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Edition 9.0 2024-01
COMMENTED VERSION

INTERNATIONAL STANDARD

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Household and similar electrical appliances – Safety – Part 2-7: Particular requirements for washing machines

IEC 60335-2-7:2024-01 CMV(en)

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Household and similar electrical appliances – Safety – Part 2-7: Particular requirements for washing machines

INTERNATIONAL
ELECTROTECHNICAL
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HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

Part 2-7: Particular requirements for washing machines

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of 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, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). 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. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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This commented version (CMV) of the official standard IEC 60335-2-7:2023 edition 9.0 allows the user to identify the changes made to the previous IEC 60335-2-7:2019 edition 8.0. Furthermore, comments from IEC TC 61 experts are provided to explain the reasons of the most relevant changes, or to clarify any part of the content.

A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text. Experts' comments are identified by a blue-background number. Mouse over a number to display a pop-up note with the comment.

This publication contains the CMV and the official standard. The full list of comments is available at the end of the CMV.

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IEC 60335-2-7 has been prepared by IEC technical committee 61: Safety of household and similar electrical appliances. It is an International Standard.

This ninth edition cancels and replaces the eighth edition published in 2019. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) alignment with IEC 60335-1:2020;
b) conversion of some notes to normative text (Clause 1, 20.104, 20.105);
c) addition of requirements for restarting the spin cycle of agitator washing machines and impeller washing machines (20.108);
d) addition of requirements for remote operation (22.51);
e) application of test probe 19 has been introduced (8.1.1, 20.2).

The text of this International Standard is based on the following documents:

Draft	Report on voting
61/7018/FDIS	61/7084/RVD

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts of the IEC 60335 series, under the general title: *Household and similar electrical appliances – Safety,* can be found on the IEC website.

This part 2 is to be used in conjunction with the latest edition of IEC 60335-1 and its amendments unless that edition precludes it; in that case, the latest edition that does not preclude it is used. It was established on the basis of the sixth edition (2020) of that standard.

NOTE 1 When "Part 1" is mentioned in this standard, it refers to IEC 60335-1.

This part 2 supplements or modifies the corresponding clauses in IEC 60335-1, so as to convert that publication into the IEC standard: Particular requirements for 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 in Part 1 is to be adapted accordingly.

NOTE 2 The following numbering system is used:

– subclauses, tables and figures that are numbered starting from 101 are additional to those in Part 1;
– unless notes are in a new subclause or involve notes in Part 1, they are numbered starting from 101, including those in a replaced clause or subclause;
– additional Annexes are lettered AA, BB, etc.

NOTE 3 The following print types are used:

– requirements: in roman type;

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– *test specifications: in italic type*;

– notes: in small roman type.

Words in **bold** in the text are defined in Clause 3. When a definition concerns an adjective, the adjective and the associated noun are also in bold.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

NOTE 4 The attention of National Committees is drawn to the fact that equipment manufacturers and testing organizations can need a transitional period following publication of a new, amended or revised IEC publication in which to make products in accordance with the new requirements and to equip themselves for conducting new or revised tests.

It is the recommendation of the committee that the content of this publication be adopted for implementation nationally not earlier than 12 months or later than 36 months from the date of publication.

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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.

Guidance documents concerning the application of the safety requirements for appliances can be accessed via TC 61 supporting documents on the IEC website

https://www.iec.ch/tc61/supportingdocuments

This information is given for the convenience of users of this International Standard and does not constitute a replacement for the normative text in this standard.

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~~ can 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.

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

NOTE 1 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 2 ~~Horizontal and generic standards~~ Horizontal publications, basic safety publications and group safety publications 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.~~ 1

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.

NOTE 3 Standards dealing with non-safety aspects of household appliances are:

– IEC standards published by TC 59 concerning methods of measuring performance;
– CISPR 11, CISPR 14-1 and relevant IEC 61000-3 series standards concerning electromagnetic emissions;
– CISPR 14-2 concerning electromagnetic immunity;
– IEC standards published by TC 111 concerning environmental matters. 2

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HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

Part 2-7: Particular requirements for washing machines

1 Scope

This clause of Part 1 is replaced by the following.

This part of IEC 60335 deals with the safety of electric washing machines for household and similar use, that are intended for washing clothes and textiles, their **rated voltage** being not more than 250 V for single-phase appliances and 480 V for other appliances including direct current (DC) supplied appliances and **battery-operated appliances**. 3

This 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 normative Annex CC.

