

# INTERNATIONAL STANDARD

**IEC**  
**60335-2-82**

Second edition  
2002-11

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## Household and similar electrical appliances – Safety –

### Part 2-82: Particular requirements for amusement machines and personal service machines

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Reference number  
IEC 60335-2-82:2002(E)

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## Household and similar electrical appliances – Safety –

### Part 2-82: Particular requirements for amusement machines and personal service machines

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PRICE CODE

**R**

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES –  
SAFETY –****Part 2-82: Particular requirements for amusement machines  
and personal service machines**

## 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.
- 4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
- 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 second edition cancels and replaces the first edition published in 1999. It constitutes a technical revision.

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

| FDIS         | Report on voting |
|--------------|------------------|
| 61/2226/FDIS | 61/2301/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 amusement machines and personal service machines.

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.

- Clause 1: Gaming machines have to comply with IEC 60950 (South Africa).
- 6.1: Class 0 appliances are allowed provided that their rated voltage does not exceed 150 V (Japan and USA).
- 6.1: Class 0I is allowed (Japan).
- 19.101: The fault condition with the contactor locked in the on-position is not applied (USA).
- 20.1: The test is different (USA).
- Clause 21: The impact energy is different (USA).
- 25.7: Lighter supply cords are allowed (USA).
- 25.7: The requirements for supply cords are different. Additional protection of the supply cord is required (Australia).

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.

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## HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

### Part 2-82: Particular requirements for amusement machines and personal service machines

#### 1 Scope

This clause of Part 1 is replaced by the following.

This International Standard deals with the safety of electric commercial amusement machines and personal service machines, their **rated voltage** being not more than 250 V for single-phase appliances and 480 V for other appliances.

NOTE 101 Examples of appliances that are within the scope of this standard are

- amusement machines:
  - billiard tables;
  - bowling machines;
  - dartboards;
  - driving simulators;
  - gaming machines;
  - kiddie rides;
  - laser shooting appliances;
  - pinball machines;
  - video games.
- personal service machines:
  - card re-value machines;
  - currency dispensers;
  - luggage lockers;
  - weighing machines;
  - shoe shining appliances.

NOTE 102 If part of the appliance is within the scope of IEC 60065 or IEC 60950, the part has to comply with the relevant standard.

As far as is practicable, this standard deals with the common hazards presented by appliances that are encountered by users and **maintenance persons**.

NOTE 103 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 authorities responsible for health, for the protection of labour and similar authorities.

NOTE 104 This standard does not apply to

- appliances intended exclusively for household use;
- appliances intended exclusively for industrial purposes;
- 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);
- appliances for washing cars;
- dispensing appliances and vending machines (IEC 60335-2-75);
- appliances within the scope of IEC 60065, such as jukeboxes and household video games;
- appliances within the scope of IEC 60950, such as copying machines, ticket machines and automatic teller machines;
- appliances intended to be used when a trained attendant is present, such as virtual reality systems;
- equipment intended exclusively for fairgrounds, such as carousels.

## 2 Normative references

This clause of Part 1 is applicable except as follows.

*Addition:*

IEC 60068-2-52: 1996, *Environmental testing – Part 2: Tests – Test Kb: Salt mist, cyclic (sodium chloride solution)*

## 3 Definitions

This clause of Part 1 is applicable except as follows.

### 3.1.9 Replacement:

#### **normal operation**

operation of the appliance under the following conditions

The appliance is operated in the **stand-by mode** until steady conditions are established and then under the most unfavourable conditions of normal use.

The appliance is refilled when necessary in accordance with the instructions for use, or the **instructions for maintenance**, and the next operating period started as soon as possible.

Appliances that support persons in normal use are loaded as follows:

- **kiddie rides**, 50 kg for each riding position;
- other appliances, 100 kg for the first riding position and 75 kg for each additional riding position.

NOTE 101 The riding position may be for a sitting or standing person.

If the instructions state that higher loads are allowed, the appliance is loaded accordingly.

Audio amplifiers are operated in accordance with the normal operating conditions specified in IEC 60065.

### 3.6.2 Replacement:

#### **detachable part**

part that can be removed without the aid of a **tool**, a part that is removed in accordance with the instructions for use or **instructions for maintenance**, even if a **tool** or **access key** is needed for removal, or a part that does not fulfill the test of 22.11

NOTE 101 If a part has to be removed for installation purposes, this part is not considered to be detachable even if the instructions state that it is to be removed.

