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Household and similar electrical appliances – Safety –

Part 2-54: Particular requirements for surface-cleaning appliances for household use employing liquids or steam



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International Electrotechnical Commission
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Withdrawing

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES –
SAFETY –****Part 2-54: Particular requirements for surface-cleaning appliances
for household use employing liquids or steam**

FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.
- 3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
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- 5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
- 6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

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

This third edition cancels and replaces the second edition published in 1995 and its amendment 1 (1999). It constitutes a technical revision.

The text of this part of IEC 60335 is based on the following documents:

FDIS	Report on voting
61/2244/FDIS	61/2311/RVD

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

This 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 surface-cleaning appliances employing liquids or steam.

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 committee has decided that the contents of this publication will remain unchanged until 2004. At this date, the publication will be

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

The following differences exist in the countries indicated below.

- 6.1: Hand-held cleaning appliances and parts held in the hand in normal use shall be class II or class III (Netherlands).
- 22.40: The addition is not applicable (USA).
- 22.104: The dimensions of the inlet aperture are different (USA).

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

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 2-54: Particular requirements for surface-cleaning appliances for household use employing liquids or steam

1 Scope

This clause of Part 1 is replaced by the following.

This International Standard deals with the safety of electric cleaning appliances for household use that are intended for cleaning surfaces such as windows, walls and empty swimming pools by using liquid cleansing agents or steam, their **rated voltage** being not more than 250 V.

NOTE 101 Appliances may incorporate heating elements or means for pressurising the liquid container.

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

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

NOTE 102 Attention is drawn to the fact that

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

NOTE 103 This standard does not apply to

- floor treatment and wet scrubbing machines (IEC 60335-2-10);
- cleaning appliances that are permanently fixed to a building;
- cleaning appliances covered by IEC 60335-2-79, namely those having a
 - pressure exceeding 2,5 MPa;
 - liquid temperature exceeding 160 °C;
 - **rated power input** exceeding 3 500 W;
 - pressurised volume over 5 l;
- cleaning appliances intended for commercial or industrial use;
- 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);
- fabric steamers (IEC 60335-2-85).

2 Normative references

This clause of Part 1 is applicable except as follows.

Addition:

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

ISO 3864, *Safety colours and safety signs*

3 Definitions

This clause of Part 1 is applicable except as follows.

3.1.9 Replacement:

normal operation

operation of the appliance under the most unfavourable conditions specified in the instructions

The cleaning head is pressed with a force of 30 N against a vertical pane of plain glass and moved up and down over a length of 1 m at a rate of 15 cycles per minute. A film of water is maintained on the pane of glass by continuously applying water having a temperature of $20^{\circ}\text{C} \pm 5^{\circ}\text{C}$.

For steam cleaners, a sheet of stainless steel is used instead of glass, without additional wetting. However, if the steam outlet is not intended to be pressed against the surface, the appliance is operated with the outlet in free air directed downwards at an angle of approximately 45° .

4 General requirement

This clause of Part 1 is applicable.

5 General conditions for the tests

This clause of Part 1 is applicable except as follows.

5.2 Addition:

A new hose is used for each of the tests of 21.101 to 21.104.

5.101 *Appliances incorporating heating elements are tested as **heating appliances** even if they incorporate motors.*

6 Classification

This clause of Part 1 is applicable except as follows.

6.1 Modification:

Appliances shall be **class I**, **class II** or **class III**.

6.2 Addition:

Hand-held appliances dispensing liquids shall be at least IPX7. Other appliances shall be at least IPX4. **Class III appliances** not exceeding 24 V can be IPX0.

7 Marking and instructions

This clause of Part 1 is applicable except as follows.

7.1 Modification:

Appliances shall be marked with their **rated power input** in watts.

Addition:

Appliances intended to be connected to the water mains shall be marked with their maximum permissible water pressure, in megapascals.

Steam cleaners and appliances dispensing liquids having a temperature exceeding 50 °C shall be marked with symbol 5597 of IEC 60417-1 or with the following:

WARNING: Danger of scalding.

NOTE 101 This symbol is a warning sign and the rules of ISO 3864 apply.

Appliance outlets for accessories shall be marked with their maximum load, in watts.

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

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

7.6 *Addition:*

[symbol 5597 of IEC 60417-1]

steam

7.12 *Addition:*

The instructions shall state that the liquid or steam must not be directed towards equipment containing electrical components, such as the interior of ovens.

For steam cleaners having a pressurised container, the instructions shall state that the filling aperture must not be opened during use. Instructions for the safe refilling of the water container shall be given.

The instructions shall state that the appliance has to be unplugged after use and before carrying out **user maintenance** on the appliance.

The instructions for appliances intended to clean swimming pools shall include the substance of the following:

Do not use in swimming pools containing water.

