pumps, pipes and hoses, hose connectors and couplers, valves and other components of **spray extraction appliances** shall be designed to withstand any mechanical, chemical or thermal stresses that may occur during normal use.

Compliance is checked by the following test:

Pipes and hoses, hose connectors and couplers, valves and other components which are subjected to the operating pressure of the ***cleaning agent*** *shall be filled with the* ***cleaning agent*** *recommended by the manufacturer at the normal dilution and aged for 10 days (240 h) freely suspended in a heating cabinet with natural circulation.*

The temperature shall be maintained:

– *at (70 ± 2) ºC, if the temperature of the* ***cleaning agent*** *solution does not exceed 50 ºC during conditions of* ***normal operation****, or*

– *at (90 ±2) ºC, if the temperature of the* ***cleaning agent*** *exceeds 50 ºC during conditions of* ***normal operation****.*

Immediately afterwards, the parts, or the entire assembly of these parts, shall be put into a water bath with a temperature of:

– *(50 ± 3) ºC, if the temperature of the* ***cleaning agent*** *does not exceed 50 ºC during conditions of* ***normal operation,*** *or*

– *(85 ± 3) ºC, if the temperature of the* ***cleaning agent*** *exceeds 50 ºC during conditions of* ***normal operation****.*

While the parts are in the water bath, they shall be subjected to a pressure test at 1,5 times the ***maximum rated operating pressure*** *of the appliance for 30 min.* ***Cleaning agent*** *shall be used as a test liquid. No damage that could impair safety shall occur to any of the parts during the test. Pressure operated switches for the control of cleaning solution pumps shall be subjected to pressure obtained during the appropriate test of Clause 19. Pressure operated switches shall also be inspected for effectiveness in avoiding* ***cleaning agent*** *coming into contact with insulation and a pin hole shall be made in any polymer diaphragm that is flexed in use to ensure that this does not pass the* ***cleaning agent*** *which would result in the reduction of* ***clearances*** *and* ***creepage distances*** *below the limits specified in Clause 29.*

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A switch or an unloading device that remains in a functioning mode shall be further tested by allowing the pressure to build up until it operates. The pressure so created is then regarded as the normal pressure for that part of the system.

Further testing at 1,5 times this (elevated) normal pressure is then done on the part of the system sustaining this pressure. There shall be no failure within the meaning of this standard.

21 Mechanical strength

This clause of Part 1 is applicable except as follows.

Modification:

The impact value is increased to 1,0 J ± 0,04 J.

21.101 Those parts of the machine which are subjected to impact in normal use are tested as follows.

If failure of the part subject to impact would cause a failure to comply with this specification, any spot of the machine which may be exposed during normal cleaning function to impacts or blows shall be subjected to a single blow with an impact energy of 6,75 Nm. The impact stress on the free-standing machines shall be exerted by a steel sphere with a diameter of 50,8 mm and mass of 0,535 kg dropped from a height of 1,3 m or hanging on a string acting as a pendulum, falling from a height of 1,3 m.

21.102 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 ± 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.

21.103 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 102. The crank rotates at 30 revolutions per minute 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 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.

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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.*

21.104 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 103. The distance between the pivot axis of the arm and the point where the hose enters the rigid part is 300 mm ± 5 mm. The arm can be raised from the horizontal position by an angle of 40° ± 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 1 It may be necessary to reposition the mass 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 ± 1 r/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.

NOTE 2 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.

21.105 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.

21.106 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 104 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 °C ± 2 °C. Immediately after the hose is removed from the cabinet it is flexed three times, as shown in Figure 105, 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 Any discoloration is neglected.

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22 Construction

This clause of Part 1 is applicable except as follows.

22.6 *Addition:*

Appliances shall be constructed so as to prevent entry of water, cleaning liquids or foam from detergents into motors, switch gear or controls.

22.35 *Modification:*

Delete the note.

Addition:

These parts are subject to the hammer test of clause 21. If this insulation does not meet the requirement of 29.3, these are subject to the following impact test.

A sample of the covered part is conditioned at a temperature of 70 °C ± 2 °C for seven days (168 h). After conditioning, the sample is allowed to attain approximately room temperature.

Inspection shall show that the covering has not shrunk to such an extent that the required insulation is no longer given or that the covering has not peeled off, so that it may move longitudinally.

