



**SLOVENSKI STANDARD**  
**SIST EN 24869-1:1999**

**01-november-1999**

---

**Akustika – Oprema za varovanje sluha - Subjektivna metoda za merjenje dušenja zvoka (ISO 4869-1:1990)**

Acoustics - Hearing protectors - Subjective method for the measurement of sound attenuation (ISO 4869-1:1990)

Akustik - Gehörschützer - Subjektive Methode zur Messung der Schalldämmung (ISO 4869-1:1990)

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

Acoustique - Protecteurs individuels contre le bruit - Méthode subjective de mesurage de l'affaiblissement acoustique (ISO 4869-1:1990)

<https://standards.iteh.ai/catalog/standards/sist/b2bc5835-e4a8-4574-a02b-a26bee0f933f/sist-en-24869-1-1999>

**Ta slovenski standard je istoveten z: EN 24869-1:1992**

---

**ICS:**

13.340.20      Varovalna oprema za glavo      Head protective equipment

**SIST EN 24869-1:1999**

**en**

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

SIST EN 24869-1:1999

<https://standards.iteh.ai/catalog/standards/sist/b2bc5835-e4a8-4574-a02b-a26bee0f933f/sist-en-24869-1-1999>

EUROPEAN STANDARD

EN 24869-1:1992

NORME EUROPÉENNE

EUROPÄISCHE NORM

October 1992

UDC 614.892:620.1:534.61:534.833.5

Descriptors: Acoustics, ear protectors, acoustic measurement, noise reduction

English version

**Acoustics - Hearing protectors - Subjective method  
for the measurement of sound attenuation (ISO  
4869-1:1990)**

Acoustique - Protecteurs individuels contre le  
bruit - Méthode subjective de mesurage de  
l'affaiblissement acoustique (ISO 4869-1:1990)

Akustik - Gehörschützer - Subjektive Methode  
zur Messung der Schalldämmung (ISO 4869-1:1990)

This European Standard was approved by CEN on 1992-10-16. CEN 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 CEN member.

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

CEN members are the national standards bodies of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

**CEN**

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

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

### Foreword

This European Standard is the endorsement of ISO 4869-1. Endorsement of ISO 4869-1 was recommended by Technical Committee CEN/TC 211 "Acoustics" under whose competence this European Standard will henceforth fall.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 1993, and conflicting national standards shall be withdrawn at the latest by April 1993.

The Standard was approved and in accordance with the CEN/CENELEC Internal Regulations, the following countries are bound to implement this European Standard : Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom.

### Endorsement notice

The text of the International Standard ISO 4869-1:1990 was approved by CEN as a European Standard without any modification.

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

SIST EN 24869-1:1999

<https://standards.iteh.ai/catalog/standards/sist/b2bc5835-e4a8-4574-a02b-a26bec0f933f/sist-en-24869-1-1999>

# INTERNATIONAL STANDARD

**ISO**  
**4869-1**

First edition  
1990-12-15

---

---

## **Acoustics — Hearing protectors —**

### **Part 1:**

Subjective method for the measurement of sound  
attenuation

*Acoustique — Protecteurs individuels contre le bruit —*

*Partie 1: Méthode subjective de mesurage de l'affaiblissement  
acoustique*

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

[SIST EN 24869-1:1999](https://standards.iteh.ai/catalog/standards/sist/b2bc5835-e4a8-4574-a02b-a26bec0f933f/sist-en-24869-1-1999)

[https://standards.iteh.ai/catalog/standards/sist/b2bc5835-e4a8-4574-a02b-  
a26bec0f933f/sist-en-24869-1-1999](https://standards.iteh.ai/catalog/standards/sist/b2bc5835-e4a8-4574-a02b-a26bec0f933f/sist-en-24869-1-1999)



Reference number  
ISO 4869-1:1990(E)

## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 4869-1 was prepared by Technical Committee ISO/TC 43, *Acoustics*.

This first edition of ISO 4869-1 cancels and replaces ISO 4869:1981, of which it constitutes a technical revision.

ISO 4869 consists of the following parts, under the general title *Acoustics – Hearing protectors*:

- *Part 1: Subjective method for the measurement of sound attenuation*
- *Part 2: Estimated noise reduction of hearing protectors*
- *Part 3: Simplified method for the measurement of insertion loss of ear-muff type protectors for quality inspection purposes*  
[Technical Report]

Annexes A and B of this part of ISO 4869 are for information only.

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

SIST EN 24869-1:1999

<https://standards.iteh.ai/catalog/standards/sist/b2bc5835-e4a8-4574-a02b-a26bec0f933f/sist-en-24869-1-1999>

© ISO 1990

All rights reserved. No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

International Organization for Standardization  
Case Postale 56 • CH-1211 Genève 20 • Switzerland

Printed in Switzerland

## Introduction

Hearing protectors are commonly used to reduce the noise to which the ear is exposed. Hearing protectors are manufactured as ear-plugs, ear-muffs or helmets. A standardized method of sound attenuation measurement allows performance data obtained in different locations under similar conditions to be compared. The data may be used for rank ordering and selection of different models and the evaluation of design and construction features that affect performance.