If symbol 5597 of 60417-1 is used, its meaning shall be explained.

8 Protection against access to live parts

This clause of Part 1 is applicable.

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.

11 Heating

This clause of Part 1 is applicable except as follows.

11.4 Addition:

*If the temperature rise limits are exceeded in appliances incorporating motors, transformers or **electronic circuits**, and the power input is lower than the **rated power input**, the test is repeated with the appliance supplied at 1,06 times **rated voltage**.*

11.7 Replacement:

Appliances are operated until steady conditions are established.

NOTE 101 Water is added as necessary to maintain the emission of liquid or steam.

Steam cleaners are also operated without emission of steam.

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

11.8 Addition:

*Temperature rises of **accessible surfaces** of hoses that supply steam to parts held in the hand shall comply with the temperature rise limits for handles that are held for short periods only in normal use. However, if a non-metallic hose is covered by textile material, the temperature rise of the surface of the textile material shall not exceed 80 K.*

*The temperature rise limits of motors, transformers and components of **electronic circuits**, including parts directly influenced by them, may be exceeded when the appliance is operated at 1,15 times **rated power input**.*

NOTE 101 The pressure in appliances having a pressurised container is measured so that the test of 22.7 can be carried out.

12 Void

13 Leakage current and electric strength at operating temperature

This clause of Part 1 is applicable.

14 Transient overvoltages

This clause of Part 1 is applicable.

15 Moisture resistance

This clause of Part 1 is applicable except as follows.

15.1.1 Addition:

*Parts of liquid-dispensing appliances that are held in the hand during normal use, and that incorporate electrical components, are subjected to the test specified for IPX7 appliances, unless they are of **class III construction** not exceeding 24 V.*

15.2 Addition:

Liquid containers are filled with water containing approximately 1 % NaCl. If the container is in a hand-held part, the part is placed in the most unfavourable position. Other parts having containers are placed on a horizontal surface and overturned to the most unfavourable stable position. After 5 min the part is returned to its normal position.

NOTE 101 This test is not carried out on parts classified as IPX7.

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 and having 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 other conductors connected together. A voltage of 3 000 V is then applied for 1 min between all the conductors and the saline solution.

17 Overload protection of transformers and associated circuits

This clause of Part 1 is applicable.

18 Endurance

This clause of Part 1 is not applicable.

19 Abnormal operation

This clause of Part 1 is applicable except as follows.

19.2 Addition:

Appliances are not connected to the water mains and are operated with their containers empty.

19.4 Addition:

For steam cleaners, any control that limits the pressure during the test of Clause 11 is rendered inoperative.

20 Stability and mechanical hazards

This clause of Part 1 is applicable except as follows.

20.2 Addition:

NOTE 101 The requirement regarding moving parts does not apply to brushes and similar devices.

20.101 Appliances shall be constructed so that inadvertent operation is unlikely.

Compliance is checked by inspection and by applying a cylindrical rod, having a diameter of 40 mm and a hemispherical end, to the switch.

The appliance shall not operate.

NOTE The requirement is considered to be met if a biased-off switch is used.

21 Mechanical strength

This clause of Part 1 is applicable except as follows.

Addition:

*Compliance is also checked by holding **hand-held appliances** in the most unfavourable position at a height of 2 m and dropping them onto a hardwood floor.*

The test is carried out three times.

21.101 Current-carrying hoses shall be resistant to crushing.

Compliance is checked by the following test.

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

The steel plates are pressed together at a rate of 50 mm/min \pm 5 mm/min until the applied force is 1,5 kN. The force is then released and the electric strength test of 16.3 is carried out between the conductors connected together and the saline solution.

21.102 Current-carrying hoses shall be resistant to abrasion.

Compliance is checked by the following test.

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

The hose is supported by a rotating smooth roller over which a belt of abrasive cloth moves at a speed of 0,1 m/min. The abrasive is corundum grit, size P 100 as specified in ISO 6344-2. A mass of 1 kg is suspended from the other end of the hose, which is guided to avoid rotation. In the lowest position, the mass has a maximum distance of 600 mm from the centre of the roller.

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

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

21.103 Current-carrying hoses shall be resistant to flexing.

Compliance is checked by the following test.

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

NOTE 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 rev/min.

The test is carried out for 1 250 revolutions of the crank after which the fixed end of the hose is turned through 90° and the test continued for a further 1 250 revolutions. The test is repeated in each of the other two 90° positions.

NOTE 2 If the hose ruptures before 5 000 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 minute.

The test is carried out for 1 000 cycles.

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

21.105 Current-carrying hoses shall be resistant to low temperatures.

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.

22 Construction

This clause of Part 1 is applicable except as follows.

22.6 Addition:

Drain holes shall be at least 5 mm in diameter or 20 mm² in area with a width of at least 3 mm.

