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EN 352-1:2002

Hearing protectors —
General requirements —
Part 1: Ear-Muffs

прийнято як національний стандарт
методом підтвердження за позначенням

ДСТУ EN 352-1:2017
(EN 352-1:2002, IDT)

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EN 352-1

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English version

Hearing protectors - General requirements - Part 1: Ear-Muffs

Protecteurs individuels contre le bruit - Exigences générales - Partie 1: Serre-tête

Gehörschützer - Allgemeine Anforderungen - Teil 1: Kapselgehörschützer

This European Standard was approved by CEN on 18 August 2002.

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 Management Centre or to any CEN 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 CEN member into its own language and notified to the Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Ref. No. EN 352-1:2002 E

Contents

Foreword

This document (EN 352-1:2002) has been prepared by Technical Committee CEN/TC 159, "Hearing protectors", the secretariat of which is held by SIS.

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of an identical text or by endorsement, at the latest by April 2003, and conflicting national standards shall be withdrawn at the latest by April 2003.

This document supersedes EN 352-1:1993.

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

For relationship with EU Directive(s), see informative annex ZA, which is an integral part of this document.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Annex A is informative.

Introduction

This standard for ”Hearing Protectors - General requirements - Ear-muffs”, sets requirements for personal hearing protection devices in relation to Directive 89/686/EEC - Personal Protective Equipment.

The particular requirement in relation to the ability of hearing protectors to reduce noise below daily limit levels is addressed in the standard by requiring the sound attenuation of the hearing protectors, measured in accordance with EN 24869-1, to be not less than a specified minimum. Further, by requiring that the measured sound attenuation be declared, the selection of suitable hearing protectors for individual circumstances may be undertaken according to established practice.

EN 352-1 deals with requirements for ear-muffs, EN 352-2 with ear-plugs, EN 352-3 with ear-muffs attached to industrial safety helmets. EN 13819 deals with testing plans common to all types of hearing protectors covered by this series of ENs, and is in two Parts; Part 1: Physical test methods, and Part 2: Acoustic test methods.

Additional safety requirements and the associated test procedures for level-dependent ear-muffs are contained in EN 352-4, for ear-muffs with active noise reduction in prEN 352-5, for ear-muffs with audio communications in prEN 352-6 and for level-dependent ear-plugs in prEN 352-7.

The Parts of EN 352, other than Parts 1, 2 and 3, cover the performance of functions additional to passive hearing protection. Hearing protectors which incorporate one or more of these functions are subject to the requirements and tests of each of the relevant Parts of EN 352, including Parts 1, 2 or 3, as appropriate.

An associated standard EN 458 covers selection, use, care and maintenance of hearing protectors.

The requirements of the standard are concerned primarily with the physical and acoustic performance of the ear-muffs.

The sizing requirements enable the great majority of the industrial population to be fitted satisfactorily by ”medium size range” ear-muffs. Populations of other sizes may be accommodated by ”small size range” or ”large size range” ear-muffs, which are required to be accompanied by information regarding the range of sizes which they are designed to fit.

The standard also calls for the values of sound attenuation afforded by the ear-muffs (measured in accordance with EN 24869-1) in order to assist purchasers in selecting the most appropriate model of ear-muffs for their needs. Minimum values of sound attenuation are also specified.

A maximum variability in insertion loss, measured objectively after a series of performance tests, is specified. The objective test method only facilitates the making of comparative measurements, and the insertion loss values obtained will differ from the measured sound attenuation values.

The latter, which require the ear-muff 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 Scope

This part of the standard specifies requirements for construction, design, performance, marking and user information for ear-muffs.

In particular, it specifies the sound attenuation of the ear-muffs, measured in accordance with EN 24869-1.

This part of the standard does not deal with ear-muffs for attachment to a helmet or which are part of a helmet.

Ergonomic aspects are addressed by taking into account, within the requirements, the interaction between the wearer, the device and where possible the working environment in which the device is likely to be used (see Annex ZA and EN 458).

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 (including amendments).

