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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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FOREWORD

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This Consolidated version of IEC 60268-5 bears the edition number 3.1. It consists of the third edition (2003) [documents 100/648/FDIS and 100/674/RVD] and its amendment 1 (2007) [documents 100/1189/CDV and 100/1245/RVC]. The technical content is identical to the base edition and its amendment.

This Final version does not show where the technical content is modified by amendment 1. A separate Redline version with all changes highlighted is available in this publication.

This publication has been prepared for user convenience.

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

The bilingual version (2013-08) of this standard corresponds to the monolingual English version, published in 2007-09.

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

The French versions of this standard and its amendment 1 have not been voted upon.

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

The committee has decided that the contents of the base publication and its amendments will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

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- withdrawn;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

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

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;
– rated noise voltage or power;
– 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 ±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.