After this, the sample is maintained for 4 h at a temperature of –10 °C ± 2 ºC.

While still at this temperature, the sample is then subjected to impact by means of the apparatus shown in Figure 101. The weight "A", having a mass of 0,3 kg, falls from a height of 350 mm on to the chisel "B" of hardened steel, the edge of which is placed on the sample.

One impact is applied to each place where the insulation is likely to be weak or damaged in normal use, the distance between the points of impact being at least 10 mm.

After this test, it shall show that the insulation has not peeled off and an electric strength test as specified in 16.3 is made between metal parts and metal foil wrapped round the insulation in the area required to be insulated.

22.101 Spray extraction appliances shall have no **live parts** at a distance of less than 30 mm from the floor where there is an opening which could admit liquid.

Compliance is checked by inspection and measurements.

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22.102 The addition of a power outlet shall not impair the safety of the appliance.

Compliance is checked by the test of this standard taking the manufacturer's instructions into consideration.

22.103 Class I appliances or **class II appliances** shall employ a mains isolating switch or switches having a contact separation in all poles that provide full disconnection under overvoltage category III conditions. Additional switches may be of single pole construction.

Components, such as RFI suppressors, mains indicating lights, phase rotation indicators, can be connected to the live side of the isolating switch, providing any failure does not constitute a failure to comply with the requirements of this standard.

Compliance is checked by inspection.

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:*

The main switch and additional switches which are operated frequently shall be tested for 50 000 cycles of operations.

24.7 Not applicable.

24.101 Appliances shall be constructed so that, in normal use, there will be no electrical or mechanical failure that could impair compliance with this standard. The insulation shall not be damaged and contacts and connections shall not work loose as a result of such things as heating and vibration.

*Compliance is checked by the tests of this standard and for appliances with motors provided with **self-resetting thermal cut-outs** as follows.*

*The appliance is supplied at a voltage equal to 1,1 times **rated voltage**, under locked rotor conditions so as to cause the **thermal cut-out** to operate within a few minutes, until the **thermal cut-out** has performed 200 cycles of operation. The test shall be carried out with a **cleaning agent** that has not been heated, and with heating elements, if any, out of circuit.*

After the test the appliance shall withstand the tests of clause 16.

25 Supply connection and external flexible cords

This clause of Part 1 is applicable except as follows.

25.1 *Addition:*

Appliances classified as IPX7 shall not be provided with an appliance inlet.

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Appliances classified as IPX4, IPX5 or IPX6 shall not be provided with an appliance inlet, unless both inlet and connector have the same classification as the appliance when coupled or separated, or unless inlet and connector can only be separated by the use of a tool and have the same classification as the appliance when coupled.

Appliances provided with appliance inlets shall also be provided with an appropriate cord set.

25.7 *Addition:*

Power supply cords shall be not lighter than:

- if rubber insulated, ordinary tough rubber sheathed flexible cord (code designation 60245 IEC 53);
- if polyvinyl chloride insulated, ordinary polyvinyl chloride sheathed flexible cord (code designation 60227 IEC 53).

25.14 *Addition:*

For appliances incorporating a **type X attachment** or **type Y attachment** the number of flexings is 20 000.

25.15 *Modification:*

Replace table 12 by the following:

Table 12 – Pull force and torque

Mass of appliance	***Pull force***	***Torque***
kg	*N*	*Nm*
≤ 1	*30*	*0,1*
>1 and ≤ 4	*60*	*0,25*
> 4	*125*	*0,40*

Addition:

The test is also applied to the cord in the cord set for appliances classified as IPX4 or higher that are provided with an appliance inlet. The cord set is fitted to the appliance inlet prior to the commencement of the test.

25.23 Addition:

NOTE 101 There is no limitation on the length of conductors in flexible hoses.

26 Terminals for external conductors

This clause of Part 1 is applicable.

27 Provision for earthing

This clause of Part 1 is applicable.

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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 due to normal use of the appliance.

30 Resistance to heat and fire

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

30.2.3 Not applicable.

31 Resistance to rusting

This clause of Part 1 is applicable.

