



Safety of household and similar electrical appliances —

Part 2-2: Particular requirements for vacuum cleaners and water suction cleaning appliances

The European Standard EN 60335-2-2:1995 with the incorporation of amendments A1:1998 and A2:2000 has the status of a British Standard

ICS 97.080

Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee CPL/61, Safety of electrical appliances, upon which the following bodies were represented:

Agricultural Engineers' Association
 Association of Consulting Scientists
 Association of Control Manufacturers [TACMA (BEAMA Ltd.)]
 Association of Manufacturers of Domestic Electrical Appliances
 British Cable Makers Confederation
 British Electrotechnical Approvals Board
 British Pest Control Association
 British Retail Consortium
 CESA (the Association of Catering Equipment Manufacturers and Importers)
 Consumer Policy Committee of BSI
 Consumers' Association
 Department of Trade and Industry (Consumer Safety Unit, CA Division)
 ERA Technology Ltd.
 Electrical Installation Equipment Manufacturers' Association (BEAMA Ltd.)
 Electricity Association
 Health and Safety Executive
 Industrial Cleaning Machine Manufacturers' Association (BEAMA Ltd.)
 Institute of Trading Standards Administration
 Institution of Electrical Engineers
 Loss Prevention Council
 Ministry of Defence
 Portable Electric Tool Manufacturers' Association
 Rotating Electrical Machines Association (BEAMA Ltd.)
 Royal Society for the Prevention of Accidents
 Small Electrical Appliances Marketing Association

The following body was also represented in the drafting of the standard, through subcommittees and panels:

Department of Health

This British Standard, having been prepared under the direction of the Electrotechnical Sector Board, was published under the authority of the Standards Board and comes into effect on 15 March 1996

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Contents

	Page
Committees responsible	Inside front cover
National foreword	ii
Foreword	2
Text of EN 60335-2-2	5
National annex NA (informative) Original IEC text amended by CENELEC common modifications	17

National foreword

This British Standard has been prepared by Technical Committee CPL/61 and is the English language version of EN 60335-2-2:1995, including amendments A1:1998 and A2:2000 and corrigendum April 2000, published by the European Committee for Electrotechnical Standardization (CENELEC). It was derived from IEC 60335-2-2:1993 (fourth edition), including amendments 1:1998 and 2:1999, published by the International Electrotechnical Commission (IEC), which has the same title as the European Standard.

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** **C1**.

The start and finish of text introduced or altered by amendment is indicated in the text by tags **A1** **A1**. 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 national differences taken from the preface to IEC 60335-2-2:1993 and parts of the original IEC text that have been modified by CENELEC are quoted in National annex NA.

NOTE Corrigendum April 2000 correct the text of 6.1, first paragraph.

The foreword of EN 60335-2-2 makes reference to the date of withdrawal, dow, of the relevant national standard. In this case the relevant national standard is BS 3456-202.2:1990 which will be withdrawn on 1 January 1998 in accordance with the CENELEC Internal Regulations. Certificates and marks will not be awarded after this date with regard to the withdrawn British Standard. However, such certificates and marks, already awarded, may continue to apply to production until 1 January 2003.

This British Standard is to be read in conjunction with BS EN 60335-1:1995, *Specification for safety of household and similar electrical appliances — Part 1: General requirements*. The many references to Part 1 should be read as references to BS EN 60335-1, which is the English language version of EN 60335-1:1994 which was derived from IEC publication 60335-1 (third edition 1991, second impression 1993). 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.

Product approval. Attention is drawn to the fact that products conforming to this British Standard may be approved by the British Electrotechnical Approvals Board for the purposes of participation in the CENELEC Certification Agreement and in the CB Scheme of the IECEE. (Details of the BEAB Approval Scheme are given on the inside back cover.)

Cross-references

Attention is drawn to the fact the CEN and CENELEC Standards normally include an annex which lists normative references to international publications with their corresponding European publications. The British Standards which implement these international or European publications may be found in the BSI Standards Catalogue under the section entitled “International Standards Correspondence Index”, or by using the “Find” facility of the BSI Standards Electronic Catalogue.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 17 and a back cover.

