

INTERNATIONAL STANDARD

IEC
60335-2-11

Fifth edition
2000-02

Safety of household and similar electrical appliances –

Part 2-11: Particular requirements for tumble dryers

Sécurité des appareils électrodomestiques et analogues –

*Partie 2-11:
Règles particulières pour les sèche-linge à tambour*



Reference number
IEC 60335-2-11:2000(E)

Numbering

As from 1 January 1997 all IEC publications are issued with a designation in the 60000 series.

Consolidated publications

Consolidated versions of some IEC publications including amendments are available. 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.

Validity of this publication

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 the date of the reconfirmation of the publication is available in the IEC catalogue.

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 to be found at the following IEC sources:

- **IEC web site***
- **Catalogue of IEC publications**
Published yearly with regular updates
(On-line catalogue)*
- **IEC Bulletin**
Available both at the IEC web site* and as a printed periodical

Terminology, graphical and letter symbols

For general terminology, readers are referred to IEC 60050: *International Electrotechnical Vocabulary* (IEV).

For graphical symbols, and letter symbols and signs approved by the IEC for general use, readers are referred to publications IEC 60027: *Letter symbols to be used in electrical technology*, IEC 60417: *Graphical symbols for use on equipment. Index, survey and compilation of the single sheets* and IEC 60617: *Graphical symbols for diagrams*.

* See web site address on title page.

INTERNATIONAL STANDARD

IEC
60335-2-11

Fifth edition
2000-02

Safety of household and similar electrical appliances –

Part 2-11: Particular requirements for tumble dryers

Sécurité des appareils électrodomestiques et analogues –

*Partie 2-11:
Règles particulières pour les sèche-linge à tambour*

© IEC 2000 — 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 Varembe Geneva, Switzerland
Telefax: +41 22 919 0300 e-mail: inmail@iec.ch IEC web site <http://www.iec.ch>



Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE

P

For price, see current catalogue

CONTENTS

	Page
FOREWORD	3
Clause	
1 Scope	5
2 Definitions	6
3 General requirement	6
4 General conditions for the tests	6
5 Void	6
6 Classification	6
7 Marking and instructions	7
8 Protection against access to live parts	7
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 Void	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	11
21 Mechanical strength	12
22 Construction	12
23 Internal wiring	13
24 Components	13
25 Supply connection and external flexible cords	13
26 Terminals for external conductors	13
27 Provision for earthing	13
28 Screws and connections	13
29 Creepage distances, clearances and distances through insulation	13
30 Resistance to heat, fire and tracking	14
31 Resistance to rusting	14
32 Radiation, toxicity and similar hazards	14
Annex A Normative references	16
Figure 101 – Probe for measuring surface temperature	15

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**SAFETY OF HOUSEHOLD AND SIMILAR
ELECTRICAL APPLIANCES –****Part 2-11: Particular requirements for tumble dryers**

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, amendment 1 (1998) and amendment 2 (1999). This fifth edition constitutes a technical revision.

The text of this standard is based on the fourth edition, amendments 1 and 2 and the following documents:

FDIS	Report on voting
61/1646/FDIS	61/1742/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 intended to be used in conjunction with the latest edition of IEC 60335-1 and its amendments. It was established on the basis of the third edition (1991) of that standard.

This part 2 supplements or modifies the corresponding clauses in IEC 60335-1, so as to convert it into the IEC standard: Safety requirements for electric tumble dryers (fourth edition).

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 in part 1 should be adapted accordingly.

NOTE 1 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.

NOTE 2 Subclauses and figures which are additional to those in part 1 are numbered starting from 101.