EN 13819-1:2002*, Hearing protectors - Testing - Part 1: Physical test methods*

EN 13819-2:2002*, Hearing protectors - Testing - Part 2: Acoustic test methods*

EN ISO 4869-2, *Acoustics - Hearing protectors - Part 2: Estimation of effective A-weighted sound pressure levels when hearing protectors are worn (ISO 4869-2:1994)*

3 Terms and definitions

For the purposes of this European Standard, the following terms and definitions apply:

3.1
cup
hollow component which is mounted on the equivalent headband and to which a cushion and a liner are usually fitted

3.2
cushion
deformable component, usually containing a foam plastic or fluid filling, fitted to the rim of the cup to improve the comfort and fit of the ear-muffs on the head

3.3
liner
acoustically absorptive material contained within the cup which is intended to increase the attenuation of the ear-muffs at certain frequencies

3.4
ear-muff
hearing protector consisting of a cup to be pressed against each pinna or of a circumaural cup to be pressed against the head around each pinna. The cups may be pressed against the head with a headband or by means of a device attached to a safety helmet or other equipment

3.4.1
over-the-head ear-muff
ear-muff designed to be worn with the headband passing over the top of the head

3.4.2
behind-the-head ear-muff
ear-muff designed to be worn with the headband passing behind the head

3.4.3
under-the-chin ear-muff
ear-muff designed to be worn with the headband passing under the chin

3.4.4
universal ear-muff
ear-muff designed to be worn as an over-the-head, a behind-the-head and an under-the-chin ear-muff

3.5
headband
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
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
insertion loss
mean 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 hearing protector absent, and the sound pressure level with the hearing protector on, with other conditions identical

3.8
sound attenuation
for a given test signal, the mean difference in decibels between the threshold of hearing with and without the hearing protector in place, for a panel of test subjects

3.9
hygiene covers
temporary, disposable covers fitted over the cushions and intended to protect them from the effects of dirt, perspiration, cosmetics, etc

4 Requirements

4.1 Sizing

Ear-muffs shall be classified into three size ranges, ‘Medium size range’, ‘Small size range’ and ‘Large size range'.

‘Medium size range' ear-muffs shall be so classified if their adjustability complies with clause 4.3.2.2 a) and 4.3.2.2 b), as appropriate.

'Small size range' ear-muffs shall be so classified if their adjustability complies with 4.3.2.3 a) and 4.3.2.3 b), as appropriate.

'Large size range' ear-muffs shall be so classified if their adjustability complies with 4.3.2.4 a) and 4.3.2.4 b), as appropriate.

'Small size range’ and ‘large size range' ear-muffs shall be accompanied by the information specified in 6.2 g).

NOTE A model of ear-muffs may fall into more than one size range.

4.2 Materials and construction

4.2.1 Materials

4.2.1.1 Those parts of the ear-muffs 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.

4.2.1.2 All materials shall be visibly unimpaired after cleaning and disinfection by the methods specified by the manufacturer.

4.2.2 Construction

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

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

4.2.2.3 All universal ear-muffs that have a mass in excess of 150 g shall be provided with a headstrap.

4.2.2.4 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.

4.3 Performance

4.3.1 General

The requirements of 4.3.2 to 4.3.12 shall be satisfied.

Ear-muffs shall be conditioned and tested in accordance with EN 13819-1:2002, 4.1.1, 4.1.2 and 4.1.3.

4.3.2 Sizing and adjustability

4.3.2.1 General

Sizing and adjustability shall be tested in accordance with EN 13819-1:2002, 4.2 and the following requirements satisfied, as appropriate.

In the case of ear-muffs incorporating a means to adjust the headband force, these requirements shall be satisfied at both the maximum and the minimum force setting.

4.3.2.2 ‘Medium size range' ear-muffs

a) Over-the-head ear-muffs

For each of the combinations of test dimensions shown by the letter M in EN 13819-1:2002, Table 1, 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.

b) Behind-the-head and under-the-chin ear-muffs

For each of the combinations of test dimensions shown by the letter M in EN 13819-1:2002, 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.

4.3.2.3 'Small size range' ear-muffs

a) Over-the-head ear-muffs

For each of the combinations of test dimensions shown by the letter S in EN 13819-1:2002, Table 1, 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.

b) Behind-the-head and under-the-chin ear-muffs

For each of the combinations of test dimensions shown by the letter S in EN 13819-1:2002, 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.