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Descriptors: Household electrical appliances, vacuum cleaners, cleaning appliances, safety requirements, protection against electric shock, fire protection, protection against mechanical hazard

English version

Safety of household and similar electrical appliances — Part 2-2: Particular requirements for vacuum cleaners and water suction cleaning appliances

(includes amendments A1:1998 and A2:2000)
(IEC 60335-2-2:1993 + A1:1998 + A2:1999, modified)

Sécurité des appareils électrodomestiques et analogues —
Partie 2-2: Règles particulières pour les aspirateurs et les appareils de nettoyage à aspiration d'eau
(inclut les amendements A1:1998 et A2:2000)
(CEI 60335-2-2:1993 + A1:1998 + A2:1999, modifiée)

Sicherheit elektrischer Geräte für den Hausgebrauch und ähnliche Zwecke —
Teil 2-2: Besondere Anforderungen für Staubsauger und Wassersauger
(enthält Änderungen A1:1998 und A2:2000)
(IEC 60335-2-2:1993 + A1:1998 + A2:1999, modifiziert)

This European Standard was approved by CENELEC on 1995-07-04. 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.

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.

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.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, 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 proposal to endorse IEC 335-2-2:1993, document CLC/TC 61 (SEC)904, was circulated under the enquiry procedure in July 1993. This proposal was discussed during the Oslo meeting in April 1994, when it was decided to submit a draft for EN 60335-2-2 to the formal vote.

This draft was circulated in November 1994 and was ratified by CENELEC as EN 60335-2-2 on 1995-07-04.

This European Standard has been prepared by the Secretariat of CENELEC Technical Committee TC 61.

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) 1996-01-01
- latest date by which national standards conflicting with the EN have to be withdrawn (dow) 1998-01-01

For products which have complied with EN 60335-2-2:1988 including its amendments A2:1990, A52:1991 and A53:1994 before 1998-01-01, as shown by the manufacturer or by a certification body, this previous standard may continue to apply for production until 2003-01-01.

This standard has to be used in conjunction with EN 60335-1, *Safety of household and similar electrical appliances — Part 1: General requirements*. It was established on the basis of the 1994 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 vacuum cleaners and water suction cleaning appliances*.

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

Subclauses and figures which are additional to those in Part 1 are numbered starting from 101.

There are no special national conditions causing a deviation from this European Standard, other than those listed in Annex ZA to EN 60335-1.

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

NOTE 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 2. When a definition of Part 1 concerns an adjective, the adjective and the associated noun are also in bold.

Foreword to amendment A1

The text of document 61/1342/FDIS, future amendment to IEC 60335-2-2:1993 prepared by the IEC Technical Committee 61, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as amendment A1 to EN 60335-2-2 on 1998-01-01.

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) 1998-10-01
- date on which national standards conflicting with the amendment have to be withdrawn (dow) 2005-01-01

This amendment supplements or modifies the corresponding clauses of EN 60335-2-2:1995.

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

There are no national deviations from this amendment.

Foreword to amendment A2

The text of document 61/1642/FDIS, future amendment to IEC 60335-2-2:1993 prepared by the IEC Technical Committee 61, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as amendment A2 to EN 60335-2-2 on 1999-12-01.

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) 2000-11-01
- date on which national standards conflicting with the amendment have to be withdrawn (dow) 2002-12-01

This amendment supplements or modifies the corresponding clauses of EN 60335-2-2:1995.

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

There are no national deviations from this amendment.

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. If the product has mechanical moving parts, a risk assessment in accordance with the Machinery Directive, 89/392/EEC, 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.

Contents

	Page
Foreword	2
1 Scope	5
2 Definitions	5
3 General requirement	6
4 General conditions for the tests	6
5 Void	6
6 Classification	6
7 Marking and instructions	6
8 Protection against access to live parts	7
9 Starting of motor-operated appliances	7
10 Power input and current	7
11 Heating	7
12 Void	8
13 Leakage current and electric strength at operating temperature	8
14 Void	8
15 Moisture resistance	8
16 Leakage current and electric strength	9
17 Overload protection of transformers and associated circuits	9
18 Endurance	9
19 Abnormal operation	9
20 Stability and mechanical hazards	9
21 Mechanical strength	10
22 Construction	11
23 Internal wiring	11
24 Components	11
25 Supply connection and external flexible cords	11
26 Terminals for external conductors	12
27 Provision for earthing	12
28 Screws and connections	12
29 Creepage distances, clearances and distances through insulation	12
30 Resistance to heat, fire and tracking	12
31 Resistance to rusting	12
32 Radiation, toxicity and similar hazards	12

