

INTERNATIONAL STANDARD



This extended version of IEC 60335-2-7:2024 includes the content of the references made to IEC 60335-1:2020

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

Document Preview

[IEC 60335-2-7:2024](https://standards.iteh.ai/catalog/standards/iec/9b97559a-c0c7-443d-b4b6-dfd75c954312/iec-60335-2-7-2024)

<https://standards.iteh.ai/catalog/standards/iec/9b97559a-c0c7-443d-b4b6-dfd75c954312/iec-60335-2-7-2024>



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2024 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Secretariat
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, ...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch

Discover our powerful search engine and read freely all the publications previews, graphical symbols and the glossary. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 500 terminological entries in English and French, with equivalent terms in 25 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

International
Standards
Document Preview
(iteh.ai)

[IEC 60335-2-7:2024](https://standards.iteh.ai/catalog/standards/iec/9b97559a-c0c7-443d-b4b6-dfd75c954312/iec-60335-2-7-2024)

<https://standards.iteh.ai/catalog/standards/iec/9b97559a-c0c7-443d-b4b6-dfd75c954312/iec-60335-2-7-2024>



IEC 60335-2-7

Edition 9.0 2024-01
EXTENDED VERSION

INTERNATIONAL STANDARD



This extended version of IEC 60335-2-7:2024 includes the content of the references made to IEC 60335-1:2020

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

Document Preview

[IEC 60335-2-7:2024](https://standards.iteh.ai/catalog/standards/iec/9b97559a-c0c7-443d-b4b6-dfd75c954312/iec-60335-2-7-2024)

<https://standards.iteh.ai/catalog/standards/iec/9b97559a-c0c7-443d-b4b6-dfd75c954312/iec-60335-2-7-2024>

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 13.120, 97.060

ISBN 978-2-8322-8215-1

Warning! Make sure that you obtained this publication from an authorized distributor.

INTERNATIONAL ELECTROTECHNICAL COMMISSION

IEC 60335-1
Edition 6.0 2020-09

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

Part 1: General requirements

INTERPRETATION SHEET 1

This interpretation sheet has been prepared by IEC technical committee 61: Safety of household and similar electrical appliances.

The text of this Interpretation Sheet is based on the following documents:

| Draft | Report on voting |
|--------------|------------------|
| 61/5999/DISH | 61/6009/RVDISH |

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

[IEC 60335-2-7:2024](https://standards.iteh.ai/catalog/standards/iec/9b97559a-c0c7-443d-b4b6-dfd75c954312/iec-60335-2-7-2024)

<https://standards.iteh.ai/catalog/standards/iec/9b97559a-c0c7-443d-b4b6-dfd75c954312/iec-60335-2-7-2024>

INTRODUCTION

Edition 6 of IEC 60335-1:2020 defines and introduces requirements for a detachable power supply part of an appliance. In the document, 24.2 prohibits the use of a power supply in a flexible cord.

QUESTION:

Does Subclause 24.2 prohibit the use of a detachable power supply part?

ANSWER

No, a "detachable power supply part" is a defined term and is not captured by the term "power supply" as used in Subclause 24.2.

NOTE A detachable power supply part is captured by the defined term when the output of the power supply part is detachable from the class III construction part of the appliance at:

- the power supply part, or
- the class III construction part of the appliance.

However, the supply cord (if any) does not have to be detachable from the detachable power supply part.

