

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**

ICS 97.080

National foreword

This British Standard is the UK implementation of EN 60335-2-69:2003+A2:2008. It is derived from IEC 60335-2-69:2002, incorporating amendments 1:2004 and 2:2007. It supersedes BS EN 60335-2-69:2003+A1:2004 which will be withdrawn on 1 February 2011.

NOTE BS EN 60335-2-69:2003+A1:2004 superseded BS EN 60335-2-69:1999, which is withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to IEC text carry the number of the IEC amendment. For example, text altered by IEC amendment 1 is indicated by **A1** **A1**.

The CENELEC common modifications have been implemented at the appropriate places in the text. The start and finish of each common modification is indicated in the text by tags **C** **C**.

The UK participation in its preparation was entrusted by Technical Committee CPL/61, Safety of household and similar electrical appliances, to Subcommittee CPL/61/10, Floor treatment machines (industrial).

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

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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

(IEC 60335-2-69:2002)

Appareils électrodomestiques et analogues —
Sécurité —
Partie 2-69: Règles particulières pour les
aspirateurs fonctionnant en présence d'eau ou à
sec, y compris les brosses motorisées, à usage
industriel et commercial
(CEI 60335-2-69:2002)

Sicherheit elektrischer Geräte für den
Hausgebrauch und ähnliche Zwecke —
Teil 2-69: Besondere Anforderungen für Staub-
und Wassersauger einschließlich
kraftbetriebener Bürsten für industrielle und
gewerbliche Zwecke
(IEC 60335-2-69:2002)

This European Standard was approved by CENELEC on 2003-03-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B-1050 Brussels

Foreword

The text of document 61J/131/FDIS, future third edition of IEC 60335-2-69, prepared by SC 61J of the IEC Technical Committee 61, was submitted to the IEC-CENELEC parallel vote.

As a result of the Kista meeting of CENELEC TC 61 in May 2002, a draft amendment prAA containing the relevant existing common modifications was submitted to the formal vote.

The texts of the FDIS and the prAA were approved by CENELEC as a new edition of EN 60335-2-69 on 2003-03-01.

This European Standard replaces EN 60335-2-69:1998 + A1:2000 + A11:2002.

The following dates are applicable:

- latest date by which the EN has to be implemented
at national level by publication of an identical
national standard or by endorsement (dop) 2004-03-01
- date on which national standards
conflicting with the EN have to be withdrawn (dow) 2006-03-01

This part 2 has to be used in conjunction with EN 60335-1, Household and similar electrical appliances – Safety – Part 1: General requirements. It was established on the basis of the 2002 edition of that standard. Amendments and revisions of Part 1 have also to be taken into account and the dates when such changes become applicable will be stated in the relevant amendment or revision of Part 1.

This part 2 supplements or modifies the corresponding clauses of EN 60335-1, so as to convert it into the European Standard: Safety requirements for electric wet and dry vacuum cleaners, including power brush, 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 of Part 1 is to be adapted accordingly.

NOTE 1 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.;
- subclauses, notes and annexes that are additional to those in the IEC standard are prefixed with the letter Z.

NOTE 2 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.

Special national conditions causing a deviation from this European Standard are listed in annex ZA and are in addition to those in EN 60335-1.

There are no national deviations from this European Standard, other than those listed in Annex ZB to EN 60335-1.

p NOTE In this document, p is used in the margin to indicate instructions for preparing the printed version.

Introduction

An investigation by CENELEC TC 61 has shown that all risks from products within the scope of this standard are fully covered by the Low Voltage Directive, 73/23/EEC. For products having mechanical moving parts, a risk assessment in accordance with the Machinery Directive, 98/37/EC, has shown that the risks are mainly of electrical origin and consequently this directive is not applicable. However, the relevant essential safety requirements of the Machinery Directive are covered by this standard together with the principal objectives of the Low Voltage Directive.

Endorsement notice

The text of the International Standard IEC 60335-2-69:2002 was approved by CENELEC as a European Standard with agreed common modifications.

Foreword to amendment A1

The text of document 61J/169/FDIS, future amendment 1 to IEC 60335-2-69:2002, prepared by SC 61J, Electrical motor-operated cleaning appliances for industrial use, of the IEC Technical Committee 61, Safety of household and similar electrical appliances, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as amendment A1 to EN 60335-2-69:2003 on 2004-10-01.

