

INTERNATIONAL STANDARD

IEC
60335-2-4

Fifth edition
2002-03

Household and similar electrical appliances – Safety –

Part 2-4: Particular requirements for spin extractors

*Appareils électrodomestiques et analogues –
Sécurité –*

*Partie 2-4:
Règles particulières pour lesessoreuses centrifuges*



Reference number
IEC 60335-2-4:2002(E)

Publication numbering

As from 1 January 1997 all IEC publications are issued with a designation in the 60000 series. For example, IEC 34-1 is now referred to as IEC 60034-1.

Consolidated editions

The IEC is now publishing consolidated versions of its publications. For example, edition numbers 1.0, 1.1 and 1.2 refer, respectively, to the base publication, the base publication incorporating amendment 1 and the base publication incorporating amendments 1 and 2.

Further information on IEC publications

The technical content of IEC publications is kept under constant review by the IEC, thus ensuring that the content reflects current technology. Information relating to this publication, including its validity, is available in the IEC Catalogue of publications (see below) in addition to new editions, amendments and corrigenda. Information on the subjects under consideration and work in progress undertaken by the technical committee which has prepared this publication, as well as the list of publications issued, is also available from the following:

- **IEC Web Site** (www.iec.ch)

- **Catalogue of IEC publications**

The on-line catalogue on the IEC web site (www.iec.ch/catlg-e.htm) enables you to search by a variety of criteria including text searches, technical committees and date of publication. On-line information is also available on recently issued publications, withdrawn and replaced publications, as well as corrigenda.

- **IEC Just Published**

This summary of recently issued publications (www.iec.ch/JP.htm) is also available by email. Please contact the Customer Service Centre (see below) for further information.

- **Customer Service Centre**

If you have any questions regarding this publication or need further assistance, please contact the Customer Service Centre:

Email: custserv@iec.ch
Tel: +41 22 919 02 11
Fax: +41 22 919 03 00

INTERNATIONAL STANDARD

IEC
60335-2-4

Fifth edition
2002-03

Household and similar electrical appliances – Safety –

Part 2-4: Particular requirements for spin extractors

*Appareils électrodomestiques et analogues –
Sécurité –*

*Partie 2-4:
Règles particulières pour lesessoreuses centrifuges*

© IEC 2002 — Copyright - all rights reserved

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

International Electrotechnical Commission, 3, rue de Varembé, PO Box 131, CH-1211 Geneva 20, Switzerland
Telephone: +41 22 919 02 11 Telefax: +41 22 919 03 00 E-mail: inmail@iec.ch Web: www.iec.ch



Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE

P

For price, see current catalogue

CONTENTS

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

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES –
SAFETY –****Part 2-4: Particular requirements for spin extractors**

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 fifth edition cancels and replaces the fourth edition published in 1993 and its amendments 1 (1997) and 2 (1999). It constitutes a technical revision.

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

FDIS	Report on voting
61/2098/FDIS	61/2129/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 spin extractors.

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 2003. 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.

- 3.1.9: As an alternative to the test material specified, pieces of cloth having an area between 4 800 cm² and 5 000 cm², with one side at least 55 cm, may be used for the tests (USA).
- 6.2: IPX0 appliances are allowed (USA).
- 15.2: The test is different (USA).
- 18.101: The test is carried out for 6 000 cycles (Canada and USA).
- 19.7: This subclause is applicable (USA).
- 20.101: The test is not carried out (USA).
- 20.103: The requirement is different (USA).
- 20.104: The requirement is different (USA).
- 20.105: The requirement is different (USA).
- 20.106: The requirement is different (USA).
- 21.101: There are constructional requirements for metal lids and the tests are different for thermoplastic lids (USA).
- 21.102: There are constructional requirements for metal lids and the tests are different for thermoplastic lids (USA).

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 which impair the level of safety covered by these requirements.

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

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

Part 2-4: Particular requirements for spin extractors

1 Scope

This clause of Part 1 is replaced by the following.

This International Standard deals with the safety of electric spin extractors for household and similar purposes that have a capacity not exceeding 10 kg of dry cloth and a drum peripheral speed not exceeding 50 m/s, their **rated voltages** being not more than 250 V for single-phase appliances and 480 V for other appliances.