4.3.2.4 'Large size range' ear-muffs

a) Over-the-head ear-muffs

For each of the combinations of test dimensions shown by the letter L in EN 13819-1:2002, Table 1, 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.

b) Behind-the-head and under-the-chin ear-muffs

For each of the combinations of test dimensions shown by the letter L in EN 13819-1:2002, 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.

4.3.3 Cup rotation

When tested in accordance with EN 13819-1:2002, 4.3, 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.

4.3.4 Headband force

When tested in accordance with EN 13819-1:2002, 4.4, the headband force of each specimen shall not be greater than 14 N. In the case of ear-muffs incorporating means to adjust this force, it shall be possible to adjust the force to 14 N or less.

4.3.5 Cushion pressure

When tested in accordance with EN 13819-1:2002, 4.5, the cushion pressure of each specimen shall be not greater than 4500 Pa. For ear-muffs incorporating means to adjust the headband force, this requirement shall apply to the maximum force setting or 14 N, whichever is the lower.

4.3.6 Resistance to damage when dropped

Unless 4.3.7 is to be satisfied, the ear-muffs (except for replaceable cushions) shall not crack when tested in accordance with EN 13819-1:2002, 4.6. 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.

4.3.7 Resistance to damage when dropped at low temperature (optional)

When tested in accordance with EN 13819-1:2002, 4.7, 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.

4.3.8 Change in headband force (including optional water immersion - headband under stress)

The headband force of each specimen shall not change by more than ± 15 % from that reported at 4.3.4 after the ear-muffs have been subjected to the appropriate conditioning and tests specified in EN 13819-1:2002, 4.1.3.7 a) to 4.1.3.7 i). If the headband force was reported at 4.3.4, at more than one size adjustment, the ± 15 % limit shall apply only to the size adjustment which gave the highest initial force. Additionally, and in all cases, the final headband force of each specimen shall not exceed 14 N.

4.3.9 Insertion loss

The standard deviations reported in accordance with EN 13819-2:2002, 4.1 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.

4.3.10 Resistance to leakage

In the case of fluid filled cushions, they shall not leak when the ear-muffs are tested in accordance with EN 13819-1:2002, 4.12.

4.3.11 Ignitability

When tested in accordance with EN 13819-1:2002, 4.13, no part of the ear-muffs shall ignite upon application of the heated rod nor continue to glow after removal of the heated rod.

4.3.12 Minimum attenuation

When tested in accordance with EN 13819-2:2002, 4.2, the values (M_f - s_f) of the ear-muffs shall be not less than the values given in Table 1 of this standard.

Table 1: Minimum attenuation requirement

Frequency in Hz	125	250	500	1000	2000	4000	8000
(M_f - s_f) in dB	5	8	10	12	12	12	12

M_f are the mean attenuation data and s_f the standard deviations as measured in accordance with EN 13819-2:2002.

5 Marking

The ear-muffs shall be durably marked with the following information:

a) the name, trade mark or other identification of the manufacturer or his authorised representative;

b) the model designation;

c) the number of this EN Standard, i.e.the generic mark “EN 352”

NOTE A product can also meet other parts of the EN 352 series simultaneously.

d) in the case of ear-muffs intended by the manufacturer to be worn in a particular orientation, an indication of the FRONT and/or TOP of the cups, and/or an indication of LEFT and RIGHT cup.

6 Information supplied by the manufacturer

6.1 General

Information in accordance with 6.2 and 6.3 shall be provided at least in the official language(s) of the European state of destination.

6.2 Wearer information

The following information for the wearer shall be supplied with the ear-muffs (as appropriate):

a) the number of this European standard, i.e. EN 352-1:2000;

b) the name, trade mark or other means of identification of the manufacturer or his authorised representative;

c) the model designation;

d) as appropriate the statement(s):

"This model of ear-muffs has satisfied the optional requirements at +50 °C."

"This model of ear-muffs has satisfied the optional requirements at –20 °C."

NOTE These statements may be combined.

e) materials of the headband (see 3.5) and of the cushions (see 3.2);

f) method of fitting/adjustment, including instructions regarding the setting of any means to adjust the headband force;

g) the size range(s) of the ear-muffs for each mode of wearing, as determined in 4.1, on both the packaging/box and in wearer information:

for 'small size range' and 'large size range' (but not for 'medium size range') ear-muffs, the statements:

On packaging/box

"Warning: Small size range or large size range (as appropriate) ear-muffs. Refer to wearer information."

