

Household and similar electrical appliances — Test code for the determination of airborne acoustical noise

Part 1. General requirements

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- Association of Manufacturers of Domestic Electrical Appliances
- Consumer Policy Committee of BSI
- Consumers Association
- Department of the Environment (Energy Efficiency Office)
- Electricity Association
- Portable Electric Tool Manufacturers' Association
- Rotating Electrical Machines Association (BEAMA Ltd.)

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National foreword

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BS EN 60704-1 : 1997 should be read in conjunction with the relevant Sections of Part 2 which supplement or modify clauses in this standard.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 34, an inside back cover and a back cover.

Descriptors: Domestic electrical appliances, noise from appliances, measurement, requirements, definitions

English version

Household and similar electrical appliances
Test code for the determination of airborne acoustical noise
Part 1: General requirements
(IEC 60704-1:1997)

Appareils électrodomestiques et
analogues - Code d'essai pour la
détermination du bruit aérien
Partie 1: Règles générales
(CEI 60704-1:1997)

Elektrische Geräte für den
Hausgebrauch und ähnliche Zwecke
Prüfvorschrift für die Bestimmung
der Luftschallemission
Teil 1: Allgemeine Anforderungen
(IEC 60704-1:1997)

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European Committee for Electrotechnical Standardization
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Foreword

The text of document 59/162/FDIS, future edition 2 of IEC 60704-1, prepared by IEC TC 59, Performance of household electrical appliances, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60704-1 on 1996-12-09.

This European Standard supersedes EN 60704-1:1994.

The following dates were fixed:

- latest date by which the EN has to be implemented
at national level by publication of an identical
national standard or by endorsement (dop) 1997-11-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) -

NOTE: "dow" can only be fixed when the present standards EN 60704-2-1, EN 60704-2-3, EN 60704-2-4, EN 60704-2-5 and EN 60704-2-6 have been revised on the basis of this EN 60704-1:1997 and ratified by the Technical Board. These European Standards are currently based on EN 60704-1:1994. Forthcoming new European Standards on noise measurement (e.g. for shavers, fans, kitchen machines and range hoods) are already based on this EN 60704-1:1997.

Annexes designated "normative" are part of the body of the standard.

Annexes designated "informative" are given for information only.

In this standard, annexes A and ZA are normative and annex B is informative.

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60704-1:1997 was approved by CENELEC as a European Standard without any modification.

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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 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 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, ISO 3743-2 and ISO 3744.

The adoption of these methods permits the use of semi-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 ¹⁾ and ISO 9614-2 ²⁾ is under consideration.

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 be of importance.

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

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

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 704 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 similar conditions as in households, for example in inns, coffee-houses, tea-rooms, hotels, barber or hairdresser shops, launderettes, etc., if not otherwise specified in part 2.

This standard does not apply to:

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

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 1.2.2 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.

NOTES

- 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.
- 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 technics 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 704-3 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 normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 704. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of IEC 704 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 651: 1979, *Sound level meters*

IEC 704-3: 1992, *Test code for the determination of airborne acoustical noise emitted by household and similar electrical appliances – Part 3: Procedure for determining and verifying declared noise emission values*

IEC 804: 1985, *Integrating-averaging sound level meters*

IEC 1260: 1995, *Electroacoustics – Octave band and fractional – octave band filters*

ISO 3741: 1988, *Acoustics – Determination of sound power levels of noise sources – Precision methods for broad-band sources in reverberation rooms*

ISO 3742: 1988, *Acoustics – Determination of sound power levels of noise sources – Precision methods for discrete frequency and narrow-band sources in reverberation rooms*

ISO 3743-1: 1994, *Acoustics – Determination of sound power levels of noise sources – Engineering methods for small, movable sources in reverberant fields using sound pressure – Part 1: Comparison method in hard-walled test rooms*

ISO 3743-2: 1994, *Acoustics – Determination of sound power levels of noise sources – Engineering methods for small, movable sources in reverberant fields using sound pressure – Part 2: Methods for special reverberation test rooms*

ISO 3744: 1994, *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: 1977, *Acoustics – Determination of sound power levels of noise sources – Precision method for anechoic and semi-anechoic rooms*

ISO 6926: 1990, *Acoustics – Determination of sound power levels of noise sources – Requirements for the performance and calibration of reference sound sources*

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 part of IEC 704, the following definitions apply:

3.1 terms and definitions pertinent to determination of sound power levels: These may be found in ISO 3743-1, ISO 3743-2 and ISO 3744.

3.2 measurement time interval: A portion or a multiple of an operational period or operational cycle for which the sound power levels are determined.

3.3 operational period: An 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).

3.4 operational cycle: A 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).

3.5 time history: A 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.

3.6 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.

3.7 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.

4 Measurement methods and acoustical environments

4.1 General

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. The sound power of a machine is essentially 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 decibels (ref. 1 pW).

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

Different types of environments, as described in 4.4, may be used. A part 2 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 according to ISO 3744 for free-field conditions over reflecting plane(s), and according to ISO 3743-2 for special reverberation test rooms.