SLOVENSKI STANDARD
SIST EN 60318-3:2002

01-september-2002

Electroacoustics - Simulator of human head and ear - Part 3: Acoustic coupler for the calibration of supra-aural earphones used in audiometry (IEC 60318-3:1998)

Electroacoustics - Simulators of human head and ear -- Part 3: Acoustic coupler for the calibration of supra-aural earphones used in audiometry

Elektroakustik - Simulatoren des menschlichen Kopfes und Ohres -- Teil 3: Akustischer Kuppler zur Kalibrierung von supra-auralen Audiometrie-Kopfhörern

Electroacoustique - Simulateurs de tête et d'oreille humaines -- Partie 3: Coupleur acoustique pour l'étalonnage des écouteurs supra-auraux utilisés en audiométrie

Ta slovenski standard je istoveten z: **EN 60318-3:1998**

ICS:

13.140	Vpliv hrupa na ljudi	Noise with respect to human beings
17.140.50	Elektroakustika	Electroacoustics

SIST EN 60318-3:2002 **en**

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EN 60318-3

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Descriptors: Audiometry, electroacoustics, earphones, calibration, couplers, equipment specifications, test equipment

English version

Electroacoustics — Simulators of human head and ear Part 3: Acoustic coupler for the calibration of supra-aural earphones used in audiometry

(IEC 60318-3:1998)

Electroacoustique — Simulateurs de tête et d'oreille humaines
Partie 3: Coupleur acoustique pour l'étalonnage des écouteurs supra-auraux utilisés en audiométrie
(CEI 60318-3:1998)

Elektroakustik — Simulatoren des menschlichen Kopfes und Ohres
Teil 3: Akustischer Kuppler zur Kalibrierung von supra-auralen Audiometrie-Kopfhörern
(IEC 60318-3:1998)

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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

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Foreword

The text of document 29/405/FDIS, future edition 1 of IEC 60318-3, prepared by IEC TC 29, Electroacoustics, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60318-3 on 1998-10-01.

The following dates were fixed:

— latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 1999-07-01

— latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2001-07-01

Annexes designated "normative" are part of the body of the standard.

In this standard, Annex ZA is normative.

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60318-3:1998 was approved by CENELEC as a European Standard without any modification.

Contents

1 Scope

This International Standard describes an acoustic coupler for loading supra-aural audiometric earphones as specified in ISO 389-1[1)] with a specified acoustic impedance, when calibrating audiometers, in the frequency range of 125 Hz to 8 000 Hz.

The sound pressure developed by an earphone is not, in general, the same in the coupler as in a person's ear. However, the IEC recommends its use as a simple and ready means for the exchange of specifications on audiometers and for the calibration of specified earphones used in audiometry.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 60318. At the same time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this part of IEC 60318 are encouraged to investigate the possibility of applying the most recent edition of the normative documents indicated below. Members of the IEC and ISO maintain registers of currently valid International Standards.

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

ISO 389-1, *— Acoustics — Reference zero for the calibration of audiometric equipment — Part 1: Reference equivalent threshold sound pressure levels for pure tones and supra-aural earphones*[1)].

3 Definition

For the purpose of this International Standard, the following definition applies:

3.1
acoustic coupler

cavity, of predetermined shape and volume, used for the calibration of earphones in conjunction with a calibrated microphone adapted to measure the pressure developed within the cavity

4 Construction

4.1 General

The coupler, shown in Figure 1, shall be made of a hard, stable, non-magnetic material, such as brass. The coupler consists essentially of a cylindrical cavity whose acoustic reactance is that of a volume defined in **4.2**. The base of the cylindrical cavity is usually formed by the diaphragm of a microphone of high mechanical impedance. The walls of the cavity should be sufficiently rigid so that flexural vibration does not affect the output of the microphone.

4.2 Critical dimensions

4.2.1 The critical dimensions (see Figure 1) of the coupler are those which determine the shape and volume of the cavity terminated by a condenser microphone, the capillary leak, the upper edge (lip) and the 45° angle.

4.2.2 The nominal effective acoustic volume shall be equal to

$V_1 = 5\ 780\ \text{mm}^3 \pm 80\ \text{mm}^3$

4.2.3 The diameter d_1 shall be equal to

$d_1 = 23{,}825\ \text{mm} \pm 0{,}015\ \text{mm}$

4.2.4 Diameter d_2 shall be equal to

$d_2 = 18{,}55\ \text{mm} \pm 0{,}10\ \text{mm}$

and the height l_2 shall be equal to

$l_2 = 1{,}95\ \text{mm} \pm 0{,}05\ \text{mm}$

4.2.5 The angle defining the slope of the external part of the coupler shall be equal to

$45° \pm 5°$

4.2.6 The height h of the coupler is calculated according to the following formula:

$$h = \frac{V_1 - V_{eq} - V_2}{\frac{1}{4}\pi d_1^2} \qquad (1)$$

where

V_1 is the nominal effective acoustic volume;

V_{eq} is the equivalent acoustic volume of the microphone;

V_2 is the volume of the front cavity of the microphone, given by

$$V_2 = \tfrac{1}{4}\pi d_2^2 \cdot l_2 \qquad (2)$$

NOTE 1 It is recommended that a value of h be selected from Table 1, according to the value of the equivalent acoustic volume of the microphone.

