

INTERNATIONAL STANDARD

NORME INTERNATIONALE



Sound system equipment –
Part 21: Acoustical (output-based) measurements

Équipements pour systèmes électroacoustiques –
Partie 21: Mesures acoustiques (basées sur la sortie)

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NORME INTERNATIONALE



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CONTENTS

FOREWORD.....	8
INTRODUCTION.....	10
1 Scope.....	11
2 Normative references	11
3 Terms, definitions and abbreviated terms	12
3.1 Terms and definitions.....	12
3.2 Abbreviated terms.....	12
4 Type description	12
5 Physical characteristics	12
5.1 Marking of terminals and controls	12
5.2 Dimensions	12
5.3 Mass.....	12
5.4 Connectors and cable assemblies.....	13
6 Design data	13
7 Conditions	13
7.1 Rated conditions	13
7.2 Climatic conditions.....	13
7.3 Normal measuring conditions	13
8 Test signals	14
8.1 General.....	14
8.2 Sinusoidal chirp	14
8.3 Steady-state single-tone signal.....	15
8.4 Steady-state two-tone signal.....	15
8.5 Sparse multi-tone complex.....	15
8.6 Broadband noise signal.....	16
8.7 Narrow-band noise signal	16
8.8 Hann-burst signal.....	16
8.9 Impulsive signal	17
9 Acoustical environment.....	17
9.1 General.....	17
9.2 Free-field conditions	17
9.3 Half-space, free-field conditions.....	17
9.4 Simulated free-field conditions	17
9.5 Half-space simulated free-field conditions	17
9.6 Diffuse sound field conditions	18
9.7 Target application conditions	18
10 Positioning of the DUT.....	18
10.1 Rated geometrical conditions	18
10.1.1 General	18
10.1.2 Reference plane and normal vector	18
10.1.3 Reference point	18
10.1.4 Reference axis	19
10.1.5 Orientation vector	19
10.1.6 Evaluation point.....	19
10.1.7 Evaluation distance	19

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10.2	Measuring distance between DUT and microphone	20
10.2.1	Far-field conditions	20
10.2.2	Near-field conditions	20
10.2.3	Diffuse field conditions	20
10.2.4	Target application condition	21
11	Measurement equipment and test results	21
12	Accuracy of the acoustical measurement	21
12.1	General	21
12.2	Measurement uncertainty	21
13	Mounting of the DUT	22
13.1	Mounting and acoustic loading of drive units	22
13.2	Mounting and acoustic loading of an electro-acoustic system	22
14	Preconditioning	23
15	Rated ambient conditions	23
15.1	Temperature ranges	23
15.1.1	Performance limited temperature range	23
15.1.2	Damage limited temperature range	23
15.2	Humidity ranges	23
15.2.1	Relative humidity range	23
15.2.2	Damage limited humidity range	23
16	Rated frequency range	23
17	Input signal	23
17.1	Rated maximum input value	23
17.1.1	Condition to be specified	23
17.1.2	Direct measurement	24
17.1.3	Indirect measurement based on SPL_{max}	25
17.2	Maximum input level	25
18	Sound-pressure output	26
18.1	Rated maximum sound pressure	26
18.1.1	Conditions to be specified	26
18.1.2	Direct measurement	26
18.1.3	Indirect measurement based on maximum input value	27
18.2	Rated maximum sound-pressure level	27
18.3	Short term maximum sound pressure level	27
18.3.1	Conditions to be specified	27
18.3.2	Method of measurement	28
18.4	Long term maximum sound pressure level	28
18.4.1	Conditions to be specified	28
18.4.2	Method of measurement	29
18.5	Sound pressure in a stated frequency band	29
18.5.1	Condition to be specified	29
18.5.2	Method of measurement	29
18.6	Sound-pressure level in a stated frequency band	30
18.7	Mean sound-pressure in a stated frequency range	30
18.7.1	Condition to be specified	30
18.7.2	Method of measurement	30
18.8	Mean sound-pressure level in a stated frequency range	30

