

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Sound system equipment –
Part 22: Electrical and mechanical measurements on transducers**

**Équipements pour systèmes électroacoustiques –
Partie 22: Mesurages électriques et mécaniques sur transducteurs**



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

SOUND SYSTEM EQUIPMENT –

Part 22: Electrical and mechanical measurements on transducers

FOREWORD

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

CDV	Report on voting
100/3311/CDV	100/3424/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.

A list of all parts in the IEC 60268 series, 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- withdrawn,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.

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INTRODUCTION

Measurements of the electrical and mechanical state variables have become increasingly important for the following reasons:

- Maximum sound pressure output is limited by voice coil heating and transducer nonlinearities. The large signal behaviour of loudspeakers can be described by nonlinear and thermal models using lumped parameters. These physical characteristics are important for transducer design and system integration.
- Mechanical vibration of the diaphragm determines the radiated sound. The modal vibration of the radiator's surface can be predicted by numerical simulations (FEA) and directly measured by laser vibrometry. This data represents important transducer characteristics that can be used to design the desired directivity into the system's acoustical output.
- DSP plays an important role in active systems. Digital pre-processing of the audio stream requires reliable transducer property information to protect the transducer against thermal and mechanical overload and to actively compensate for linear and nonlinear distortion generated in the output signal.

SOUND SYSTEM EQUIPMENT –

Part 22: Electrical and mechanical measurements on transducers

1 Scope

This part of IEC 60268 applies to transducers converting an electrical input signal into a mechanical or acoustical output signal. However, if the electrical input terminals and the surface of the radiator are accessible, this document can also apply to passive and active sound systems such as loudspeakers, headphones, TV-sets, multi-media devices, personal portable audio devices, automotive sound systems and professional equipment. This document describes only electrical and mechanical measurements that help assess the transfer behaviour of the device under test (DUT). This includes operating the DUT in both the small- and large-signal domains. The influence of the target application's acoustical boundary conditions (e.g. car interior) can also be considered in the physical evaluation of the sound system. Perception and cognitive evaluations of the reproduced sound and the impact of perceived sound quality are outside the scope of this document.

NOTE This document does not apply to microphones and other sensors. Implementation of this document does not require access to the sound pressures generated in the near or far fields of the radiator. Directivity and other characteristics describing the electro-acoustical transfer properties are described in IEC 60268-21, which covers acoustical measurements. The practical application of the measurements for research and development (R&D), end-of-line testing (QC) and evaluation in the final target application (TA) is discussed in Annex A.

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 60263:1982, *Scales and sizes for plotting frequency characteristics and polar diagrams*

IEC 60268-1:1985, *Sound system equipment – Part 1: General*

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

IEC 60268-11:1987, *Sound system equipment – Part 11: Application of connectors for the interconnection of sound system components*

IEC 60268-12:1987, *Sound system equipment – Part 12: Application of connectors for broadcast and similar use*
IEC 60268-12:1987/AMD1:1991

IEC 60268-21:2018, *Sound system equipment – Part 21: Acoustical (output-based) measurements*

IEC 62458:2010, *Sound system equipment – Electroacoustical transducers – Measurement of large signal parameters*

IEC 62459:2010, *Sound system equipment – Electroacoustical transducers – Measurement of suspension parts*

ISO 3:1973, *Preferred numbers – Series of preferred numbers*

ISO/IEC GUM:1995, *Guide to the expression of uncertainty in measurement (GUM)*

3 Terms, definitions and abbreviated terms

For the purposes of this document, the following terms and definitions apply.

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>

3.1 Terms and definitions

3.1.1

linear behaviour

behaviour of the DUT at small amplitudes where the relationship between input and output signal can be modelled by a linear system and described by a linear transfer function

3.1.2

reference unit

DUT having measured properties representative of units in the sample lot passing the end-of-line test

3.2 Abbreviated terms

DUT device under test

SPL sound pressure level

FEA finite element analysis

FT Fourier transform

4 Type description

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

- transduction principle (e.g. electro-dynamical, capacitive, electro-magnetic transducer);
- system description including operation principle (e.g. the number of the transducers used in the loudspeaker system);
- acoustical loading (e.g. horn loading and enclosure types, such as bass reflex, column, line array, ...);
- power amplification (e.g. maximum output power, class type, minimum load impedance, ...);
- DSP processing (e.g. equalizer, active protection), if any.

5 Marking of terminals and controls

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

6 Physical characteristics

6.1 Dimensions

The outer dimensions of the DUT shall be specified.