



BSI Standards Publication

Household and similar electrical appliances - Safety

Part 2-7: Particular requirements for washing machines

National foreword

This British Standard is the UK implementation of EN 60335-2-7:2010+A2:2019. It is derived from IEC 60335-2-7:2008, incorporating amendments 1:2011 and 2:2016 and corrigendum September 2012. It supersedes BS EN 60335-2-7:2010+A11:2013, which will be withdrawn on 1 November 2022.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to IEC text carry the number of the IEC amendment. For example, text altered by IEC amendment 1 is indicated by A1 A1.

Text altered by CENELEC amendment A11 is indicated by A11 A11.

The CENELEC common modifications have been implemented at the appropriate places in the text. The start and finish of each common modification is indicated in the text by tags C C.

Where a common modification to an IEC amendment has been introduced, the tags carry the number of the amendment. For example, the common modifications introduced by CENELEC to IEC amendment 1 are indicated by C1 C1.

The start and finish of text introduced or altered by corrigendum is indicated in the text by tags. Text altered by IEC corrigendum September 2012 is indicated in the text by AC1 AC1.

The UK participation in its preparation was entrusted to Technical Committee CPL/61, Safety of household and similar electrical appliances.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Amendments/corrigenda issued since publication

Date	Text affected
30 June 2013	Implementation of IEC amendment 1:2011 with CENELEC modifications
30 June 2013	Implementation of IEC corrigendum September 2012
30 April 2014	Implementation of CENELEC amendment A11:2013

Date	Text affected
30 November 2019	Implementation of IEC amendment 2:2016 with CENELEC modifications

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 60335-2-7:2010+A2

November 2019

ICS 13.120; 97.060

English Version

**Household and similar electrical appliances - Safety - Part 2-7:
Particular requirements for washing machines
(IEC 60335-2-7:2008, modified)**

Appareils électrodomestiques et analogues - Sécurité -
Partie 2-7: Règles particulières pour les machines à laver le
linge
(IEC 60335-2-7:2008, modifiée)

Sicherheit elektrischer Geräte für den Hausgebrauch und
ähnliche Zwecke - Teil 2-7: Besondere Anforderungen für
Waschmaschinen
(IEC 60335-2-7:2008, modifiziert)

This European Standard was approved by CENELEC on 2009-11-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.



European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

European foreword

The text of document 61/3564/FDIS, future edition 7 of IEC 60335-2-7, prepared by IEC Technical Committee 61, Safety of household and similar electrical appliances, was submitted to the IEC-CENELEC parallel vote.

A draft amendment was prepared by the Technical Committee CENELEC TC 61, Safety of household and similar electrical appliances. It was discussed during the meetings of CENELEC TC 61 in Malaga in June 2007, in Berlin in November 2007, in Kista in June 2008 and in London in December 2008, when it was decided to submit a draft for an amendment to the Unique Acceptance Procedure.

The combined texts were approved by CENELEC as EN 60335-2-7 on 2009-11-01.

This European Standard supersedes EN 60335-2-7:2003 + corr. July 2003 + A1:2004 + A2:2006.

The principal changes compared to EN 60335-2-7:2003 are as follows (minor changes are not listed):

- the text of some notes has been converted to normative text;
- the spillage test has been made applicable to all washing machines (15.2);
- additional requirements concerning the accessibility of mechanical release mechanisms have been added (22.105);
- requirements for washing machines employing an electrolyte, instead of detergent, have been introduced in Annex CC.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN and CENELEC shall not be held responsible for identifying any or all such patent rights.

The following dates are applicable:

- latest date by which the EN has to be implemented
at national level by publication of an identical
national standard or by endorsement (dop) 2010-11-01
- date on which national standards
conflicting with the EN have to be withdrawn (dow) 2014-11-01

This part 2 has to be used in conjunction with EN 60335-1, Household and similar electrical appliances – Safety – Part 1: General requirements. It was established on the basis of the 2002 edition of that standard. Amendments and revisions of Part 1 have also to be taken into account and the dates when such changes become applicable will be stated in the relevant amendment or revision of Part 1.

This part 2 supplements or modifies the corresponding clauses of EN 60335-1, so as to convert it into the European Standard: Safety requirements for electric washing 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 of Part 1 is to be adapted accordingly.

NOTE 1 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.;
- subclauses, notes and annexes that are additional to those in the IEC standard are prefixed with the letter Z.

NOTE 2 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.

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

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

p NOTE In this document, p is used in the margin to indicate instructions for preparing the printed version.

Endorsement notice

The text of the International Standard IEC 60335-2-7:2008 was approved by CENELEC as a European Standard with agreed common modifications as given below.

Foreword to amendment A1

The text of document 61/4279/FDIS, future edition 1 of IEC 60335-2-7:2008/A1, prepared by IEC TC 61 "Safety of household and similar electrical appliances" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 60335-2-7:2010/A1:2013.

A draft amendment, which covers common modifications to IEC 60335-2-7:2008/A1:2011, was prepared by CLC/TC 61 "Safety of household and similar electrical appliances" and approved by CENELEC.

The following dates are fixed:

- latest date by which this document has (dop) 2013-11-20
to be implemented at national level
by publication of an identical
national standard or by endorsement
- latest date by which the national (dow) 2015-11-20
standards conflicting with this document
have to be withdrawn

This amendment supplements or modifies the corresponding clauses of EN 60335-1:2012 and EN 60335-2-7:2010.

Endorsement notice

The text of the International Standard IEC 60335-2-7:2008/A1:2011 was approved by CENELEC as a European Standard with agreed common modifications.

In the Bibliography of EN 60335-2-7:2010, delete the following note:

ISO 13732-1

NOTE Harmonized as EN ISO 13732-1.

EN 60335-2-7:2010+A2:2019 (E)**Foreword to amendment A11**

This document (EN 60335-2-7:2010/A11:2013) has been prepared by CLC/TC 61 "Safety of household and similar electrical appliances".

The following dates are fixed:

- latest date by which this document has to be implemented (dop) 2014-04-25
at national level by publication of an identical national standard or by endorsement
- latest date by which the national standards conflicting with (dow) 2014-11-21
this document have to be withdrawn

This amendment supplements or modifies the corresponding clauses of EN 60335-1:2012 and its amendments, EN 60335-2-7:2010 and EN 60335-2-7:2010/A1:2013.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

This standard covers the Principle Elements of the Safety Objectives for Electrical Equipment Designed for Use within Certain Voltage Limits (LVD - 2006/95/EC).