NOTE 101 Spin extractors incorporated in washing machines are within the scope of this standard, irrespective of their capacity.

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, in light industry and on farms, are within the scope of this standard.

NOTE 102 Examples of such appliances are spin extractors for communal use in blocks of flats or in laundrettes.

As 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. 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 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 health authorities, the national authorities responsible for the protection of labour, the national water supply authorities and similar authorities.

NOTE 104 This standard does not apply to

- 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).

2 Normative references

This clause of Part 1 is applicable except as follows.

Addition:

IEC 60436, *Methods for measuring the performance of electric dishwashers*

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 drum is filled with textile material having a mass in the dry condition equal to the maximum mass specified in the instructions. The textile material consists of pre-washed double hemmed cotton sheets having dimensions of approximately 70 cm × 70 cm and a specific mass between 140 g/m² and 175 g/m² in the dry condition. It is saturated with water before being evenly distributed in the drum.

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.

5.3 Addition:

The test of 22.101 is carried out before the tests of Clause 20.

5.101 Spin extractors are tested as **portable appliances**, unless they are **fixed appliances** or are incorporated in another appliance.

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 shall be at least IPX4.

7 Marking and instructions

This clause of Part 1 is applicable except as follows.

7.10 Addition:

If the **off position** is only indicated by letters, the word "off" shall be used.

7.12 Addition:

The instructions shall specify the maximum mass of dry cloth in kilograms, to be used in the appliance.

7.12.1 Addition:

If the label specified in 7.101 is supplied with the appliance, the installation instructions shall state that it has to be permanently fixed to the wall close to the appliance.

For appliances intended for communal use in blocks of flats, and having an interlock system that has to be energized in order to release the lid, the installation instructions shall state that a device for switching off the appliance automatically is not to be installed in the supply circuit.

7.101 Addition:

Appliances intended for communal use in blocks of flats, and having an interlock system that has to be energized in order to release the lid, shall be supplied with a label that states the substance of the following, unless the instruction is marked on the appliance:

This spin extractor has to be connected to the supply mains before the lid can be opened. Do not force it open.

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.

11.7 Replacement:

Appliances are operated for five periods of water extraction, the periods being separated by a rest period. Each rest period, which includes the braking time, has a duration of 1 min for each kilogram of dry textile material or 4 min, whichever is longer. During the rest period, the textile material is re-saturated with water.

For appliances incorporating a programmer or timer, the water extraction period is the maximum allowed by the control.

For other appliances, the water extraction period has a duration of

- 15 min for continuous-flow rinsing appliances;*
- 5 min for other appliances.*

If a longer period is indicated in the instructions, this period applies instead.

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 Replacement:

Appliances shall be constructed so that spillage of liquid in normal use does not affect their electrical insulation.

Compliance is checked by the following tests.

*Appliances with **type X attachment**, except those having a specially prepared cord, are fitted with the lightest permissible type of flexible cord and having the smallest cross-sectional area specified in Table 13.*

*The inlet to the discharge pump or to the gravity drain is blocked. The drum is filled as specified for **normal operation**, the mass of water being twice the mass of the dry textile material. Any water remaining after the saturation process is poured into the appliance, which is supplied at **rated voltage** and operated for 1 min or the maximum period allowed by the programmer or timer, whichever is shorter.*

*In addition, continuous-flow rinsing appliances having a vertical axis, are completely filled with saturated textile material and 10 l of water is poured in over a period of 20 s. The appliance is then operated while supplied at **rated voltage**.*

For appliances having a working surface, controls are placed in the on position and 0,5 l of water containing approximately 1 % NaCl and 0,6 % of rinsing agent, as specified in Annex AA, is poured over the top of the appliance. The controls are then operated through their working range, this operation being repeated after a period of 5 min.

*The appliance shall then withstand the electric strength test of 16.3 and inspection shall show that there is no trace of water on insulation that could result in a reduction of **clearances** and **creepage distances** below the values specified in Clause 29.*

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 replaced by the following.