NOTE 101 Guidance is given in informative Annex DD for requirements that can be used to ensure an acceptable level of protection against electrical and thermal hazards for washing machines fitted with a power driven wringer.

Appliances not intended for normal household use but which nevertheless ~~may~~ can be a source of danger to the public, such as appliances intended to be used by laymen in shops, in light industry and on farms, are within the scope of this standard.

~~NOTE 102 Examples of such appliances are washing machines for communal use in blocks of flats or in launderettes.~~

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

– persons (including children) whose:
  - physical, sensory or mental capabilities; or
  - lack of experience and knowledge

  prevents them from using the appliance safely without supervision or instruction;
– children playing with the appliance.

~~NOTE 103~~ 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~~ can be necessary;
– in many countries additional requirements are specified by the national health authorities, the national authorities responsible for the protection of labour, the national water supply authorities and similar authorities.

~~NOTE 104~~ This standard does not apply to:

– washing machines intended exclusively for industrial purposes (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);
– washing machines incorporating steam generating devices in which steam is produced at a pressure exceeding 50 kPa;

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– washing machines for commercial use including those for communal use in blocks of flats or in launderettes (IEC 60335-2-122). **4**

2 Normative references

This clause of Part 1 is applicable except as follows.

Addition:

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

IEC 60079-15, *Explosive atmospheres – Part 15: Equipment protection by type of protection "n"*

IEC 60584-1, *Thermocouples – Part 1: EMF specifications and tolerances*

IEC 60730-2-12:2015, *Automatic electrical controls ~~for household and similar use~~ – Part 2-12: Particular requirements for electrically operated door locks*

ISO 1817:~~2015~~2022, *Rubber, vulcanized or thermoplastic – Determination of the effect of liquids*

3 Terms and definitions

This clause of Part 1 is applicable except as follows.

3.1 Definitions relating to physical characteristics

~~*Replacement:*~~

3.1.9 *Modification:* **5**

Replace the first paragraph with the following:

~~**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 to entry: For some appliances incorporating a programmer, using the 50 % reduced load ~~may~~ can 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.

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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/m^2 and 175 g/m^2 in the dry condition.

For **impeller 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/m^2 and 110 g/m^2 in the dry condition, may be used.

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

A **steam generator** intended to be filled by hand is filled according to the instructions, water being added to maintain the steam generation.

A **steam generator** intended to be filled automatically is connected to the water mains.

3.5 Definitions relating to types of appliances

3.5.101
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)

Note 1 to entry: This device usually extends above the maximum water level.

3.5.102
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 which reverses after a number of revolutions (an impeller)

Note 1 to entry: The uppermost point of this device is substantially below the minimum water level.

3.5.103
drum washing machine
washing machine in which the textiles are placed in either a horizontal drum or a drum that is inclined up to and including 45° from the horizontal and the textile is 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

3.6 Definitions relating to parts of an appliance

3.6.101
steam generator
device in which steam is produced at a pressure not exceeding 50 kPa and in which the pressure drops to atmospheric pressure when the steam is not supplied

4 General requirement

This clause of Part 1 is applicable.

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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:*

Replace the first paragraph with the following:

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.

7.12 *Addition:*

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

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~~. **6**

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

7.12.1 *Addition:*

For ~~washing machines~~ appliances 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 except as follows.

8.1.1 *Addition:*

For parts of appliances situated not more than 850 mm above the floor after installation or in normal use, in addition to the use of test probe 18, test probe 19 of IEC 61032 is also applied wherever test probe 18 is used and with the same test conditions used for test probe 18. **7**

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.

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11 Heating

This clause of Part 1 is applicable except as follows.

11.3 *Addition:*

Where the external ***accessible surfaces*** *are suitably flat and access permits, then the test probe of Figure 101 may be used to measure the temperature rises of external* ***accessible surfaces*** *specified in Table 101. The probe is applied with a force of 4 N ± 1 N to the surface in such a way that the best possible contact between the probe and the surface is ensured. The measurement is performed after a contact period of 30 s.*

The probe may be held in place using a laboratory stand clamp or similar device. Any measuring instrument giving the same results as the probe may be used.