19	Frequency response of the fundamental component	30
19.1	Transfer function	30
19.1.1	Conditions to be specified	30
19.1.2	Method of measurements	30
19.2	SPL frequency response	32
19.2.1	Conditions to be specified	32
19.2.2	Method of measurement	32
19.3	Time-varying amplitude compression of the fundamental component	33
19.3.1	General	33
19.3.2	Method of measurement	33
19.4	Amplitude compression at maximum input	33
19.4.1	Short term amplitude compression	33
19.4.2	Method of measurement	33
19.4.3	Long-term amplitude compression	34
19.4.4	Method of measurement	34
19.5	Corrections based on a free-field reference measurement	34
19.5.1	General	34
19.5.2	Correction of the measured sound pressure signal	34
19.5.3	Correction of the amplitude response	35
19.6	Effective frequency range	36
19.6.1	Conditions to be specified	36
19.6.2	Method of measurement	36
19.7	Internal latency	36
19.7.1	Conditions to be specified	36
19.7.2	Methods of measurement	36
20	Directional characteristics	37
20.1	General	37
20.2	Direct sound field in 3D space	37
20.2.1	Directional transfer function	37
20.2.2	Extrapolated far-field data	37
20.2.3	Parameters of the holographic sound field expansion	38
20.2.4	Extrapolated near-field data	39
20.3	Directional far field characteristics	39
20.3.1	Directional factor	39
20.3.2	Directional gain	41
20.3.3	Directivity factor	41
20.3.4	Directivity index	41
20.4	Acoustic output power	42
20.4.1	Conditions to be specified	42
20.4.2	Methods of measurement	42
20.5	Sound power level	44
20.6	Mean acoustic output power in a frequency band	44
20.6.1	Conditions to be specified	44
20.6.2	Method of measurement	44
20.7	Radiation angle	44
20.7.1	Conditions to be specified	44
20.7.2	Method of measurement	44

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 IEC 60268-21:2018
<https://standards.iteh.ai/catalog/standards/sist/68e1848b-95da-4f62-89e5-b15ac8ac24b5/iec-60268-21-2018>

20.8	Coverage angle or angles	45
20.8.1	Conditions to be specified.....	45
20.8.2	Method of measurement	45
20.9	Mean sound pressure level in an acoustical zone.....	45
20.9.1	General	45
20.9.2	Method of measurement	45
21	Harmonic distortion.....	46
21.1	General.....	46
21.2	N^{th} -order harmonic component	46
21.2.1	Conditions to be specified.....	46
21.2.2	Method of measurement	46
21.3	Total harmonic components	47
21.3.1	Conditions to be specified.....	47
21.3.2	Method of measurement	47
21.4	Total harmonic distortion.....	47
21.4.1	Conditions to be specified.....	47
21.4.2	Method of measurement	47
21.5	Higher-order harmonic distortion	48
21.5.1	Conditions to be specified.....	48
21.5.2	Method of measurement	48
21.6	Maximum sound pressure level limited by total harmonic distortion	49
21.6.1	Conditions to be specified.....	49
21.6.2	Method of measurement	49
21.7	N^{th} -order equivalent input harmonic distortion component	50
21.7.1	Conditions to be specified.....	50
21.7.2	Method of measurement	50
21.8	Equivalent input total harmonic distortion.....	51
21.8.1	Conditions to be specified.....	51
21.8.2	Method of measurement	51
22	Two-tone distortion	52
22.1	Variation of excitation frequencies	52
22.2	Modulation distortion.....	52
22.2.1	Conditions to be specified.....	52
22.2.2	Method of measurement	52
22.3	Amplitude modulation distortion	53
22.3.1	Conditions to be specified.....	53
22.3.2	Method of measurement	54
23	Multi-tone distortion	54
23.1	Conditions to be specified	54
23.2	Method of measurement	55
24	Impulsive distortion.....	55
24.1	Impulsive distortion level.....	55
24.1.1	Conditions to be specified.....	55
24.1.2	Method of measurement	56
24.2	Maximum impulsive distortion ratio	56
24.2.1	Conditions to be specified.....	56
24.2.2	Method of measurement	56

24.3	Mean impulsive distortion level	57
24.3.1	Conditions to be specified.....	57
24.3.2	Method of measurement	57
24.4	Crest factor of impulsive distortion	57
24.4.1	Conditions to be specified.....	57
24.4.2	Method of measurement	57
25	Stray magnetic fields	58
25.1	General.....	58
25.2	Static component	58
25.2.1	Characteristic to be specified.....	58
25.2.2	Method of measurement	58
25.3	Dynamic components.....	59
25.3.1	Characteristics to be specified	59
25.3.2	Method of measurement	59
Annex A	(informative) Uncertainty analysis	60
Annex B	(normative) Transducer mounting	62
B.1	Standard baffle	62
B.2	Standard measuring enclosures.....	64
B.2.1	General	64
B.2.2	Type A.....	64
B.2.3	Type B.....	64
Annex C	(normative) Simulated programme signal.....	66
Annex D	(informative) Rating the maximum input and output values	68
Annex E	(informative) Spherical wave expansion.....	70
E.1	Coefficients of spherical wave expansion.....	70
E.2	Directional factor.....	70
E.3	Directivity factor.....	71
E.4	Acoustic output power.....	71
Annex F	(informative) Non-linearity	72
F.1	Equivalent harmonic input distortion.....	72
F.2	Two-tone intermodulation.....	72
F.3	Signal distortion generated in audio systems	73
Annex G	(informative) Stray magnetic field	75
Bibliography	76