Foreword to amendment A2

This document (EN 60335-2-7:2010/A2:2019) consists of the text of IEC 60335-2-7:2008/A2:2016 prepared by IEC/TC 61 "Safety of household and similar electrical appliances", together with the common modifications prepared by CLC/TC 61 "Safety of household and similar electrical appliances".

The following dates are fixed:

- latest date by which this document has to be (dop) 2020-05-01
implemented at national level by publication of an identical national standard or by endorsement
- latest date by which the national standards (dow) 2022-11-01
conflicting with this document have to be withdrawn

This amendment supplements or modifies the corresponding clauses of the standards below:

- EN 60335-1:2012 + A11:2014 + A13:2017 (Part 1)
- EN 60335-2-7:2010 + A1:2013 + A11:2013 (Part 2)

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For the relationship with EU Directive(s) see informative Annex(es) ZZ, which is(are) an integral part(s) of this document.

Endorsement notice

The text of the International Standard IEC 60335-2-7:2008/A2:2016 was approved by CENELEC as a European Standard with agreed common modifications.

Annex ZC
(normative)

**Normative references to international publications
with their corresponding European publications**

Addition:

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60730-2-12 (mod)	2005	Automatic electrical controls for household and similar use – Part 2-12: Particular requirements for electrically operated door locks	EN 60730-2-12 + A11	2006 2008
ISO 1817	2015	Rubber, vulcanized or thermoplastic - Determination of the effect of liquids	–	–

Replace Annex ZZA in the part 1 by the following:

Annex ZZA (informative)

Relationship between this European Standard and the safety objectives of Directive 2014/35/EU [2014 OJ L96] aimed to be covered

This European Standard has been prepared under a Commission's standardization request relating to harmonized standards in the field of the Low Voltage Directive, M/511, to provide one voluntary means of conforming to safety objectives of Directive 2014/35/EU of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits [2014 OJ L96].

Once this standard is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of this standard given in Table ZZA.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding safety objectives of that Directive, and associated EFTA regulations.

Compliance with this Part 2 when used together with Part 1 provides one means of conformity with the safety objectives.

**Table ZZA.1 – Correspondence between this European Standard
and Annex I of Directive 2014/35/EU [2014 OJ L96]**

Safety objectives of Directive 2014/35/EU	Clause(s) / sub-clause(s) of this EN	Remarks/ Notes
1 a)	Clauses 4, 7	None
1 b)	Clauses 4, 7	None
1 c)	Clauses 4, 7	None
2 a)	Clauses 6, 7, 8, 9, 10, 11, 13, 14, 15, 16, 17, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31	None
2 b)	Clauses 6, 7, 8, 9, 10, 11, 13, 14, 15, 16, 17, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31	None
2 c)	Clauses 6, 7, 11, 15, 17, 18, 19, 20, 21, 22, 24, 25, 30, 32	None
2 d)	Clauses 6, 7, 8, 9, 10, 11, 13, 14, 15, 16, 17, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31	None
3 a)	Clauses 6, 7, 11, 17, 18, 19, 20, 21, 22	None
3 b)	Clauses 7, 11, 15, 19, 22, 25, 32	None
3 c)	Clauses 6, 7, 9, 10, 11, 14, 17, 18, 19, 21, 22	None

WARNING 1 — Presumption of conformity stays valid only as long as a reference to this European Standard is maintained in the list published in the Official Journal of the European Union. Users of this standard should consult frequently the latest list published in the Official Journal of the European Union.

WARNING 2 — Other Union legislation may be applicable to the product(s) falling within the scope of this standard.

Annex ZZB
(informative)

Annex ZZB is not applicable.

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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 and takes into account the way in which electromagnetic phenomena can affect the safe operation of appliances.

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.

NOTE 1 For example, if appliances within the scope of this Part 2

- have a separate spin container for water extraction, IEC 60335-2-4 is also applicable as far as is reasonable;
- have a drying function, IEC 60335-2-11 is also applicable as far as is reasonable.

When a part 2 standard does not include additional requirements to cover hazards dealt with in Part 1, Part 1 applies.

NOTE 2 This means that the technical committees responsible for the part 2 standards have determined that it is not necessary to specify particular requirements for the appliance in question over and above the general requirements.

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.

NOTE 3 Horizontal and generic standards covering a hazard are not applicable since they have been taken into consideration when developing the general and particular requirements for the IEC 60335 series of standards. For example, in the case of temperature requirements for surfaces on many appliances, generic standards, such as ISO 13732-1 for hot surfaces, are not applicable in addition to Part 1 or part 2 standards.

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 2-7: Particular requirements for washing machines

1 Scope

Ⓒ11 This clause of Part 1 is replaced by the following.

This European Standard deals with the safety of electric washing machines for household and similar purpose, that are intended for washing clothes and textiles, their rated voltage being not more than 250 V for single-phase and 480 V for others. These washing machines in this European Standard are generally referred to as appliances.

This European Standard also deals with the safety of electric washing machines for household and similar use employing an electrolyte instead of detergent. Additional requirements for these appliances are given in Annex CC.

Appliances intended to be used by laymen in shops and other premises for normal housekeeping purposes, are within the scope of this European Standard.

NOTE Z101 Examples of appliance for household environment are appliances for typical housekeeping functions used in the household environment that may also be used by non-expert users for typical housekeeping functions:

- in shops and other similar working environments;
- in farm houses;
- by clients in hotels, motels and other residential type environments;
- in bed and breakfast type environments.

NOTE Z102 Household environments include the dwelling and its associated buildings, the garden, etc.

As far as is practicable, this European Standard deals with the common hazards presented by appliances that are encountered by all persons in household and similar environments.

However, in general, it does not take into account

- **children** playing with the appliance,
- the use of the appliance by **very young children**,
- the use of the appliance by **young children** without supervision,
- **user maintenance** by **children**, including the cleaning of the appliance.

It is recognised that **very vulnerable people** may have needs beyond the level addressed in this European Standard.

This European Standard does not apply to

- appliances to be used in the commercial areas, e.g. laundrettes (EN 50571),
- appliances intended exclusively for industrial purposes (EN ISO 10472-2),
- 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).