	Page
Annex A (normative) Normative reference	16
Annex C (normative) Ageing test on motors	16
Figure 101 — Apparatus for testing the abrasion resistance of current-carrying hoses (21.102)	13
Figure 102 — Apparatus for testing the resistance to flexing of current-carrying hoses (21.103)	14
Figure 103 — Configuration of the hose for the freezing treatment (22.102)	14
Figure 104 — Flexing positions for the hose after removal from the freezing cabinet (22.102)	15

1 Scope

This clause of part 1 is replaced by:

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. A_1 It also applies to **centrally-sited vacuum cleaners**. A_1

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

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 1 Examples are appliances intended to be used for normal housekeeping purposes in hotels, offices, schools, hospitals and similar premises.

So far as is practicable, this standard deals with the common hazards presented by appliances which are encountered by all persons in and around the home.

This standard does not in general take into account:

- the use of appliances by young children or infirm persons without supervision;
- playing with the appliance by young children.

NOTE 2 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;
- for appliances intended to be used in tropical countries special 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 3 This standard does not apply to:

- appliances incorporating heating elements;
- A_1 — appliances designed exclusively for industrial purposes; A_1
- 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).

2 Definitions

This clause of part 1 is applicable except as follows:

2.2.4

Addition:

NOTE For **appliances** incorporating a **booster setting**, the **rated power input** corresponds to the operation of the appliance when the **booster setting** is not activated.

2.2.9

Replacement

normal operation: 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 min 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 which 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 A_2 which is adjustable without the aid of a **tool**, and A_2 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 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 % of the mean value. If the difference exceeds 10 %, 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 for use 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 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.

2.2.101

water suction cleaning appliances

appliance for aspirating an aqueous solution which may contain a foaming detergent

2.2.102

booster setting

position of a control resulting in a temporary higher power input which is automatically reduced to that obtained when the setting is not used

Ⓐ)

2.2.103

centrally-sited vacuum cleaner

vacuum cleaner which is connected to a ducting system installed in the building

NOTE During use, the nozzle and its associated hose are connected to one of the air inlets of the ducting system. Ⓐ)

3 General requirement

This clause of part 1 is applicable.

4 General conditions for the tests

This clause of part 1 is applicable except as follows:

4.2 Addition:

A new hose is used for each of the tests of **21.101**, **21.102**, **21.103** and **21.104**.

4.101 *Current-carrying hoses operating at **safety extra-low voltage** are not subjected to the tests.*

5 Void

6 Classification

This clause of part 1 is applicable except as follows:

6.1 Replacement:

Ⓒ) Vacuum cleaners intended for household use only, other than **centrally-sited vacuum cleaners**, and vacuum cleaners for animal grooming shall be **class II** or **class III**.

Other vacuum cleaners and water suction cleaning appliances shall be **class I**, **class II** or **class III**. Ⓒ)

Compliance is checked by inspection and by the relevant tests.

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:

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.

The sum of the **rated power input** of the vacuum cleaner and the maximum load of the appliance outlet shall also be marked on the appliance.

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.

7.12 Addition:

The instructions for use for appliances provided with 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.
- Do not immerse in water for cleaning.
- The hose should be checked regularly and must not be used if damaged.

7.12.1 Addition:

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.

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 the 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 checked separately.

NOTE 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 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.

11.5 Addition:

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

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.

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 The **booster setting** is not activated.

14 Void

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 unstable appliances and **hand-held appliances** does not affect their electrical insulation.

NOTE 1 An appliance is considered to be unstable if it overturns when a force of 180 N is applied to the top of the appliance in the most unfavourable horizontal direction. The appliance is placed on a support inclined at an angle of 10° to the horizontal, the liquid container being filled to half the level indicated in the instructions for use.

Compliance is checked by the following test.

*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 11.*

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

Liquid containers which are filled by hand are 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.

*Containers of **hand-held appliances** and unstable appliances 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.*

*The nozzle of **water suction cleaning appliances** is 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 2 The solution is to be stored in a cool atmosphere and used within seven days of its preparation.

