



SLOVENSKI STANDARD

SIST EN 60268-5:2003

01-december-2003

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SIST EN 60268-5:1999

SIST EN 60268-5:1999/A2:1999

Sound system equipment - Part 5: Loudspeakers (IEC 60268-5::2003)

Sound system equipment -- Part 5: Loudspeakers

Elektroakustische Geräte -- Teil 5: Lautsprecher

Equipements pour systèmes électroacoustiques -- Part 5: Haut-parleurs

Ta slovenski standard je istoveten z: **EN 60268-5:2003**

ICS:

33.160.50 Pribor Accessories

SIST EN 60268-5:2003 en

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EUROPEAN STANDARD

EN 60268-5

NORME EUROPÉENNE

EUROPÄISCHE NORM

July 2003

ICS 33.160.50

Supersedes EN 60268-5:1996 + A2:1996

English version

**Sound system equipment
Part 5: Loudspeakers
(IEC 60268-5:2003)**

Equipements pour systèmes
électroacoustiques
Part 5: Haut-parleurs
(CEI 60268-5:2003)

Elektroakustische Geräte
Teil 5: Lautsprecher
(IEC 60268-5:2003)

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This European Standard was approved by CENELEC on 2003-06-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

The text of document 100/648/FDIS, future edition 3 of IEC 60268-5, prepared by IEC TC 100, Audio, video and multimedia systems and equipment, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60268-5 on 2003-06-01.

This European Standard supersedes EN 60268-5:1996 + A2:1996.

This standard is to be used in conjunction with HD 483.1 S2:1989, HD 483.2 S2:1993 and ISO 3741:1999.

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) 2004-03-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2006-06-01

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

Annexes designated "informative" are given for information only.

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

Annex ZA has been added by CENELEC.

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Endorsement notice

SIST EN 60268-5:2003

The text of the International Standard IEC 60268-5:2003 was approved by CENELEC as a European Standard without any modification. <https://standards.iteh.ai/catalog/standards/sist-en-60268-5-2003>

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

ISO 3743-1	NOTE	Harmonized as EN ISO 3743-1:1995 (not modified).
ISO 3743-2	NOTE	Harmonized as EN ISO 3743-2:1996 (not modified).

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60050-151	- ¹⁾	International Electrotechnical Vocabulary (IEV) Part 151: Electrical and magnetic devices	-	-
IEC 60263	- ¹⁾	Scales and sizes for plotting frequency characteristics and polar diagrams	-	-
IEC 60268-1	- ¹⁾	Sound system equipment Part 1: General	HD 483.1 S2	1989 ²⁾
IEC 60268-2	- ¹⁾	Part 2: Explanation of general terms and calculation methods	HD 483.2 S2	1993 ²⁾
IEC 60268-3	- ¹⁾	Part 3: Amplifiers	EN 60268-3 + corr. January	2000 ²⁾ 2002 ²⁾
IEC 60268-11	- ¹⁾	Part 11: Application of connectors for the interconnection of sound system components	HD 483.11 S3	1993 ²⁾
IEC 60268-12	- ¹⁾	Part 12: Application of connectors for broadcast and similar use	EN 60268-12	1995 ²⁾
IEC 60268-14	- ¹⁾	Part 14: Circular and elliptical loudspeakers; outer frame diameters and mounting dimensions	-	-
IEC 60651	- ¹⁾	Sound level meters	EN 60651	1994 ²⁾
IEC 61260	- ¹⁾	Electroacoustics - Octave-band and fractional-octave-band filters	EN 61260	1995 ²⁾

1) Undated reference.

2) Valid edition at date of issue.

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<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
ISO 3741	- ¹⁾	Acoustics - Determination of sound power levels of noise sources using sound pressure - Precision methods for reverberation rooms	EN ISO 3741	1999 ²⁾
ISO 3744	- ¹⁾	Acoustics - Determination of sound power levels of noise sources using sound pressure - Engineering method in an essentially free field over a reflecting plane	EN ISO 3744	1995 ²⁾
ISO 3745	- ¹⁾	Acoustics - Determination of sound power levels of noise sources - Precision methods for anechoic and semi-anechoic rooms	-	-

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INTERNATIONAL STANDARD

IEC 60268-5

Third edition
2003-05

Sound system equipment –

Part 5: Loudspeakers

Equipements pour systèmes électroacoustiques –

**Partie 5:
Haut-parleurs**

SIST EN 60268-5:2003

<https://standards.iteh.ai/catalog/standards/sist/414e1ac6-0593-4158-8eee-3a27cf22dba7/sist-en-60268-5-2003>

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Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE

X

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

SOUND SYSTEM EQUIPMENT –

Part 5: Loudspeakers

FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The 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 the 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 National Committees.
- 3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
- 4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
- 5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
- 6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60268-5 has been prepared by IEC technical committee 100: Audio, video and multimedia systems and equipment.