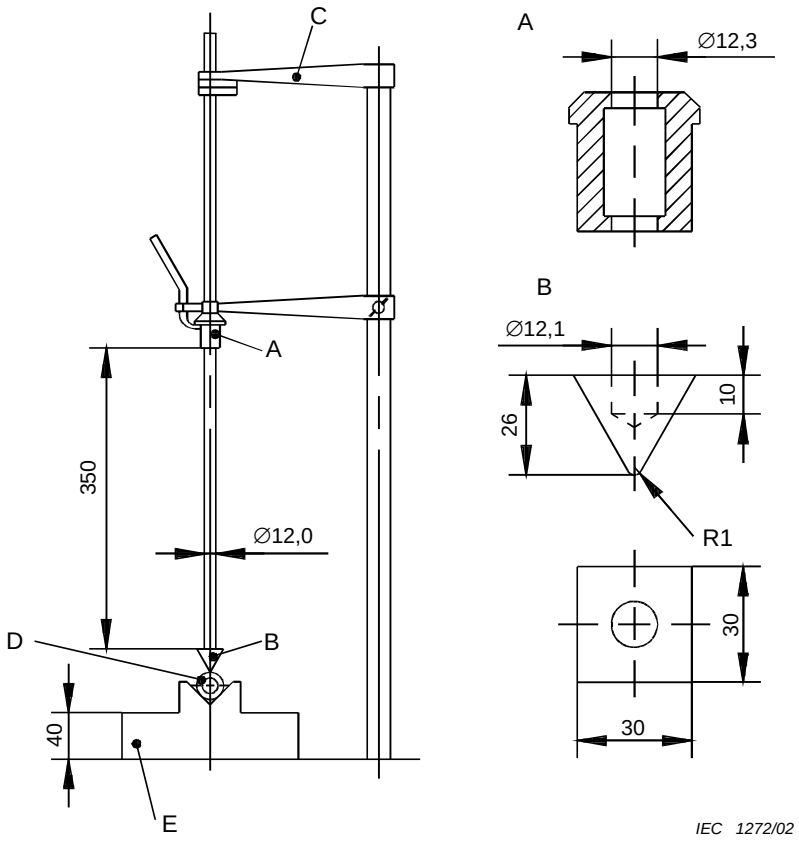
32 Radiation, toxicity and similar hazards

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

Addition:

NOTE 101 For attachments intended to pick up hazardous dust, additional requirements are specified in Annex AA of IEC 60335-2-69.