22.7 Replacement:

Appliances having a pressurised container shall incorporate adequate safeguards against the risk of excessive pressure.

If jets of steam or liquids are emitted through **protective devices**, the electrical insulation shall not be affected or the user exposed to a hazard.

Compliance is checked by inspection and by the following tests.

*The maximum pressure occurring during the test of Clause 11 is measured. All pressure-regulating devices that operated during the test are rendered inoperative and the pressure measured again. The pressure shall not increase by more than 200 kPa. Any pressure-limiting **protective device** is then rendered inoperative and the pressure in the container is raised hydraulically to five times the pressure measured originally or twice the pressure measured with the pressure-regulating device rendered inoperative, whichever is higher. There shall be no leakage from the container.*

Steam cleaners incorporating hoses, and in which the device regulating the steam supply is within the container, are operated as specified in Clause 11 but with all pressure-regulating devices operating during the test of Clause 11 rendered inoperative. The steam outlet is sealed and the device regulating the steam supply is opened. There shall be no leakage from the hose except at an intentionally weak place within the enclosure of the container. If this occurs, the test is repeated on another appliance that shall also leak in the same way.

*The steam outlet of instantaneous steam cleaners is sealed and the pressure in the water container is raised hydraulically until the pressure-limiting **protective device** operates. The pressure shall not exceed 200 kPa. The outlet of the **protective device** is then sealed and the pressure is further raised to twice the previous value. There shall be no leakage from the container.*

NOTE 101 An instantaneous steam cleaner is an appliance in which small quantities of water are pumped from the water container, the steam being produced when the water contacts the heated surface of the steam chamber. The water container and the steam chamber are at atmospheric pressure.

22.40 Addition:

The switch shall provide **all-pole disconnection**.

22.101 Rotating parts shall be secured against loosening.

Compliance is checked by inspection.

NOTE This requirement may be met by using a counter-rotating thread.

22.102 Appliances intended to be connected to the water mains shall withstand the water pressure expected in normal use.

Compliance is checked by connecting the appliance to a water supply having a static pressure equal to twice the maximum permissible pressure or 1,2 MPa, whichever is higher, for a period of 5 min.

There shall be no leakage of water.

NOTE Leakage from the inlet-water hose is ignored.

22.103 Steam cleaners shall be constructed so that there is no spillage of water or sudden jets of steam or hot water likely to expose the user to a hazard when the appliance is used in accordance with the instructions. Steam emission shall stop when the switch actuator is released.

When removing the filling cap of a pressurised container, the pressure shall be relieved in a controlled manner before the cap is removed completely in order to avoid the emission of jets of steam or hot water in a manner likely to expose the user to a hazard.

Compliance is checked by inspection during the test of Clause 11 and by removing the filling cap at the end of the test.

22.104 Pressure-limiting **protective devices** that operate during the tests of 19.4 and 22.7 shall have an inlet aperture at least 5 mm in diameter or 20 mm² in area and a width of at least 3 mm. The area of the aperture at the outlet shall not be less than that of the aperture at the inlet.

NOTE The requirement is not applicable to instantaneous steam cleaners.

Compliance is checked by measurement.

23 Internal wiring

This clause of Part 1 is applicable.

24 Components

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

24.101 Protective devices incorporated in appliances for compliance with 19.4 shall be not self-resetting and shall only be accessible by using a **tool**.

Compliance is checked by inspection.

25 Supply connection and external flexible cords

This clause of Part 1 is applicable except as follows.

25.5 Addition:

Type X attachment is not allowed for appliances classified as IPX7.

25.23 Addition:

Conductors in a flexible hose shall have an insulation and sheath thickness at least equivalent to that specified for a cord of (2 × 0,75) mm² having a code designation 60227 IEC 53.

NOTE 101 The conductors 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 Clearances, creepage distances and solid insulation

This clause of Part 1 is applicable excepts as follows.

29.2 Addition:

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

30 Resistance to heat and fire

This clause of Part 1 is applicable except as follows.