The following differences exist in some countries:

- 2.2.9: Different size cloths are used (USA).
- 6.2: Tumble dryers are not required to be IPX4 (USA).
- 7.1: An instruction concerning cleaning the lint trap is to be marked on the dryer in letters not less than 8 mm high and is to be conspicuous when the dryer door is open (Australia, New Zealand).
- 7.12: Actual articles of clothing can be specified instead and warnings are required to be marked on the appliance regarding the use of chemicals for cleaning (USA).
- 11.2: Other methods are used for conducting heating tests on tumble dryers (USA).
- 11.7: This test is continued until steady conditions are established and different criteria are used to determine when steady conditions are reached (USA).
- 19.4: The test is conducted differently (USA).
- 19.9: A running overload test is required on automatically controlled tumble dryers (USA).
- 20.101: The requirement is applicable to door openings with a dimension exceeding 20 cm (Norway).
- 20.102: When considering accessibility to rotating drums, the maximum drum volume is 60 dm³ and the maximum door opening is 20 cm (USA).
- 20.103: This test is not conducted (USA).
- 22.103: Different methods are used to evaluate the stability of stacked tumble dryers and washing machines (USA).
- 27.1: Earthing terminals and contacts are permitted to be electrically connected to the neutral conductor of a tumble dryer (USA).

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

SAFETY OF HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES –

Part 2-11: Particular requirements for tumble dryers

1 Scope

This clause of part 1 is replaced by:

This standard deals with the safety of electric **tumble dryers** intended for household and similar purposes and having a **rated voltage** not more than 250 V for single-phase appliances and 480 V for other appliances.

NOTE 1 This standard applies to the drying function of appliances having both a washing and drying function.

Appliances not intended for normal household use but which nevertheless may be a source of danger to the public, such as appliances for communal use in blocks of flats or in laundrettes, are also within the scope of this standard.

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. However, 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 intended exclusively for industrial or commercial 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 Definitions

This clause of part 1 is applicable except as follows:

2.2.9 Replacement:

normal operation

the **tumble dryer** is operated with the drum filled with textile material having a mass in the dry condition equal to the maximum load stated in the instructions for use.

The textile material consists of pre-washed double-hemmed cotton sheets approximately 70 cm × 70 cm having a mass between 140 g/m² and 175 g/m² in the dry condition. The textile material is soaked with water having a temperature of 25 °C ± 5 °C and a mass equal to that of the textile material.

If the drying function can automatically follow the washing function in a washing machine, the drum is not separately loaded. The **tumble dryer** is operated with the maximum quantity of textile material stated in the instructions for use for the combined washing-drying cycle.

NOTE Cotton having a water content not exceeding 10 % is considered as being in the dry condition. Cotton conditioned for 24 h in still air having a temperature of 20 °C ± 2 °C, a relative humidity between 60 % and 70 % and a pressure between 860 mbar and 1 060 mbar, will contain approximately 7 % of water.

2.101

tumble dryer

an appliance in which textile material is dried by tumbling in a rotating drum through which heated air is blown

2.102

condensation-type tumble dryer

a **tumble dryer** in which the air used for the drying process is dehumidified by cooling.

3 General requirement

This clause of part 1 is applicable.

4 General conditions for the tests

This clause of part 1 is applicable.

5 Void

6 Classification

This clause of part 1 is applicable, except as follows:

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 for use shall state

- the maximum mass in kilogrammes of dry textile material for which the appliance is designed;
- that the **tumble dryer** is not to be used if chemicals have been used for cleaning;
- that there has to be adequate ventilation to avoid the back flow of gases into the room from appliances burning other fuels, including open fires, when operating the tumble dryer.

NOTE This instruction is not required if the tumble dryer discharges the air back into the room.

7.12.1 Addition:

The instructions for use shall state

- that the lint trap is to be cleaned frequently, if applicable;
- that lint is not to be allowed to accumulate around the **tumble dryer** (not applicable for appliances intended to be vented to the exterior of the building);
- for **condensation-type tumble dryers** intended to be connected to the water mains:
 - the maximum permissible inlet water pressure, in pascals or bars;
 - the minimum permissible inlet water pressure, in pascals or bars, if necessary for correct operation;
 - the appliance is to be connected to the water mains using a new hose-set and old hose-sets should not be reused.

