

Electroacoustics — Sound calibrators

The European Standard EN 60942:1998, with the incorporation of amendment A1:2001 has the status of a British Standard

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National foreword

This British Standard is the English language version of EN 60942:1998 including amendment A1:2001. It is identical with IEC 60942:1997 including amendment 1:2000. It supersedes BS 7189:1989 which will be withdrawn on 1998-10-01.

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Summary of pages

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English version

Electroacoustics — Sound calibrators

(includes amendment A1:2001)
(IEC 60942:1997 + A1:2000)

Electroacoustique — Calibreurs
acoustiques
(inclut l'amendement A1:2001)
(CEI 60942:1997 + A1:2000)

Elektroakustik — Schallkalibratoren
(enthält Änderung A1:2001)
(IEC 60942:1997 + A1:2000)

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European Committee for Electrotechnical Standardization
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Foreword

The text of document 29/371/FDIS, future edition 2 of IEC 60942, prepared by IEC TC 29, Electroacoustics, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60942 on 1998-01-01.

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Annexes designated “normative” are part of the body of the standard.

In this standard, Annex A, Annex B and Annex ZA are normative.

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60942:1997 was approved by CENELEC as a European Standard without any modification.

Foreword to amendment A1

The text of document 29/456/FDIS, future amendment 1 to IEC 60942:1997, prepared by IEC TC 29, Electroacoustics, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as amendment A1 to EN 60942:1998 on 2000-11-01.

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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 Annex C is informative. Annex ZA has been added by CENELEC.

Endorsement notice

The text of amendment 1:2000 to the International Standard IEC 60942:1997 was approved by CENELEC as an amendment to the European Standard without any modification.

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Introduction

Sound calibrators are designed to produce a known sound pressure level or levels at a specified frequency or frequencies when coupled to specified models of microphone in specified configurations, for example, with or without protective grid. In practice, the sound pressure level generated by a sound calibrator may depend on ambient parameters such as atmospheric pressure, temperature and humidity.

Sound calibrators have two principal uses:

- a) in the determination of the electroacoustical pressure sensitivity of specified models of microphone in specified configurations;
- b) in the checking or adjustment of the overall sensitivity of acoustical measuring devices or systems employing specified models of microphone in specified configurations.

Free-field and diffuse-field sensitivity of a microphone mounted on a sound level meter is likely to have characteristics specific to the combination. Information applicable to specific microphone configurations with specific sound level meters is given in IEC 61672.

Sound calibrators of a given class will realize their stated specifications and tolerances only if they are used carefully in accordance with the instructions given in the instruction manual and in an environment where the ambient sound level reaching the microphone is significantly lower than the sound pressure level generated by the sound calibrator.

1 Scope

1.1 This International Standard specifies the performance requirements for three classes of sound calibrator: class 0, class 1, and class 2 in decreasing order of accuracy under specified conditions. Class 0 calibrators are normally used in the laboratory, whilst classes 1 and 2 are considered as calibrators for field use.

1.2 The tolerances in this standard do not include the associated expanded uncertainty of measurement, due to the scarcity of reliable data, particularly for some combinations of sound calibrator and model of microphone. However, maximum permitted expanded uncertainties of measurement are quoted separately in Annex A and Annex B. The dependence of the expanded uncertainty both on the frequency of the sound calibrator and on the method used to calibrate the microphone used for the measurements is reflected in the maximum permitted expanded uncertainties quoted. Refinement of these maximum permitted expanded uncertainties is expected as further experience is gained and further data become available. This will eventually enable the specification tolerances and maximum permitted expanded uncertainties of measurement to be combined in the main body of the standard.

1.3 Conformance to the specifications of this standard is demonstrated only when the result of a measurement, extended by the expanded uncertainty of measurement, lies fully within the specification tolerances given in this standard extended by the expanded uncertainty of measurement.

2 Normative references

[A1] The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document applies. Members of IEC and ISO maintain registers of currently valid International Standards. **[A1]**

IEC 60050(801):1994, *International Electrotechnical Vocabulary (IEV) — Chapter 801: Acoustics and electroacoustics*

[A1] IEC 61000-4-2:1995, *Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 2: Electrostatic discharge immunity test. Basic EMC publication*

IEC 61000-4-3:1995, *Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 3: Radiated, radio-frequency, electromagnetic field immunity test*

IEC 61000-6-1:1997, *Electromagnetic compatibility (EMC) — Part 6: Generic standards — Section 1: Immunity for residential, commercial and light-industrial environments*

IEC 61000-6-2:1999, *Electromagnetic compatibility (EMC) — Part 6-2: Generic standards — Immunity for industrial environments* **[A1]**

Ⓐ) IEC 61000-6-4:1997, *Electromagnetic compatibility (EMC) — Part 6: Generic standards — Section 4: Emission standard for industrial environments* Ⓐ)

IEC 61094-1:1992, *Measurement microphones — Part 1: Specifications for laboratory standard microphones*