Appliances having lids that can be opened while the drum is rotating shall be constructed so that braking mechanisms and lid interlocks withstand the stresses to which they may be exposed in normal use.

Compliance is checked by the following test.

*The appliance is supplied at 1,06 times **rated voltage** and operated under **normal operation** until the motor has reached its maximum speed.*

The lid is then fully opened. The test is repeated after the drum has been at rest for a period long enough to ensure that the appliance does not attain an excessive temperature.

The test is carried out

- 3 500 times for separate spin extractors.
- 1 000 times for spin extractors incorporated in washing machines having facilities for separate spinning.

The textile material is re-saturated with water at least every 250 times.

After the test the appliance shall be fit for further use and compliance with this standard shall not be impaired.

NOTE Forced cooling may be used to prevent excessive temperatures and to shorten the test.

19 Abnormal operation

This clause of Part 1 is applicable except as follows.

19.7 Not applicable.

19.9 Not applicable.

20 Stability and mechanical hazards

This clause of Part 1 is applicable except as follows.

20.1 Addition:

*The drum is empty, or filled as specified for **normal operation**, whichever is more unfavourable.*

20.101 Appliances shall not be adversely affected by an unbalanced load.

Compliance is checked by the following test.

The appliance is placed on a horizontal support and a load having a mass of 0,2 kg or 10 % of the maximum mass of textile material specified in the instructions, whichever is higher, is fixed to the inside wall of the drum half-way along its length.

*The appliance is supplied at **rated voltage** and operated for 5 min or the maximum period allowed by a programmer or timer, whichever is shorter.*

The test is carried out four times, the load being moved each time through an angle of 90° around the wall of the drum.

The appliance shall not overturn and the drum shall not hit other parts except the enclosure.

After the test, the appliance shall be fit for further use.

20.102 The lid or door shall be interlocked so that the appliance can only be operated when the lid or door is in the closed position.

Compliance is checked by inspection and by manual test.

NOTE Interlocks that can be released by means of the test probe B of IEC 61032 are not considered to meet this requirement.

20.103 For spin extractors, whether they are separate or incorporated in a washing machine with a separate drum for water extraction, having a drum with a kinetic energy exceeding 1 500 J or a maximum peripheral speed exceeding 20 m/s, it shall not be possible to open the lid while the drum is in motion.

Compliance is checked by inspection, by measurement and by the following test.

*The appliance is supplied at **rated voltage** and operated empty. The force determined during the test of 22.101 with the lid interlocked is applied to the lid in an attempt to open it.*

It shall not be possible to open the lid while the drum is in motion.

NOTE 1 If the drum is not cylindrical, the peripheral speed is the mean peripheral speed.

NOTE 2 The kinetic energy is calculated from the following formula:

$$E = \frac{mv^2}{4}$$

where

E is the kinetic energy, in J;

m is the mass of the cloth specified in the instructions for use, in kilograms;

v is the maximum peripheral speed of the drum, in m/s.

20.104 For spin extractors, whether they are separate or incorporated in a washing machine with a separate drum for water extraction, having a drum with a kinetic energy not exceeding 1 500 J and a maximum peripheral speed not exceeding 20 m/s, moving parts shall not be accessible while the motor is energized or when the drum speed exceeds 60 rev/min.

The braking system shall not be affected by the penetration of water.

Compliance is checked by the following test, which is carried out after repeating the spillage test of 15.2.

*The appliance is supplied at **rated voltage** and operated empty. The lid is gradually opened and*

- with an opening of 4 mm to 10 mm, it shall not be possible to touch parts rotating at a speed exceeding 60 rev/min with the test probe 12 of IEC 61032;*
- with an opening greater than 10 mm, but not more than 12 mm, it shall not be possible to touch parts rotating at a speed exceeding 60 rev/min with a test rod 3 mm in diameter and 120 mm long. In addition, the test probe B of IEC 61032 is applied and shall not come within a distance of 20 mm from the rotating parts;*
- with an opening greater than 12 mm, the motor shall be disconnected from the supply and the drum speed shall not exceed 60 rev/min.*

20.105 For appliances in which water extraction takes place in the drum used for washing and in which the drum has a kinetic energy exceeding 1500 J or a peripheral speed exceeding

- 20 m/s, for washing machines having a drum that rotates about the horizontal axis;
- 40 m/s, for washing machines having a drum that rotates about the vertical axis;

it shall not be possible to open the lid or door while the drum is in motion at a speed exceeding 60 rev/min.