NOTE 102 A part that can be opened is considered to be a part that can be removed.

### 3.7.3 Replacement:

#### **thermal cut-out**

device that during abnormal operation limits the temperature of the controlled part by automatically opening the circuit, or reducing the current, and constructed so that its setting cannot be altered by the user or the **maintenance person**

### 3.8.5 Replacement:

#### **maintenance operation**

operation that the user or **maintenance person** is intended to perform as stated in the instructions for use, or the **instructions for maintenance**, or as marked on the appliance

NOTE 101 The **instructions for maintenance** marked on the appliance, or supplied with the appliance or subsequently, are applicable only to the **user area** and the **maintenance area**.

NOTE 102 **Maintenance operation** includes preparing and commissioning the appliance for new operating methods. It does not include operations that are to be performed in the **service area**.

**3.101**

**stand-by mode**

mode of the appliance when it is energized and ready for use, while filled as intended but with empty cash boxes

**3.102**

**access key**

key or other means that gives access to the **maintenance area** but does not give access to the **service area**

NOTE "Other means" includes a **tool** or operation by codes or signals produced by optical or electromagnetic sources.

**3.103**

**override key**

key or other means that is used to render an interlock inoperative

**3.104**

**instructions for maintenance**

instructions explaining how to carry out cleaning, replenishing, coin collecting, setting of controls and similar operations

**3.105**

**maintenance person**

person who maintains the appliance in accordance with the **instructions for maintenance**

**3.106**

**user area**

area where access is gained without the use of an **access key** or a **tool**

**3.107**

**maintenance area**

area where access can only be gained by the use of an **access key**

**3.108**

**service area**

area where access cannot be gained by the use of an **access key** alone

**3.109**

**kiddie ride**

moving appliance having a stationary base for use by one or two children between the ages of three and ten years, under the supervision of an adult

**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.

**5.6 Replacement:**

*Controls or switching devices in the **user area** are adjusted to the most unfavourable setting.*

*Controls, switching devices or other parts in the **maintenance area** are adjusted to the most unfavourable setting within the limits stated in the **instructions for maintenance**.*

NOTE 101 Controls or switching devices in the **service area** are not adjusted.

### 5.9 Addition:

When alternative software is made available by the appliance manufacturer, the appliance is tested with the software that gives the most unfavourable results.

**5.101** The requirements of this standard for the **maintenance area** are applicable when the **instructions for maintenance** are being followed. If an **override key** is provided for access to the **maintenance area**, it is used before a test is carried out if this is more unfavourable.

**5.102** When reference is made to the application of test probe B, test probe 18 of IEC 61032 is also applied in the **user area**.

**5.103** Appliances incorporating transformers, **electronic circuits** and lamps are tested as **motor-operated appliances** unless they incorporate a heating element, in which case they are tested as **combined appliances**.

## 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:

Appliances intended for outdoor use shall be at least IPX4.

Appliances that may be cleaned by water jets, or installed where water jets are liable to be used, shall be at least IPX5.

Appliances that use water jets in normal use shall be at least IPX5 unless the water jet cannot be directed at the enclosure of electrical parts, in which case it may be IPX4.

## 7 Marking and instructions

This clause of Part 1 is applicable except as follows.

### 7.1 Addition:

For appliances incorporating a socket outlet, the voltage, nature of the supply and current or power output shall be marked in the vicinity of the socket outlet.

### 7.3 Addition:

The requirement also applies when the adjustment has to be made by the **maintenance person**.

#### 7.12.1 Addition:

The installation instructions shall state if the appliance is suitable for outdoor use.

For appliances that are not at least IPX5, the instructions shall state that the appliance is not suitable for installation in an area where a water jet could be used.

The installation instructions for moving ride appliances shall state the free space necessary around the appliance for safe operation.

The installation instructions for **kiddie rides** shall state that the installation of a residual current device (RCD) having a rated residual operating current not exceeding 30 mA is advisable.

**7.12.101** If it is necessary to take special precautions during **maintenance operations**, details of these shall be supplied. The **instructions for maintenance** shall state how to gain access to the **maintenance area**. They shall not include instructions on how to gain access to a **service area**.