In wearer information

"Warning: These ear-muffs are of 'small size range' or 'large size range' (as appropriate). Ear-muffs complying with EN 352-1 are of 'medium size range' or 'small size range' or 'large size range'. 'Medium size range' ear-muffs will fit the majority of wearers. 'Small size range' or 'large size range' ear-muffs are designed to fit wearers for whom 'medium size range' ear-muffs are not suitable."

h) for each mode of wearing (as defined in 3.4), the following sound attenuation values:

1) mean value and standard deviation at each test frequency;

2) APV-value at each test frequency in accordance with EN ISO 4869-2 with the parameter $\alpha = 1$;

3) H-, M- and L- value in accordance with EN ISO 4869-2 with the parameter $\alpha = 1$;

4) SNR-value in accordance with EN ISO 4869-2 with the parameter $\alpha = 1$;

Each set of values shall be given equal prominence.

i) recommendation that the wearer should ensure that:

1) the ear-muffs are fitted, adjusted and maintained in accordance with the manufacturer's instructions;

2) the ear-muffs are worn at all times in noisy surroundings;

3) the ear-muffs are regularly inspected for serviceability;

j) a warning that, if the recommendations given in 6.2 i) are not adhered to, the protection afforded by the ear-muffs will be severely impaired;

k) methods of cleaning and disinfection which shall specify, and require the use of, agents that are not known to be harmful to the wearer;

l) the statement "This product may be adversely affected by certain chemical substances. Further information should be sought from the manufacturer";

m) the statement " Ear-muffs, and in particular cushions, may deteriorate with use and should be examined at frequent intervals for cracking and leakage, for example";

n) the statement "The fitting of hygiene covers to the cushions may affect the acoustic performance of the ear-muffs";

o) recommended storage conditions before and after use;

p) the designation/reference and other information required when ordering replacement cushions;

q) if appropriate, the method of cushion replacement;

r) the mean mass of the ear-muffs to the nearest gram;

s) the address from which additional information can be obtained.

6.3 Additional information

The following information shall be available from the manufacturer on request:

a) range of head sizes fitted;

b) information as specified in 6.2;

c) results of tests performed in accordance with this standard;

d) the name and country of the test laboratory which performed the tests specified in 6.3 c) and the date of the tests.

Annex A
(informative)

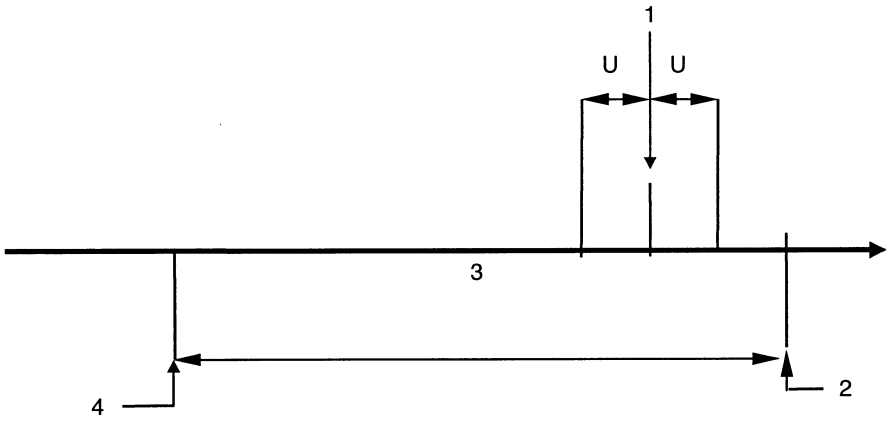
Uncertainty of measurement and interpretation of test results

For each of the required measurements performed in accordance with this standard, a corresponding estimate of the uncertainty of measurement should be evaluated.

This estimate of uncertainty should be applied and stated when reporting test results, in order to enable the user of the test report to assess the reliability of the data.