11.7 ~~*Replacement*~~ *Modification:* **8**

Replace the first paragraph with the following:

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* ***impeller washing machines***;

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- *18 min, for **agitator washing machines**;*
- *25 min for **drum washing machines** unless a longer period is stated in the instructions;*

– *the water extraction period has a duration of 5 min.*

The rest period, including any braking time, 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 during normal use. The outlet of the water discharge pipe is 900 mm above the floor.

Replace the first dashed item of the third paragraph with the following:

– *the **battery** that has been **fully discharged** is charged for 1 h, while the appliance is operated as specified performing its intended function, if allowed by the construction of the appliance.* **9**

11.8 ~~*Addition*~~ *Modification:*

Replace the first paragraph with the following:

During the test, the temperature rises are monitored continuously for one cycle and shall not exceed the values shown in Table 3 and Table 101. **10**

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Table 101 – Maximum temperature rises for specified external accessible surfaces under normal operating conditions

Surface	Temperature rise of external accessible surfaces [a, c] 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 [b]
	Front surfaces	Other surfaces [b]	
Bare metal	38	42	42
Coated metal [d]	42	49	49
Glass and ceramic	51	56	56
Plastic and plastic coating > 0,4 mm ~~[d,]~~ [e, f]	58	62	62

NOTE The temperature rise limits of handles, knobs, grips, keyboards, keypads and similar parts are specified in Table 3.

[a] Temperature rises are not measured on
- the underside of appliances intended to be used on a working surface or floor, where these surfaces are inaccessible to a 75 mm diameter probe having a hemispherical end~~, applied with a force not exceeding 1 N~~,
- the rear surface of appliances which, according to the instructions, shall be placed against a wall and where these surfaces are inaccessible to a 75 mm diameter probe having a hemispherical end~~, applied with a force not exceeding 1 N~~,
- hot water supply fittings and hoses~~,~~
- ~~surfaces within 25 mm from air outlets values can be increased by 10 K~~.

[b] If these values are exceeded, the test is allowed to be repeated with the appliance moved away from the test corner wall. The test is repeated for 1 cycle.

[c] For surfaces within 25 mm from air outlets, the values may be increased by 10 K.

[d] Metal is considered coated when a coating having a minimum thickness of 90 µm made ~~by~~ of enamel, powder or non-substantially plastic coating is used.

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

[f] When the thickness of the plastic coating does not exceed 0,4 mm, the temperature rise limits of coated metal for underlying metal apply or the temperature rise limits for glass or ceramic material for underlying glass or ceramic material apply.

12 ~~Void~~ Charging of metal-ion batteries

This clause of Part 1 is applicable. **11**

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.*~~

Replace the last two dashed items in the eighth paragraph with the following:

– *for **stationary class I appliances*** *3,5 mA, or 1 mA per kW of **rated power input** with a maximum of 5 mA, whichever is higher* **12**

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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~~ the spillage solution **13**. 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 normative Annex AA is added for each litre of water in the appliance. Each 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. The appropriate tests being applied one at a time to each inlet valve.

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 ~~a solution comprising water containing approximately 1 % NaCl and 0,6 % of rinsing agent,~~ the spillage solution is rapidly poured over the top of the appliance so that the spillage solution flows over the surfaces of the appliance that incorporate controls, 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.

Any commercially available non-ionic rinsing agent may be used, but if there is any doubt with regards to the test results, the rinsing agent shall have the following properties:

– *viscosity, 17 mPa·s;*
– *pH, 2,2 (1 % in water)*
– *and its composition shall ~~be~~ comprise the following substances:*

• *Plurafac ® LF 221*[1]	*15,0 % parts by mass*
• *Cumene sulfonate (40 % solution)*	*11,5 % parts by mass*
• *Citric acid (anhydrous)*	*3,0 % parts by mass*
• *Deionized water*	*70,5 % parts by mass*

[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.

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*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.

*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 normative Annex AA.*

For appliances incorporating a detergent dispenser, the solution is added manually at the point in the cycle when it would ~~normally~~ be dispensed automatically during normal use. 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, except as follows.

16.2 *Modification*

Replace the last two dashed items in the fourth paragraph with the following:

– *for **stationary class I appliances***	*3,5 mA, or 1 mA per kW of **rated power input** with a maximum of 5 mA, whichever is higher* **14**

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~~ can 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*

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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 60730-2-12:2015, 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 to 20.105 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~~ can 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 according to Table 3.* **15**

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 can 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~~ the minimum amount of water to cover the heating elements, whichever is the more unfavourable.

