



SLOVENSKI STANDARD
SIST EN 60651:1997

01-oktober-1997

Sound level meters (IEC 60651:1979)

Sound level meters

Schallpegelmesser

Sonomètres

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Ta slovenski standard je istoveten z: EN 60651:1994

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EUROPEAN STANDARD

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IEC/TC29

ENGLISH VERSION

Sound level meters
(IEC 651:1979)Sonomètres
(CEI 651:1979)Schallpegelmesser
(IEC 651:1979)

This European Standard was approved by CENELEC on 1993-12-08. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B-1050 Brussels

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Ref. No. EN 60651:1994 E

FOREWORD

As a consequence of the IEC-CENELEC Agreement, HD 425 S1:1983 (IEC 651:1979) was submitted to the CENELEC voting procedure for conversion into a European Standard.

The text of the International Standard was approved by CENELEC as EN 60651 on 8 December 1993.

The following dates were fixed:

- latest date of publication of
an identical national standard (dop) 1994-12-01
- latest date of withdrawal of
conflicting national standards (dow) -

Annexes designated "normative" are part of the body of the standard. In this standard, annexes A, B, C and ZA are normative.

~~ENDORSEMENT NOTICE~~
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The text of the International Standard IEC 651:1979 was approved by CENELEC as a European Standard without any modification.

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ANNEX ZA (normative)

OTHER INTERNATIONAL PUBLICATIONS QUOTED IN THIS STANDARD
WITH THE REFERENCES OF THE RELEVANT EUROPEAN PUBLICATIONS

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

NOTE : When the international publication has been modified by CENELEC common modifications, indicated by (mod), the relevant EN/HD applies.

IEC Publication	Date	Title	EN/HD	Date
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537	1976	Frequency weighting for the measurement of aircraft noise (0-weighting)	-	-

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Sonomètres

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Sound level meters

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

SOUND LEVEL METERS

FOREWORD

- 1) The formal decisions or agreements of the IEC on technical matters, prepared by Technical Committees on which all the National Committees having a special interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subjects dealt with.
- 2) They have the form of recommendations for international use and they are accepted by the National Committees in that sense.
- 3) In order to promote international unification, the IEC expresses the wish that all National Committees should adopt the text of the IEC recommendation for their national rules in so far as national conditions will permit. Any divergence between the IEC recommendation and the corresponding national rules should, as far as possible, be clearly indicated in the latter.

PREFACE

This standard has been prepared by Sub-Committee 29C, Measuring Devices, of IEC Technical Committee No. 29, Electro-acoustics.

A first draft was discussed at the meeting held in Moscow in 1974 and then was replaced by a second one in 1975. As a result of the meeting held in Gaithersburg in 1976, a draft, Document 29C(Central Office)32, was submitted to the National Committees for approval under the Six Months' Rule in June 1977. It was replaced by Document 29C(Central Office)36 which was submitted to the National Committees for approval under the Two Months' Procedure in March 1978.

The National Committees of the following countries voted explicitly in favour of publication:

Argentina	Netherlands
Australia	Norway
Belgium	Poland
Canada	Romania
Czechoslovakia	South Africa (Republic of)
Denmark	Spain
Egypt	Sweden
France	Switzerland
Germany	Turkey

The National Committee of the United States of America voted against the publication of this standard, asking that the following statement explaining the reason for their negative vote be printed in the present preface: "In the opinion of the United States National Committee, this standard contains significant improvements in the standardization of sound level meters. It is expected that most of these improvements will be incorporated in a revised American National Standard. However, the freedom to select any angle of incidence, including 0° incidence, for calibration is too broad. In many practical situations, when high-frequency noise is present, this freedom will lead to measured sound levels that are significantly low".

* * *

This standard supersedes IEC Publications 123 (1961), 179 (1965 and 1973) and 179A (1973). The specifications of this standard for sound level meters Type 1 have been derived from Publication 179 with some modifications; those for sound level meters Type 3 have been derived from Publication 123 with only minor changes. The term "dynamic characteristics" used in the previous publications to denote the time-dependent (transient) response performance of sound level meters has been changed in this standard to the more general term "time weighting characteristics", and the former designations "slow", "fast" and "impulse" have been changed to S, F and I respectively in recognition of the conventional nature of these characteristics.

Other IEC publication quoted in this standard:

Publication No. 537: Frequency Weighting for the Measurement of Aircraft Noise (D-weighting).

SOUND LEVEL METERS

1. Scope

1.1 General

This standard describes instruments (sound level meters) for the measurement of certain frequency and time weighted sound pressure levels.

1.2 Types

This standard specifies sound level meters of four degrees of precision, designated Types 0, 1, 2 and 3.

1.3 Tolerances

The specifications for Types 0, 1, 2 and 3 sound level meters have the same centre values and differ only in the tolerances allowed. Tolerances generally broaden as the type number increases and differ for the various types to a degree which affects manufacturing costs significantly.

1.4 Characteristics specified

This standard specifies the following characteristics of sound level meters:

- a) directional characteristics;
- b) frequency weighting characteristics;
- c) time weighting, detector and indicator characteristics;
- d) sensitivity to various environments.

1.5 Tests specified

This standard specifies electrical and acoustical tests to verify compliance with the characteristics specified (see Sub-clause 1.4). It also describes the method for absolute sensitivity calibration.

