

INTERNATIONAL STANDARD



This full version of IEC 60704-2-10:2024 includes the content of the references made to IEC 60704-1:2021

**Household and similar electrical appliances – Test code for the determination of airborne acoustical noise –
Part 2-10: Particular requirements for ranges, ovens, steam ovens, grills and microwave ovens**

Document Preview

[IEC 60704-2-10:2024](https://standards.iteh.ai/catalog/standards/iec/c22f2fc5-3441-405a-be99-e26849fa3d8a/iec-60704-2-10-2024)

<https://standards.iteh.ai/catalog/standards/iec/c22f2fc5-3441-405a-be99-e26849fa3d8a/iec-60704-2-10-2024>





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 It also gives information on projects, replaced and withdrawn publications.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
standards.iteh.ai
Document Preview

[IEC 60704-2-10:2024](https://standards.iteh.ai/catalog/standards/iec/c22f2fc5-3441-405a-be99-e26849fa3d8a/iec-60704-2-10-2024)

<https://standards.iteh.ai/catalog/standards/iec/c22f2fc5-3441-405a-be99-e26849fa3d8a/iec-60704-2-10-2024>



IEC 60704-2-10

Edition 3.0 2024-09
EXTENDED VERSION

INTERNATIONAL STANDARD



This full version of IEC 60704-2-10:2024 includes the content of the references made to IEC 60704-1:2021

**Household and similar electrical appliances – Test code for the determination of airborne acoustical noise –
Part 2-10: Particular requirements for ranges, ovens, steam ovens, grills and microwave ovens**

Document Preview

[IEC 60704-2-10:2024](https://standards.iteh.ai/catalog/standards/iec/c22f2fc5-3441-405a-be99-e26849fa3d8a/iec-60704-2-10-2024)

<https://standards.iteh.ai/catalog/standards/iec/c22f2fc5-3441-405a-be99-e26849fa3d8a/iec-60704-2-10-2024>

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 17.140.20; 97.040.20

ISBN 978-2-8322-9677-6

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

CONTENTS

FOREWORD	4
INTRODUCTION to IEC 60704-1:2021	7
INTRODUCTION to IEC 60704-2-10:2024	8
1 Scope	9
2 Normative references	9
3 Terms and definitions	10
4 Measurement methods and acoustical environments	12
4.1 General	12
4.2 Direct method	13
4.3 Comparison method	13
4.4 Acoustical environments	14
4.4.1 General requirements and criterion for adequacy of the test environment	14
4.4.2 Criterion for background noise level	14
4.4.3 Environmental conditions	14
4.5 Measurement uncertainties	15
4.5.1 General	15
4.5.2 Standard deviations on repeatability and reproducibility and standard deviations related to declaration and verification	15
5 Instrumentation	15
5.1 Instrumentation for measuring acoustical data	15
5.2 Instrumentation for measuring climatic conditions	16
5.3 Instrumentation for measuring operating conditions	16
6 Operation and location of appliances under test	16
6.1 Equipping and pre-conditioning of appliances	16
6.2 Supply of electric energy and of water or gas	17
6.3 Climatic conditions	17
6.4 Loading and operating of appliances during tests	18
6.5 Location and mounting of appliances	20
7 Measurement of sound pressure levels	22
7.1 Microphone array, measurement surface and RSS location for essentially free field conditions over reflecting plane(s)	22
7.2 Microphone array and RSS location in hard-walled test rooms	24
7.3 Microphone array and RSS location in special reverberation test rooms	25
7.4 Measurements	25
8 Calculation of sound pressure and sound power levels	25
8.1 General	25
8.2 Corrections for background noise levels	26
8.3 Corrections for the test environment	26
8.4 Calculation of sound pressure level averaged over the microphone positions	26
8.5 Calculation of sound power levels with the comparison method	27
8.6 Calculation of sound power levels in free field conditions over a reflecting plane	27
8.7 Calculation of A-weighted sound power level with the direct method in special reverberation test rooms	28
9 Information to be recorded	28