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

SIST EN 24869-1:1999

<https://standards.iteh.ai/catalog/standards/sist/b2bc5835-e4a8-4574-a02b-a26bec0f933f/sist-en-24869-1-1999>

## Acoustics — Hearing protectors —

### Part 1:

### Subjective method for the measurement of sound attenuation

#### 1 Scope

This International Standard specifies a subjective method for measuring sound attenuation of hearing protectors at the threshold of hearing. The method and procedures are designed to yield values close to the maximum attenuation which are not normally attained under field conditions. This approach has been adopted because the attenuation values can then be consistently reproduced. The values reflect the attenuating characteristics of the hearing protector only to the extent that users wear the device in the same manner as did the test subjects.

This test method yields data which are collected at low sound pressure levels (close to the threshold of hearing) but which are also representative of the attenuation values of hearing protectors at higher sound pressure levels. An exception occurs in the case of amplitude-sensitive hearing protectors for sound pressure levels above the point at which their level-dependent characteristics become effective. At those sound pressure levels the method specified in this International Standard is inapplicable; it will usually underestimate sound attenuation for these devices.

NOTE 1 At low frequencies (below 500 Hz) the sound attenuation may be overestimated by a few decibels as a result of masking the occluded ear thresholds caused by physiological noise during the occluded ear tests.

#### 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 4869. At the time of publication, the editions indicated were valid. All standards are

subject to revision, and parties to agreements based on this part of ISO 4869 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 354:1985, *Acoustics — Measurement of sound absorption in a reverberation room.*

ISO 8253-2:—<sup>1)</sup>, *Acoustics — Audiometric test methods — Part 2: Sound field audiometry with pure tone and narrow-band test signals.*

IEC 225:1966, *Octave, half-octave and third-octave band filters intended for the analysis of sounds and vibrations.*

IEC 263:1982, *Scales and sizes for plotting frequency characteristics and polar diagrams.*

IEC 645-1:—,<sup>2)</sup> *Audiometers — Part 1: Pure tone audiometers.*

IEC 651:1979, *Sound level meters.*

IEC 804:1985, *Integrating-averaging sound level meters.*

#### 3 Definitions

For the purposes of this part of ISO 4869, the following definitions apply.

**3.1 hearing protector:** A device worn by a person to prevent unwanted auditory effects from acoustic stimuli.

1) To be published.

2) To be published. (Revision of IEC 645:1979.)



**NOTE 2** Hearing protectors may include electronic devices for communication or devices designed to play an active role in the reduction of the noise level between the hearing protector and the ear-drum.

**3.2 ear-muff:** A hearing protector consisting of an ear-cup to be pressed against each pinna or of a circumaural ear-cup to be pressed against the head around the pinna. The ear-cups can be pressed against the head with a special headband or neckband or by means of a device attached to a safety helmet or other equipment.

**3.3 ear-plug:** A hearing protector worn within the external ear canal (aural) or in the concha against the entrance to the external ear canal (semi-aural).

**3.4 helmet:** A device which covers a substantial part of the head.

**3.5 hearing level (of a pure tone):** At a specified frequency, for a specified type of earphone and for a specified manner of application, the sound pressure level of this pure tone produced by the earphone in a specified acoustic coupler or artificial ear minus the appropriate reference equivalent threshold sound pressure level.

**NOTE 3** Values of reference equivalent threshold sound pressure levels are specified in ISO 389.

**3.6 hearing threshold level (of a given ear):** At a specified frequency and for a specified type of earphone, the threshold of hearing expressed as hearing level.

**NOTE 4** For appropriate test conditions see, for example, ISO 6189 and ISO 8253-1.

**3.7 threshold of hearing:** The lowest sound pressure level at which, under specified conditions, a person gives a predetermined percentage of correct detection responses on repeated trials.

**NOTE 5** For the purpose of this International Standard, the threshold of hearing is measured with and without the hearing protector. For appropriate test conditions, see ISO 8253-2.

**3.8 sound attenuation:** For a given test signal, the difference, in decibels, between the threshold of hearing with and without the hearing protector in place for a test subject.

**3.9 pink noise:** Noise the sound pressure spectral density of which is inversely proportional to frequency.

**3.10 reference point:** The midpoint of a line connecting the test subject's ear canal openings.

**3.11 reverberation time:** The time required for the sound pressure level to decrease by 60 dB after the sound source has stopped (see ISO 354).

**3.12 repeatability:** The value below which the absolute difference between two single test results obtained with the same method on identical test material, under the same conditions (same operator, same apparatus, same laboratory, and a short interval of time), may be expected to lie with a specified probability; in the absence of other indications, the probability is 95 %.

**3.13 reproducibility:** The value below which the absolute difference between two single test results obtained with the same method on identical test material, under different conditions (different operators, different apparatus, different laboratories and/or different time), may be expected to lie with a specified probability; in the absence of other indications, the probability is 95 %.

## 4 Measurement of the sound attenuation of hearing protectors

### 4.1 Test signals

The test signals shall consist of a signal from pink noise filtered through one-third octave bands with centre frequencies in accordance with IEC 225. Tests shall be performed at the following centre frequencies:

63 Hz (optional)

125 Hz

250 Hz

500 Hz

1 000 Hz

2 000 Hz

4 000 Hz

8 000 Hz

### 4.2 Test site

**4.2.1** Diffuse sound field conditions are required and are adequately approximated when the following requirements are met:

- a) With the test subject and the subject's chair absent, the sound pressure level measured with an omnidirectional microphone at positions 15 cm from the reference point on the front-back, right-left and up-down axes shall deviate by no more than  $\pm 2,5$  dB from the sound pressure level at