INTERNATIONAL STANDARD

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

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International Standard IEC 60268-21 has been prepared by IEC technical committee 100: Audio, video and multimedia systems and equipment.

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

<table>
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<tr>
<th>CDV</th>
<th>Report on voting</th>
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<td>100/2957/CVD</td>
<td>100/3019/RVC</td>
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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.

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

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- withdrawn,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

A bilingual version of this publication may be issued at a later date.

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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.

- 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.
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]. 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.

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 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