NOTE Z103 Attention is drawn to the fact that

- for washing machines 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,
- for washing machines having a separate spin container for water extraction, EN 60335-2-4 is also applicable,
- for washing machines having a drying function, EN 60335-2-11 is also applicable,
- if an appliance within the scope of this European Standard also incorporates functions that are covered by another Part 2 of EN 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. Ⓒ11

2 Normative references

This clause of Part 1 is applicable except as follows.

Addition:

Ⓒ Text deleted Ⓒ

IEC 60730-2-12:2005, *Automatic electrical controls for household and similar use – Part 2: Particular requirements for electrically operated door locks*

Ⓐ₂ ISO 1817:2015, *Rubber, vulcanized or thermoplastic – Determination of the effect of liquids* Ⓐ₂

3 Ⓐ₁ Terms and definitions Ⓐ₁

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 filled with dry textile material having a mass equal to the maximum mass stated in the instructions, and with the maximum quantity of water for which it is constructed. However, if the power input or current is higher when only 50 % of the textile material is used, the appliance is operated with this load instead if this gives more unfavourable conditions than the full load during the test of Clause 11.

NOTE 101 For some appliances incorporating a programmer, using the 50 % reduced load may result in automatic selection of a reduced wash programme.

The temperature of the water is

- 65 °C ± 5 °C for appliances without heating elements;
- 15 °C ± 5 °C for appliances without heating elements and intended for connection to the cold water supply only;
- 15 °C ± 5 °C for other appliances.

If the appliance does not incorporate a programmer, the water is heated to 90 °C ± 5 °C or as high as the construction will allow if lower, before starting the first washing period.

The textile material consists of pre-washed double-hemmed cotton sheets having dimensions approximately 700 mm × 700 mm and a specific mass between 140 g/m² and 175 g/m² in the dry condition.

For impeller type washing machines, if the textile material does not move properly during operation,

- the quantity of textile material may be reduced until the maximum power input of the motor is attained, or
- a textile material comprising pre-washed double-hemmed cotton sheets, having dimensions of approximately 900 mm × 900 mm and a mass between 90 g/m² and 110 g/m² in the dry condition, may be used.

However, for impeller type washing machines, in case of doubt, the test is carried out using the reduced quantity of textile material.

3.Z101**washing machine**

appliance for cleaning and rinsing of textiles using water which may also have a means of extracting excess water from the textiles

3.Z102**agitator washing machine**

washing machine in which the textiles are substantially immersed in the washing water, the mechanical action being produced by a device moving about or along its vertical axis with a reciprocating motion (an agitator). This device usually extends above the maximum water level

3.Z103**horizontal drum washing machine**

washing machine in which the textiles are placed in a horizontal or inclined drum and partially immersed in the washing water, the mechanical action being produced by rotation of the drum about its axis, the movement being either continuous or periodically reversed

3.Z104**impeller washing machine**

washing machine in which the textiles are substantially immersed in the washing water, the mechanical action being produced by a device rotating about its axis continuously or reversing after a number of revolutions (an impeller). The uppermost point of this device is substantially below the minimum water level

3.Z105**washer-dryer**

washing machine which includes also a means for drying the textiles, usually by heating and tumbling

3.Z106**spin extraction**

water-extracting function by which water is removed from textiles by centrifugal force. This is usually included as a function of a **washing machine** 

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:

The relevant tests of 21.101, 21.102 and 22.104 shall be carried out on the same appliance as that used for the test of Clause 18.

5.3 Addition:

The test of 15.101 is carried out before the test of 15.3.

The relevant tests of 21.101 and 21.102 are carried out before the test of Clause 18. The test of 22.104 is carried out after the test of Clause 18.

5.7 Addition:

Doubt is considered to exist if the temperature of the water is within 6 K of the boiling point and the difference between the temperature rise of the relevant part and the limit specified does not exceed 25 K minus the room temperature.

6 Classification

This clause of Part 1 is applicable except as follows.

6.1 Modification:

Appliances shall be of **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.

7.1 Addition:

Appliances without automatic water level control shall be marked with the maximum water level.

Appliances not intended for connection to the hot water supply and not provided with heating elements shall be marked with the substance of the following:

CAUTION: Do not connect to the hot water supply.

7.10 Addition:

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

Ⓒ11 Replace the text beginning by "Devices used to start/stop operational..." and ending in "or position, etc..." by the following:

The accessible switch required by 22.40 shall be distinguished from other manual devices by means of shape, or size, or surface texture, or position, etc. Ⓒ11

7.12 Addition:

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

Ⓐ2 The instructions shall include the substance of the following:

This appliance is intended to be used in household and similar applications such as:

- staff kitchen areas in shops, offices and other working environments;
- farm houses;
- by clients in hotels, motels and other residential type environments;
- bed and breakfast type environments;
- areas for communal use in blocks of flats or in launderettes.

If the manufacturer wants to limit the use of the appliance to less than the above, this shall be clearly stated in the instructions. Ⓐ2

Ⓒ11 Children of less than 3 years should be kept away unless continuously supervised. Ⓒ11

7.12.1 Addition:

For washing machines having ventilation openings in the base, the installation instructions shall state that the openings must not be obstructed by a carpet.

7.15 Addition:

The caution relating to connection to the hot water supply shall be on the appliance at its point of attachment to the water supply.

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 except as follows.

10.1 Addition:

The selected representative period is the period, such as filling with water, washing, rinsing, water extraction, spinning or braking, during which the power input is the highest.

10.2 Addition:

The selected representative period is the period, such as filling with water, washing, rinsing, water extraction, spinning or braking, during which the current is the highest.