[1)] To be published

Table 1 — Height of the coupler as a function of the acoustic volume of the microphone

Equivalent acoustic volume of the microphone mm^3	Height of the coupler mm
$0 < V_{eq} \leq 50$	11,72 ± 0,05
$50 < V_{eq} \leq 100$	11,62 ± 0,05
$100 < V_{eq} \leq 150$	11,50 ± 0,05
$150 < V_{eq} \leq 200$	11,39 ± 0,05

NOTE 2 If the coupler described in this standard is constructed with a fixed value of $h + l_2 = 13{,}41$ mm ± 0,025 mm regardless of the equivalent volume of the microphone, then the coupler will be identical with the NBS 9A coupler (ANSI S3.7:1995). The nominal effective acoustic volume of the type 9A coupler is:

$V_1 = V_{eq} + 5\,640\ mm^3$

4.3 Calibrated pressure microphone

The internal shape of the base of the coupler corresponds to that of certain commercial microphones without protective grid but with a coupler ring, which can be used to form that base, e.g. a WS1P microphone conforming to IEC 61094-4. Other microphones of same dimensions as types WS1 can be used, provided that the dimensions and stipulated volume are preserved, for example by using an adaptor.

The microphone used shall have a high mechanical impedance, the equivalent volume being less than 200 mm^3 of air, at frequencies between 125 Hz and 8 000 Hz. The manufacturer of the microphone shall state the equivalent volume.

The overall pressure sensitivity of the microphone and associated measuring system over the specified frequency range shall be known with an uncertainty of ± 0,2 dB with a coverage factor of k = 2.

There shall be an effective seal between the coupler and the microphone achieved by using a suitable material, for example grease.

Any obstruction in the static pressure equalization device of the microphone should be avoided.

4.4 Static pressure equalizer

Static pressure equalization shall be provided. To equalize the static air pressure inside the coupler cavity with the external atmospheric pressure, a hole of 0,6 mm ± 0,05 mm diameter is drilled into the coupler. A wire of 0,4 mm ± 0,05 mm diameter is inserted into the hole.

A glass capillary tube may also be used for pressure equalization, in which case care shall be taken to seal the tube along its complete length in such a way that air leakage occurs only through the inner bore. The sound pressure difference, developed by a given voltage at the earphone terminals with the hole plugged or left open should not be greater than 0,2 dB at any frequency between 100 Hz and 10 000 Hz.

5 Coupling of earphone to acoustic coupler

The earphone to be calibrated shall be applied to the ear simulator without acoustic leakage with a force 4,5 N ± 0,5 N, not including the weight of the earphone itself (see Figure 2). If, for a specific earphone, a different coupling force is specified this shall be stated.

The earphone shall not rest on the sloping side of the ear simulator, but only on the upper edge (or rim).

In the case of earphones with a hard earcap, a thin film of sealing material or thin soft rubber ring should be used on the lip in order to produce an effective seal between the earphone and the upper edge of the coupler.

NOTE With some earphones, a special adapter can be used for coupling the earphone to the coupler.

6 Calibration

6.1 Environmental test conditions for calibration

Reference ambient pressure:	101,3 kPa
Reference temperature:	23 °C
Reference relative humidity:	50 %

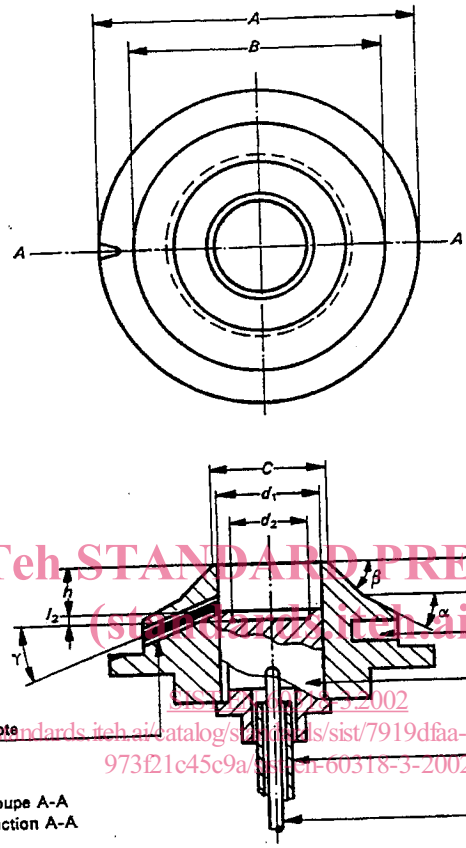
6.2 Method of calibration

The manufacturer shall describe in an instruction manual the method(s) for determining calibration and overall stability of the complete acoustic coupler including the microphone.

