IEC 60704-3

Edition 3.0 2019-05

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

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

Appareils électrodomestiques et analogues – Code d'essai pour la détermination du bruit aérien – Partie 3: Méthode de détermination et de vérification des valeurs déclarées d'émission sonore

IEC 60704-3:2019-05(en-fr)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

FOREWORD

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International Standard IEC 60704-3 has been prepared by IEC technical committee 59: Performance of household electrical appliances.

IEC 60704-1:2010 has served as a basis for the elaboration of this standard.

This third edition cancels and replaces the second edition published in 2006. This edition constitutes a technical revision. It includes the following significant technical changes with respect to the previous edition:

a) in Annex A, standard deviations that are now specified for various appliance categories in the parts of IEC 60704-2 have been excluded from Table A.1;
b) furthermore, this edition makes reference to new standards and is implementing ISO/IEC Directives, Part 2 in a more accurate manner.

Standard deviations specified in part 2 documents of the IEC 60704 series supersede the values given in Table A.1.

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

CDV	Report on voting
59/675/CDV	59/680A/RVC

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.

This International Standard is to be used in conjunction with IEC 60704-1:2010 and the latest edition of IEC 60704-2 (all parts).

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 "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
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INTRODUCTION

A comprehensive and correct declaration of noise emission is very helpful to enable the potential buyer to make a good choice between appliances of the same category (serving for the same purpose) of different makes or for different models.

In order to ensure a correct declaration of noise emission values, this part of IEC 60704 describes a simple method for verifying declared values and provides information for determining the noise emission values.

Different countries are implementing different market surveillance strategies. This document is not implementing a mandatory market surveillance strategy.

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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

1 Scope

This part of IEC 60704 describes procedures for determining and verifying the declared values of the noise emitted by household and similar appliances.

It applies to all categories of household and similar electrical appliances covered by IEC 60704-1 and all parts of IEC 60704-2, which include particular requirements for special categories of appliances.

It applies to appliances being produced in quantity, such as in batches, series or lots, which are manufactured to the same technical specification and characterized by the same declared value of noise emission.

This part of IEC 60704:

– considers the term "declaration" to include all means for providing information on the noise emission values to potential users (consumers) of the appliances; this includes labels, brochures, advertisements, commercial and technical information papers, etc.;
– considers the declaration for appliances manufactured by mass production;
– specifies a simple statistical method for verifying the declared values by investigating a sample of only three appliances.

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 60704-1:2010, *Household and similar electrical appliances – Test code for the determination of airborne acoustical noise – Part 1: General requirements*

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

ISO 3534-1:2006, *Statistics – Vocabulary and symbols – Part 1: Probability and general statistical terms*

ISO 7574-4:1985, *Acoustics – Statistical methods for determining and verifying stated noise emission values of machinery and equipment – Part 4: Methods for stated values for batches of machines*

3 Terms, definitions and calculations

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60704-1 and the following apply.

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

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

3.1.1
sound power level
L_W
ten times the logarithm to the base 10 of the ratio of the sound power of a source to the reference sound power, expressed in decibels

Note 1 to entry: The reference sound power is 1 pW (10^{-12} W). The frequency weighting, or the midband frequency of the frequency band used, is indicated in the symbol.

Note 2 to entry: For example, the A-weighted sound power level is L_{WA}.

3.1.2
A-weighted sound power level
L_{WA}
sound power level of an appliance, determined according to the appropriate requirements specified in IEC 60704-1 and the relevant part of IEC 60704-2

Note 1 to entry: Henceforth, the subscript $_{WA}$ is left out for reasons of simplicity.

3.1.3
noise emission value
single value of the noise emission quantity

3.1.4
measured value
L_i
noise emission value for an individual appliance determined in accordance with the appropriate requirements of IEC 60704

3.1.5
family of appliances
category of appliances
appliances of similar design or type, or intended to perform the same functions

[SOURCE: ISO 7574-1:1985, 3.5, modified – The notes have been deleted, "category of appliances" has been added as a preferred term, "machines" has been replaced by "appliances" in the term and in the definition, and "or equipment" has been deleted from the definition.]