11 Heating

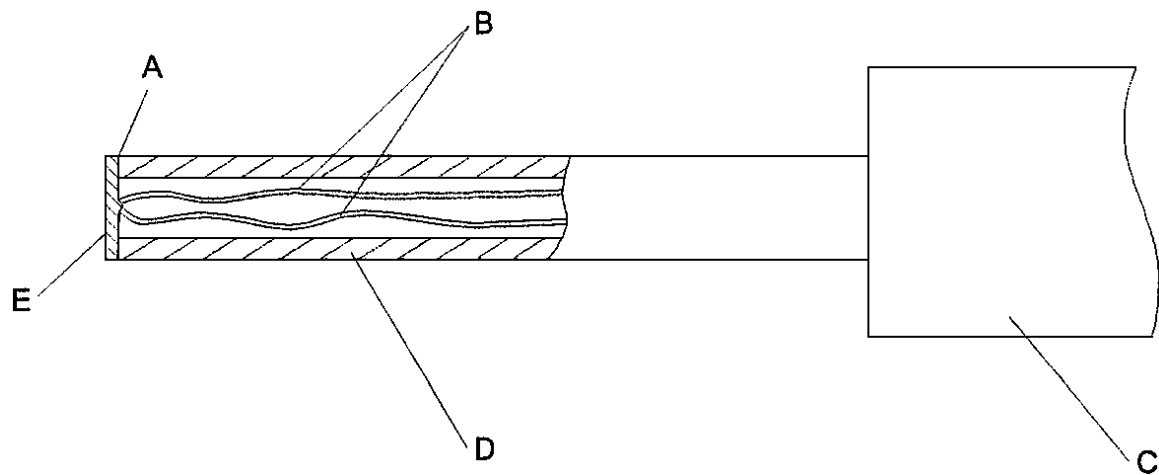
This clause of Part 1 is applicable except as follows.

11.3 Addition:

For flat surfaces, temperature rises of the accessible front surface are measured using the probe of Figure Z101. 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 Z101 Any measuring instrument giving the same results as the probe may be used.

Add the following Figure Z101:



Key

- A adhesive
- B thermocouple wires 0,3 mm diameter to EN 60584-1 Type K (chrome alumel)
- C handle arrangement permitting a contact force of $4\text{ N} \pm 1\text{ N}$
- D polycarbonate tube: inside diameter 3 mm, outside diameter 5 mm
- E tinned copper disc: 5 mm diameter, 0,5 mm thick

NOTE The contact face of the disc is to be flat.

Figure Z101 – Probe for measuring flat surface temperatures 

11.7 Replacement:

Appliances incorporating a programmer are operated for three cycles with the programme that results in highest temperature rises, with a rest period of 4 min between cycles.

Other appliances are operated for three cycles, with a rest period of 4 min between cycles. Each cycle consists of the following operations:

- *for appliances without means for water extraction and for washing machines with a hand-operated wringer,* washing;
- *for appliances having a single drum for washing and water extraction,* washing followed by water extraction;
- *for appliances having separate drums for washing and water extraction that cannot be used simultaneously,* washing and water extraction separated by an additional 4 min rest period;
- *for appliances having separate drums for washing and water extraction that can be used simultaneously,* washing together with water extraction so that the operations terminate simultaneously;
- *for appliances having a single drum for washing, water extraction and drying*
 - *that allow the same quantity of textile material to be washed and dried in the drum,* washing followed by water extraction, followed by drying;
 - *that, according to the instructions, only allow a portion of the washed textile material to be dried in the drum,* washing followed by water extraction followed by two drying periods, with an additional rest period of 4 min before each drying period. In this case only two cycles of operation are carried out.

For appliances incorporating a timer, the washing period, the water extraction period and the drying period are equal to the maximum period allowed by the timer.

For appliances without a timer,

- *the washing period has a duration of*
 - *6 min, for washing machines of the continuously rotating impeller type,*
 - *18 min, for washing machines of the agitator type,*
 - *25 min for washing machines of the drum type, unless a longer period is stated in the instructions;*
- *the water extraction period has a duration of 5 min.*

The rest period [C] text deleted [C] has a duration of 4 min.

After the specified sequence of operation, discharge pumps that are driven by a separate motor and switched on and off manually, are subjected to three operating periods separated by rest periods of 4 min. Each operating period is equal to 1,5 times the period necessary to empty the appliance when filled to the maximum normal water level. The outlet of the water discharge pipe is 900 mm above the floor.

11.8 Modification:

Replace the first paragraph of Part 1 by the following: “During the test, the temperature rises are monitored continuously and shall not exceed the values shown in Table 3 and Table Z101 in accordance with 11.Z101”.

In Table 3, delete the row “External enclosure of **motor-operated appliances**, except handles held in normal use” and the corresponding footnotes.

Add the following Table Z101.

**Table Z101 – Maximum temperature rises
for external surfaces under normal operating conditions**

Surface ^a	Temperature rise K		
	Surfaces of appliances situated not more than 850 mm above the floor after installation		Surfaces situated more than 850 mm above the floor after installation
	Front surfaces	Other surfaces	
Bare metal	40	45	45
Coated metal ^b	45	55	55
Glass and ceramic	55	60	60
Plastic and plastic coating > 0,3 mm ^c	60	65	65

^a When the thickness of the plastic coating does not exceed 0,3 mm, the temperature rise limits of the coated metal or of glass and ceramic material apply.

^b Metal is considered coated when a coating having a minimum thickness of 80 µm made by enamel or non substantially plastic coating is used.

^c The temperature rise limit applies also for plastic material having a metal finish of thickness less than 0,1 mm.

Add the following new subclause:

11.Z101 Temperature rises are not measured:

- on the underside of appliances intended to be used on a working surface or floor;
- on the rear surface of appliances which, according to the instructions, shall be placed against a wall. **11**

12 Void

13 Leakage current and electric strength at operating temperature

This clause of Part 1 is applicable except as follows.

13.2 Modification:

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

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 even if an inlet valve fails to close.

Compliance is checked by the following test.

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

Appliances intended to be filled with water by the user are completely filled with water containing approximately 1 % NaCl. A further quantity of this solution equal to 15 % of the capacity of the appliance or 0,25 l, whichever is greater, is poured in steadily over a period of 1 min.

Other appliances are operated until the maximum water level is reached, and 5 g of the detergent specified in Annex AA is added for each litre of water in the appliance. The inlet valve is held open and the filling is continued for 15 min after first evidence of overflow or until the inflow is automatically stopped by other means.

For appliances that are loaded from the front, the door is then opened if this can be achieved manually and without damage to the door interlock system.

For all appliances, 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 being placed in the on position. The controls are then operated through their working range, this operation being repeated after a period of 5 min.

- ☐ For appliances having a working surface, the test is repeated with the appliance tilted at an angle of 2° in relation to the position of normal use in the direction which is likely to be the most unfavourable.

The lid of top loading appliances is considered as a working surface if it is flat enough to put something on. ☐

*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** or **creepage distances** below the values specified in Clause 29.*

15.101 Appliances shall be constructed so that foaming does not affect electrical insulation.

Compliance is checked by the following test that is carried out immediately after that of 15.2.