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. However, for **water suction cleaning appliances**, the test voltage is:*

- 1 000 V for **basic insulation**;
- 2 750 V for **supplementary insulation**;
- 3 750 V for **reinforced insulation**.

*Inspection shall show that there is no trace of liquid on insulation which could result in a reduction of **creepage distances** and **clearances** below the values specified in 29.1.*

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 $20\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$. While the hose is still immersed, a voltage of 2 000 V is applied for 5 min between each conductor and all the others connected together. A voltage of 3 750 V is then applied for 1 min between all the conductors and the water.

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 made on motorized cleaning heads.

Water suction cleaning appliances provided with a valve are additionally subjected to the test of 19.101.

*Appliances incorporating a **booster setting** which is not deactivated electronically, are additionally subjected to the test of 19.102.*

A₁ Centrally-sited vacuum cleaners are additionally subjected to the tests of 19.103 and 19.104, if applicable. **A₁**

19.7 Addition:

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

19.9 Not applicable.

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, 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 C **Water suction cleaning appliances** having a liquid container incorporating a valve or other **protective device**, are supplied at **rated voltage** with the valve or **protective device** held open or otherwise rendered inoperative. The appliance is operated with the nozzle placed in a trough containing water until water starts to overflow and for a further period of 30 s. **C**

NOTE If the appliance incorporates more than one **protective device**, they are rendered inoperative in turn.

19.102 Appliances are operated under the conditions specified in clause 11 with the booster setting activated but its deactivating control rendered inoperative.

A₁

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 air flow through the motor blocked. **A₁**

20 Stability and mechanical hazards

This clause of part 1 is applicable except as follows:

20.1 Addition:

NOTE Motorized cleaning heads are not subjected to this test.

20.2 Addition:

NOTE The requirement regarding moving parts does not apply to brushes and similar devices. It does not apply to moving parts such as shafts which become accessible when changing accessories and which only move when the brush or similar device is moving.

21 Mechanical strength

This clause of part 1 is applicable except as follows:

21.101 Current-carrying hoses shall be resistant to crashing.

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 and metal foil applied to the outside of the hose, the test voltage however being 2 500 V.

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 per min which results 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 DIS 6344.

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 conductor and metal foil applied to the outside of the hose, the voltage however being 1 250 V.*

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 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 which rotates at a speed of 10 rev per min \pm 1 rev per 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.

21.104 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. This 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 min.

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.*

22 Construction

This clause of part 1 is applicable except as follows:

22.32 Addition:

*For **water suction cleaning appliances**, compliance with the requirement concerning protection against deposition of dirt has been adequately checked by the test of **15.2**.*

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



22.101 Water suction cleaning appliances shall not be provided with motorized cleaning heads.

Compliance is checked by inspection.

22.102 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 Any discolouration is neglected.

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 be provided with a **supply cord**.

25.7 Modification:

Instead of the types of **supply cords** specified, the following applies:

Supply cords shall be not lighter than:

- for **hand-held appliances** having a mass not exceeding 1,5 kg when fitted with the heaviest accessory but excluding the **supply cord**;
 - if rubber insulated, ordinary tough rubber sheathed flexible cord (code designation 245 IEC 53);
 - if polyvinyl chloride insulated, light polyvinyl chloride sheathed flexible cord (code designation 227 IEC 52);
- for appliances for animal grooming:
 - ordinary polychloroprene sheathed flexible cord (code designation 245 IEC 57);
- for **Class III** appliances:
 - if rubber insulated, ordinary tough rubber sheathed flexible cord (code designation 245 IEC 53);
 - if polyvinyl chloride insulated, flat twin flexible cord (code designation 227 IEC 42);
- for other appliances:
 - if rubber insulated, ordinary tough rubber sheathed flexible cord (code designation 245 IEC 53);
 - if polyvinyl chloride insulated, ordinary polyvinyl chloride sheathed flexible cord (code designation 227 IEC 53).

25.23 Addition:

Live conductors in a flexible hose shall have an insulation and sheath thickness at least equivalent to that specified for a 227 IEC 52 cord of $2 \times 0,75 \text{ mm}^2$.

NOTE The conductors used may consist of copper-plated steel wires.

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 Creepage distances, clearances and distances through insulation

This clause of part 1 is applicable.

30 Resistance to heat, fire and tracking

This clause of part 1 is applicable except as follows:

30.2 Addition:

A1

30.2.3 is applicable to *centrally-sited vacuum cleaners*.