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19.7 *Addition:*

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

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

*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.*

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 can be 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 20.103 to 20.105 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~~ can 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 mm^2 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**;*
- *the **steam generator** is operating without water.*

*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~~ adjusted **16** after the programme has started to operate.*

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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:*

Replace the fifth and sixth paragraphs with the following:

*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.*

20.2 *Addition:*

For parts of appliances situated not more than 850 mm above the floor after installation or in normal use, in addition to the use of test probe 18, test probe 19 of IEC 61032 is also applied wherever test probe 18 is used and with the same test conditions used for test probe 18. **17**

20.101 **Drum washing machines** that are loaded from the top through an opening with a hinged lid shall incorporate an interlock that de-energizes the motor before the lid opening 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.

The interlock shall be constructed so that unexpected operation of the appliance is unlikely unless the lid is in the closed position.

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

Test probe B of IEC 61032 is applied with a force of 5 N and test probe 18 of IEC 61032 is applied with a force of 2,5 N **18** *in order to try and release any interlock that is needed to comply with the requirement. The interlock shall not release.*

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.*

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

*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**.*

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 **Drum washing machines** that are loaded from the front or from the top, the door or lid shall be interlocked so that the appliance can only be operated when the door or lid is in the closed position.

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

Test probe B of IEC 61032 is applied with a force of 5 N and test probe 18 of IEC 61032 is applied with a force of 2,5 N **19** *in order to try and release any interlock that is needed to comply with the requirement. The interlock shall not release.*

20.104 It shall not be possible to open the lid or door of the appliance while the drum speed exceeds 60 r/min if the drum has a rotational kinetic energy exceeding 1 500 J, or a maximum peripheral speed exceeding:

– 20 m/s, for drums that rotate about the horizontal axis or an axis inclined up to and including 45° from the horizontal;
– 40 m/s, for drums that rotate about the vertical axis.

Compliance is checked by the following test.

*The appliance is supplied at **rated voltage** and operated empty. The force determined during the test of 22.104 with the lid interlocked is applied to the lid or door in an attempt to open it.*

*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 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. The tests are carried out with surge protective devices disconnected unless they incorporate spark gaps.* **20**

It shall not be possible to open the lid or door while the drum speed exceeds 60 r/min. If the appliance is loaded from the front and the door can be opened, the motor shall be de-energized before the opening exceeds 50 mm.

~~NOTE~~ *The rotational kinetic energy ~~can~~ shall be calculated from the following formula:*

$$E = mv^2/4$$

where

E is the rotational kinetic energy, in J;

m is the mass of cloth specified in the instructions, in kg;

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

*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 normative Annex R.*

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20.105 Appliances shall have an automatic means for switching off the motor, or for reducing the drum speed to 60 r/min, when the lid or door is opened if the drum has a rotational kinetic energy not exceeding 1 500 J calculated in accordance with 20.104 and a peripheral speed not exceeding:

– 20 m/s, for drums that rotate about the horizontal axis or an axis inclined up to and including 45° from the horizontal;

– 40 m/s, for drums that rotate about the vertical axis.

~~NOTE The rotational kinetic energy is calculated in accordance with the formula in 20.104.~~

Compliance is checked by the following test.

*The appliance is supplied at **rated voltage** and operated in accordance with 20.1 empty or filled as specified for **normal operation**, whichever is more unfavourable. A force not exceeding 50 N is applied to the lid or door in an attempt to open it, as in normal use.*

*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 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. The tests are carried out with surge protective devices disconnected unless they incorporate spark gaps.* **21**

If the lid or door opens, the drum speed shall be no higher than 60 r/min within 7 s of opening the lid or door by 50 mm. In addition, if the appliance is loaded from the front, the motor shall become de-energized.

*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 normative Annex R.*

20.106 For appliances with a front opening door having an opening dimension exceeding 200 mm, and drum volume exceeding 60 dm^3, 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~~:

– start the washing cycle until a separate means that controls the movement of the drum is operated manually, after the door has been closed;

– recommence the washing cycle until a separate means that controls the movement of the drum is operated manually, after the door has been opened and closed again. **22**

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 tests are carried out with surge protective devices disconnected unless they incorporate spark gaps.* **23**

The washing cycle shall not start or recommence.

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20.107 For appliances with a front opening door having an opening dimension exceeding 200 mm, and drum volume exceeding 60 dm^3, 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.