[A₁] *The appliance is operated under the conditions specified in Clause 11 but at rated voltage for one complete cycle with the programme that results in the longest period of operation. A quantity of detergent necessary to cause foaming is added. The composition of the detergent is specified in Annex AA. **[A₁]***

For appliances incorporating a detergent dispenser, the solution is added manually at the point in the cycle when it would normally be dispensed automatically. For other appliances, the solution is added before starting the cycle.

The appliance shall then withstand the electric strength test of 16.3.

The appliance is kept in a test room having a normal atmosphere for 24 h before being subjected to the test of 15.3.

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.

18.101 Appliances shall be constructed so that the lid or door interlock withstands the stresses to which it may be exposed in normal use.

Compliance is checked by the following test.

The lid or door is opened as in normal use and the force applied to the handle, or actuating means of the release mechanism, is measured. The force required to close the lid or door is also measured.

*The lid or door is then subjected to 10 000 cycles of opening and closing. For the first 6 000 cycles, the appliance is supplied at **rated voltage** and operated so that the interlock mechanism is energized and de-energized each cycle. For the last 4 000 cycles, the appliance is not connected to the supply mains. For appliances having a drying function, the total number of cycles is increased to 13 000, the first 9 000 cycles being carried out with the interlock mechanism energized and de-energized each cycle.*

*If the interlock complies with IEC 60730-2-12, the appliance is not connected to the supply mains during this test. If the interlock operates more than once during **normal operation**, it is operated for this number of times during each cycle.*

Lids are opened each time by approximately 45° and doors by 90°, the speed of opening being approximately 1,5 m/s. The force applied to open the lid or door is twice the measured opening force, with a minimum of 50 N and a maximum of 200 N.

Doors are closed at a speed of approximately 1,5 m/s, the force applied being five times the measured closing force, with a minimum of 50 N and a maximum of 200 N. Lids are allowed to close under their own weight but if they fail to latch, a force of five times the measured closing force is applied, with a minimum of 50 N and a maximum of 200 N.

After the tests, compliance with the relevant requirements of 20.103 and 20.104 shall not be impaired.

18.102 The braking mechanism of appliances having a lid that can be opened during the water extraction period shall 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 highest 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 1 000 times, the textile material being 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.

19.1 Addition:

For appliances incorporating a programmer or a timer, the tests of 19.2 and 19.3 are replaced by the test of 19.101.

The test of 19.7 is not carried out on motors driving moving parts of an oscillating agitator.

Appliances not intended for connection to the hot water supply and not provided with heating elements are also subjected to the test of 19.102.

19.2 Addition:

Restricted heat dissipation is obtained without water in the appliance or with just sufficient water to cover the heating elements, whichever is the more unfavourable.

19.7 Addition:

Appliances without a programmer or timer are operated for 5 min.

A₁ 19.9 Addition:

The running overload test is carried out on appliances that have overload protective devices incorporating electronic circuits to protect the windings of the drum motor. However, the test is not carried out if the protective device senses the winding temperature directly.

NOTE Measuring winding resistance or winding current is not directly measuring the winding temperature. A₁

A1 The appliance is operated under the conditions of Clause 11 for one cycle. The load is then increased so that the current through the motor windings is raised by 10 %. The appliance is operated again for the same cycle, the supply voltage being maintained at its original value. The load is again increased and the test is repeated until the protective device incorporating the electronic circuit operates or the motor stalls. **A1**

19.13 Addition:

The textile material shall not ignite and shall not show any charring or glowing.

NOTE 101 Light brown colouring of the textile material or slight emission of smoke is ignored.

During the tests of 19.101 and 19.102, the temperature of windings shall not exceed the values specified in Table 8.

*The appliance shall comply with the appropriate requirements of **C**20.103 and 20.104 **C** if it can still be operated.*

19.101 The appliance is supplied at **rated voltage** and operated under **normal operation**. Any fault condition or unexpected operation that may be applied in normal use is introduced.

The fault conditions and unexpected operations to be applied are:

- *the programmer stopping in any position;*
- *disconnection and reconnection of one or more phases of the supply during any part of the programme;*
- *open-circuiting or short-circuiting of components;*
- *failure of a magnetic valve;*
- *failure or blocking the mechanical parts of a water-level switch. This fault condition is not applied if*
 - *the cross-sectional area of the tube supplying the air chamber is greater than 500 mm² with a minimum dimension of 10 mm,*
 - *the outlet of the chamber is at least 20 mm above the highest water level, and*
 - *the tube connecting the air chamber to the water-level switch is fixed so that there is no likelihood of bending or pinching;*
- *puncture of the capillary tube of a **thermostat**.*

If operation without water in the appliance is a more unfavourable condition for starting any programme, the tests with that programme are carried out with the water valve closed. This valve is not closed after the programme has started to operate.

NOTE The fault condition with

- *the automatic filling device held open is covered by 15.2;*
- *thermal controls short-circuited is covered by 19.4;*
- *motor capacitors short-circuited or open-circuited is covered by 19.7;*
- *the failure of door interlocks is covered by 24.1.4.*

19.102 Appliances not intended for connection to the hot water supply and not provided with heating elements are operated under the conditions of Clause 11, except that they are supplied at **rated voltage** and filled with water at a temperature of 65 °C ± 5 °C.

20 Stability and mechanical hazards

This clause of Part 1 is applicable except as follows.

20.1 Modification:

*The appliance is empty or filled as specified for **normal operation**, whichever is more unfavourable. Doors and lids are closed and any castors turned to the most unfavourable position.*

- ☐ **20.101** For appliances of the drum type, the drum drive motor shall be de-energized before the opening of the lid or door exceeds 50 mm.

If a removable or sliding lid is provided, the motor shall be de-energized as soon as the lid is removed or displaced and it shall not be possible to start the motor unless the lid is in the closed position.

Compliance is checked by measurement and inspection. ☐

☐₂ Text deleted ☐₂

- 20.102** 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 the cloth specified in the instructions, whichever is greater, is fixed to the inside wall of the drum half-way along its length.

*The appliance is supplied at **rated voltage** and operated during the water extraction period.*

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

☐₁ *If compliance relies on the operation of an electronic circuit, the test is repeated with the fault conditions in a) to g) of 19.11.2 applied one at a time to the electronic circuit.* ☐₁

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.