CONTENTS

| | |
|--|-----|
| FOREWORD..... | 6 |
| INTRODUCTION..... | 9 |
| 1 Scope..... | 10 |
| 2 Normative references | 11 |
| 3 Terms and definitions | 16 |
| 4 General requirement..... | 28 |
| 5 General conditions for the tests | 28 |
| 6 Classification..... | 33 |
| 7 Marking and instructions..... | 33 |
| 8 Protection against access to live parts..... | 42 |
| 9 Starting of motor-operated appliances | 44 |
| 10 Power input and current..... | 44 |
| 11 Heating..... | 46 |
| 12 Charging of metal-ion batteries..... | 54 |
| 13 Leakage current and electric strength at operating temperature..... | 55 |
| 14 Transient overvoltages | 58 |
| 15 Moisture resistance | 59 |
| 16 Leakage current and electric strength..... | 62 |
| 17 Overload protection of transformers and associated circuits | 64 |
| 18 Endurance..... | 64 |
| 19 Abnormal operation | 65 |
| 20 Stability and mechanical hazards..... | 77 |
| 21 Mechanical strength | 81 |
| 22 Construction | 83 |
| 23 Internal wiring..... | 98 |
| 24 Components | 100 |
| 25 Supply connection and external flexible cords | 105 |
| 26 Terminals for external conductors..... | 114 |
| 27 Provision for earthing | 116 |
| 28 Screws and connections | 118 |
| 29 Clearances, creepage distances and solid insulation | 120 |
| 30 Resistance to heat and fire | 129 |
| 31 Resistance to rusting..... | 134 |
| 32 Radiation, toxicity and similar hazards..... | 134 |
| Annex A (informative) Routine tests | 148 |
| Annex B (normative) Battery-operated appliances, separable batteries and detachable batteries for battery-operated appliances..... | 150 |
| Annex C (normative) Ageing test on motors | 171 |
| Annex D (normative) Thermal motor protectors | 172 |
| Annex E (normative) Needle-flame test..... | 173 |
| Annex F (normative) Capacitors..... | 174 |
| Annex G (normative) Safety isolating transformers | 176 |

| | |
|---|-----|
| Annex H (normative) Switches | 177 |
| Annex I (normative) Motors having basic insulation that is inadequate for the rated voltage of the appliance | 179 |
| Annex J (normative) Coated printed circuit boards | 181 |
| Annex K (informative) Overvoltage categories | 182 |
| Annex L (informative) Guidance for the measurement of clearances and creepage distances | 183 |
| Annex M (informative) Pollution degree | 186 |
| Annex N (normative) Proof tracking test..... | 187 |
| Annex O (informative) Selection and sequence of the tests of Clause 30 | 188 |
| Annex P (informative) Guidance for the application of this standard to appliances used in tropical climates | 193 |
| Annex Q (informative) Sequence of tests for the evaluation of electronic circuits | 195 |
| Annex R (normative) Software evaluation | 198 |
| Annex S (informative) Guidance for the application of this standard on measurement of power input and current based on the requirements of 10.1 and 10.2 concerning the representative period | 212 |
| Annex T (normative) UV-C radiation effect on non-metallic materials | 213 |
| Annex U (normative) Appliances intended for remote communication through public networks | 216 |
| Annex AA (normative) Detergent..... | 220 |
| Annex BB (normative) Ageing test for elastomeric parts..... | 221 |
| Annex CC (normative) Detergent free electrolyser washing machines..... | 223 |
| Annex DD (informative) Washing machines incorporating a power driven wringer | 227 |
| Bibliography..... | 229 |
| Index of defined terms | 232 |
| Figure 1 – Circuit diagram for leakage current measurement at operating temperature for single-phase connection of class II appliances and for parts of class II construction | 135 |
| Figure 2 – Circuit diagram for leakage current measurement at operating temperature for single-phase connection of other than class II appliances or parts of class II construction | 136 |
| Figure 3 – Circuit diagram for leakage current measurement at operating temperature for three-phase with neutral class II appliances and for parts of class II construction | 137 |
| Figure 4 – Circuit diagram for leakage current measurement at operating temperature for three-phase with neutral appliances other than those of class II or parts of class II construction | 138 |
| Figure 5 – Small part | 139 |
| Figure 6 – Example of an electronic circuit with low-power points | 139 |
| Figure 7 – Test finger nail..... | 140 |
| Figure 8 – Flexing test apparatus..... | 141 |
| Figure 9 – Constructions of cord anchorages | 142 |
| Figure 10 – An example of parts of an earthing terminal | 143 |
| Figure 11 – Examples of clearances | 144 |
| Figure 12 – Example of the placement of the cylinder | 145 |
| Figure 13 – Small parts cylinder..... | 146 |