NOTE 1 This instruction is not required if the hose is permanently attached to the appliance.

- for appliances with ventilation openings in the base, that a carpet must not obstruct the openings;
- that exhaust air must not be discharged into a flue which is used for exhausting fumes from appliances burning gas or other fuels.

NOTE 2 This instruction is not required if the tumble dryer discharges the air back into the room.

If the instructions for use state that the **tumble dryer** can be placed on top of a washing machine, the instructions shall state which washing machines are suitable. Instructions shall be given for the assembly of the **tumble dryer** and washing machine.

7.101 The enclosure of magnetic valves and similar components incorporated in external hoses for direct connection to the water mains, shall be marked with the symbol No. 5036 of IEC 60417-1 if their **working voltage** exceeds **extra-low voltage**.

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 Addition:

Lint traps are cleaned and then 50 % of the area of the filter is blocked.

11.3 Addition:

Temperature rises of the accessible front surface are measured using the probe shown in figure 101. The probe is applied with a force of $4\text{ N} \pm 1\text{ N}$ to the surface in such a way that the best possible contact between the probe and the surface is ensured.

NOTE Any measuring instrument giving the same results may be used.

11.7 Replacement:

Appliances incorporating a timer, a humidity sensing control or other time-limiting control are operated in cycles. Each cycle comprises an operating period having a duration equal to the maximum time that can be provided by the control and a rest period of 4 min during which the appliance is reloaded.

The test may be ended if the temperature rise of any part does not exceed the value determined during the preceding cycle by more than 8 K.

Appliances having a washing and drying function which incorporates a programmer are operated with the drying programme leading to the highest temperature rise.

Other appliances are operated continuously until steady conditions are established.

11.8 Addition:

The temperature rises of the accessible front surface shall not exceed the following values:

- | | |
|---|------|
| – metal and painted metal parts | 60 K |
| – vitreous-enamelled metal parts | 65 K |
| – glass and ceramic parts | 65 K |
| – plastic parts having a thickness exceeding 0,3 mm | 80 K |

The temperature rise limit of 80 K also applies to plastic material having a metal finish of thickness less than 0,1 mm.

NOTE When the thickness of the plastic coating does not exceed 0,3 mm, the temperature-rise limits of the supporting material applies.

The temperature rises are measured with all doors or covers in the closed position.

12 Void

13 Leakage current and electric strength at operating temperature

This clause of part 1 is applicable except as follows:

13.2 Modification:

*Instead of the permissible leakage current for **stationary class I appliances**, the following applies:*

*For **stationary class I appliances**, the leakage current shall not exceed 3,5 mA or 1 mA per kW **rated power input** whichever is the greater, with a maximum of 5 mA.*

14 Void

15 Moisture resistance

This clause of part 1 is applicable except as follows:

15.1 Addition:

Magnetic valves and similar components incorporated in external hoses for connection to the water mains are subjected to the test specified for IPX7 appliances.

15.2 Modification:

Instead of the test specification, the following applies:

*The drum is filled with wet textile material as specified for **normal operation**, the mass of the water however, being approximately 1,5 times the mass of the dry textile material.*

*Appliances intended to be connected to the water mains are operated with the outlet of the condensation circuit blocked. The inlet valve is held open and the filling continued for 1 min after first evidence of overflow or until a **protective device** operates to stop the flow. The inlet valve is held open for 5 min after the **protective device** operates. Front loading doors are opened but interlocks and similar devices are not forced.*

For appliances having a working surface, 0,5 l of water containing approximately 1 % NaCl and 0,6 % of acid rinsing agent, as specified in annex AA of IEC 60335-2-5, is poured over the top of the appliance, the controls being placed in the on position. The control knobs 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 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:

16.2 Modification:

*Instead of the permissible leakage current for **stationary class I appliances**, the following applies:*

*For **stationary class I appliances**, the leakage current shall not exceed 1 mA or 1 mA per kW rated power input whichever is the greater, with a maximum of 5 mA.*

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 Modification:

Instead of being subjected to the tests of 19.2 and 19.3, appliances are subjected to the tests of 19.101 and 19.102, if applicable.