- ☐ **20.103** For appliances of the drum type, it shall only be possible to energize the drum drive motor when the lid or door is in the closed position.

Compliance is checked by inspection and by manual test using test probe B of IEC 61032 in an attempt to override the locking function.

- 20.104** It shall not be possible to open the lid or door of an appliance while the drum speed exceeds 60 r/min.

Compliance is checked by the following test.

*The appliance is supplied at **rated voltage** and operated empty or filled as specified for **normal operation**, whichever is more unfavourable. The force determined during the test of 22.104 with the lid or door locked is applied to the lid or door in an attempt to open it.*

☐₁ *If compliance relies on the operation of an electronic circuit, the test is repeated under the following conditions applied separately:* ☐₁ ☐

- Ⓒ Ⓐ₁ – the fault conditions in a) to g) of 19.11.2 applied one at a time to the electronic circuit;
- the electromagnetic phenomena tests of 19.11.4.2 and 19.11.4.5 applied to the appliance.

Ⓐ₁ Text deleted Ⓐ₁

If the electronic circuit is programmable, the software shall contain measures to control the fault/error conditions specified in Table R.1 and is evaluated in accordance with the relevant requirements of Annex R. Ⓐ₁

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

Text deleted Ⓒ

20.105 Ⓒ₁ Text deleted Ⓒ₁

- Ⓐ₂ **20.106** For appliances with a front opening door having an opening dimension exceeding 200 mm, and drum volume exceeding 60 dm³, it shall not be possible to start or recommence the washing cycle until a separate means which controls the movement of the drum is operated manually, even after the door has been opened and closed again.

NOTE The volume of the drum can be calculated by measuring the maximum internal diameter and maximum internal length of the drum.

Compliance is checked by inspection, measurement ignoring any non-metallic seal fitted in the door opening, and by the following test.

The appliance is supplied at **rated voltage**, and the door is opened and then closed.

If compliance relies on the operation of an **electronic circuit**, the test is repeated under the following conditions applied separately:

- the fault conditions in a) to g) of 19.11.2 are applied one at a time to the **electronic circuit**;
- the electromagnetic phenomena tests of 19.11.4.2 and 19.11.4.5 are applied to the appliance.

The washing cycle shall not start or recommence.

20.107 For appliances with a front opening door having an opening dimension exceeding 200 mm, and drum volume exceeding 60 dm³, it shall be possible to open from the inside the closed door, when the appliance is not energized or in a standby mode, with a force not exceeding 70 N.

NOTE 1 The volume of the drum can be calculated by measuring the maximum internal diameter and maximum internal length of the drum.

Compliance is checked by measurement, ignoring any non-metallic seal fitted in the door opening, and by applying a force of 70 N perpendicular to the plane of the closed door at a point furthest from the hinges accessible from the inside of the door. If the appliance is supplied with an additional decorative door, the test is carried out with this door closed.

NOTE 2 The force can be applied to the outside of the door. Ⓐ₂

21 Mechanical strength

This clause of Part 1 is applicable except as follows.

21.101 Lids and doors shall have adequate mechanical strength.

Compliance is checked by the test of 21.101.1 for lids and 21.101.2 for doors.

21.101.1 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 100 mm onto the centre of the lid.

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

21.101.2 A vertically downwards force of 150 N is applied in the most unfavourable position to the door while it is open at an angle of $90^\circ \pm 5^\circ$. The force is maintained for 1 min.

*After the test, the appliance shall not be damaged or deformed to such an extent that compliance with **20.103** and **20.104** is impaired.*

21.102 Lids 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 **20.103** and **20.104** is impaired.*

22 Construction

This clause of Part 1 is applicable except as follows.

22.6 Modification to the requirement:

The requirement relating to leakage from containers, hoses, couplings and similar parts of the appliance is not applicable to parts that withstand the ageing test specified in Annex BB.

Modification to the test specification:

Instead of coloured water, a solution composed of 5 g of the detergent specified in Annex AA per litre of distilled water is used.

22.40 Add the following text after the note:

Washing machines shall be fitted with an accessible switch to stop all operational functions of the appliance.

22.101 Appliances shall be constructed so that when the water level is above the lower edge of the door opening, it shall not be possible to open the door by a simple action while the appliance is operating. This requirement is not applicable to appliances fitted with interlocked doors or doors that are opened by means of a key or by two separate actions, such as pushing and turning.

Compliance is checked by inspection and by manual test.

A2 If compliance relies on the operation of an **electronic circuit** and the appliance is capable of providing a wash water temperature of 60 °C or higher or is marked as having a wash water temperature of 60 °C or higher, the test is repeated under the following conditions applied separately: **A2**

*It shall not be possible to open the lid or door by a simple action. If the **electronic circuit** is programmable, the software shall contain measures to control the fault/error conditions specified in Table R.1 and is evaluated in accordance with the relevant requirements of Annex R. A1*

22.102 Appliances shall be constructed so that textile material cannot come into contact with heating elements.

Compliance is checked by inspection.

A1 **22.103** Appliances shall be constructed so that, during normal use, filter compartments cannot be opened by a simple action. This requirement is not applicable to appliances intended for connection to the cold water supply only and without means to heat the water or to appliances fitted with filter compartment covers that are

- interlocked;
- opened by means of a key;
- opened by two separate actions such as pushing and turning; or
- opened by rotating by more than 180 °.

Compliance is checked by inspection and by manual test. A1

22.104 Lid and door interlocks required for compliance with Clause 20 shall be constructed so that they are unlikely to be forced open in normal use.

Compliance is checked by the following test.

The lid or door is opened as in normal use and the force applied to the handle, or actuating means of the release mechanism, is measured.

*The lid and door is closed. The appliance is supplied at **rated voltage** and operated for a sufficient period for the interlock to be energized. An attempt is then made to open the lid or door as in normal use. The force applied is gradually increased to five times the measured opening force, with a minimum of 50 N and a maximum of 200 N, over a period of 5 s.*

The test is carried out 300 times at a rate of approximately six times per minute.

The force is then increased to 10 times the measured opening force, with a minimum of 50 N. It shall not be possible to open the lid or door.

NOTE Damage to handles is ignored.

22.105 Any mechanical release mechanism intended to open the loading door after a failure shall only be accessible by using a **tool**.

