



SLOVENSKI STANDARD
SIST EN 352-1:1996

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Varovanje sluha - Varnostne zahteve in preskušanje - 1. del: Naušniki

Hearing protectors - Safety requirements and testing - Part 1: Ear muffs

Gehörschützer - Sicherheitstechnische Anforderungen und Prüfungen - Teil 1:
Kapselgehörschützer

Protecteurs contre le bruit - Exigences de sécurité et essais - Partie 1: Serre-tete

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English version

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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 CEN member.

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CEN

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

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Foreword

This European Standard has been produced by CEN/TC 159 "Hearing protectors", the Secretariat of which is held by SIS.

This European Standard has been prepared under a mandate given to CEN by the Commission of the European Communities and the European Free Trade Association, and supports essential requirements of EC Directive(s).

The particular requirement for hearing protectors in relation to their ability to reduce noise to below daily limit levels is addressed in the standard by means of a requirement for attenuation performance, tested to EN 24869-1, to be declared, and by the setting of a minimum level of attenuation, enabling selection of suitable protectors for individual circumstances to be undertaken according to established practice.

Part 2 of this standard deals with ear-plugs and Part 3¹⁾ with ear-muffs for attachment to safety helmets. An associated European Standard EN 458, covers selection, use, care and maintenance of hearing protection.

Amplitude sensitive hearing protectors as well as the attenuation of hearing protectors when exposed to impulsive noise (peak levels larger than 140 dB) will be dealt with in coming standards.

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of an identical text or by endorsement, at the latest by February 1994, and conflicting national standards shall be withdrawn at the latest by February 1994.

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This European Standard was approved and according to 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 and United Kingdom.

Introduction

The sizing requirements in the standard enable the great majority of the industrial population to be fitted satisfactorily by "Normal size range" size ear-muffs. Populations of other sizes may be accommodated by "Small/Large size range" size ear-muffs, which are required to be accompanied by information regarding the range of sizes which they are designed to fit.

The requirements and tests of the standard are concerned primarily with physical performance. However, the standard also calls for the values of sound attenuation afforded by the ear-muffs, as measured in accordance with EN 24869-1, to be provided in order to assist purchasers in selecting the most appropriate type of ear-muffs for their needs, and minimum values of sound attenuation are specified. A maximum variability in insertion loss, measured objectively after a series of performance tests, is specified.

The objective method is defined in ISO/TR 4869-3. It only facilitates the making of comparative measurements and insertion loss values obtained from its use will differ from the sound attenuation values measured using the procedures given in EN 24869-1. The latter, which require the ear-muffs to be tested whilst being worn by human test subjects, is regarded as providing the reference test method for the measurement of the acoustic performance of hearing protectors.

¹⁾ Currently in draft stage

Hearing protectors - Safety requirements and testing - Part 1: Ear-muffs**1 Scope**

This part of the Standard is concerned with ear muffs and specifies constructional, design and performance requirements, methods of test, marking requirements and user information.

It calls for information to be made available concerning the sound attenuation characteristics of the ear-muffs measured in accordance with EN 24869-1, and defines a minimum level of attenuation required for compliance with this specification.

This part of the Standard does not deal with ear-muffs for attachment to a helmet or which are part of a helmet. Neither does it deal with the performance of electronic devices which may be incorporated within ear-muffs nor amplitude sensitive ear-muffs.

This standard does not deal with the performance of hearing protectors to impulsive noise.

2 Normative references

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.

EN 24869-1:1992 Acoustics - Hearing protectors, Part 1: Subjective method for the measurement of sound attenuation.

ISO/DIS 4869-2:1992 Acoustics - Hearing protectors - Part 2: Estimation of effective A-weighted sound pressure levels when hearing protectors are worn.

ISO/TR 4869-3:1989 Acoustics - Hearing protectors - Part 3: Simplified method for the measurement of insertion loss of ear-muff type protectors for quality inspection purposes.

3 Definitions

For the purposes of this Standard the following definitions apply:

3.1 acoustic test fixture (ATF): A device that approximates certain dimensions of an average adult human head and is used for measuring the insertion loss of ear-muffs, as defined in ISO/TR 4869-3.

3.2 cup: A hollow component which is mounted on the headband and to which a cushion and a liner are usually fitted.

3.3 cushion: A deformable component, usually containing a foam plastic or liquid filling, fitted to the rim of the cup to improve the comfort and fit of the ear-muffs on the head.

3.4 ear-muff: A hearing protector, consisting of a cup to be pressed against each pinna or of a circumaural cup to be pressed against the head around the pinna. The cups can be pressed against the head with a special headband or neckband. Over-the-head, behind-the-head and under-the-chin ear-muffs are designed to be worn with the headband passing over the top of the head, behind the head and under the chin respectively. Universal ear-muffs can be worn in all of these modes.