Addition:

If operation without water is considered to be a more unfavourable condition for appliances which are connected to the water mains, the tests are made with the water tap closed. However, this tap is not closed after the appliance has been switched on.

19.4 Replacement:

*The appliance is operated under the conditions specified in clause 11 but at 1,15 times **rated power input** and with dry textile material. Controls which operate during the test of clause 11 and all **self-resetting thermal cut-outs** which protect the heating element are short-circuited or rendered inoperative simultaneously. The test is terminated at the end of the maximum period allowed by a timer.*

19.9 Not applicable.

19.13 Addition:

The textile material shall not ignite and shall show no charring or glowing.

NOTE Light-brown colouring of the textile material or slight emission of smoke is ignored.

19.101 The test of 19.4 is repeated but with the thermal controls not short-circuited and the drum belt removed. The duration of the test is 90 min or the maximum period allowed by a timer.

If the air circulation is likely to be prevented due to a fault condition, the test is repeated but with the drum belt in position and with the air circulation stopped.

NOTE Care is taken to ensure that the textile material is tumbling properly by reducing the load if necessary.

If both of these conditions are likely to occur simultaneously, the tests are combined.

19.102 For **condensation-type tumble dryers**, the test of 19.4 is repeated, but with 75 % of the air outlet of the condenser blocked. The test is then carried out again with the air outlet fully blocked.

20 Stability and mechanical hazards

This clause of part 1 is applicable except as follows:

20.1 Modification:

The test with the angle of inclination increased to 15° is not made.

20.101 Appliances shall have means to prevent opening of the door during operation or an interlock which disconnects the motor before the door opening exceeds 75 mm. It shall not be possible to start the motor while the door opening exceeds 75 mm. For appliances with a door opening having a dimension exceeding 30 cm and a drum having a volume exceeding 100 dm³, starting of the motor shall not be possible until a separate means which controls the movement of the drum is operated manually.

Interlocks shall be constructed so that unexpected operation of the appliance is unlikely to occur while the door is open.

*Compliance is checked by inspection, by measurement and by manual test with the appliance supplied at **rated voltage** and under **normal operation**.*

If means to prevent the door opening incorporates a coil or similar component to lock the door in the closed position, the component is energized and de-energized 6 000 times, six times a minute or at the rate imposed by the construction of the appliance if this is lower.

The locking means and its components shall be fit for further use.

NOTE 1 The door is opened and closed during the test if this is necessary for the mechanical operation of the interlock.

NOTE 2 Interlocks which can be released by means of the test finger shown in figure 1 are considered likely to cause unexpected operation of the appliance.

20.102 For appliances with a door opening having a dimension exceeding 30 cm and a drum volume exceeding 100 dm³, it shall be possible to open the door from the inside with a force not exceeding 70 N.

Compliance is checked by inspection, by measurement and by applying the force perpendicular to the plane of the door at a point farthest from the hinges.

NOTE The force may be applied to the outside of the door.

20.103 Appliances with horizontally hinged doors shall have adequate stability when the open door is subjected to a load.

Compliance is checked by the following test:

The empty appliance is placed on a horizontal surface and a mass of 23 kg applied to the centre of the open door. The appliance shall not tilt and the door and hinges shall not be damaged to such an extent that compliance with this standard is impaired.

NOTE 1 **Built-in appliances** and top-loading appliances are not subjected to this test.

NOTE 2 The test is made with the **tumble dryer** placed on a horizontal surface even if it can be stacked on top of a washing machine.

21 Mechanical strength

This clause of part 1 is applicable.

22 Construction

This clause of part 1 is applicable except as follows:

22.101 Heating elements shall be located or guarded so that they cannot be contacted by textile material.

Compliance is checked by inspection.

22.102 Condensation-type tumble dryers 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 inlet-water pressure or 1,2 MPa (12 bar) whichever is the higher, for a period of 5 min.