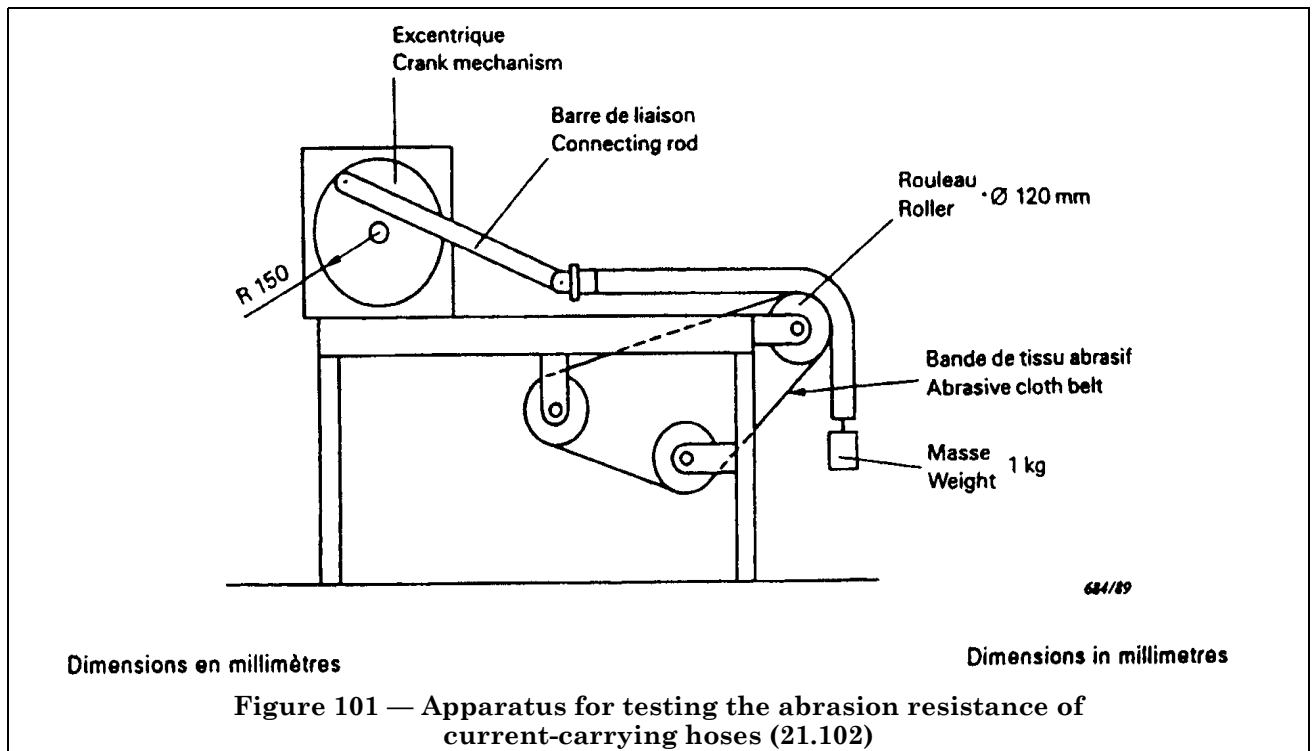
30.2.2 is applicable to other appliances. **A1**

