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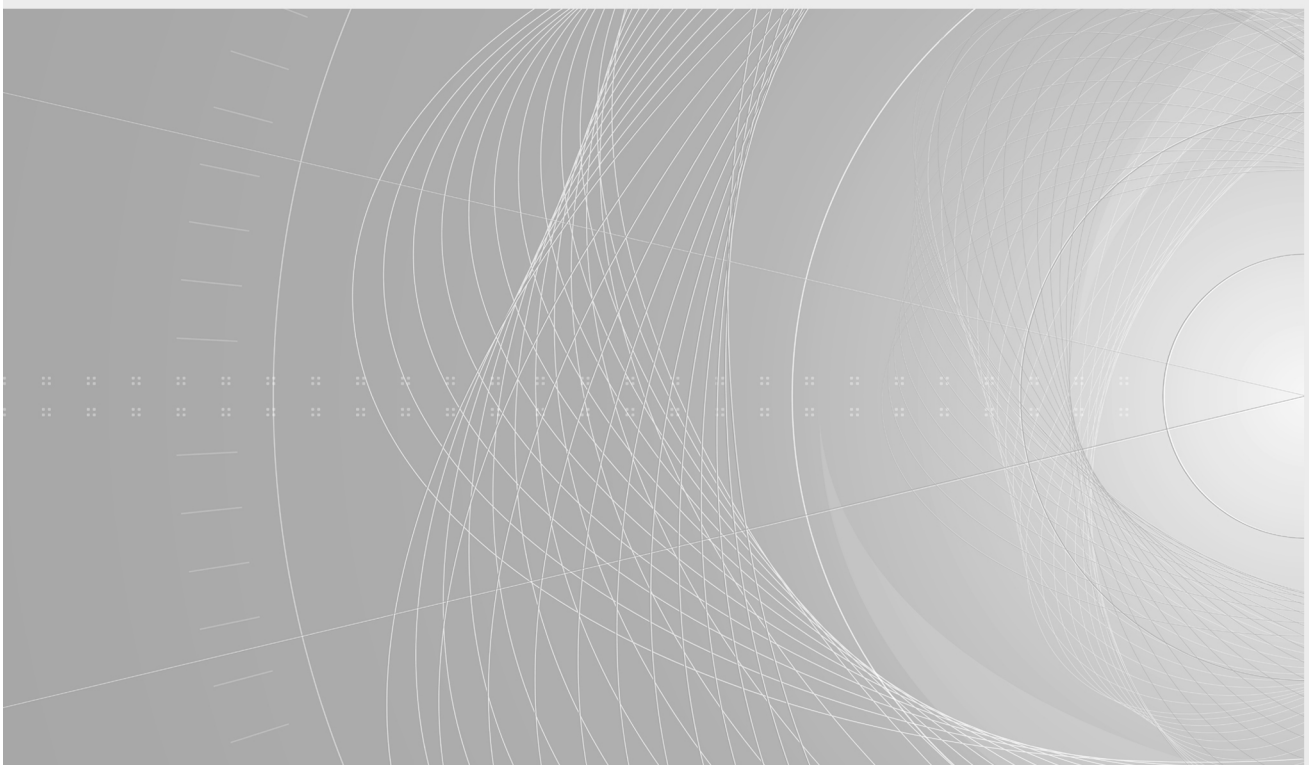


Household and similar electrical appliances – Test code for the determination of airborne acoustical noise – Part 1: General requirements

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

Part 1: General requirements

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 redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 60704-1:2010. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

International Standard IEC 60704-1 has been prepared by IEC technical committee 59: Performance of household and similar electrical appliances.

This fourth edition cancels and replaces the third edition published in 2010. This edition constitutes a technical revision.

It includes the following significant changes with respect to the previous edition:

- a) update of references (especially to ISO standards);
- b) revision of requirements on climatic conditions;
- c) revision of requirements on background noise level.

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

FDIS	Report on voting
59/753/FDIS	59/762/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all the parts in the IEC 60704 series, 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 "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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INTRODUCTION

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) ~~should~~ be kept at a modest level.