This third edition of IEC 60268-5 cancels and replaces the second edition published in 1989, amendment 1 (1993) and amendment 2 (1996). This third edition constitutes a technical revision.

The text of this standard is based on the following documents:

FDIS	Report on voting
100/648/FDIS	100/674/RVD

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

This standard is to be read in conjunction with IEC 60268-1, IEC 60268-2 and ISO 3741.

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

The committee has decided that the contents of this publication will remain unchanged until 2005. At this date, the publication will be

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

A bilingual edition of this standard may be issued at a later date.

SOUND SYSTEM EQUIPMENT –

Part 5: Loudspeakers

1 Scope

This standard applies to sound system loudspeakers, treated entirely as passive elements. Loudspeakers with built-in amplifiers are excluded.

NOTE 1 The term "loudspeaker" used in this standard relates to loudspeaker drive units themselves and also to loudspeaker systems, which comprise one or more loudspeaker drive units provided with a baffle, enclosure or horn and such relevant devices as built-in crossover filters, transformers and any other passive element.

The purpose of this standard is to give the characteristics to be specified and the relevant methods of measurement for loudspeakers using sinusoidal or specified noise or impulsive signals.

NOTE 2 The methods of measurement given in this standard have been chosen for their appropriateness to the characteristics.

NOTE 3 If equivalent results can be obtained using other methods of measurement, details of the methods used should be presented with the results.

NOTE 4 The following items are under consideration:

- loudspeakers with built-in amplifiers;
- measurements under conditions other than free-field, half-space free-field and diffuse field;
- measurements with signals other than sinusoidal or noise or impulsive signals.

2 Normative references

SIST EN 60268-5:2003

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The following referenced documents are indispensable for the application 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 60050(151), *International Electrotechnical Vocabulary (IEV) – Part 151: Electrical and magnetic devices*

IEC 60263, *Scales and sizes for plotting frequency characteristics and polar diagrams*

IEC 60268-1, *Sound system equipment – Part 1: General*

IEC 60268-2, *Sound system equipment – Part 2: Explanation of general terms and calculation methods*

IEC 60268-3, *Sound system equipment – Part 3: Amplifiers*

IEC 60268-11, *Sound system equipment – Part 11: Application of connectors for the interconnection of sound system components*

IEC 60268-12, *Sound system equipment – Part 12: Application of connectors for broadcast and similar use*

IEC 60268-14, *Part 14: Circular and elliptical loudspeakers; outer frame diameters and mounting dimensions*

IEC 60651, *Sound level meters*

IEC 61260, *Electroacoustics – Octave-band and fractional-octave-band filters*

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

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

3 Conditions for measurement

3.1 General conditions

This standard is to be used in conjunction with IEC 60268-1, IEC 60268-2 and ISO 3741.

3.2 Measuring conditions

3.2.1 General

For convenience in specifying how loudspeakers are to be set up for measurement, normal measuring conditions are defined in this standard. To obtain the correct conditions for measurement, some values (known as “rated conditions”) shall be taken from the manufacturer’s specification. These values themselves are not subject to measurement but they constitute the basis for measuring the other characteristics.

The following values and conditions are of this type, and shall be stated by the manufacturer:

- rated impedance;
- rated sinusoidal voltage or power; [SIST EN 60268-5:2003](https://standards.iteh.ai/catalog/standards/sist/414e1ac6-0593-4158-8eee-3a27cf22dba7/sist-en-60268-5-2003)
- rated noise voltage or power; <https://standards.iteh.ai/catalog/standards/sist/414e1ac6-0593-4158-8eee-3a27cf22dba7/sist-en-60268-5-2003>
- rated frequency range;
- reference plane;
- reference point;
- reference axis.

NOTE A full explanation of the term “rated” is given in IEC 60268-2. See also term 151-04-03 in IEC 60050(151).

3.2.2 Normal measuring conditions

A loudspeaker shall be understood to be working under normal measuring conditions when all the following conditions are fulfilled:

- a) the loudspeaker to be measured is mounted in accordance with Clause 10;
- b) the acoustical environment is specified and is selected from those specified in Clause 5;
- c) the loudspeaker is positioned with respect to the measuring microphone and the walls in accordance with Clause 7;
- d) the loudspeaker is supplied with a specified test signal, in accordance with Clause 4, of a stated voltage U , within the rated frequency range in accordance with 19.1. If required, the input power P can be calculated from the equation: $P = U^2/R$, where R is the rated impedance in accordance with 16.1;
- e) attenuators, if any, are set to their “normal” position as stated by the manufacturer. If other positions are chosen, for example those providing a maximally flat frequency response or maximum attenuation, these shall be specified;
- f) measuring equipment suitable for determining the wanted characteristics is connected in accordance with Clause 8.