*Compliance is checked by inspection.*

**7.12.101.1** The **instructions for maintenance** for appliances incorporating an appliance inlet and intended to be partially or completely immersed in water for cleaning, shall state that the connector must be removed before the appliance is cleaned and that the appliance inlet must be dried before the appliance is used again.

If the appliance is not at least IPX5, the **instructions for maintenance** shall state that the appliance must not be cleaned by a water jet.

*Compliance is checked by inspection.*

**7.12.101.2** If the use of an **override key** allows access to moving parts, a suitable warning shall be given in the **instructions for maintenance**.

*Compliance is checked by inspection.*

**7.12.101.3** The **instructions for maintenance** shall list any accessories that may be used with the appliance.

*Compliance is checked by inspection.*

**7.12.101.4** For appliances using water, the **instruction for maintenance** shall give details on how to prevent freezing-up or how to ensure safe operation if freezing-up occurs.

*Compliance is checked by inspection.*

## **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.

## 11.2 Modification:

*Appliances normally fixed to the floor, and those having a mass greater than 40 kg and not provided with casters or rollers, are installed in accordance with the instructions.*

NOTE 101 If no instructions are provided, the appliance is placed on the floor as close to the walls as possible.

*Other appliances, except **fixed appliances**, are placed on the floor as near to the walls as possible.*

## 11.7 Replacement:

*The appliance is operated under **normal operation** until steady conditions are established.*

## 11.8 Addition:

*The temperature rise limits for handles and similar parts that are continuously held in normal use also applies to seats. The temperature rise of other surfaces in the **user area** shall not exceed the limits specified for handles and similar parts that are held for short periods only in normal use.*

NOTE 101 Illuminated surfaces of glass or plastic that are not intended to be touched by the user are considered to be outside the **user area**.

## 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.

### 15.2 Addition:

*Compliance is also checked by the tests of 15.2.101 to 15.2.104 using water containing approximately 1% NaCl.*

**15.2.101** *Appliances having external surfaces that are lower than 2 m above the floor, and on which it is possible to place a vessel such as a cup, are tested by rapidly pouring 0,5 l of saline solution over the surface.*

NOTE If there is more than one surface, they are tested in turn.

**15.2.102** *Appliances with accessible openings that are lower than 2 m above the floor are tested by slowly pouring 0,25 l of saline solution into each opening. If the opening is in a vertical surface, the solution is projected towards the opening.*

NOTE Accessible openings include slots for coins or cards.

**15.2.103** ***Maintenance operations** involving the use of liquids are carried out three times.*

**15.2.104** *Parts liable to be cleaned are wiped with a sponge having dimensions approximately 150 mm × 75 mm × 50 mm, saturated with saline solution. The sponge is applied without appreciable force for approximately 10 s to each surface.*

NOTE This test is not applied to surfaces in the **maintenance area** for which cleaning instructions are given.

**15.3** *Addition:*

NOTE 101 If it is not possible to place the appliance in the humidity cabinet, electrical parts are tested separately.

## **16 Leakage current and electric strength**

This clause of Part 1 is applicable.

## **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.*

***Detachable parts in the user area are removed or placed in the most unfavourable position.***

***Detachable parts in the maintenance area are placed in their normal position following a maintenance operation.***

*Containers are filled to the most unfavourable level.*

**19.2** *Addition:*

NOTE 101 Examples of achieving restricted heat dissipation are

- operating without water;
- switching off the fan;
- covering ventilation openings.

**19.4** *Addition:*

NOTE 101 If a control also performs other functions, only the part controlling the temperature is short-circuited.

**19.7** *Addition:*

*The appliance is operated with the most unfavourable cycle for the motor under test.*

**19.9 Addition:**

*This test is applicable for **kiddie rides**, regardless of their method of control.*

**19.11.2 Modification:**

*The fault conditions are simulated until steady conditions are established.*

**19.13 Addition:**

*During the tests, molten plastic shall not be emitted.*

*After the tests, compliance with 15.1 and 15.2 shall not be impaired.*

**19.101** *The appliance is supplied at **rated voltage** and operated under **normal operation**. Any fault condition or unexpected operation likely to occur during use of the appliance is introduced.*

NOTE 1 Damaged components or parts may be replaced after each test.