20.108 For **agitator washing machines** and **impeller washing machines** having an opening dimension exceeding 200 mm, and drum volume exceeding 60 dm^3, it shall not be possible to:

– start the spin cycle until a separate means which controls the movement of the washing machine is operated manually, after the lid has been closed;
– recommence the spin cycle until a separate means which controls the movement of the washing machine is operated manually, after the lid has been opened and closed again.

NOTE The opening dimension can be measured from the top of the agitator to the top of the drum opening for **agitator washing machines**. The volume of the drum can be calculated by measuring the maximum internal diameter and maximum internal length of the drum and subtracting the volume of the agitator for **agitator washing machines**.

Compliance is checked by inspection and by the following test.

*The appliance is supplied at **rated voltage**, and the programme controller is set to the spin cycle. The lid is opened and then closed and the spin cycle shall not start until a separate manual action has been performed to start the cycle. After the spin cycle has started, the lid is again opened and then closed and the spin cycle shall not recommence until a separate manual action has been performed to restart the cycle.*

*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 tests are carried out with surge protective devices disconnected unless they incorporate spark gaps.*

*If the **electronic circuit** is programmable, the software shall contain measures to control the fault/error conditions specified in Table R1 and is evaluated in accordance with the relevant requirements of normative Annex R.* **24**

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.*

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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° ± 5°. 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 to 20.105 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 to 20.105 is impaired.

22 Construction

This clause of Part 1 is applicable except as follows.

22.6 ~~*Modification to the requirement*~~ *Addition:*

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 normative Annex BB.

Modification ~~*to the test specification*~~*:*

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

22.51 *Replacement:*

For appliances with a door opening having a dimension exceeding 200 mm and a drum having a volume exceeding 60 dm³, a control on the appliance shall be manually adjusted to the setting for **remote operation** before the appliance can be operated in this mode. The **remote operation** mode shall be deactivated automatically when the appliance door or lid has been opened.

Remote operation not involving the starting or restarting of a delayed cycle of the appliance does not require a control on the appliance to be manually adjusted for **remote operation**.

Examples of this type of remote user functionality are:

– cancelling or pausing an operating cycle; or

– changing the appliance's user configurable settings (e.g. cycle temperature).

The **remote operation** mode shall be deactivated automatically in the case of a loss in the supply mains, unless:

– the loss is less than 300 ms;

– a change in door or lid state can be determined while in this condition once the supply mains has been restored; or

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– door or lid cannot be opened during loss in the supply mains.

A separate manual action distinct from closing the door is necessary for the user to re-initiate the **remote operation** cycle. The door lock or door interlock shall be actuated when the appliance is set for **remote operation** by the user.

Compliance is checked by inspection and, if necessary, by an appropriate test.

*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 tests are carried out with surge protective devices disconnected unless they incorporate spark gaps.*

*The appliance shall not enter the mode of **remote operation** and any existing setting for **remote operation** shall be deactivated.*

*If programmable **electronic circuits** are used to ensure compliance, 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 normative Annex R.* **25**

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.

*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:*

– *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. The tests are carried out with surge protective devices disconnected unless they incorporate spark gaps.* **26**

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 normative Annex R.*

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

Compliance is checked by inspection.

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;

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– 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.

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~~ until the interlock ~~to be~~ is 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.

22.106 **Steam generators** shall be vented to the atmosphere. The aperture shall be at least 5 mm in diameter or at least 20 mm^2 in area with a minimum dimension of 3 mm.

Compliance is checked by inspection and by measurement.

22.107 Appliances with **steam generators** shall be constructed in such a way that there is no spillage of water or sudden jets of steam or hot water likely to expose the user to a hazard when the appliance is used in accordance with the instructions.

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

Compliance is checked by inspection and by inspection during the tests of Clause 11 and Clause 19.

22.108 For appliances that are controlled by programmable **electronic circuits** that limit the number of heating elements and motors from being energised at the same time, simultaneous activation of any combination of heating elements and motors shall not render the appliance unsafe.

Compliance is checked as follows:

– *the fault/error conditions specified in Table R.1 are applied and evaluated in accordance with the relevant requirements of normative Annex R; or*

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– *the appliance is operated under the conditions of Clause 11 while being supplied at **rated voltage**, the programmable **electronic circuits** being modified to allow simultaneous activation of all heaters and motors under their control. Under these conditions, compliance with 19.13 shall be fulfilled.*

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 60730-2-12:2015~~ 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 thermal cut-outs**.