3.1.6
declared value
L_c
value of the noise emission quantity which is rounded to the nearest decibel stated for all appliances of a complete series of production or of a batch thereof, when the appliances are new

Note 1 to entry: The declared value indicates the upper statistical value below which a specified large proportion of noise emission values of the relevant batch lies. L_c depends on the specified verification procedure, which is designed such that there is a probability of acceptance of 95 % for the batch, when no more than 6,5 % of all noise emission values exceeds L_c, and if the specified reference standard deviations σ_M equals the actual total standard deviation σ_t.

[SOURCE: ISO 7574-1:1985, 3.6, modified – The term "stated value; labelled value" has been replaced by "declared value"; the first sentence has been rephrased to "which is rounded to the nearest decibel stated for all appliances of a complete series of production or of a batch thereof" and "when the appliances are new" has been added; the second sentence has been deleted; the fact "are new" is integrated in first sentence and notes 1 and 2 have been replaced by a Note 1 to entry.]

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3.1.7
declaration
statement of the declared value, L_c, which is included in brochures, advertisements, product or commercial literature and/or affixed to an appliance or part thereof for providing information on the noise emission values to potential users (buyers, consumers) of the appliance

Note 1 to entry: The term "labeller" is used in this document for a person making declarations.

[SOURCE: ISO 7574-1:1985, 3.7, modified – The term "label" has been replaced by "declaration", "brochures, advertisements, or commercial literature" have been added, the phrase after "and/or affixed" has been replaced by "to an appliance or part thereof for providing information on the noise emission values to potential users (buyers, consumers) of the appliance" and Note 1 to entry has been added.]

3.1.8
batch of appliances
group of the same family produced in quantity, manufactured to the same technical specifications and characterized by the same declared value, L_c

Note 1 to entry: A batch may be either an entire production series or a portion thereof.

[SOURCE: ISO 7574-1:1985, 3.8, modified – The term "batch (lot) of machines" has been replaced by "batch of appliances" and the note has been transferred into Note 1 to entry.]

3.1.9
size of the batch
size of the population
N
number of items (appliances in the batch or noise emission values in the population) of the batch (or of the population)

[SOURCE: ISO 7574-1:1985, 3.9, modified – The term "size of the population" has been explicitely added as a preferred term, word "machines" is replaced by "appliances" and phrase "of the batch (or of the population)" is added.]

3.1.10
sample
one or more appliances (or measured values) randomly selected from a lot (or population)

[SOURCE: ISO 7574-1:1985, 3.10, modified – "Machines" is replaced by "appliances".]

3.1.11
size of the sample
n
number of items in the sample

[SOURCE: ISO 7574-1:1985, 3.11].

3.1.12
arithmetic mean of a batch
arithmetic mean of a population
μ
sum of the noise emission values in a batch (or in a population) divided by the size of the batch (or of the population)

[SOURCE: ISO 7574-1:1985, 3.12, modified – The term "arithmetic mean of a population" has been explicitly added and the formula has been deleted.]

3.1.13
arithmetic mean of a sample
$\overline{L}$
sum of the measured values, L_i, in a sample divided by the size of the sample

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Note 1 to entry: The arithmetic mean value of the sample, $\overline{L}$ is used as an estimator of the mean value of a batch (or of a population), μ.

[SOURCE: ISO 7574-1:1985, 3.13, modified – The formula has been deleted and the explanation has been transferred to Note 1 to entry.]

3.1.14
standard deviation of a batch
standard deviation of a population
σ
standard deviation of the noise emission values of the batch (or of the population)

[SOURCE: ISO 7574-1:1985, 3.14, modified – The phrase "of size N is given by the equation" and the related formula have been deleted.]

3.1.15
standard deviation of a sample
s
standard deviation of the noise emission values of the sample

Note 1 to entry: The standard deviation of the sample, s, is used as an estimator of the standard deviation of a batch (or of a population), σ.

[SOURCE: ISO 7574-1:1985, 3.15, modified – Phrase "of the noise emission" has been added, formula has been deleted and the explanation has been transferred to Note 1 to entry.]