4 Test signals

4.1 General

Acoustical measurements shall be made under one of the following measuring signal conditions, and the choice shall be indicated with the results.

4.2 Sinusoidal signal

The sinusoidal test signal shall not exceed the rated sinusoidal voltage (as defined in 17.4) at any frequency. The voltage across the input terminals of the loudspeaker under test shall be kept constant for all frequencies unless otherwise stated.

4.3 Broadband noise signal

NOTE This term is explained in IEC 60268-2.

The crest factor of a noise source should fall between 3 and 4 to avoid clipping of amplifiers.

A true r.m.s. voltmeter with a time constant at least as long as the "slow" constant of the sound level meter, specified in IEC 60651, shall be used to measure the amplitude of the signal.

4.4 Narrow-band noise signal

NOTE This term is explained in IEC 60268-2.

For measurement using narrow-band noise, constant relative bandwidth filters in accordance with IEC 61260 shall be used with a pink-noise generator, the relative bandwidth being usually 1/3 octave.

4.5 Impulsive signal

A short-duration pulse shall have constant spectral power per unit bandwidth over at least the bandwidth of interest in the measurement. Such a signal has low energy content relative to its peak amplitude.

NOTE To minimize the influence of acoustical and electrical noise on the measurement, the peak amplitude of the pulse should be as high as possible within the capability of the driving amplifier and consistent with linear operation of the loudspeaker.

5 Acoustical environment

5.1 General

Acoustical measurements shall be made under one of the acoustical field conditions specified in 5.2 to 5.6, and the choice shall be indicated with the results.

5.2 Free-field conditions

If acoustical conditions approach those of free-field space, an environment (for example an anechoic room) in which the sound pressure decreases with the distance (r) from a point source according to a $1/r$ law, with an accuracy of $\pm 10\%$, in the region that will be occupied by the sound field between the loudspeaker system and the microphone during the measurements shall be used. The minimum conditions shall be deemed to exist if this requirement is met along the axis joining the measuring microphone and the reference point on the loudspeaker.

Free-field conditions shall exist over the whole frequency range of measurement.

5.3 Half-space free-field conditions

If acoustical conditions are used in which the free-field exists in a half space, these conditions shall be met with a reflecting plane of sufficient size so that the sound pressure from a point source mounted in the surface of that plane decreases in the manner specified in 5.2.

5.4 Diffuse sound field conditions

NOTE 1 These conditions are normally used for band noise measurements only.

If diffuse sound field conditions are used for measurements with 1/3 octave band limited noise, as defined and specified in ISO 3741, the lower limiting frequency shall be determined as specified in ISO 3741, Appendix A.

NOTE 2 While ISO 3741 provides details of measuring instruments, it should be clearly understood that both space averaging and time averaging are required in loudspeaker power determination. This may be achieved as stated in the standard or alternatively by using continuous space and time averaging techniques.

NOTE 3 The precision of the measurement depends on a number of factors including the room volume, the room reverberation time, and the degree of diffusion.

NOTE 4 For measurement below 125 Hz, a room volume greater than 200 m³ is desirable.

5.5 Simulated free-field conditions

If acoustical conditions are used in which the simulated free-field conditions that are equivalent to those of free space for the period of time required for a measurement, these conditions shall be used.

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The conditions shall be met in any environment (for example large, unobstructed rooms) in which sound emitted by a loudspeaker in response to an impulsive signal reflected from any surface or object in the environment does not reach the measuring microphone before measurement of the direct path sound at the microphone has been completed.

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Any such reflection reaching the microphone shall be excluded from the measurement by gating or other means.

NOTE 1 These conditions are normally used only for measurements with impulsive signals.

NOTE 2 Under such conditions, successive measurements are separated by time intervals sufficient for the sound pressure level due to reverberation within the space to decrease to a negligible value.

5.6 Half-space simulated free-field conditions

If acoustical conditions are used in which the simulated free-field exists in a half-space, these conditions shall be used when a reflecting plane, forming one boundary of a simulated free-field environment, is of sufficient size that no reflections from its edge reach the measuring microphone within the measurement time.

NOTE 1 These conditions are normally used only for measurements with impulsive signals.

NOTE 2 Under such conditions, successive measurements are separated by time intervals sufficient for the sound pressure level due to reverberation within the space to decrease to a negligible value.

6 Unwanted acoustical and electrical noise

Unwanted acoustical and electrical noise shall be kept at the lowest possible level as its presence may obscure low-level signals.

Data related to signals which are less than 10 dB above the noise level in the frequency band considered shall be discarded.