The following dates are applicable:

- latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2005-08-01
- date on which national standards conflicting with the amendment have to be withdrawn (dow) 2007-10-01

This amendment supplements or modifies the corresponding clauses of EN 60335-2-69:2003.

As a consequence of endorsing amendment 1:2004 to IEC 60335-2-69:2002, the common modifications in EN 60335-2-69:2003 are replaced by IEC text and therefore withdrawn.

There are no special national conditions causing a deviation from this amendment.

There are no national deviations from this amendment.

Endorsement notice

The text of amendment 1:2004 to the International Standard IEC 60335-2-69:2002 was approved by CENELEC as an amendment to the European Standard without any modification.

Foreword to amendment A2

The text of document 61J/271/FDIS, future amendment 2 to IEC 60335-2-69:2002, prepared by SC 61J, Electrical motor-operated cleaning appliances for industrial use, of IEC Technical Committee 61, Safety of household and similar electrical appliances, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as amendment A2 to EN 60335-2-69:2003 on 2008-02-01.

The following dates are applicable:

- latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2008-11-01
- date on which national standards conflicting with the amendment have to be withdrawn (dow) 2011-02-01

This amendment supplements or modifies the corresponding clauses of EN 60335-2-69:2003.

There are no special national conditions causing a deviation from this amendment.

There are no national deviations from this amendment.

Endorsement notice

The text of amendment 2:2007 to the International Standard IEC 60335-2-69:2002 was approved by CENELEC as an amendment to the European Standard without any modification.

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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.

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 that impair the level of safety covered by these requirements.

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

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

Part 2-69: Particular requirements for wet and dry vacuum cleaners, including power brush, 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 motor-operated vacuum cleaners and includes appliances and stationary equipment specifically designed for wet suction, dry suction, or wet and dry suction for industrial and commercial use with or without attachments, for example for suction to withdraw dust or the like from work benches and production machines, their **rated voltage** being not more than 250 V for single-phase appliances and 480 V for other appliances.

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

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.

For battery operated appliances reference shall be made to IEC 60335-2-72.

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 for household use to which IEC 60335-2-2 applies;
- centrally sited stationary vacuum cleaning systems;
- 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).

 – hand-held mains-operated electrical garden blowers, vacuums and blower vacuums (IEC 60335-2-100). 

2 Normative references

This clause of Part 1 is applicable except as follows.

Addition:

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

IEC 60335-2-72, *Household and similar electrical appliances – Safety – Part 2-72: Particular requirements for automatic machines for floor treatment for commercial and industrial use*

A1 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*

IEC 61241-1-1, *Electrical apparatus for use in the presence of combustible dust – Part 1-1: Electrical apparatus protected by enclosures and surface temperature limitation – Specification for apparatus*

IEC 61241-10:2004, *Electrical apparatus for use in the presence of combustible dust – Part 10: Classification of areas where combustible dusts are or may be present*

A2 ISO 2602, *Statistical interpretation of test results – Estimation of the mean – Confidence interval* **A2**

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

ISO 7731, *Safety of machinery – Auditory danger signals – General requirements, design and testing*

ISO 11428, *Ergonomics – Visual danger signals – General requirements, design and testing* **A1**

3 Definitions

This clause of Part 1 is applicable except as follows.

3.1.9 Replacement:

normal operation

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 measurements are made with the appliance fitted with a clean dust bag and filter and with the water container, if any, empty. If the appliance is intended for use only with a hose, detachable nozzles are removed and 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, 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 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:

- 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 should 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.

3.1.9.101 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

soiled water discharge pump

pump for discharging the soiled water from the machine

3.102

water-suction cleaning appliance

appliance for aspirating an aqueous solution that may contain foaming detergent

3.103

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:

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

 Metal parts that may continuously contact the body shall be considered as handles for which 22.36 applies. 

Compliance is checked by inspection and by the relevant tests.

6.2 Addition:

Water suction appliances shall be so constructed that neither water nor foam from detergents can penetrate into the motor or come in contact with **live parts**.

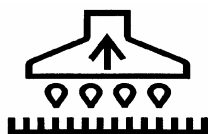
Water suction appliances shall be at least IPX4.