Figure 1	– Rated conditions used to describe the position of the DUT in the coordinate system.....	18
Figure 2	– Recommended position and orientation of the DUT	19
Figure 3	– Valid region of expansion of the sound pressure $p(r)$ at the observation point r at the distance $r > a$	39
Figure 4	– Measurement of the distortion generated by a multi-tone stimulus.....	55
Figure 5	– Measurement of impulsive distortion	56
Figure A.1	– Relationship between tolerance limits, corresponding acceptance intervals and the maximum permitted uncertainty of measurement, U_{MAX}	60
Figure B.1	– Standard baffle, dimensions.....	62
Figure B.2	– Standard baffle with chamfer	63
Figure B.3	– Standard baffle with sub-baffle.....	63

Figure B.4 – Standard measuring enclosure type A (net volume is about 600 l)	64
Figure B.5 – Standard measuring enclosure type B (net volume is about 450 l)	65
Figure C.1 – Block diagram of test setup for generating the simulated noise signal used for testing passive loudspeaker systems comprising a network filter	66
Figure F.1 – Signal flow chart of the electro-acoustical system	72
Figure F.2 – Variation of the frequencies of the two-tone stimulus in the intermodulation measurement	73
Figure F.3 – Generation of the signal distortion in audio systems	73
Figure G.1 – Measuring apparatus for stray magnetic field	75
Table A.1 – Example uncertainty budget – acoustical loudspeaker evaluation	61
Table C.1 – Power spectrum of simulated programme signal in 1/3 octave bands rated	67

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SOUND SYSTEM EQUIPMENT –

Part 21: Acoustical (output-based) measurements

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CDV	Report on voting
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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.

The French version of this standard has not been voted upon.

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

A list of all parts in the IEC 60628, published under the general title *Sound system equipment*, 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

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INTRODUCTION

Loudspeakers, headphones and other actuators have become more versatile and, as a result, new measurement techniques are required to evaluate these systems. The following is a list of examples where new measurement techniques are required:

- Limited access to the electrical terminals of the transducer
The higher integration of electrical, acoustical and mechanical elements limit the access to the electrical terminals of the transducer.
- Analogue or digital audio input signals
Audio inputs can accept analogue or digital signals in various formats.
- Latency and other kinds of distortion associated with digital signal processing
Digital signal processing is used to correct the transfer behaviour of the passive system and to generate a desired sound output and as a result, latency and other kinds of distortion not found in analogue equipment can be generated.
- Excessive equalization
Excessive equalization can force the transducer to operate in the large signal domain causing thermal and nonlinear effects.
- Active protection
Active protection attenuates the input signal to prevent a mechanical and thermal overload of the transducer and other components.
- Other transducer principles
Although most loudspeaker systems use a moving coil in an electro-dynamical transducer, there is a need to expand the application to electro-static, electro-magnetic or any other transduction principles. <https://standards.iteh.ai/catalog/standards/sist/68e1848b-95da-4f62-89e5-b15ac8ac24b5/iec-60268-21-2018>
- Other mechanical and acoustical elements
To improve sound radiation, vented enclosures, sealed enclosures, passive radiators, horns, wave guides, flat panels, and other mechanical and acoustical elements are implemented.
- Impulsive distortions
Defects in manufacturing (e.g. voice coil rubbing) or operating under overload conditions can create impulsive distortions, which have a high impact on perceived sound quality but cannot be detected by conventional measurements (e.g. total harmonic distortion).
- Directional characteristics and complex near field properties
The comprehensive evaluation of professional equipment, including directional characteristics, can be realized by considering the complex near-field properties as a supplement to the existing far-field measurement techniques. In addition, devices intended for use in the near field, such as hand-held personal audio devices (e.g. laptops, tablets, smart phones) and other portable sound systems, need to be evaluated in a manner appropriate to their intended use.