There shall be no leakage from any part, including the inlet-water hose.

22.103 If the manufacturer states that the **tumble dryer** can be placed on top of a washing machine this shall be possible without the **tumble dryer** tilting or falling. If this is achieved by attachments, these shall be made available by the manufacturer.

Compliance is checked by inspection and by the following test:

*The washing machine and **tumble dryer** are assembled together in accordance with the instructions.*

The combination is placed in the most unfavourable position on a surface which is inclined at 5° to the horizontal.

*Each appliance is supplied at **rated voltage** and under **normal operation** in turn.*

*The appliances shall not tilt and the **tumble dryer** shall not fall off the washing machine.*

23 Internal wiring

This clause of part 1 is applicable except as follows:

23.101 Internal wiring for the connection of magnetic valves and similar components incorporated in hoses outside the appliance shall be at least equivalent to light polyvinyl chloride sheathed cord (code designation 60227 IEC 52).

Compliance is checked by inspection.

24 Components

This clause of part 1 is applicable except as follows:

24.1.2 Addition:

The number of cycles of operation for programmers is 3 000.

24.101 If a **protective device** operates during the test of 19.4 or 19.102 it shall be of the non-self-resetting type.

Compliance is checked by inspection.

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 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:

30.2.2 Not applicable.

30.3 Addition:

NOTE Switching devices with moving contacts, other than those manually operated and those intended to operate only during abnormal operation, are considered to be subjected to extra-severe duty conditions.

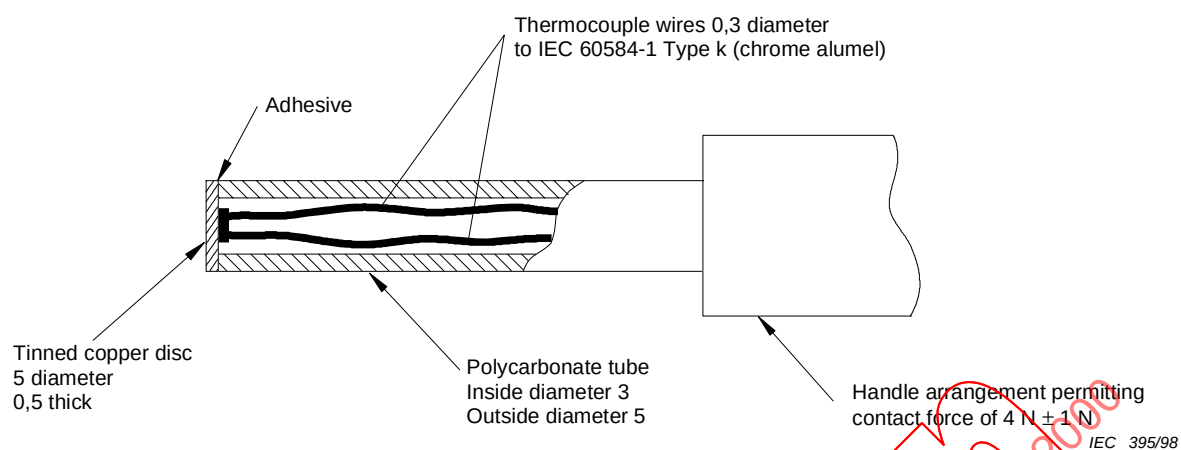
Switching devices with moving contacts intended to operate only during abnormal operation and other parts of insulating materials are also considered to be subjected to extra-severe duty conditions, unless they are enclosed or located so that pollution by condensation is unlikely to occur. In this case they are considered to be subjected to severe duty conditions.

31 Resistance to rusting

This clause of part 1 is applicable.

32 Radiation, toxicity and similar hazards

This clause of part 1 is applicable.



Dimensions in millimetres

NOTE The contact face of the disc must be flat.

The thermocouple must be soldered with care to ensure disc temperature is measured.

Figure 101 – Probe for measuring surface temperature