The results of noise measurements ~~will be~~ 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 ~~will be~~ 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 ~~semi~~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 and ISO 9614-2 is subject to a specific part 2.~~

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.

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

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

Part 1: General requirements

1 ~~Scope and object~~

~~1.1 Scope~~

~~1.1.1 General~~

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 [IEC 60704-1:2021](https://standards.iteh.ai/standards/iec-60704-1-2021)
- appliances exclusively for outdoor use. <https://standards.iteh.ai/standards/iec-60704-1-2021>

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

~~1.1.2 Types of noise~~

~~A classification of different types of noise is given in ISO 12001. The method specified in ISO 3744 is suitable for measurements of all types of noise emitted by household appliances. The methods specified in ISO 3743-1 and ISO 3743-2 are suitable for all types of noise, except for sources of impulsive noise consisting of short duration noise bursts. This will be taken into account in the preparation of parts 2.~~

~~1.1.3 Size of the source~~

~~The method specified in ISO 3744 is applicable to noise sources of any size. Limitations for the size of the source are given in 1.3 of ISO 3743-1 and ISO 3743-2. This will be taken into account in the preparation of parts 2.~~

~~1.2 Object~~

~~This standard is concerned with objective methods of engineering accuracy (grade 2 according to ISO 12001) 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.~~

~~The following quantities are used:~~

- ~~— A-weighted sound power level, L_{WA} ; and~~
- ~~— octave band sound power levels.~~

~~In general, the described methods are specified for appliances without an operator present. A part 2 can specify that an operator will be present only for the (rare) cases where an appliance can only be operated, or must be fed, by an operator.~~

~~Methods for determining sound power levels with precision accuracy (grade 1 according to ISO 12001), specified for example in ISO 3741 and ISO 3745, are not included in this standard. 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 part will not necessarily correspond with the noise experienced under the operational conditions of practical use.~~

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

~~1.3 Measurement uncertainty~~

~~The estimated values of the standard deviations of reproducibility of sound power levels determined according to this part are given in 1.4 of ISO 3743-1 and of ISO 3743-2, and in 1.4 of ISO 3744. But for a particular family of appliances of similar size with similar operating conditions, the standard deviations of reproducibility may be smaller than these values. Hence, in part 2, standard deviations smaller than those listed in ISO standards may be stated if substantiation is available from the results of suitable interlaboratory tests.~~

~~IEC 60704-3 gives values of standard deviations of reproducibility for several categories of appliances.~~

~~In case of discrepancies between the measurements where the results normally remain inside the foreseen standard deviation, it will be necessary to perform measurements according to the upper grade of accuracy: grade 1, laboratory or precision, as described in ISO 3741 or ISO 3745.~~

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 60038:2009, *IEC standard voltages*~~

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

~~IEC 60704-3:2006/2019, *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 61260:1995, *Electroacoustics – Octave-band and fractional-octave-band filters*~~

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

IEC 61672-1:2002/2013, *Electroacoustics – Sound level meters – Part 1: Specifications*

~~ISO 3741:1999, Acoustics – Determination of sound power levels of noise sources using sound pressure – Precision methods for reverberation rooms~~

ISO 3743-1:1994/2010, *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 3743-2:1994/2018, *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 3744:1994/2010, *Acoustics – Determination of sound power levels of noise sources using sound pressure – Engineering method in an essentially free field over a reflecting plane*

~~ISO 3745:2003, Acoustics – Determination of sound power levels of noise sources using sound pressure – Precision method for anechoic and hemi-anechoic rooms~~

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 6926:1999/2016, *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 ~~may~~ 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

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. ~~During the operational cycle, each operational period is associated with a specific process that may occur only once, or may be repeated (for example, for a dishwasher, washing and rinsing and drying)~~

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

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~~3.5 standard test operator~~

~~a person necessary for operating or feeding the appliance under test, not wearing abnormally sound absorptive clothing which might influence the sound measurements~~

~~3.6 centre of location or position of a source~~

~~the term used for describing the location or position of the source (appliance) to be tested within the test environment and, in free field environment, with respect to the co-ordinate system of microphone positions~~