IEC 61094-2:1992, *Measurement microphones — Part 2: Primary method for pressure calibration of laboratory standard microphones by the reciprocity technique*

IEC 61094-3:1995, *Measurement microphones — Part 3: Primary method for free-field calibration of laboratory standard microphones by the reciprocity technique*

IEC 61094-4:1995, *Measurement microphones — Part 4: Specifications for working standard microphones*

IEC 61672, *Electroacoustics — Sound level meters*¹⁾

ISO 266:1997, *Acoustics — Preferred frequencies*

ISO 14253-1, — *Geometrical product specifications (GPS) — Inspection by measurement of workpieces and measuring instruments — Part 1: Decision rules for proving conformance or non-conformance with specifications*¹⁾

ISO Information Publication:1995, ISBN 92-67-10188-9, *Guide to the expression of uncertainty in measurement*

Ⓐ) CISPR 22:1997, *Information technology equipment — Radio disturbance characteristics — Limits and methods of measurement*

CISPR 61000-6-3:1996, *Electromagnetic compatibility (EMC) — Part 6: Generic standards — Section 3: Emission standard for residential, commercial and light-industrial environments* Ⓐ)

3 Definitions

Ⓐ) For the purposes of this International Standard the definitions contained in IEC 60050(801), IEC 61000-4-2, IEC 61000-4-3, IEC 61000-6-1, IEC 61000-6-2, IEC 61000-6-4 and CISPR 61000-6-3 apply, together with the following definitions. Ⓐ)

3.1

sound calibrator

device that generates a sinusoidal sound pressure of specified level and frequency when coupled to specified models of microphone in specified configurations

3.2

specified value of sound pressure level or frequency

sound pressure level or frequency specified in the instruction manual for characterizing a sound calibrator when used with a particular microphone model or configuration, valid for all sound calibrators of the same model under reference conditions

3.3

nominal frequency

a close approximation to the specified value of frequency, often rounded according to ISO 266

3.4

equivalent free-field sound pressure level

sound pressure level of a plane progressive wave having the same frequency as the sound calibrator which produces the same output voltage from a particular microphone configuration as the sound calibrator

3.5

equivalent diffuse-field sound pressure level

sound pressure level of a random incidence sound field having the same frequency as the sound calibrator which produces the same output voltage from a particular microphone configuration as the sound calibrator

3.6

principal sound pressure level

in a multi-level calibrator, a level specified in the instruction manual

¹⁾ To be published.

3.7**principal frequency**

in a multi-frequency calibrator, a frequency specified in the instruction manual

3.8**uncertainty of measurement**

parameter, associated with the result of a measurement, that characterizes the dispersion of the values that could reasonably be attributed to a particular quantity subject to measurement, i.e. a measurand

NOTE 1 Adapted from ISO 14253-1.

NOTE 2 The parameter may be, for example, a standard deviation (or a given multiple of it), or the half-width of an interval having a stated level of confidence.

NOTE 3 Uncertainty of measurement comprises, in general, many components. Some of these components may be evaluated from the statistical distribution of the results of series of measurements and can be characterised by experimental standard deviations. The other components, which can also be characterized by standard deviations, are evaluated from assumed probability distributions based on experience or other information.

NOTE 4 It is understood that the result of the measurement is the best estimate of the value of the measurand, and that all components of uncertainty including those arising from systematic effects, such as components associated with corrections and reference standards, contribute to the dispersion.

3.9**combined standard uncertainty of a measurement**

the result of a measurement when that result is obtained from a number of other quantities, equal to the positive square root of the sum of terms, the terms being variances or covariances of these other quantities weighted according to how the measurement result varies with changes in these quantities

NOTE Adapted from ISO 14253-1.

3.10**expanded uncertainty of a measurement**

quantity defining an interval about the result of a measurement that may be expected to encompass a large fraction of the distribution of values that could reasonably be attributed to the measurand

NOTE 1 From ISO 14253-1.

NOTE 2 The fraction may be viewed as the coverage probability or the level of confidence of the interval.

NOTE 3 To associate a specific level of confidence with the interval defined by the expanded uncertainty requires explicit or implicit assumptions regarding the probability distribution characterized by the measurement result and its combined standard uncertainty. The level of confidence that may be attributed to this interval can be known only to the extent to which such assumptions may be justified.

3.11**coverage factor, k**

numerical factor used as a multiplier of the combined standard uncertainty in order to obtain an expanded uncertainty

NOTE From ISO 14253-1.

3.12**reference standard**

device with a calibration directly traceable to national standards

3.13**working standard**

device regularly calibrated against a reference standard, used to measure the instrument under test

3.14**replication**

complete repeat of a measurement. In this standard a replication involves completely removing the microphone from the calibrator and then re-coupling

3.15**total distortion**

unwanted components such as harmonics and noise present in the output of the calibrator, expressed as a percentage of the fundamental sinusoidal output signal