31 Resistance to rusting

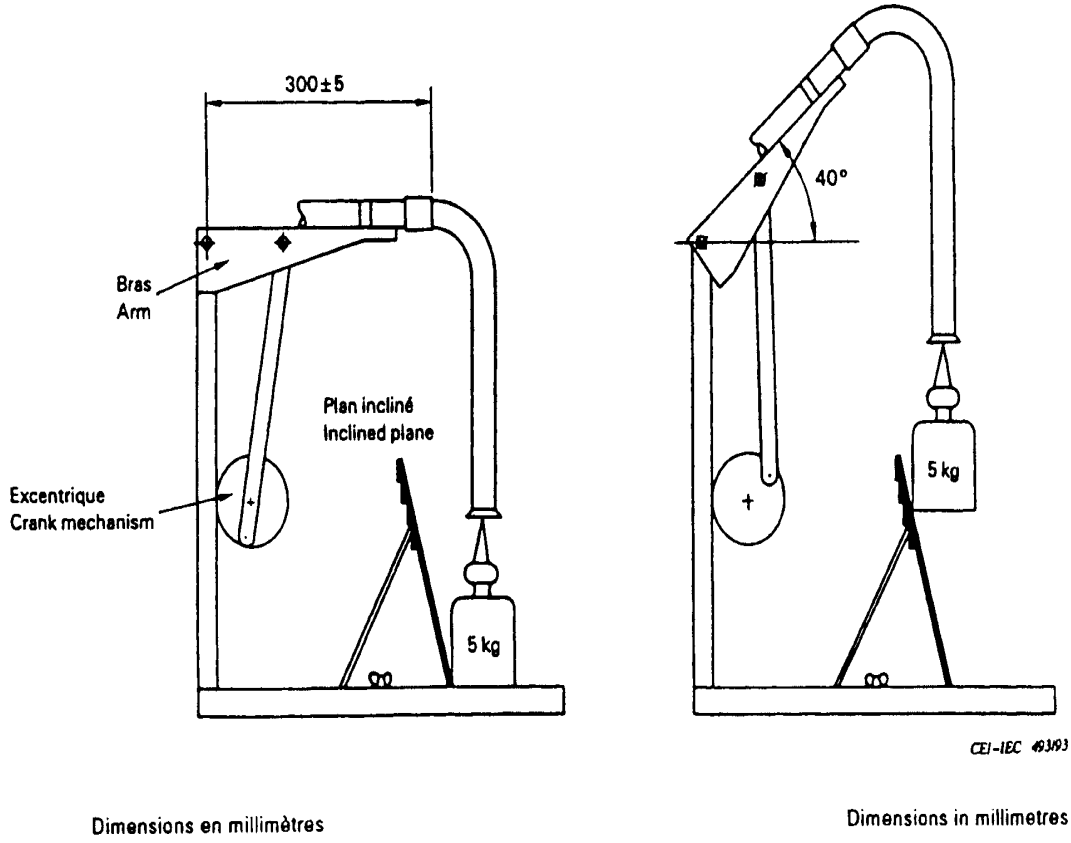
This clause of part 1 is applicable.

32 Radiation, toxicity and similar hazards

This clause of part 1 is applicable.



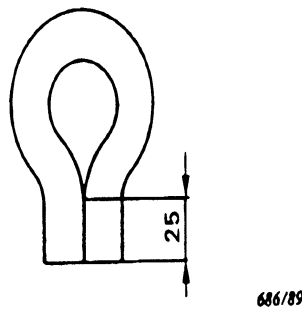
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Dimensions en millimètres