3.1.16
standard deviation of repeatability
σ_r
standard deviation of noise emission values obtained under repeatability conditions, that is the repeated application of the same noise emission measurement method on the same noise source within a short interval of time under the same conditions (same laboratory, same operator, same measuring equipment)

Note 1 to entry: Values for the standard deviation of repeatability, σ_r, obtained in practice, are given in Annex A.

[SOURCE: ISO 7574-1:1985, 3.16, modified – The phrase "same apparatus" has been replaced by "same measurement equipment", reference to ISO 5725 has been deleted and Note 1 to entry has been added.]

3.1.17
standard deviation of reproducibility
σ_R
standard deviation of noise emission values obtained under reproducibility conditions, that is the repeated application of the same noise emission measurement method on the same noise source at different times and under different conditions (different laboratory, different operator, different measuring apparatus)

Note 1 to entry: The standard deviation of reproducibility includes the standard deviation of repeatability (see 3.1.16).

Note 2 to entry: Estimates of the standard deviation of reproducibility, σ_R, obtained in practice, are given in Annex A.

[SOURCE: ISO 7574-1:1985, 3.17, modified – The reference to ISO 5725 has been deleted, the second sentence has been transferred to Note 1 to entry and Note 2 to entry has been added.]

3.1.18
standard deviation of production
σ_p
standard deviation of noise emission values obtained on different appliances from batches of the same category (family), using the same noise emission measurement method under repeatability conditions (same laboratory, same operator, same measuring apparatus)

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Note 1 to entry: Estimates of the standard deviation of production, σ_P, obtained in practice, are given in Annex A.

[SOURCE: ISO 7574-1:1985, 3.18, modified – Phrase at the beginning has been replaced by "of noise emission values obtained on different appliances from batches of the same category (family)", the note has been deleted and Note 1 to entry has been added.]

3.1.19
total standard deviation
σ_t
square root of the sum of the squares of the standard deviation of reproducibility (see 3.1.17) and of the standard deviation of production (see 3.1.18)

Note 1 to entry: Estimates of the total standard deviation, σ_t, obtained in practice are given in Annex A.

[SOURCE: ISO 7574-1:1985, 3.19, modified – The formula has been deleted and Note 1 to entry has been added.]

3.1.20
reference standard deviation
σ_M
total standard deviation specified and fixed for the family of appliances under consideration which is considered to be typical for batches from this family

Note 1 to entry: The use of a fixed σ_M for each category of appliances enables the application of a statistical method to deal with small sample sizes.

Note 2 to entry: Values of the reference standard deviation, σ_M, fixed for the various categories of household appliances (obtained from practical investigations) are given in Annex A.

[SOURCE: ISO 7574-1:1985, 3.20, modified – The words "and fixed" have been added, "machines" has been replaced by "appliances", first sentence of note has been transferred to a Note 1 of entry, remaining part of the note has been deleted and Note 2 to entry has been added.]

3.1.21
single sampling
type of sampling which consists in taking only one sample from the batch

Note 1 to entry: See ISO 3534-1:2006.

[SOURCE: ISO 7574-1:1985, 3.21, modified – Reference to ISO 3534-1 has been transferred to Note 1 to entry.]

3.1.22
inspection by variables
method which consists in measuring a quantitative characteristic for each item of a population or of a sample taken from this population

Note 1 to entry: The quantitative characteristic is the noise emission quantity.

Note 2 to entry: See ISO 3534-1:2006.

[SOURCE: ISO 7574-1:1985, 3.24, modified – Second sentence has been transferred to Note 1 to entry, reference to ISO 3534-1 has been transferred to a Note 2 to entry and notes 1 and 2 have been deleted.]

3.1.23
probability of acceptance
P_a
probability that a batch of given quality (expressed by its proportion p of noise emission values exceeding the declared value) will be accepted by a given sampling plan

Note 1 to entry: $(1–P_a)$ is called "probability of rejection". If $(1–P_a)$ has the fixed value α (see 3.1.25), this is called the "producer's risk". If P_a has the fixed value β (see 3.1.26), this is called the "consumer's risk".

Note 2 to entry: See ISO 3534-1:2006.