Compliance is checked by inspection.

23 Internal wiring

This clause of Part 1 is applicable except as follows.

23.101 The insulation and sheath of internal wiring for the supply of magnetic valves and similar components incorporated in external hoses for connection to the water mains shall be at least equivalent to the electrical characteristics of light polyvinyl chloride sheathed flexible cord (code designation 60227 IEC 52).

Compliance is checked by the appropriate tests.

24 Components

This clause of Part 1 is applicable except as follows.

24.1.4 Addition:

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

*For lid or door interlocks, the number of cycles of operation declared for Subclauses 6.10 and 6.11 of IEC 60730-2-12 shall not be less than 6 000. For washing machines that include a drying function, the minimum number of cycles of operation is increased to 9 000. If the interlock operates more than once during **normal operation**, the minimum number of cycles of operation is increased accordingly.*

24.101 Thermal cut-outs incorporated in washing machines for compliance with 19.4 shall not be self-resetting.

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 Clearances, creepage distances and solid insulation

This clause of Part 1 is applicable except as follows.

29.2 Addition:

The microenvironment is pollution degree 3, and the insulation shall have a CTI not less than 250, unless the insulation is enclosed or located so that it is unlikely to be exposed to pollution during normal use of the appliance due to

- condensation produced by the appliance;
- chemicals, such as detergent or fabric conditioner.

30 Resistance to heat and fire

This clause of Part 1 is applicable except as follows.

30.2 Addition:

For washing machines incorporating a programmer or a timer, 30.2.3 is applicable. For other washing machines, 30.2.2 is 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 R (normative)

Software evaluation

R.2.2.5 *Modification:*

For programmable **electronic circuits** with functions requiring software incorporating measures to control the fault/error conditions specified in Table R.1 or Table R.2, detection of a fault/error shall occur before compliance with Clauses 19, 20.104, 20.105 and 22.101 is impaired.

R.2.2.9 *Modification:*

The software and safety-related hardware under its control shall be initialized and shall terminate before compliance with Clauses 19, 20.104, 20.105 and 22.101 is impaired. 

Annex AA (normative)

Detergent and rinsing agent

AA.1 Detergent

The detergent specified in the instructions may be used, but if there is any doubt with regards to the test results, the composition of the detergent shall be as follows:

Substance	Parts by mass %
Linear sodium alkyl benzene sulphonate (mean length of alkane chain C _{11,5})	6,4
Ethoxylated tallow alcohol (14 EO)	2,3
Sodium soap (chain length C _{12 to 16} : 13 % to 26 % and C _{18 to 22} : 74 % to 87 %)	2,8
Sodium tripolyphosphate	35,0
Sodium silicate (SiO ₂ : 76,75 % and Na ₂ O: 23,25 %)	6,0
Magnesium silicate	1,5
Carboxy methyl cellulose	1,0
Ethylenediamine tetra-acetic-sodium-salt	0,2
Optical whitener for cotton (dimorpholinostilbene type)	0,2
Sodium sulphate (as accompanying substance or added)	16,8
Water	7,8
Sodium perborate tetrahydrate (supplied separately)	20,0

NOTE The composition of the detergent is extracted from IEC 60456:1994.

AA.2 Rinsing agent

Any commercially available rinsing agent may be used, but if there is any doubt with regards to the test results, the composition of the rinsing agent shall be as follows:

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

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 document and does not constitute an endorsement by IEC of this product.

The rinsing agent with the above composition has the following properties:

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

NOTE The composition of the rinsing agent is extracted from IEC 60436.

Annex BB (normative)

Ageing test for elastomeric parts

A2 *The ageing test on elastomeric parts is carried out by measuring their hardness and mass before and after immersion in solutions of detergent and rinsing agent at elevated temperature.*

The test is carried out on at least three samples of each part. The test procedure is as specified in ISO 1817 with the following modifications.

5 Test liquids

Two test liquids are used:

- one liquid is obtained by dissolving 5 g of the detergent specified in Annex AA per litre of distilled water;*
- the other liquid is composed of 0,6 ml of rinsing agent as specified in Annex AA per litre of distilled water.*

Care is to be taken to ensure that the total mass of the test pieces immersed does not exceed 100 g for each litre of solution, that the test pieces are completely immersed and that their entire surface is freely exposed to the solution. During the tests, the test pieces are not to be exposed to direct light. Test pieces of different compounds are not to be immersed at the same time in the same solution.

6 Test pieces

6.4 Conditioning

The temperature is $23\text{ °C} \pm 2\text{ °C}$ and the relative humidity is $(50 \pm 5)\%$.

7 Immersion in the test liquid

7.1 Temperature

The solution is heated within 1 h with the test pieces immersed, to a temperature of 75^{+5}_0 °C and maintained at this value. The solution is renewed every 24 h and heated in the same way.

NOTE To avoid undue evaporation of the solution, a closed-circuit system or similar method can be used for renewing the solution.

7.2 Duration

The test pieces are immersed for a total period of 48^{+1}_0 h .

The test pieces are then immediately immersed in a fresh solution, which is maintained at ambient temperature. The pieces are immersed for $45\text{ min} \pm 15\text{ min}$.

After having been removed from the solution, the test pieces are rinsed in cold water at $15\text{ °C} \pm 5\text{ °C}$ and then dried with blotting paper.

8 Procedure

8.2 Change in mass

The increase in mass of the test pieces shall not exceed 10 % of the value determined before immersion.

8.6 Change in hardness

The micro-test for hardness applies.

The hardness of the test pieces shall not have changed by more than 8 IRHD. Their surface shall not have become sticky and shall show no crack visible to the naked eye or any other deterioration. 

Annex CC (normative)

Detergent free electrolyser washing machines

The following modifications to this standard are applicable to washing machines for household and similar use that incorporate an electrolytic process employing an electrolyte instead of detergent.

NOTE Additional subclauses and notes in this annex are numbered starting with 201.

2 Normative references

Addition:

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

IEC 60079-15, *Electrical apparatus for explosive gas atmospheres – Part 15: Construction, test and marking of type of protection “n” electrical apparatus*

3 Definitions

3.1.9 *Addition:*

Appliances employing an electrolyte added by the user shall be filled with the amount and type of electrolyte specified in the instructions.