3.5 headband: A band, usually of metal or plastics, designed to enable the ear-muffs to fit securely around the ears by exerting force against the cups and pressure through the cushions.

3.6 headstrap: A flexible strap fitted to each cup, or to the headband close to the cup. It is designed to support behind-the-head and under-the-chin ear-muffs by passing over, and resting on top of, the head.

3.7 helmet: A device which may or may not include hearing protection and which covers a substantial part of the head.

3.8 insertion loss: The algebraic difference in decibels between the one third octave band sound pressure level, measured by the microphone of the acoustic test fixture in a specified sound field under specified conditions, with the ear-muff absent, and the sound pressure level with the ear-muff on, with other conditions identical.

3.9 liner: Acoustically absorptive material contained within the cup which is intended to increase the attenuation of the ear-muffs at certain frequencies.

3.10 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.

3.11 test depth: Vertical distance between the axis through the centres of the mounting holes of the pinna simulators and the top of the headband support, with the pinna simulators attached with their shorter axes vertical (see figure 1).

3.12 test height: Vertical distance between the axis through the centres of the mounting holes of the pinna simulators and the top of the headband support, with the pinna simulators attached with their longer axes vertical (see figure 1).

3.13 test width: Width between the two centres of the mounting holes for the pinna simulators of the mounting fixture in figure 1.

4 Sizing

The requirements of 6.2 give rise to and accord with the classification of ear-muffs into two types, 'Normal size range' and 'Small/Large size range'.

'Normal size range' ear-muffs are so classified if their adjustability complies with 6.2.1.1 and 6.2.1.2 as appropriate, when assessed at the test dimensions specified in tables 2 and 3.

'Small size range' ear-muffs are so classified if their adjustability complies with 6.2.2.1 and 6.2.2.2 as appropriate, when assessed at the test dimensions specified in tables 2 and 3.

'Large size range' ear-muffs are so classified if their adjustability complies with 6.2.3.1 and 6.2.3.2 as appropriate, when assessed at the test dimensions specified in tables 2 and 3.

'Small/large size range' ear-muffs shall be accompanied by the information specified in 8.1 g).

5 Materials and construction

5.1 Materials

5.1.1 Those parts of the ear-muff that may come into contact with the skin shall be non-staining, soft, pliable and not known to be likely to cause skin irritation, allergic reaction or any other adverse effect on health.

5.1.2 All materials shall be visibly unimpaired after cleaning by the method specified by the manufacturer.

5.2 Construction

5.2.1 All parts of the ear-muffs shall be radiused, finished smooth and be free from sharp edges.

5.2.2 Ear-muffs whose cushions and/or liners are intended by the manufacturers to be replaced by the wearer shall not require the use of tools for this purpose.

5.2.3 All universal ear-muffs shall be provided with a headstrap

Ear-muffs that are suitable for wearing only in the behind-the-head or under-the-chin modes, and that have a mass in excess of 150 g, shall be provided with a headstrap.

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6 Performance

6.1 General

The requirements specified in 6.2 to 6.12 shall be satisfied.

Specimens of ear-muffs shall be conditioned and tested as specified in 7.1.1 and 7.1.2. The scheme of testing shall be as specified in 7.1.3.

6.2 Adjustability

When tested in accordance with 7.2.

6.2.1 'Normal size range' ear-muffs

6.2.1.1 Over-the-head and under-the-chin ear-muffs

For each of the combinations of test dimensions shown by the letter N in table 2, the range of adjustment of the cups/headband and of the width between the cushions shall enable the ear-muffs to be fitted to the fixture.

6.2.1.2 Behind-the-head ear-muffs

For each of the combinations of test dimensions shown by the letter N in table 3, the range of adjustment of the cups/headband and of the width between the cushions shall enable the ear-muffs to be fitted to the fixture.

6.2.2 'Small size range' ear-muffs

6.2.2.1 Over-the-head and under-the-chin ear-muffs

For each of the combinations of test dimensions shown by the letter S in table 2, the range of adjustment of the cups/headband and of the width between the cushions shall enable the ear-muffs to be fitted to the fixture.

6.2.2.2 Behind-the-head ear-muffs

For each of the combinations of test dimensions shown by the letter S in table 3, the range of adjustment of the cups/headband and of the width between the cushions shall enable the ear-muffs to be fitted to the fixture.

6.2.3 Large size range ear-muffs

6.2.3.1 Over-the-head and under-the-chin ear-muffs

For each of the combinations of test dimensions shown by the letter L in table 2, the range of adjustment of the cups/headband and of the width between the cushions shall enable the ear-muffs to be fitted to the fixture.

6.2.3.2 Behind-the-head ear-muffs

For each of the combinations of test dimensions shown by the letter L in table 3, the range of adjustment of the cups/headband and of the width between the cushions shall enable the ear-muffs to be fitted to the fixture.