30.2.3 Not applicable.

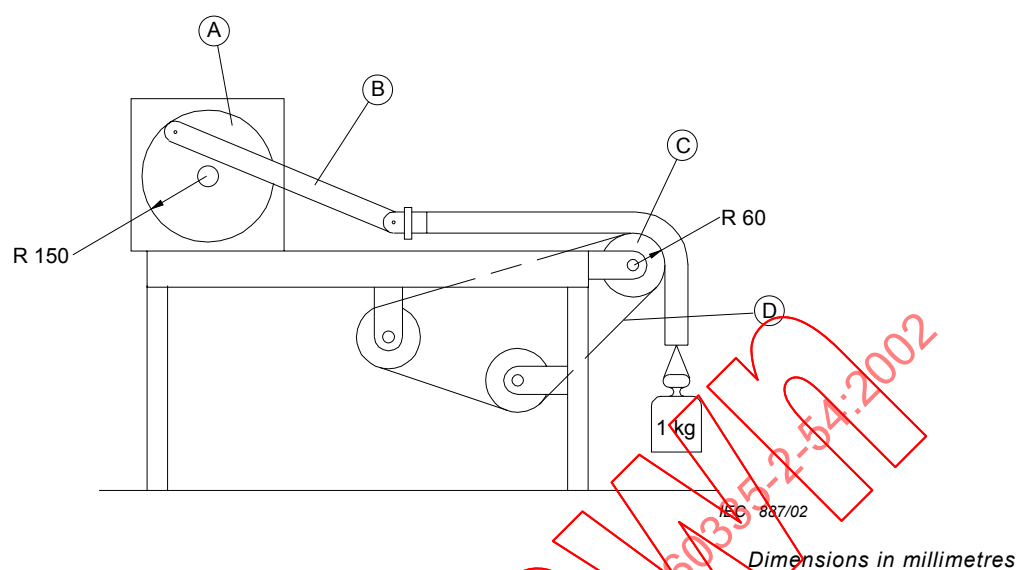
31 Resistance to rusting

This clause of Part 1 is applicable.

32 Radiation, toxicity and similar hazards

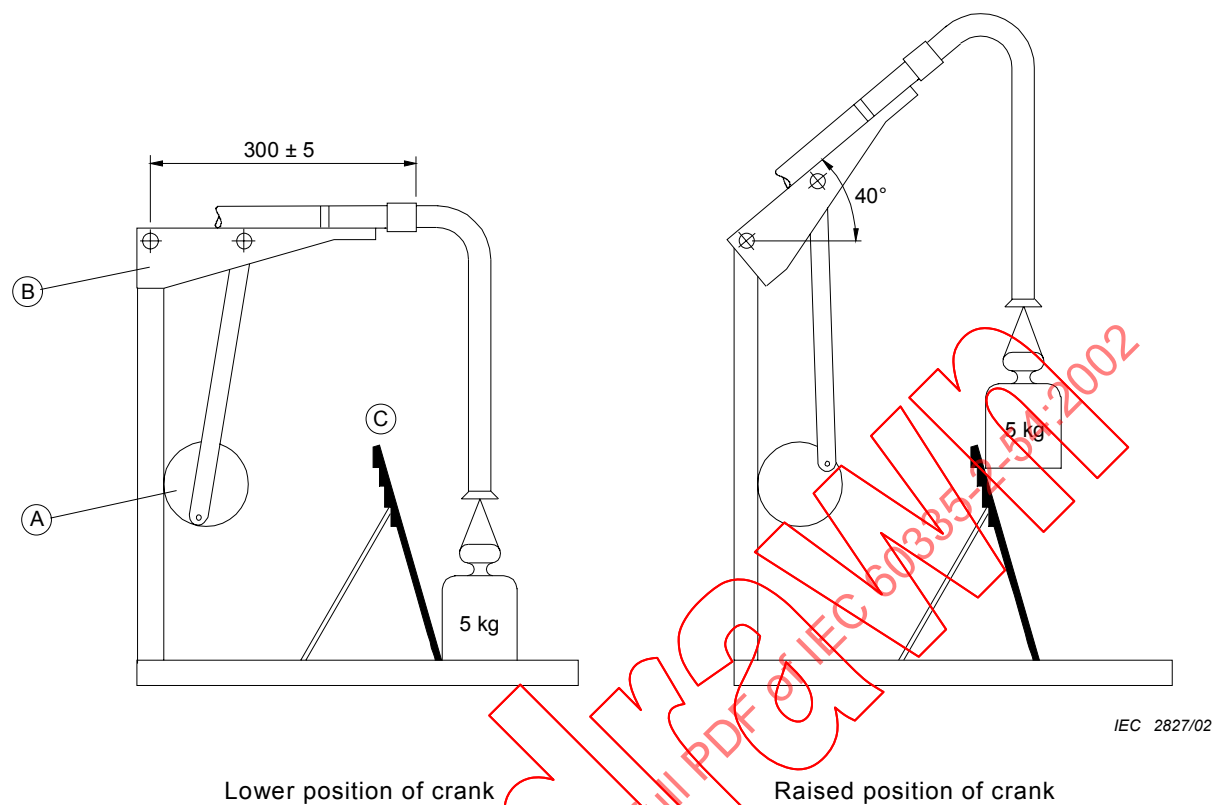
This clause of Part 1 is applicable.

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**Key**

- A Crank mechanism
- B Connecting rod
- C Roller
- D Abrasive belt

Figure 101 – Apparatus for testing the abrasion resistance of current-carrying hoses



Dimensions in millimetres

Key

- A Crank mechanism
- B Arm
- C Inclined plane

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