7 Marking and instructions

7.12 *Addition:*

The instructions for appliances intended to be filled with electrolyte by the user shall contain details of the electrolyte to be used and the substance of the following:

In order to avoid hazards, use only the electrolyte specified.

NOTE 201 Details of the electrolyte to be used may be given, for example, in terms of a generic name or a manufacturer's part number.

7.12.1 *Addition:*

The installation instructions shall state that the appliance shall be installed so that there is a distance of at least 200 mm between the appliance enclosure and external heat sources, such as appliances containing heating elements.

15 Moisture resistance

15.2 *Replace the third and fourth paragraphs of the compliance in the replacement by the following:*

Appliances are operated under the conditions of Clause 11 but without a clothes load. When the maximum water level is reached, the inlet valve is held open and the filling is continued for 15 min after first evidence of overflow or until the inflow is automatically stopped by other means.

15.101 Not applicable.

19 Abnormal operation

19.201 Appliances shall be constructed so that foaming does not affect electrical insulation.

Compliance is checked by the following test that is carried out immediately after 15.2.

Detergent having a composition as specified in Annex AA is added, the quantity of detergent being twice the quantity of electrolyte necessary for normal washing. The appliance is then operated under the conditions specified in Clause 11 but for one complete cycle with the programme that results in the longest period of operation.

The appliance shall then withstand the electric strength test of 16.3.

22 Construction

22.6 *Modification:*

Instead of coloured water, a coloured solution from the electrolysed portion of the wash water is used.

Add the following subclause:

22.17 *Addition:*

Spacers intended to prevent the electrolyser aperture being blocked by walls shall be fixed so that it is not possible to remove them from the outside of the appliance by hand or by means of a screwdriver or a spanner.

22.201 Appliances fitted with an electrolyser, consisting of cathodic and anodic chambers separated by an electrolytic separator, shall be constructed so that the electrolyser is always open to the atmosphere through an aperture of at least 5 mm in diameter, or 20 mm² in area with a width of at least 3 mm. The aperture shall be located so that it is unlikely to be obstructed in normal use.

Compliance is checked by inspection and by measurement.

22.202 During normal use of the appliance, the chemical reaction in the electrolyser shall not produce hydrogen gas that is released in hazardous amounts into areas

- where electrical components that produce arcs and sparks during **normal operation** or abnormal operation are mounted, unless these components have been tested and found at least to comply with IEC 60079-15 for group IIC gases; or
- that contain surfaces with a temperature exceeding 460 °C during **normal operation** or abnormal operation and that may be exposed to the released hydrogen gas.

*Compliance is checked by inspection, by measuring the temperature of the relevant surfaces during **normal operation** and abnormal operation and by the following test.*

*The appliance is operated for one cycle under conditions of **normal operation**.*

The concentration of hydrogen gas in the relevant areas is measured continuously for one wash cycle from the beginning of the test until the end of the cycle. The background hydrogen concentration measured prior to the test is subtracted from the maximum concentration measured during the test.

The measured value shall not exceed 50 % of the lower flammability limit (LFL) of hydrogen.

NOTE 1 The LFL of hydrogen gas is 4 % V/V of air.

NOTE 2 Instruments used for monitoring gas concentration, such as those that use infrared sensing techniques, should have a fast response, typically 2 s to 3 s and should not unduly influence the result of the test.

NOTE 3 If gas chromatography is used, the gas sampling in confined areas should occur at a rate not exceeding 2 ml every 30 s.

NOTE 4 Other instruments are not precluded from being used provided that they do not unduly influence the results.

22.203 During normal use of the appliance, the chemical reaction in the electrolyser shall not produce wash water that causes corrosion due to the pH value of the wash water.

Compliance is checked by the salt mist test of IEC 60068-2-52, severity 2 being applicable. The pH value of the solution used shall be approximately equal to that of the wash water as measured during normal use of the appliance.

Before the test, enclosures having a coating are scratched by means of a hardened steel pin, the end of which has the form of a cone with a top 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 pin is held at an angle of 80°– 85° to the horizontal and 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 surface.

29 Clearances, creepage distances and solid insulation

29.2 Modification:

In the second dashed item of the addition, replace “detergent” by “electrolyte”.

32 Radiation, toxicity and similar hazards

Addition:

The ozone concentration produced by the chemical reactions in the electrolyser shall not be excessive.

Compliance is checked by the following test, which is carried out in a room without openings having dimensions of 2,5 m × 3,5 m × 3,0 m, the walls being covered with polyethylene sheet.

*The room is maintained at approximately 25 °C and 50 % relative humidity. The appliance is positioned in accordance with the instructions and then operated for one cycle under conditions of **normal operation**.*

The ozone sampling tube is to be located 10 mm from the gas outlet aperture specified in 22.201. The background ozone concentration measured prior to the test is subtracted from the maximum concentration measured during the test.

The percentage of ozone in the room shall not exceed 5×10^{-6} .

Annex BB

Modification:

Instead of the solution containing detergent, a solution of the electrolysed portion of the wash water obtained under the conditions of Clause 11 is used.

☐ Annex DD deleted ☐

Bibliography

The bibliography of Part 1 is applicable except as follows.

Addition:

IEC 60335-2-4, *Household and similar electrical appliances – Safety – Part 2-4: Particular requirements for spin extractors*

Ⓒ IEC 60335-2-4 NOTE Harmonized as EN 60335-2-4. Ⓒ

IEC 60335-2-11, *Household and similar electrical appliances – Safety – Part 2-11: Particular requirements for tumble dryers*

Ⓒ IEC 60335-2-11 NOTE Harmonized as EN 60335-2-11. Ⓒ

IEC 60436, *Electric dishwashers for household use – Methods for measuring the performance*

Ⓒ IEC 60436 NOTE Harmonized as EN 50242/EN 60436. Ⓒ

IEC 60456:1994, *Electric clothes washing machines for household use – Methods for measuring the performance*²⁾

Ⓒ IEC 60456 NOTE Harmonized as EN 60456:1994 + A11:1995 + A12:1997 (modified). Ⓒ

ISO 10472-2, *Safety requirements for industrial laundry machinery – Part 2: Washing machines and washer-extractors*

Ⓒ ISO 10472-2 NOTE Harmonized as EN ISO 10472-2. Ⓒ

Ⓐ₁ Text deleted Ⓐ₁

²⁾ Withdrawn

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