6.3 Cup rotation

When tested in accordance with 7.3, the contact between the cushions and the plates of the fixture shall be continuous insofar as it provides an unbroken barrier between the inside and outside perimeter of the cushions.

6.4 Headband force

When tested in accordance with 7.4, the headband force shall be not greater than 14N.

6.5 Cushion pressure

When tested in accordance with 7.5, the cushion pressure shall be not greater than 4500 Pa.

6.6 Resistance to damage when dropped

Unless 6.7 is to be satisfied, the ear-muffs (except for replaceable cushions) shall not crack when tested in accordance with 7.6. Neither shall any part of the ear-muffs become detached, such that correct re-assembly requires the use of either a tool or a replacement part.

6.7 Resistance to low temperature (optional)

When tested in accordance with 7.7 the ear-muffs (except for replaceable cushions) shall not crack. Neither shall any part of the ear-muffs become detached, such that correct re-assembly requires the use of either a tool or a replacement part.

6.8 Change in headband force (including optional resistance to high temperature)

The headband force shall not change by more than $\pm 20\%$ from that measured in accordance with 7.4 after the ear-muffs have been subjected to the appropriate conditioning and tests specified in 7.1.3.1 to 7.1.3.12.

6.9 Insertion loss

The standard deviations reported in accordance with 7.11.4, shall be not greater than 4,0 dB in four or more adjacent one-third octave bands, and not greater than 7,0 dB in any individual one-third octave band.

6.10 Resistance to leakage

In the case of liquid filled cushions, they shall not leak when the ear-muffs are tested in accordance with 7.12.

6.11 Ignitability

When tested in accordance with 7.13 no part of the ear-muffs shall ignite or continue to glow after the removal of the heated rod.

6.12 Minimum attenuation

When tested in accordance with 7.14 the values ($M_r - s_r$) of the ear-muff shall be not less than the data in table 1.

M_r are the mean attenuation data and s_r the standard deviations according to EN 24869-1.

Table 1: Attenuation requirement for ear-muffs

f in Hz	125	250	500	1000	2000	4000	8000
($M_r - s_r$) in dB	-5	8	10	12	12	12	12

7 Testing

7.1 Specimens, Conditioning and Scheme of testing

7.1.1 Specimens

Ear-muffs shall be submitted for testing in the condition in which they are offered for sale. Ten specimens shall be submitted and they shall be numbered 1 to 10.

7.1.2 Conditioning and testing atmosphere

All specimens shall be conditioned and tested in an atmosphere having a temperature of $22^\circ\text{C} \pm 5^\circ\text{C}$ and a relative humidity of not more than 85%, unless required otherwise by the test procedure.

7.1.3 Scheme of testing

NOTE: Testing may be discontinued in the event of a specimen failing to satisfy the respective requirement.

The scheme of testing for the ten specimens shall be as follows (see table 4).

7.1.3.1 Unpack all ear-muffs completely.

7.1.3.2 Condition all specimens for not less than 4 h in the atmosphere specified in 7.1.2.

7.1.3.3 Weigh each specimen and report the mean mass of the ten specimens to the nearest gram.

The scheme of testing for specimens 1 to 6 shall be as follows:

7.1.3.4 Check each specimen for compliance with the requirements of 6.2 adjustability, 6.3 cup rotation, 6.4 headband force and 6.5 cushion pressure.

7.1.3.5 Unless the optional low temperature performance requirement of 6.7 is to be tested, check each specimen for compliance with the requirements of 6.6 resistance to damage when dropped.

7.1.3.6 Optionally, check each specimen for compliance with the requirements of 6.7 resistance to low temperature.

7.1.3.7 Subject each specimen to 7.8 headband flexing.

7.1.3.8 Remove the cups (if possible) or the cushions and liners from each of the cups of each specimen, identifying the cups or liners to enable subsequent identical re-assembly. If the cups are not removable and cushions or liners are not removable and/or replaceable, the cushions and liners shall be protected from the water immersion during the testing.

7.1.3.9 Unless the optional high temperature conditioning of 7.1.3.10 is to be performed, subject each specimen to 7.9 water immersion.

7.1.3.10 Optionally, subject each specimen to 7.10, conditioning at high temperature.

7.1.3.11 Remove each specimen from the water bath noting the time of removal and re-fit the cups (if removed). Remove excess water. If the liners were removed, re-fit them, and for all specimens with replaceable cushions fit new cushions to each of the cups in accordance with the manufacturer's instructions.

7.1.3.12 Condition each specimen for 60 min \pm 5 min, measured from the time of removal from the water bath in 7.1.3.11, under the conditions specified in 7.1.2, and then immediately measure the headband force in accordance with 7.4.

7.1.3.13 Condition each specimen for not less than 16 hours under the conditions specified in 7.1.2.

Continue with the scheme of testing for all 10 specimens as follows:

7.1.3.14 Measure the insertion loss of each cup of each specimen in accordance with 7.11.