Dimensions in millimetres

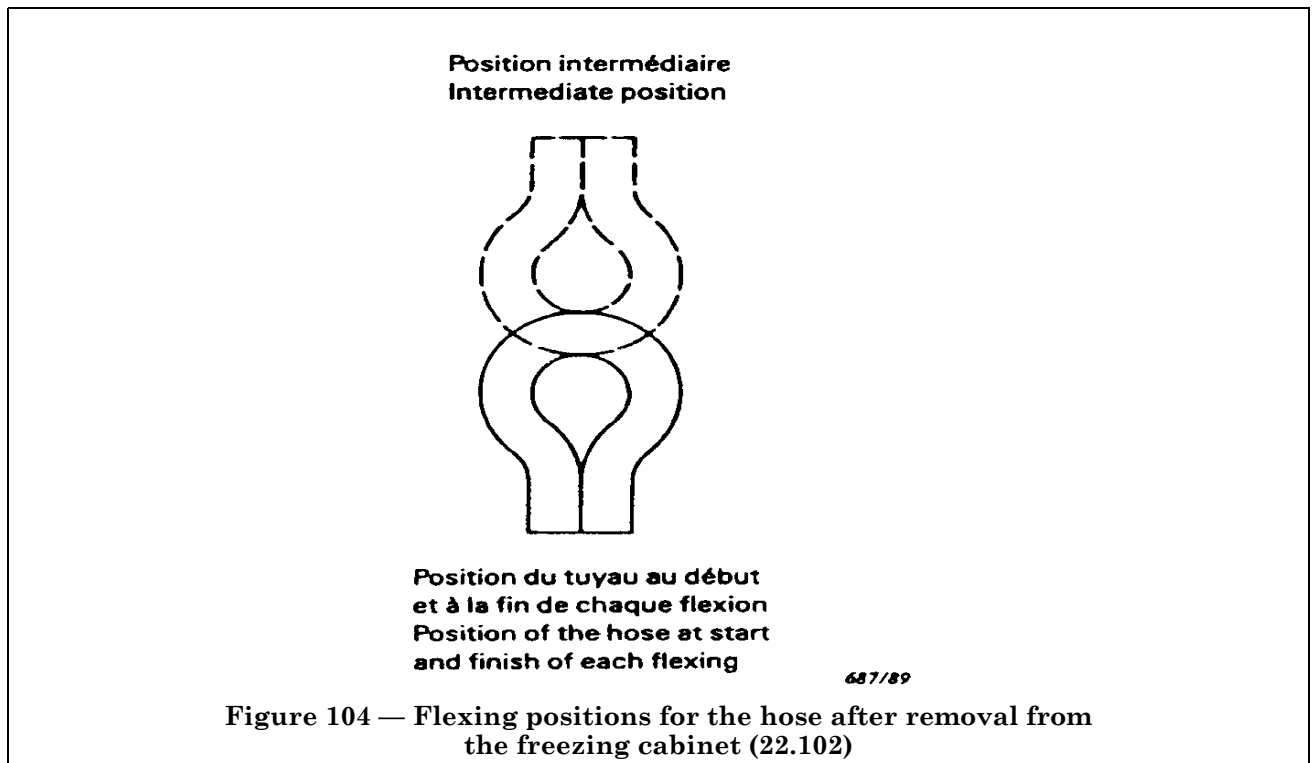
Figure 102 — Apparatus for testing the resistance to flexing of current-carrying hoses (21.103)



Dimensions en millimètres

Dimensions in millimetres

Figure 103 — Configuration of the hose for the freezing treatment (22.102)



Annexes

The annexes of part 1 are applicable except as follows:

Annex A (normative) **Normative reference**

Addition:

ISO/DIS 6344: *Coated abrasives — Grain size analysis.*

Annex C (normative) **Ageing test on motors**

Addition:

The value of $p = 2\ 000$.

National annex NA (informative)

Original IEC text amended by CENELEC common modifications

Preface

The preface has been deleted. The text pointing out national differences read as follows:
The following additional differences exist in some countries:

- **2.2.9:** The **normal operation** is conducted differently and involves contact between the nozzle and the carpet (USA).
- **Clause 3:** The d.c. component in the appliance neutral is limited (Australia).
- **6.1:** **Class 0 appliances** are allowed (Canada, Japan, USA).
Household vacuum cleaners are required to be **Class II** or **Class III** (Denmark, France, Italy, Netherlands, Norway and Turkey).
- **6.2:** IPX4 is not required (USA).
- **7.1:** The additional marking for appliance outlets for accessories is not required (USA).
- **10.1:** The power input of booster settings is taken into account (USA).
- **11.5:** Booster settings are activated 2 min of every 8 min during the test (USA).
- **11.7:** The test is conducted with one-third of the cord unreeled until steady conditions are established (USA).
- **15.2:** The test is conducted differently (USA).
- **6.3:** The test is conducted differently (USA).
- **21.101:** The tests are made differently (Canada and USA).
- **21.102:** The tests are made differently (Canada and USA).
- **21.103:** The tests are made differently (Canada and USA).
- **21.104:** This test is not conducted (USA).
- **25.1:** The **supply cord** is not necessary if the inlet and outlet are of the locking type (USA).
- **25.7:** Ordinary polyvinyl chloride sheathed cords are allowed for animal grooming appliances (Australia).
Lighter cords are permitted for vacuum cleaners for household purposes (USA).

6 Classification

6.1 The requirement has been replaced. It read as follows:

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

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

19 Abnormal operation

19.101 The text has been replaced. It read as follows:

Water suction cleaning appliances, the container of which is provided with a valve or other protective device, are subjected to the test with the nozzle placed in a container as specified in 15.2 but with the valve or protective device held open or otherwise rendered inoperative.

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

22 Construction

22.40 The text has been deleted. It read as follows:

For **water suction cleaning appliances**, the switch shall provide **all-pole disconnection**.

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