NOTE 2 Examples of fault conditions or unexpected operations are

- defects in the appliance:
  - a programmer stopping in any position;
  - disconnection and reconnection of one or more phases of the supply mains during any part of the programme;
  - open-circuiting or short-circuiting of components;
  - locking the main contacts of a contactor in the "on" position if they are used for energizing heating elements. However, this defect is not introduced if at least two independent sets of contacts are provided. This may be achieved by two contactors operating independently of each other or by one contactor having two independent armatures operating two independent sets of main contacts;
  - failure of a pneumatic or hydraulic control;
  - blocking the coin or prize channel;
- faulty operation by users or **maintenance persons**:
  - incorrect actuation of knobs, handles, switches or push-buttons;
  - incorrect opening or closing of doors or lids;
  - improper application of the **instructions for maintenance**;
  - setting controls, switches or programmers in the most unfavourable position;
  - incorrect loading;
  - incorrect coin collection;
- abuse by users:
  - obstructing openings;
  - blocking moving parts.

NOTE 3 In general, tests are limited to the fault conditions that may be expected to give the most unfavourable results.

## **20 Stability and mechanical hazards**

This clause of Part 1 is applicable except as follows.

**20.1 Modification:**

*The appliance is tested with doors, lids and similar parts in the **maintenance area** placed in the normal position of use. **Kiddie rides** and driving simulators are loaded as specified for **normal operation**.*

**Kiddie rides** and driving simulators, while still placed on the plane inclined by 10°, are then supplied at **rated voltage** and operated under **normal operation**.

The test with the appliance tilted to 15° is not carried out.

*Addition:*

The test is repeated with doors, lids and similar parts in the **maintenance area** placed in the most unfavourable positions, however, the appliance is only tilted to an angle of 5°.

**20.2 Addition:**

Covers over moving parts having a kinetic energy exceeding 4 J shall be interlocked so that it is only possible to remove them when the parts are stationary unless they are only removable with the aid of a **tool**.

For **kiddie rides**, compliance is also checked by applying a spherical probe having a diameter of 150 mm. The probe shall not be trapped by the movement of any parts.

## 21 Mechanical strength

This clause of Part 1 is applicable except as follows.

*Addition:*

The impact energy of 0,5 J is applied in the **maintenance area**. In the **user area**, the value is increased to

- 2,0 J, for floor mounted appliances;
- 1,0 J, for other appliances.

## 22 Construction

This clause of Part 1 is applicable except as follows.

**22.7 Addition:**

Pressure relief devices shall be constructed so that they cannot be rendered inoperative or set to a higher pressure without the aid of a **tool** that is normally only available to the manufacturer.

Compliance is checked by inspection.

**22.14 Addition:**

The requirement also applies in the **maintenance area** to parts liable to be touched during **maintenance operations**.

**22.101** Appliances shall be constructed so that interlocks cannot be rendered inoperative without using an **override key** if they are necessary for compliance with the standard.

It shall not be possible to reset **thermal cut-outs** from the **user area**.

Compliance is checked by inspection, by manual test and by applying test probe B of IEC 61032.

**22.102** It shall not be possible to gain access to the **service area** by only using the **access key** for the **maintenance area**.

*Compliance is checked by inspection and by manual test.*

**22.103** Appliances incorporating lasers shall comply with subclause 6.2 of IEC 60065.

*Compliance is checked by inspection and by the relevant tests.*

**22.104** Coin boxes and containers for other payment means shall be positioned or protected so that overfilling cannot cause a hazard.

*Compliance is checked by inspection.*

**22.105** Seats of **kiddie rides** shall not be adjustable to a height exceeding 1,5 m above the floor. **Kiddie rides** with adjustable seats shall be provided with means for restraining passengers. The width of any slots in barriers provided for this purpose shall be between 60 mm and 75 mm.

NOTE Examples of restraining means are hand holds, foot wells, seat belts and lap bars.

*Compliance is checked by inspection and by measurement.*

## **23 Internal wiring**

This clause of Part 1 is applicable except as follows

### **23.3 Modification:**

The requirement also applies to **maintenance operations**.

*The number of flexings is*

- 200 000, for conductors flexed during normal use;
- 10 000, for conductors flexed during **maintenance operations**.