The calibration should be performed at the environmental test conditions given in **6.1** with the following tolerances:

Ambient pressure:	± 3,0 kPa
Temperature:	± 3 °C
Relative humidity:	± 20 %

If it is not possible to meet these requirements, the actual values shall be stated.



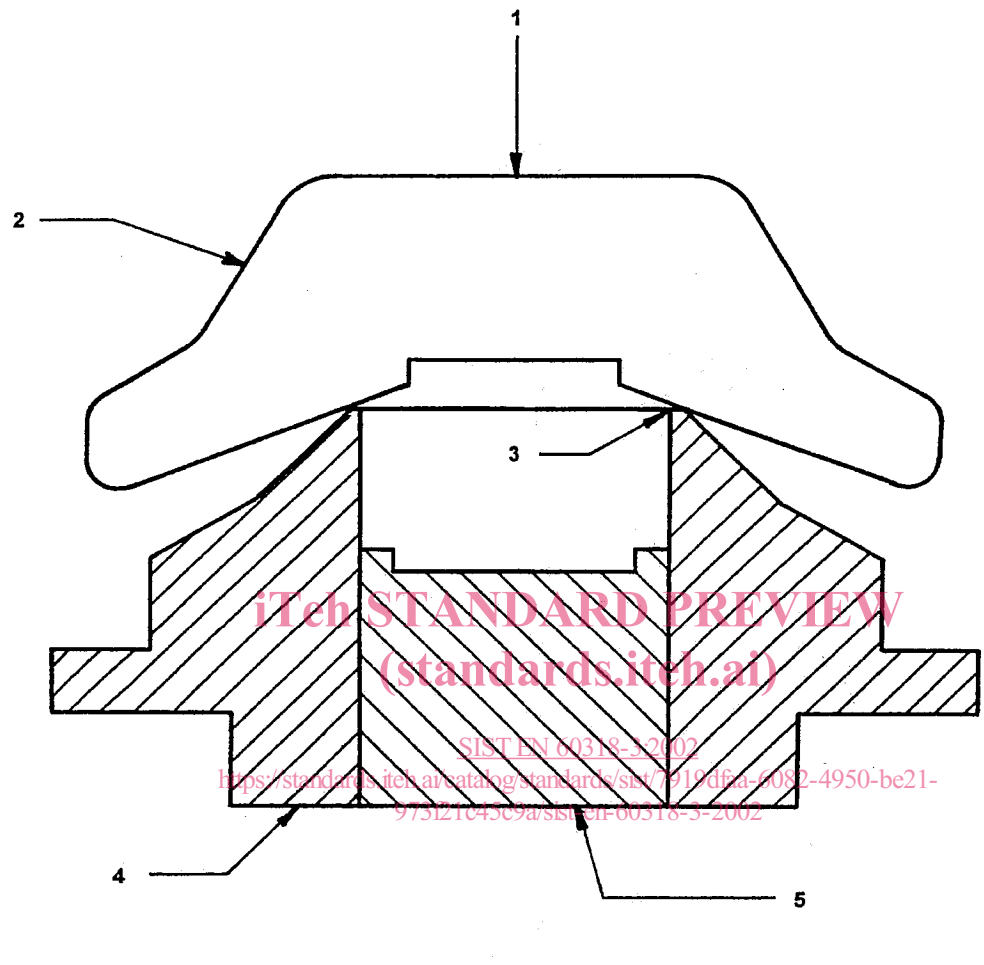
Key

1 Hole for thermometer
2 Microphone
3 Ground shield
4 Contact pin

NOTE Capillary tube contoured to cavity Bore of 0,6 mm and wire of 0,4 mm. See **4.4.**

Quotation	Dimensions mm
A	73 ± 0,2
B	57,2 ± 0,2
C	25,27 ± 0,13
d_1	23,825 ± 0,015
d_2	18,55 ± 0,10
l_2	1,95 ± 0,05
h	see **4.2.6**
H	7,5 ± 0,1
Angle	**Degrees**
α	25 ± 5
β	45 ± 5
γ	25 ± 5

Figure 1 — Dimensions of acoustic coupler



Key
1 Coupling force between 4 N and 5 N
2 Earphone
3 Lip
4 Coupler
5 Microphone

Figure 2 — Coupling of earphone to coupler