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.

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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*~~ *Modification:*

Replace the two dashed items in the compliance criteria with the following: **27**

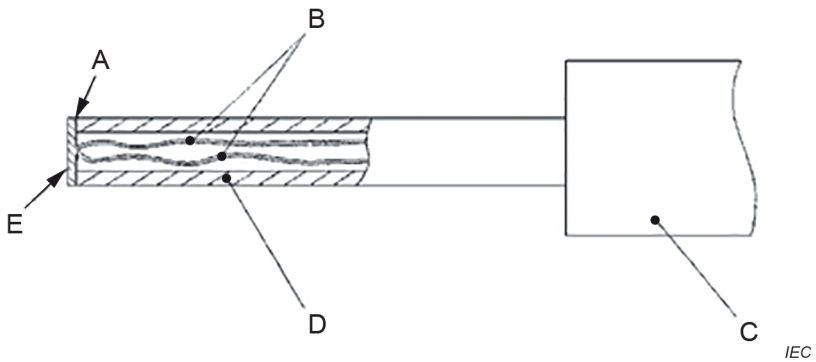
– *for washing machines incorporating a programmer or a timer, 30.2.3 is applicable;*
– *for other washing machines, 30.2.2 is applicable.*

31 Resistance to rusting

This clause of Part 1 is applicable.

32 Radiation, toxicity and similar hazards

This clause of Part 1 is applicable.



Key

A adhesive
B thermocouple wires 0,3 mm diameter to IEC 60584-1 Type K ~~(chrome-alumel)~~
C handle arrangement permitting a contact force of 4 N ± 1 N
D polycarbonate tube: inside diameter 3 mm, outside diameter 5 mm
E tinned copper disc: 5 mm diameter, 0,5 mm thick with a flat contact face

Figure 101 – Probe for measuring surface temperatures

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Annexes

The annexes of Part 1 are applicable except as follows.

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Annex B
(normative)

Battery-operated appliances, separable batteries and detachable batteries for battery-operated appliances

B.11.1 *Replacement:*

Battery-operated appliances *are tested under the conditions of* ***normal operation.***

For appliances operated with ***detachable batteries*** *or* ***separable batteries*** *that are disconnected from the appliance for charging purposes, the appliance is operated as specified in 11.7 until it no longer operates due to depletion of the* ***battery****. If the* ***battery*** *is depleted before the appliance completes the duration of the test, the depleted* ***battery*** *is immediately replaced with another* ***battery*** *that is* ***fully charged****, the* ***battery*** *being the model or type reference of the* ***battery*** *provided or indicated in the instructions. The test is continued until the appliance completes the duration of the test as specified or it no longer operates due to depletion of the* ***battery****.*

For appliances incorporating ***integral batteries*** *or* ***separable batteries*** *not disconnected from the appliance for charging purposes, and that cannot perform their intended function while the* ***batteries*** *are being charged, the appliance is operated as specified in 11.7 until it cannot perform its intended function due to the depletion of the* ***batteries****.*

For appliances operated with ***batteries*** *that are replaceable, including* ***integral batteries*** *that are replaceable, or* ***non-rechargeable batteries****, the appliance is operated until the minimum capacity of the* ***battery*** *as specified in Table B.1 has been delivered or the appliance completes the duration of the test as specified in 11.7 whichever occurs first.* **28**

B.22.3 *Addition:*

For parts of appliances situated not more than 850 mm above the floor after installation or in normal use, in addition to the use of test probe 18, test probe 19 of IEC 61032 is also applied wherever test probe 18 is used and with the same test conditions used for test probe 18. **29**

B.22.4 *Addition:*

For parts of ***batteries*** *situated not more than 850 mm above the floor after installation or in normal use, in addition to the use of test probe 18, test probe 19 of IEC 61032 is also applied wherever test probe 18 is used and with the same test conditions used for test probe 18.* **30**

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Annex R
(normative)

Software evaluation

R.2.2.5 *Modification:*

Replace the first paragraph with the following:

For programmable **electronic circuits** with functions requiring software incorporating measures to control the fault/error conditions specified in Table R.1, detection of a fault/error shall occur before compliance with Clause 19, 20.104, 20.105, 20.108, 22.51, 22.101 ~~and~~ or 22.108 is impaired.