9.1	General data	28
9.2	Description of appliance under test	28
9.3	Measurement method	29
9.4	Acoustical test environment	29
9.5	Instrumentation	29
9.6	Equipment and pre-conditioning of appliance under test	29
9.7	Electric supply, water supply, etc.	29
9.8	Climatic conditions	30
9.9	Operation of the appliance under test	30
9.10	Location and mounting of the appliance under test.....	30
9.11	Microphone array	30
9.12	Measurement data	30
9.13	Calculated sound pressure and sound power levels	31
9.14	Reporting	31
10	Information to be reported	31
10.1	General data	31
10.2	Appliance under test	31
10.3	Test conditions for the appliance.....	31
10.4	Acoustical data	32
Annex A (normative) Standard test table		33
Annex B (normative) Test enclosure		34
Annex C (informative) Guidelines for the design of simple test rooms with essentially free field conditions.....		35
Bibliography.....		36
Figure 1 – Measurement surface – parallelepiped – with key microphone positions, for floor free-standing appliances		22
Figure 2 – Measurement surface – parallelepiped – with key microphone positions, for floor standing appliances placed against a wall.....		23
Figure 3 – Measurement surface – parallelepiped – with key microphone positions, for high floor-standing appliances placed against a wall.....		24
Figure B.1 – Test enclosure		34
Table 1 – Standard deviations of sound power levels.....		15
Table 2 – Standard deviations for declaration and verification.....		15
Table 101 – Settings and measurement time		19

INTERNATIONAL ELECTROTECHNICAL COMMISSION

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – TEST CODE FOR THE DETERMINATION OF AIRBORNE ACOUSTICAL NOISE –

Part 2-10: Particular requirements for ranges, ovens, steam ovens, grills and microwave ovens

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 full content of the Standard.

IEC 60704-2-10:2024 EXV includes the content of IEC 60704-2-10:2024, and the references made to IEC 60704-1:2021.

The specific content of IEC 60704-2-10:2024 is displayed on a blue background.

IEC 60704-2-10 has been prepared by subcommittee 59K: Performance of household and similar electrical cooking appliances, of IEC technical committee 59: Performance of household and similar electrical appliances. It is an International Standard.

This third edition cancels and replaces the second edition published in 2011. This edition constitutes a technical revision.

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

- a) alignment with the fourth edition of IEC 60704-1:2021;
- b) alignment with IEC 60350-1:2023 regarding the definitions and settings;
- c) introduction of the measurement of the steam function;
- d) revision of settings and test parameters.

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

Draft	Report on voting
59K/396/FDIS	59K/398/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.

<https://standards.iteh.ai/> IEC 60704-2-10:2024
 This document is intended to be used in conjunction with IEC 60704-1:2021, *Household and similar electrical appliances – Test code for the determination of airborne acoustical noise – Part 1: General requirements*.

The relevant text of IEC 60704-1:2021 as amended by this publication establishes the test code ranges, ovens, steam ovens, grills and microwave ovens.

This document supplements or modifies the corresponding clauses in IEC 60704-1:2021. When a particular subclause of IEC 60704-1:2021 is not mentioned in this document, that subclause is applicable as far as reasonable. Where this document states "addition", "modification" or "replacement", the relevant requirements, test specifications or explanatory matter in IEC 60704-1:2021 are to be adapted accordingly.

Subclauses, tables and figures that are numbered starting from 101 are additional to those in IEC 60704-1:2021. Additional annexes are lettered AA, BB, etc.

Unless notes are in a new subclause or involve notes in IEC 60704-1:2021, they are numbered starting from 101, including those in a replaced clause or subclause.

In this standard, the following print types are used:

- terms defined in Clause 3: bold type.

A list of all parts in the IEC 60704 series, published under the general title *Household and similar electrical appliances – Test code for the determination of airborne acoustical noise*, can be found on the IEC website.

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.

IMPORTANT – The "colour inside" logo on the cover page of this document 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.

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

[IEC 60704-2-10:2024](#)

<https://standards.iteh.ai/catalog/standards/iec/c22f2fc5-3441-405a-be99-e26849fa3d8a/iec-60704-2-10-2024>

INTRODUCTION to IEC 60704-1:2021

Although the noise emitted by household appliances does not generally present a hazard to the hearing of the operator and other exposed persons, the need for standardization procedures for the determination of the noise emitted has been recognized for a long time. Such procedures should be specified, not only for special types of appliances, but also the principles should be applicable to the majority of appliances in general use.

Generally, the determination of noise levels is only part of a comprehensive testing procedure covering many aspects of the properties and performances of the appliance. It is therefore important that the requirements for noise measurements (such as test environment, instrumentation, and amount of labour involved) be kept at a modest level.

The results of noise measurements are used for many purposes, for example for noise declaration, as well as for comparing the noise emitted by a specific appliance to the noise emitted by other appliances of the same family. In other cases, the results are taken as a basis for engineering action in the development stages of new pieces of equipment, or in deciding on means for sound insulation. For all purposes, it is important to specify procedures with known accuracy so that the results of measurements taken by different laboratories can be compared.

These conditions have, as far as possible, been taken into account in the preparation of this test code. The acoustic measuring methods are based on those described in ISO 3743-1:2010, ISO 3743-2:2018 and ISO 3744:2010.