7 Marking and instructions

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

 *Text deleted* 

7.6 Addition:



[symbol IEC 60417-5935 (DB:2000-10)]

motorized cleaning head for water-suction cleaning

7.9 Addition:

The operation of the motor is deemed to be an adequate indication of the switch position.

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 7000-0434A/B 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 include the substance of the following warnings, as applicable.

- CAUTION This appliance is not suitable for picking up hazardous dust.
- CAUTION This appliance is for dry use only and is not to be used or stored outdoors in wet conditions.
- WARNING Only use the brushes provided with the appliance or those specified in the instruction manual. The use of other brushes may impair safety.

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 that 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 intended use of brushes which are specified for the appliance.

The instruction manual shall state the A-weighted sound pressure level L_{PA} in dB(A) emitted by the appliance. 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 sound level is measured in accordance with IEC 60704-2-1).

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.

For wet suction appliances, 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.

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 The hose contains electrical connections:
 - do not use to collect water;
 - do not immerse in water for cleaning;
 - the hose should be checked regularly and shall not be used if damaged.

If symbol IEC 60417-5935 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 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 The soiled liquid picked up by the wet suction appliance is considered to be conductive.

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.

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, with brushes not in contact with the floor, with declutched drive, etc. to check that the assembling has been accomplished properly.

11.4 Not applicable.

11.5 Addition:

For the heating test the normal load P_r on the motor driving the moving brushes can be simulated by a brake or other means.

11.6 Not applicable.

11.7 Addition:

Appliances are operated until steady conditions are established.

12 Void

13 Leakage current and electric strength at operating temperature

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

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 specified in 15.2.

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 having a liquid container 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 having a liquid container and provided with an appliance inlet are fitted with an appropriate connector and flexible cable or cord; appliances having a liquid container and **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.

[A1] *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.

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

NOTE 102 The solution should 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 24 h before being subjected to the test of 15.3. **[A1]**

15.3 Modification:

The relative humidity shall be $(93 \pm 6) \%$.

[A1] **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 EC 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. **[A1]***

A1 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** being a **working voltage** up to 24 V. **A1**

16 Leakage current and electric strength

This clause of Part 1 is applicable.

A1 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 $20\text{ °C} \pm 5\text{ °C}$. 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. **A1**

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 test of 19.101.

A1 The test of 19.7 is only carried out on **motorized cleaning heads**. **A1**

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

A1 **Motorized cleaning heads** are tested with the rotating brush or similar device locked for 30 s. **A1**

19.9 Not applicable.**19.10 Addition:**

NOTE 101 For this test the lowest possible load for radial turbines is obtained with the air inlet sealed. Other turbine types may have different characteristics.

In the case of cleaners driving a brush or agitator, the belt is removed.

19.101 *Appliances having containers that 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 are 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 devices that failed are made inoperative.

NOTE 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.

*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.

A1 20.1 Addition:

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

20.101 Shaft ends and similar rotating parts shall be protected if they protrude by more than a quarter of their diameter, unless the end is rounded and less than 50 mm in length.

Injury due to unintentional closing or slamming of parts, such as movable side walls and covers, shall be prevented.

Wheels or rollers for the transport of appliances heavier than 20 kg shall be located or protected so that injury to the feet of the operator is prevented.

*Compliance is checked by inspection, by measurement and by manual test. **A1***

20.2 Addition:

This requirement does not apply to rotating brushes and similar devices, or to moving parts exposed during the fitting of accessories that allow conversion from one application to another.

Ⓒ 20.2101 Shaft ends and similar rotating parts shall be protected if they protrude by more than a quarter of their diameter, unless the end is rounded and less than 50 mm in length.

Injury due to unintentional closing or slamming of parts, such as movable side walls and covers, shall be prevented.

Wheels or rollers for the transport of appliances heavier than 20 kg shall be located or protected so that injury to the feet of the operator is prevented.

Compliance is checked by inspection, by measurement and by manual test. Ⓒ

21 Mechanical strength

This clause of Part 1 is applicable except as follows.

Modification:

The impact value is increased to $1,0 \text{ J} \pm 0,04 \text{ J}$.

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 $50 \text{ mm/min} \pm 5 \text{ mm/min}$ 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. Ⓐ