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Dimensions in millimeters

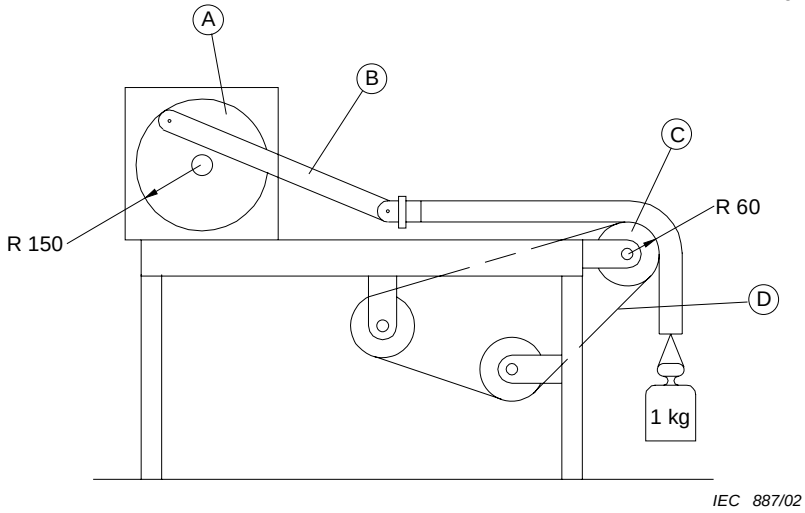
Key

A = Weight
B = Chisel
C = Fixing arm
D = Sample
E = Base having mass of 10 kg

Figure 101 – Impact test apparatus

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Dimensions in millimetres



Key

A Crank mechanism

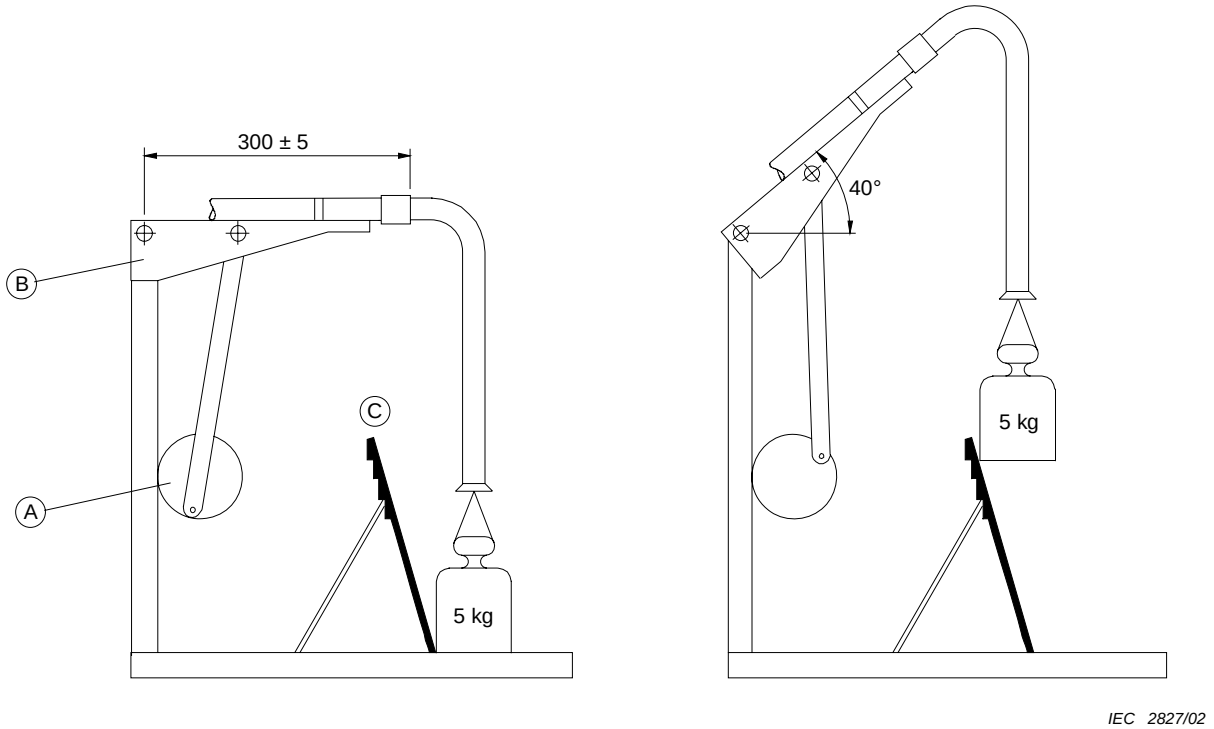
B Connecting rod

C Roller, diameter 120 mm

D Abrasive cloth belt

Figure 102 – Apparatus for testing the abrasion resistance of current-carrying hoses

Dimensions in millimetres



Key

A Crank mechanism

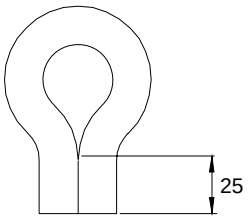
B Arm

C Inclined plane

Figure 103 – Apparatus for testing the resistance to flexing of current-carrying hoses

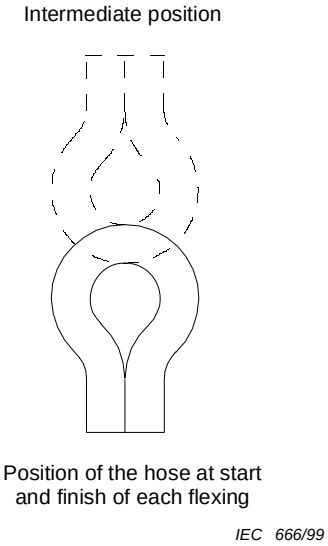
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Dimensions in millimetres



IEC 665/99

Figure 104 – Configuration of the hose for the freezing treatment



IEC 666/99

Figure 105 – Flexing positions for the hose after removal from the freezing cabinet

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Annexes

The annexes of Part 1 are applicable.

Bibliography

The bibliography of Part 1 is applicable except as follows.

Addition:

IEC 60335-2-69, *Household and similar electrical appliances – Safety – Part 2-69: Particular requirements for wet and dry vacuum cleaners, including power brush, for industrial and commercial use*

ISO 3864-1, *Graphical symbols – Safety colours and safety signs – Part 1: Design principles for safety signs in workplaces and public areas*

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