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[SOURCE: ISO 7574-1:1985, 3.25, modified – Word "labelled" has been replaced by "declared", the note has been transferred to Note 1 of entry and ISO 3534-1 has been transferred to Note 2 to entry.]

3.1.24
operating characteristic curve
OC
curve showing, for a given sampling plan, the probability of acceptance P_a of a batch as a function of its proportion p of noise emission values exceeding the declared values

Note 1 to entry: The operating characteristic curve is fully determined by two specified points [for example, the producer's risk point (see 3.1.25) and the consumer's risk point (see 3.1.26)) or by one point (for example, the producer's risk point) and the sample size n.

Note 2 to entry: See ISO 3534-1:2006.

[SOURCE: ISO 7574-1:1985, 3.26, modified – The note has been transferred to Note1 to entry and reference to ISO 3534-1 is made in Note 2 to entry.]

3.1.25
producer's risk point
point on the operating characteristic curve corresponding to a predetermined and usually low probability of rejection α

Note 1 to entry: This probability of rejection is called the "producer's risk".

Note 2 to entry: The corresponding quality level is the proportion $p_{1-\alpha}$ of noise emission values of the batch exceeding the declared value. For a continuous production, the proportion $p_{1-\alpha}$ would be approximately equal to the acceptable quality level (AQL).

Note 3 to entry: See ISO 3534-1:2006.

[SOURCE: ISO 7574-1:1985, 3.27, modified – The last sentence has been transferred to Note 1 to entry, the explanation has been transferred to Note 2 to entry, NOTE 1 has been deleted, NOTE 2 has been added to Note 2 to entry and reference to ISO 3534-1 is made in Note 3 to entry.]

3.1.26
consumer's risk point
point on the operating characteristic curve corresponding to a predetermined and usually low probability of acceptance β

Note 1 to entry: This probability of acceptance is then called the "consumer's risk".

Note 2 to entry: See ISO 3534-1:2006.

[SOURCE: ISO 7574-1:1985, 3.28, modified – The second sentence has been transferred to Note 1 to entry, the third sentence has been deleted and reference to ISO 3534-1 is made in Note 2 to entry.]

3.2 Calculations

For the purposes of this document, the following calculation formulas apply:

3.2.1
sound power level
L_W

$$L_W = 10 \cdot \lg \frac{W}{W_0} \text{ dB}$$

where W is the sound power of a source and W_0 is the reference sound power, 1 pW (10^{-12} W).

Note 1 to entry: See 3.1.1.

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3.2.2
arithmetic mean of a batch (or of a population)
μ

$$\mu = \frac{1}{N}\sum_{i=1}^{N} L_i$$

where N and L_i are defined in 3.1.9 and 3.1.4, respectively.

Note 1 to entry: See 3.1.12.

3.2.3
arithmetic mean of a sample
$\overline{L}$

$$\overline{L} = \frac{1}{n}\sum_{i=1}^{n} L_i$$

where n and L_i are defined in 3.1.11 and 3.1.4., respectively.

Note 1 to entry: See 3.1.13.

3.2.4
standard deviation of a batch (or of a population)
σ

$$\sigma = \sqrt{\frac{1}{N}\sum_{i=1}^{N}\left(L_i - \mu\right)^2}$$

where N, μ and L_i are defined in 3.1.9, 3.1.12 and 3.1.4, respectively.

Note 1 to entry: See 3.1.14.

3.2.5
standard deviation of a sample
s

$$s = \sqrt{\frac{1}{n-1}\sum_{i=1}^{N}\left(L_i - \overline{L}\right)^2}$$

where n, $\overline{L}$, and L_i are defined in 3.1.11, 3.1.13 and 3.1.4, respectively.

Note 1 to entry: See 3.1.15.

3.2.6
total standard deviation
σ_t

$$\sigma_t = \sqrt{\sigma_R{}^2 + \sigma_p{}^2}$$

where σ_R and σ_p are defined in 3.1.17 and 3.1.18, respectively.

Note 1 to entry: See 3.1.19.

4 General

4.1 Test method

All the measurements shall be performed according to IEC 60704 by a testing laboratory that shall have appropriate test facilities and trained staff.

4.2 Values and symbols

In this document, the following values apply:

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