2. Object and general requirements

2.1 Object

Owing to the complexity of operation of the human ear, it is not possible at present to design an objective noise measuring apparatus to give results which are absolutely comparable, for all types of noise, with those obtained by subjective methods. However, it is considered essential to standardize an apparatus by which sounds can be measured under closely defined conditions so that results obtained by users of such apparatus are always reproducible within stated tolerances.

The object of this standard is to ensure specified accuracy and stability of a particular sound level meter in practice, and to reduce to the practical minimum any differences in equivalent measurements taken with devices of various makes and models which satisfy the requirements of this standard.

2.2 Applications

The Type 0 sound level meter is intended as a laboratory reference standard. Type 1 is intended especially for laboratory use, and for field use where the acoustical environment can be closely specified and/or controlled; the measurement accuracy possible with such an instrument will generally not be realized under ordinary conditions. The Type 2 sound level meter is suitable for general field applications. Type 3 is intended primarily for field noise survey applications to determine whether an established noise limit has been significantly violated.

Sound level meters intended for field use have to meet rigorous environmental specifications. Other sound level meters are only used in laboratories where the environment is controlled, and it is not justifiable to require such instruments to meet the design constraints imposed on field instruments. The distinction is provided for in Sub-clauses 8.5 and 8.6 which specify additional requirements for instruments intended for field use.

2.3 Weighting characteristics

2.3.1 Frequency weighting

A sound level meter shall have one or more frequency weighting characteristics designated A, B and C. Optional weighting characteristics which may be included are:

- i) a characteristic designated Lin for which the response is constant as a function of frequency;
- ii) a characteristic designated D as specified in IEC Publication 537, Frequency Weighting for the Measurement of Aircraft Noise (D-weighting).

2.3.2 Time weighting

A sound level meter shall have one or more time weighting characteristics designated S, F and I. A Peak characteristic may also be included.

2.3.3 Significance of weighting characteristics

In the past, frequency weighting and time weighting have been associated with certain characteristics of the ear. However, recent work has not substantiated these historical associations so that frequency and time weighting characteristics of sound level meters may be considered to be conventional. The A weighting characteristic is now frequently specified for rating sounds irrespective of level and is no longer restricted to low level sounds. Furthermore, standardization of the I time weighting characteristic does not imply that the relationship between loudness or hearing damage risk of impulsive sounds and the physical characteristics of sounds is thereby precisely represented. However, a wide dynamic range, overload indication, and a high crest factor capability are necessary for the accurate measurement of short-duration sounds, and these characteristics are specified in this standard for sound level meters which incorporate the I time weighting characteristic.

2.4 Optional features

This standard is intended to allow special features in a sound level meter such as wide indicator range, digital display, recording display and automatic range changing.

2.5. Method of use

It is recognized that sound level meters are used to measure many types of sound, under different conditions, and for a variety of reasons. For each application, the measurement technique should be chosen and controlled carefully to obtain valid and consistent results. It is important to note that the method of use has at least as much effect on a measurement as the quality of the instrument itself; errors will often result if the effect of the environment, and (especially for portable instruments) the presence of the observer, are ignored.

3. Definitions

3.1 For the definitions of terms used in this standard, reference should be made to the International Electrotechnical Vocabulary (I.E.V.), Chapter 801, Acoustics and Electroacoustics (in preparation). Certain additional terms are defined below.

3.2 *Weighted sound pressure level* in decibels (dB) is 20 times the logarithm to the base ten of the ratio of a weighted sound pressure to the reference sound pressure. The sound pressure is weighted in accordance with one of the frequency weightings A, B or C, and is time weighted in accordance with characteristics S, F, I, or Peak, the frequency and time weightings being as specified in this standard. The reference sound pressure is 20 μPa (20 $\mu\text{N/m}^2$) and does not depend on the frequency or time weighting. When quoting the weighted sound pressure level, the frequency weighting and time weighting shall be indicated.

Note. — The term “weighted sound pressure level”, used throughout this standard, is often abbreviated to “weighted sound level” or “sound level” in English-speaking countries.

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3.3 *Crest factor* of a signal is the ratio of the peak value to the r.m.s. value measured over a specified time interval, the instantaneous values of the signal being measured with respect to the arithmetic mean value. The relation between crest factor and pulse duty factor for sequences of rectangular pulses and for tone bursts is given in Appendix A.

3.4 *Primary indicator range* of a sound level meter is a specified range of the indicator for which the sound level meter readings are within particularly close tolerances on level linearity as specified in Sub-clauses 7.9 and 7.10.

3.5 *Level linearity* means that the reading of the sound level meter is a linear function of the level of the input signal, within stated tolerances.

3.6 *Reference direction* is the direction of sound incidence specified by the manufacturer to be used for testing the absolute sensitivity, the directional characteristics and the frequency weighting of a sound level meter.

3.7 *Reference frequency* is a frequency specified by the manufacturer in the range 200 Hz to 1 000 Hz used for calibration of the absolute sensitivity of a sound level meter.

Note. — A reference frequency of 1 000 Hz is preferred.

3.8 *Reference sound pressure level* is a sound pressure level specified by the manufacturer used for calibrating the absolute sensitivity of the sound level meter.

Note. — A reference sound pressure level of 94 dB is preferred or, if this level is not within the measuring range of the instrument, 84 dB or 74 dB.