The adoption of these methods permits the use of hemi-anechoic rooms, special reverberation test rooms and hard-walled test rooms. The result of the measurements is the sound power level of the appliance. Within the measuring uncertainty specific to these methods, the results from the determination under free field conditions over a reflecting plane are equal to those obtained in reverberant fields.

The use of intensity methods as described in ISO 9614-1:1993, ISO 9614-2:1996, and ISO 9614-3:2002 is applicable under special conditions, which are described in specific parts of the IEC 60704-2 series.

This test code is concerned with airborne noise only. In some cases, structure-borne noise, for example transmitted to the adjoining room, can be of importance.

INTRODUCTION to IEC 60704-2-10:2024

The measuring conditions specified in this document provide for sufficient accuracy in determining the noise emitted and comparing the results of measurements taken by different laboratories, whilst simulating as far as possible the practical use of ranges, ovens, steam ovens, grills and microwave ovens.

It is recommended to consider the determination of noise levels as part of a comprehensive testing procedure covering many aspects of the properties and performance of household appliances.

NOTE As stated in the Introduction to IEC 60704-1, this test code is concerned with airborne noise only.

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

[IEC 60704-2-10:2024](https://standards.iteh.ai/catalog/standards/iec/c22f2fc5-3441-405a-be99-e26849fa3d8a/iec-60704-2-10-2024)

<https://standards.iteh.ai/catalog/standards/iec/c22f2fc5-3441-405a-be99-e26849fa3d8a/iec-60704-2-10-2024>

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – TEST CODE FOR THE DETERMINATION OF AIRBORNE ACOUSTICAL NOISE –

Part 2-10: Particular requirements for ranges, ovens, steam ovens, grills and microwave ovens

1 Scope

This part of IEC 60704 applies to electric appliances (including their accessories or components) for household and similar use, supplied from mains or from batteries.

By "similar use" is understood the use in conditions similar to those found in households, for example in inns, coffee houses, tea rooms, hotels, barber or hairdresser shops, launderettes, etc., if not otherwise specified in the IEC 60704-2 series.

This document does not apply to

- appliances, equipment, or machines designed exclusively for industrial or professional purposes;
- appliances that are integrated parts of a building or its installations, such as equipment for air conditioning, heating and ventilating (except household fans, cooker hoods, free-standing heating appliances, dehumidifiers, air cleaners, and stand-alone water heaters), oil burners for central heating, pumps for water supply and for sewage systems;
- separate motors or generators and
- appliances exclusively for outdoor use.

For determining and verifying noise emission values declared in product specifications, see IEC 60704-3:2019.

These particular requirements apply to ranges, ovens, steam ovens, **grills** and microwave ovens for household and similar use.

This document does not apply to hobs.

This document does not apply to appliances or parts of appliances that use gas energy.

Requirements for the declaration of noise emission values are not within the scope of this document.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60350-1:2023, *Household electric cooking appliances – Part 1: Ranges, ovens, steam ovens and grills – Methods for measuring performance*

IEC 60704-2 (all parts), *Household and similar electrical appliances – Test code for the determination of airborne acoustical noise*

IEC 60704-3:2019, *Household and similar electrical appliances – Test code for the determination of airborne acoustical noise – Part 3: Procedure for determining and verifying declared noise emission values*

IEC 60705:–1, *Household microwave ovens – Methods for measuring performance*

IEC 61260-1:2014, *Electroacoustics – Octave-band and fractional-octave-band filters – Part 1: Specifications*

IEC 61672-1:2013, *Electroacoustics – Sound level meters – Part 1: Specifications*

ISO 3743-1:2010, *Acoustics – Determination of sound power levels of noise sources – Engineering methods for small, movable sources in reverberant fields – Part 1: Comparison method for hard-walled test rooms*

ISO 3743-2:2018, *Acoustics – Determination of sound power levels of noise sources using sound pressure – Engineering methods for small, movable sources in reverberant fields – Part 2: Methods for special reverberation test rooms*

ISO 3744:2010, *Acoustics – Determination of sound power levels of noise sources using sound pressure – Engineering method in an essentially free field over a reflecting plane*

ISO 9614-1:1993, *Acoustics – Determination of sound power levels of noise sources using sound intensity – Part 1: Measurement at discrete points*

ISO 9614-2:1996, *Acoustics – Determination of sound power levels of noise sources using sound intensity – Part 2: Measurement by scanning*

ISO 9614-3:2002, *Acoustics – Determination of sound power levels of noise sources using sound intensity – Part 3: Precision method for measurement by scanning*

ISO 6926:2016, *Acoustics – Requirements for the performance and calibration of reference sound sources used for the determination of sound power levels*

ISO 12001:1996, *Acoustics – Noise emitted by machinery and equipment – Rules for the drafting and presentation of a noise test code*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply. Terms and definitions pertinent to the determination of sound power levels can be found in ISO 3743-1:2010, ISO 3743-2:2018 and ISO 3744:2010.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1

measurement time interval

portion or a multiple of an operational period or operational cycle for which the sound power levels are determined

¹ Under preparation. Stage at the time of publication: IEC FDIS 60705:2024.