~~The centre of location is such that the centre of the appliance coincides with the centre of a parallelepiped drawn around the main part of hand-held, suspended, or stand-type appliances.~~

~~The centre of location is such that the centre of the appliance coincides with the centre of a rectangle drawn around the projection of the main part of the appliance on the floor, for floor-supported appliances, and on the wall, for wall-mounted appliances.~~

3.7 nominal height

h_n

the smallest integer multiple of 5 mm that accommodates the height of the installation opening according to the manufacturer's installation instructions

3.8**nominal width** w_n

~~the smallest integer multiple of 5 mm that accommodates the width of the installation opening according to the manufacturer's installation instructions~~

3.9**nominal depth** d_n

~~the smallest integer multiple of 5 mm, equal to or greater than 515 mm, that accommodates the depth of the installation opening according to the manufacturer's installation instructions~~

4 Measurement methods and acoustical environments

4.1 General

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 ~~essentially~~ 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.

The preferred noise emission quantity is the A-weighted sound power level, L_{WA} , in dB (re 1 pW).

According to this document, two principal methods exist, the direct method and the comparison method, as described in 4.2 and 4.3. These two methods can be used alternatively.

Different types of environments, as described in 4.4, may be used. A part of the IEC 60704-2 series may, if necessary, exclude one or several combinations among those available.

4.2 Direct method

The direct method can be used only for measurements in qualified test environments in accordance with ISO 3744:2010 for free field conditions over reflecting plane(s), and in accordance with ISO 3743-2:2018 for special reverberation test rooms.

With this method, the sound power level is determined

- in free field conditions over reflecting plane(s), from time-averaged sound pressure levels (on a mean-square basis) over the measurement surface and from the area of the measurement surface, S , or
- in reverberation and special reverberation test rooms, from averaged sound pressure levels, and from the reverberation time and the volume of the test room.

~~This method yields results expressed in A-weighted sound power levels (and in octave-band sound power levels, if required) which are calculated directly from measured sound pressure levels.~~

If for a measurement in a free field, reverberation or special reverberation room is not possible because the appliance cannot be placed or operated in such an environment, the intensity method in accordance with ISO 9614-1:1993, ISO 9614-2:1996, and ISO 9614-3:2002 shall be applied. For the intensity method, the standard deviations given in the parts of the IEC 60704-2 series and IEC 60704-3:2019 are not applicable unless stated explicitly.

These methods yield results expressed in A-weighted sound power levels (and in octave- or 1/3 octave-band sound power levels, if required) that are calculated directly from measured sound pressure levels.

NOTE This method can also be used in conjunction with more precise methods, such as those given in ISO 3741 and ISO 3745.

4.3 Comparison method

The comparison method for measurement is explicitly described in ISO 3743-1:2010 and in ISO 3743-2:2018.

NOTE The term "comparison method" is not explicitly given in ISO 3744:2010, but when applying the "absolute comparison test" for the determination of the environmental correction given in A.3 of ISO 3744:2010, by using a reference sound source, the procedure is, in fact, a comparison method.

With this method, the sound power level is determined by comparing the averaged values (on a mean-square basis) of the sound pressure levels produced by the source in the test room to the averaged values of the sound pressure levels produced in the same room by a calibrated reference sound source (RSS) of known sound power output, complying with the requirements of ISO 6926:2016. The difference in sound pressure levels is equal to the difference in sound power levels when conditions are the same for both sets of measurements.

This method yields results expressed in octave- or 1/3 octave-band sound power levels, and the A-weighted sound power level is calculated from the octave- or 1/3 octave-band sound power levels.

To check whether there is a systematic difference between results obtained in different environments, the use of the comparison method is recommended.

4.4 Acoustical environments

4.4.1 General requirements and criterion for adequacy of the test environment

They are given in the following clauses:

- Clause 4 of ISO 3743-1:2010 for hard-walled test rooms;
- Clause 5 of ISO 3743-2:2018 for special reverberation test rooms and
- Clause 4 of ISO 3744:2010 for free-field conditions over a reflecting plane.

A classification of different types of noise is given in ISO 12001:1996. The method specified in ISO 3744:2010 is suitable for measurements of all types of noise emitted by household