R.2.2.9 *Modification:*

Replace the first sentence of the first paragraph with the following:

The software and safety-related hardware under its control shall be initialized and shall terminate before compliance with Clause 19, 20.104, 20.105, 20.108, 22.51, 22.101 ~~and~~ or 22.108 is impaired.

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Annex AA
(normative)

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_2O: 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~~

Table AA.1 – Composition of the reference detergent

Ingredient	%	Tolerance (±)
Linear sodium alkyl benzene sulfonate	8,8	0,5
Ethoxylated fatty alcohol C12/14 (7 EO)	4,7	0,3
Sodium soap (tallow soap)	3,2	0,2
Foam inhibitor concentrate (12 % silicon on inorganic carrier)	3,9	0,3
Sodium aluminium silicate zeolite 4 A (80 % active substance)	28,3	1,0
Sodium carbonate	11,6	1,0
Sodium salt of a copolymer from acrylic and maleic acid (granulate)	2,4	0,2
Sodium silicate (SiO2:Na2O = 3,3:1)	3,0	0,2
Carboxymethylcellulose	1,2	0,1
Phosphonate (DEQUEST 2066, 25 % active acid)	2,8	0,2
Optical whitener for cotton (stilbene type)	0,2	0,02
Sodium sulfate	6,5	0,5
Protease (Savinase 8.0)	0,4	0,04
Sodium perborate tetrahydrate (active oxygen 10,00 % to 10,40 %)	20,0	
Tetra-acetylethylenediamine (active content 90,0 % to 94,0 %)	3,0	

NOTE The composition of the detergent is extracted from IEC 60456:~~1994~~[2] 2010 and IEC 60456:2010/AMD1:2022, Annex B. Further detergent compositions are under consideration. **31**

[2] ~~Withdrawn.~~

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Annex BB
(normative)

Ageing test for elastomeric parts

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 1817:2022, with the following modifications.

~~5~~6 Test liquids

Two test liquids are used:

– one liquid is obtained by dissolving 5 g of the detergent specified in normative Annex AA per litre of distilled water;

– the other liquid is composed of 0,6 ml of rinsing agent as specified in 15.2 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~~7 Test pieces

~~6~~7.4 Conditioning

The temperature is 23 °C ± 2 °C and the relative humidity is (50 ± 5) %.

~~7~~8 Immersion in the test liquid

~~7~~8.1 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~~8.2 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 min ± 15 min.

After having been removed from the solution, the test pieces are rinsed in cold water at 15 °C ± 5 °C and then dried with blotting paper.

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~~8~~9 Procedure

~~8.2~~9.3 Change in mass

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

~~8.6~~9.7 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.

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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.~~

~~CC.2 Normative references~~

~~*Addition:*~~

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

~~IEC 60079-15, *Explosive atmospheres – Part 15: Equipment protection by type of protection "n"*~~ **32**

The clause numbers without an annex letter prefix refer to the clause numbers in the main part of this standard that are modified or replaced. Clauses that are new or additional to the clauses in the main part of this standard are identified by adding the annex letter followed by the numbering starting at 1. **33**

~~CC.~~3 Terms and 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.

~~CC.~~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~~CC.1 Details of the electrolyte to be used can be given, for example, in terms of a generic name or a manufacturer's part number.

7.12.1 *Addition:*

The 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.

~~CC.~~15 Moisture resistance

15.2 *Modification:*

Replace the third and fourth paragraphs of the compliance criteria in the replacement with the following:

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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.

~~CC.~~19 Abnormal operation

CC.19.~~201~~1 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 normative 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.

~~CC.~~22 Construction

~~**22.6** *Modification:*~~

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

CC.22.~~201~~1 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 mm^2 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.

CC.22.~~202~~2 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~~ can 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.*

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*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.

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

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

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

CC.22.~~203~~3 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° to 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.

~~CC.~~29 Clearances, creepage distances and solid insulation

29.2 *Modification:*

In the second dashed item of the addition, replace *"detergent"* by *"electrolyte".*

~~CC.~~32 Radiation, toxicity and similar hazards

Addition:

CC.32.1 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**.*

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The ozone sampling tube is to be located 10 mm from the gas outlet aperture specified in CC.22.~~201~~1. 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 − Ageing test for elastomeric parts

6 *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.*~~

Replace the first dashed item with the following:

– one liquid is a solution of the electrolysed portion of the wash water obtained under the conditions of Clause 11;

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