**23.101** Anchorages for internal wiring that can easily be replaced shall be constructed and located so that

- the wiring cannot touch the clamping screws of the anchorage if these screws are accessible, unless they are separated from **accessible metal parts** by **supplementary insulation**;
- the wiring is not clamped by a metal screw that bears directly on the wiring;
- for **class I appliances**, the anchorages are of insulating material or are provided with an insulating lining, unless failure of the insulation of the wiring does not make **accessible metal parts** live;
- for **class II appliances**, the anchorages are of insulating material or if of metal, they are insulated from **accessible metal parts** by **supplementary insulation**.

*Compliance is checked by inspection.*

**23.102** Internal wiring that is accessible in the **maintenance area** and that is moved during **normal operation** shall comply with 25.13, 25.14, 25.15 and 25.21.

*Compliance is checked by the relevant tests.*

## 24 Components

This clause of Part 1 is applicable except as follows.

### 24.2 Modification:

Switches and automatic controls operating at **safety extra-low voltage** may be fitted in **interconnection cords** in the **maintenance area**.

**24.101** Connecting devices of **interconnection cords** shall be identified if they are interchangeable with other connecting means in the appliance if this could result in a hazard.

NOTE Colour coding may be used for identification.

**24.102** Interlock switches shall comply with IEC 61058-1 as far as reasonable and shall ensure **all pole disconnection**. However, single-pole disconnection is allowed for protection against mechanical hazards.

*Compliance is checked by testing the switch in accordance with the relevant clauses of IEC 61058-1, the number of cycles of operation for the test of Clause 17 being 10 000. However, if the switch is operated once per operating cycle, the number of cycles of operation is 100 000.*

NOTE This requirement only applies to interlock switches necessary for compliance with this standard.

**24.103 Thermal cut-outs** that disconnect heating elements, and are incorporated for compliance with Clause 19, shall not be self-resetting and shall have a trip-free mechanism.

*Compliance is checked by inspection and by manual test.*

## 25 Supply connection and external flexible cords

This clause of Part 1 is applicable except as follows.

### 25.7 Addition:

**Supply cords** of appliances intended for outdoor use shall be polychloroprene sheathed and not be lighter than ordinary polychloroprene sheathed cord (code designation 60245 IEC 57). However, if the appliance is intended to be placed on the ground, the **supply cord** shall not be lighter than heavy polychloroprene sheathed cord (code designation 60245 IEC 66).

### 25.15 Addition:

*When the test is carried out on internal wiring, the pull force is 30 N and the torque 0,1 Nm, irrespective of the mass of the appliance.*

*For internal wiring, a force of 30 N is applied when pushing the wiring into the appliance.*

## 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 except as follows.

### 28.1 Addition:

The requirement also applies to screws that may be removed during **maintenance operations**.

*The test also applies to screws likely to be tightened during **maintenance operations**.*

### 28.3 Addition:

The requirement also applies to screws operated by the **maintenance person**.

## 29 Clearances, creepage distances and solid insulation

This clause of Part 1 is applicable except as follows.

### 29.1 Modification:

*The force applied to **accessible surfaces** is increased to 100 N.*

### 29.2 Modification:

*The force applied to **accessible surfaces** is increased to 100 N.*

## 30 Resistance to heat and fire

This clause of Part 1 is applicable except as follows.

**30.2.2** Not applicable.

## 31 Resistance to rusting

This clause of Part 1 is applicable except as follows.

### Addition:

*For appliances intended for outdoor use, compliance is checked by the salt mist test of IEC 60068-2-52, severity 2 being applicable.*

*Before the test, coatings are scratched by means of a hardened steel pin, the end of which has the form of a cone with an angle of 40°. Its tip is rounded with a radius of 0,25 mm ± 0,02 mm. The pin is loaded so that the force exerted along its axis is 10 N ± 0,5 N. The scratches are made by drawing the pin along the surface of the coating at a speed of approximately 20 mm/s. Five scratches are made at least 5 mm apart and at least 5 mm from the edges.*

*After the test, the appliance shall not have deteriorated to such an extent that compliance with this standard, in particular with Clauses 8 and 27, is impaired. The coating shall not be broken and shall not have loosened from the metal surface.*

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

This clause of Part 1 is applicable.

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