Compliance is checked by the following test.

*The appliance is supplied at **rated voltage** and operated empty. The force, determined during the test of 22.101 with the lid or door interlocked, is applied to the lid or door in an attempt to open it.*

It shall not be possible to open the lid or door while the drum speed exceeds 60 rev/min.

20.106 Appliances in which water extraction takes place in the drum used for washing, and in which the drum has a kinetic energy not exceeding 1500 J and a peripheral speed not exceeding

- 20 m/s, for washing machines having a drum that rotates about the horizontal axis;
- 40 m/s, for washing machines having a drum that rotates about the vertical axis;

shall be provided with an automatic means for reducing the drum speed to 60 rev/min when the lid or door is opened.

Compliance is checked by the following test.

*The appliance is supplied at **rated voltage** and operated empty. A force not exceeding 50 N is applied to the lid or door in an attempt to open it as in normal use. If the lid or door opens, the drum speed shall be no higher than 60 rev/min within 7 s of opening the lid or door by 50 mm.*

20.107 Protective devices fitted in the upper part of spin extractors having a vertical axis shall be positioned or protected so that the device is not likely to be damaged by textile material that may escape from the drum in normal use.

Compliance is checked by inspection.

21 Mechanical strength

This clause of Part 1 is applicable except as follows.

21.101 Lids of appliances shall have adequate mechanical strength.

Compliance is checked by the following test.

A rubber hemisphere having a diameter of 70 mm and a hardness between 40 IRHD and 50 IRHD is fixed to a cylinder having a mass of 20 kg and dropped from a height of 10 cm onto the centre of the lid.

The test is carried out three times, after which the lid shall not be damaged to the extent that moving parts become accessible.

21.102 Lids and their hinges shall have adequate resistance to distortion.

Compliance is checked by the following test.

A force of 50 N is applied to the open lid in the most unfavourable direction and position.

The test is carried out three times, after which the hinges shall not have worked loose and the appliance shall not be damaged or deformed to such an extent that compliance with the appropriate requirements of 20.102 to 20.106 is impaired.

22 Construction

This clause of Part 1 is applicable except as follows.

22.101 Interlocks shall be constructed so that lids or doors are unlikely to be forced open in normal use.

Compliance is checked by the following test.

The lid or door is opened manually as in normal use, the force applied being measured. The lid or door is closed and interlocked. An attempt is then made to open the lid or door in the same way.

It shall not be possible to force open the lid or door with a force less than 10 times the value originally measured, with a minimum of 50 N.

NOTE The test is not carried out if the interlock is not required for compliance with Clause 20.

23 Internal wiring

This clause of Part 1 is applicable.

24 Components

This clause of Part 1 is applicable except as follows.

24.1.4 Modification:

The number of cycles of operation for timers is increased to 10 000.

25 Supply connection and external flexible cords

This clause of Part 1 is applicable.

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.

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.

Annexes

The annexes of Part 1 are applicable except as follows.

Annex C (normative)

Ageing test on motors

Modification:

The value of p in Table C.1 is 2 000.

Annex AA (normative)

Rinsing agent

The composition of the rinsing agent is extracted from IEC 60436 and is as follows:

Substance	Parts by mass
	%
Plurafax LF 221 ¹⁾	15,0
Cumene sulfonate (40 % solution)	11,5
Citric acid (anhydrous)	3,0
Deionized water	70,5

The rinsing agent has the following properties:

- viscosity, 17 mPa·s;
- pH, 2,2 (1 % in water).

NOTE Any commercially available rinsing agent may be used, but if there is any doubt with regards to the test results, this composition is to be used.

1) Plurafac LF 221 is the trade name of a product supplied by BASF. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by IEC of this product.