| | |
|---|-----|
| Figure 14 – Example of a specified operating region of a lithium-ion cell during charging | 147 |
| Figure 101 – Probe for measuring surface temperatures | 147 |
| Figure B.1 – Examples of battery-operated appliance constructions and application of normative Annex B (1 of 2) | 169 |
| Figure B.2 – Examples of correct polarity connection marking representing three batteries | 170 |
| Figure I.1 – Simulation of faults | 180 |
| Figure L.1 – Sequence for the determination of clearances | 183 |
| Figure L.2 – Sequence for the determination of creepage distances | 184 |
| Figure L.3 – Measurement of clearances | 185 |
| Figure O.1 – Tests for resistance to heat | 188 |
| Figure O.2 – Selection and sequence of tests for resistance to fire in hand-held appliances | 189 |
| Figure O.3 – Selection and sequence of tests for resistance to fire in attended appliances | 189 |
| Figure O.4 – Selection and sequence of tests for resistance to fire in unattended appliances | 190 |
| Figure O.5 – Some applications of the term "within a distance of 3 mm" | 192 |
| Figure Q.1 – Flowchart outlining the sequence of tests for the evaluation of electronic circuits (1 of 2) | 196 |
| Figure S.1 – Flowchart giving guidance on measurement of power input and current concerning the representative period | 212 |
| Table 1 – Power input deviation | 44 |
| Table 2 – Current deviation | 45 |
| Table 101 – Maximum temperature rises for specified external accessible surfaces under normal operating conditions | 50 |
| Table 3 – Maximum normal temperature rises | 50 |
| Table 4 – Voltage for electric strength test | 57 |
| Table 5 – Characteristics of high-voltage sources | 58 |
| Table 6 – Impulse test voltage | 58 |
| Table 7 – Test voltages | 63 |
| Table 8 – Maximum winding temperature | 68 |
| Table 9 – Maximum abnormal temperature rise | 74 |
| Table 10 – Dimensions of cables and conduits | 107 |
| Table 11 – Minimum cross-sectional area of conductors | 109 |
| Table 12 – Pull force and torque | 111 |
| Table 13 – Nominal cross-sectional area of conductors | 115 |
| Table 14 – Torque for testing screws and nuts | 119 |
| Table 15 – Rated impulse voltage | 121 |
| Table 16 – Minimum clearances | 122 |
| Table 17 – Minimum creepage distances for basic insulation | 126 |
| Table 18 – Minimum creepage distances for functional insulation | 127 |
| Table 19 – Minimum thickness for accessible parts of reinforced insulation consisting of a single layer | 129 |

| | |
|---|-----|
| Table A.1 – Test voltages | 149 |
| Table B.1 – Artificial source characteristics..... | 152 |
| Table B.2 – Total area of openings for metal-ion cells..... | 160 |
| Table B.3 – Volume of air injected at 2 070 kPa..... | 160 |
| Table C.1 – Test conditions | 171 |
| Table R.1 – General fault/error conditions..... | 200 |
| Table R.2 – Specific fault/error conditions..... | 202 |
| Table R.3 – Semi-formal methods | 208 |
| Table R.4 – Software architecture specification | 208 |
| Table R.5 – Module design specification | 209 |
| Table R.6 – Design and coding standards..... | 210 |
| Table R.7 – Software safety validation | 210 |
| Table T.1 – Minimum property retention limits after UV-C exposure | 214 |
| Table T.2 – Minimum electric strength for internal wiring after UV-C exposure | 215 |
| Table U.1 – Examples of acceptable measures against unauthorised access and transmission fault/error modes..... | 218 |
| Table AA.1 – Composition of the reference detergent | 220 |

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

[IEC 60335-2-7:2024](https://standards.iteh.ai/catalog/standards/iec/9b97559a-c0c7-443d-b4b6-dfd75c954312/iec-60335-2-7-2024)

<https://standards.iteh.ai/catalog/standards/iec/9b97559a-c0c7-443d-b4b6-dfd75c954312/iec-60335-2-7-2024>

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at <https://patents.iec.ch>. IEC shall not be held responsible for identifying any or all such patent rights.

This extended version (EXV) of the official IEC Standard provides the user with the comprehensive content of the Standard.

IEC 60335-2-7:2024 EXV includes the content of IEC 60335-2-7:2024, and the references made to IEC 60335-1:2020.

The specific content of IEC 60335-2-7:2024 is displayed on a blue background.

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;

- *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.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

<https://standards.iteh.ai>
Document Preview

[IEC 60335-2-7:2024](https://standards.iteh.ai/catalog/standards/iec/9b97559a-c0c7-443d-b4b6-dfd75c954312/iec-60335-2-7-2024)

<https://standards.iteh.ai/catalog/standards/iec/9b97559a-c0c7-443d-b4b6-dfd75c954312/iec-60335-2-7-2024>

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 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 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.

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.

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

Part 2-7: Particular requirements for washing machines

1 Scope

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**.

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 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.

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.

Attention is drawn to the fact that:

- for washing machines intended to be used in vehicles or on board ships or aircraft, additional requirements 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.

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