SOUND SYSTEM EQUIPMENT –

Part 21: Acoustical (output-based) measurements

1 Scope

This part of IEC 60268 specifies an acoustical measurement method that applies to electro-acoustical transducers and passive and active sound systems, such as loudspeakers, TV-sets, multi-media devices, personal portable audio devices, automotive sound systems and professional equipment. The device under test (DUT) can be comprised of electrical components performing analogue and digital signal processing prior to the passive actuators performing a transduction of the electrical input into an acoustical output signal. This document describes only physical measurements that assess the transfer behaviour of the DUT between an arbitrary analogue or digital input signal and the acoustical output at any point in the near and far field of the system. This includes operating the DUT in both the small and large signal domains. The influence of the acoustical boundary conditions of the target application (e.g. car interior) can also be considered in the physical evaluation of the sound system. This document does not assess the perception and cognitive evaluation of the reproduced sound and the impact of perceived sound quality.

NOTE Some measurement methods defined in this document can be applied to headphones, headsets, earphones and earsets in accordance with [1]¹. This document does not apply to microphones and other sensors. This document does not require access to the state variables (voltage, current) at the electrical terminals of the transducer. Sensitivity, electric input power and other characteristics based on the electrical impedance will be described in a separate future standard document, IEC 60268-22, dedicated to electrical and mechanical measurements.

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2 Normative references

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

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

IEC 60268-2:1987, *Sound system equipment – Part 2: Explanation of general terms and calculation methods*

IEC 61094-4, *Measurement microphones – Part 4: Specifications for working standard microphones*

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

ISO 3, *Preferred numbers – Series of preferred numbers*

ISO 3741:2010, *Acoustics – Determination of sound power levels and sound energy levels of noise sources using sound pressure – Precision methods for reverberation test rooms*

¹ Numbers in square brackets refer to the Bibliography.

ISO 3744, *Acoustics – Determination of sound power levels and sound energy levels of noise sources using sound pressure – Engineering methods for an essentially free field over a reflecting plane*

ISO 3745, *Acoustics – Determination of sound power levels and sound energy levels of noise sources using sound pressure – Precision methods for anechoic rooms and hemi-anechoic rooms*

CTA 2034-A, *Standard Method of Measurement for In-Home Loudspeakers, Consumer Technology Association (Formerly CEA), 02/01/2015*

CTA 2010-B, *Standard Method of Measurement for Powered Subwoofers, standard by Consumer Technology Association (Formerly CEA), 11/28/2014*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

No terms and definitions are listed in this document.

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>

3.2 Abbreviated terms

DUT device under test
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4 Type description

The type description shall be provided by the manufacturer, including the following information:

- type, principles and number of the transducers used in the loudspeaker system;
- acoustical loading (e.g. enclosure, horn, bass reflex, column, line array);
- power amplification;
- DSP processing (e.g. equalizer, active protection).

5 Physical characteristics

5.1 Marking of terminals and controls

The terminals and controls shall be marked in accordance with IEC 60268-1 and IEC 60268-2.

5.2 Dimensions

The outer dimensions of the DUT shall be specified.

5.3 Mass

The total mass of the DUT when ready for use shall be specified.

5.4 Connectors and cable assemblies

Cable assemblies and connectors shall be in accordance with IEC 60268-11 and IEC 60268-12.

NOTE In some circumstances, the connectors that are currently standardized are unsuitable and the use of other types is unavoidable.

6 Design data

Further design data shall be specified as additional information such as:

- type of transducer principle;
- number of transducers (drive units);
- digital processing of the audio signal (equalization, linearization, active protection).

7 Conditions

7.1 Rated conditions

For convenience, this document specifies how sound system equipment shall be set up for measurement. Normal measuring conditions are defined in this document. To obtain the actual conditions for measurement, some values (known as "rated conditions") shall be taken from the manufacturer's specification.

These rated conditions are not subject to measurement, but they constitute the basis for performing the measurements to determine the other characteristics.

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

- rated maximum sound pressure output or maximum input value;
- rated frequency range;
- geometrical conditions as per 10.1;
- ambient conditions as per Clause 15.

7.2 Climatic conditions

IEC 60268-1 states that tests should be carried out in the following environment in order to prevent the influence of temperature and humidity that can affect the properties of the drive unit suspensions [2]:

- ambient temperature T_{norm} : 15 °C to 35 °C;
- relative humidity: 25 % to 75 %;
- air pressure: 86 kPa to 106 kPa.

7.3 Normal measuring conditions

The DUT shall be understood to be under normal measuring conditions if all the following conditions are defined:

- a) The DUT to be measured is mounted in accordance with Clause 13;
- b) The acoustical environment is specified and selected from those given in Clause 9;
- c) Unwanted acoustical signals, electrical signals, and noise generated by other sources shall be kept at the lowest levels possible because their presence may obscure low-level signals. Data related to signals, which are less than 20 dB above the noise level in the frequency band being considered, shall be discarded or marked as corrupted by noise;