**3.2
operational period**

interval of time during which a specified process is accomplished by the appliance under test (for example, washing or rinsing or drying for a dishwasher)

**3.3
operational cycle**

specific sequence of operational periods occurring while the appliance under test performs a complete work cycle

Note 1 to entry: During the operational cycle, each operational period is associated with a specific process that can occur only once, or can be repeated (for example, washing and rinsing and drying for a dishwasher).

**3.4
time history**

continuous recording of the sound pressure level (for a distinct microphone position) as a function of time, which is obtained during one or more operational periods of an operational cycle

**3.5
reference box**

hypothetical right parallelepiped terminating on the reflecting plane(s) on which the noise source under test is located, that just encloses the source including all the significant sound radiating components and any test table on which the source is mounted

[SOURCE: ISO 3744:2010, 3.10, modified – The note has been omitted.]

**3.6
test enclosure**

enclosure used for simulating the typical acoustic built-in or/and mounting conditions

**3.101
grill**

appliance or part of an appliance in which food is cooked by radiant heating

[SOURCE: IEC 60350-1:2023, 3.6]

**3.102
steam function**

heat transmission to the food mainly by condensation of steam at ambient pressure (approximately 100 kPa) and with a temperature ≤ 100 °C

[SOURCE: IEC 60350-1:2023, 3.21]

**3.103
hot steam function**

heat transmission to the food by generated steam in combination with radiation or convection, or a combination of both, at ambient pressure (approximately 100 kPa) and with a temperature > 100 °C

[SOURCE: IEC 60350-1:2023, 3.9]

**3.104
heating function**

heat transmission by natural or forced air circulation, or radiation for baking and roasting

EXAMPLE

- Forced air circulation function which heats food mainly by circulating the air with the aid of a fan;

- conventional **heating function** which heats food mainly by natural convection of the air;
- or a combination of both functions.

Note 1 to entry: Heat transmission by steam or by microwave power, also in combination with any **heating function**, is excluded.

[SOURCE: IEC 60350-1:2023, 3.7]

3.105 microwave function

function using only electromagnetic energy in one or several of the ISM frequency bands between 300 MHz and 30 GHz for heating food and beverages in a cavity

[SOURCE: IEC 60705:–, 3.5]

3.106 combination microwave function

heat transfer by electromagnetic energy simultaneously or consecutively with energy transfer by forced air circulation, conventional heating, by hot steam or by steam

[SOURCE: IEC 60705:–, 3.2, modified – the note has been removed.]

3.107 multiple cavity appliance

appliance that has more than one separate cavity in which food is cooked and which can be controlled independently, but cannot be installed separately

[SOURCE: IEC 60350-1:2023, 3.10]

4 Measurement methods and acoustical environments

4.1 General

[IEC 60704-2-10:2024](https://standards.iteh.ai/catalog/standards/iec/c22f2fc5-3441-405a-be99-e26849fa3d8a/iec-60704-2-10-2024)

<https://standards.iteh.ai/catalog/standards/iec/c22f2fc5-3441-405a-be99-e26849fa3d8a/iec-60704-2-10-2024>

This document is concerned with objective methods of engineering accuracy grade 2 in accordance with ISO 12001:1996 for determining sound power levels L_W , expressed in decibels (dB), with reference to a sound power of one picowatt (1 pW), of airborne acoustical noise within the specified frequency range of interest (generally including the octave-bands with centre frequencies from 125 Hz to 8 000 Hz), and for prescribed operating conditions of the appliance to be measured.

Methods for determining sound power levels with precision accuracy grade 1 in accordance with ISO 12001:1996, as specified for example in ISO 3741 and ISO 3745, are not included in this document. They may, however, be applied if the appropriate test environment and instrumentation are available.

NOTE 1 The noise values obtained under the described conditions of this document will not necessarily correspond to the noise experienced under the operational conditions of practical use.

NOTE 2 For quality control during production etc., simplified methods can be appropriate. For noise reduction purposes, other measurement methods employing, for example, narrow-band analysis or intensity techniques usually have to be applied. These methods are not covered by this document.

The total noise emitted by machinery or equipment and radiated in all directions to the space surrounding the machine can be characterized by the sound power of the machine. Within the accuracy range of this document, the sound power of a machine is basically independent of the environment in which the machine is installed

Therefore, the concept of sound power level has been chosen for expressing the noise emission of appliances for household and similar purposes.