The following protocol with regard to uncertainty of measurement should be applied to test results:

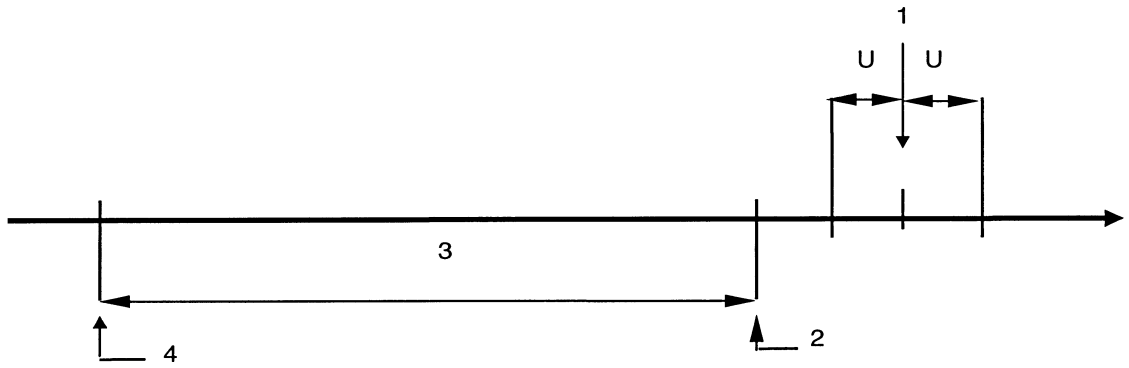
If the limit value for the particular test given in the standard falls outside of the range of values calculated from the test data plus/minus the estimated uncertainty of measurement (U), then the result should be deemed to be a straightforward pass or fail (Figures A.1 and A.2).



Key

1 Result of a measurement
2 Upper specification limit (USL)
3 Specification range
4 Lower specification

Figure A.1 — Result pass

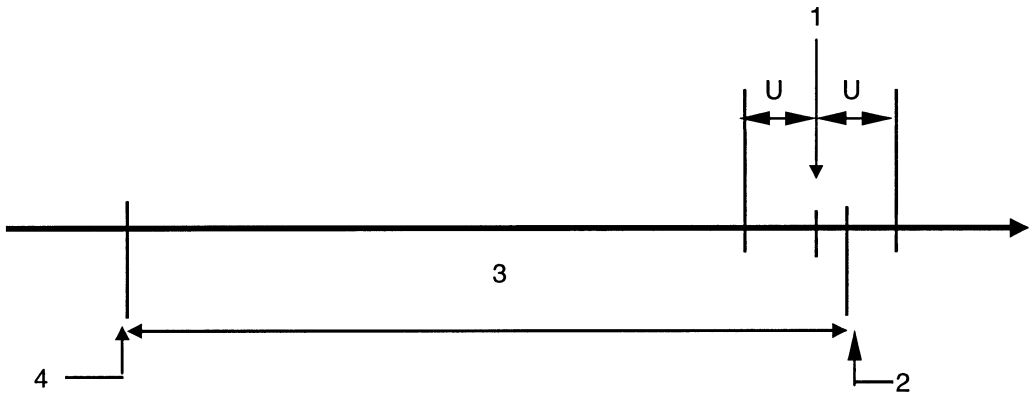


Key

1 Result of measurement
2 Upper specification limit (USL)
3 Specification range
4 Lower specification limit (LSL)

Figure A.2 — Result fail

If the limit value for the particular test given in the standard falls within the range of values calculated from the test data plus/minus the estimated uncertainty of measurement U), then the assessment of pass or fail should be determined on the basis of safety, that is, considering the safest conditions for the user of the PPE (Figure A.3).



Key

1 Result of measurement
2 Upper specification limit (USL)
3 Specification range
4 Lower specification limit (LSL)

Figure A.3 — Result fall

Annex ZA
(informative)

Clauses of this European standard addressing essential requirements or other provisions of EU Directives

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association and supports essential requirements of EU Directive:

-89/686/EEC.

Compliance with this Standard provides one means of conforming with the specific essential requirements of the Directiv concerned and associated EFTA Regulations.

WARNING: Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

The following clauses of this document are likely to support requirements of Directive 89/686/EEC, Annex II

Table ZA.1

Essential requirements of Directive 89/686/EEC	**Clauses of this European standard**
1.1 Design principles	
1.1.1 Ergonomics	Scope, 4
1.1.2 Levels and classes of protection	
1.1.2.1 Highest level of protection possible	4.3.12
1.1.2.2 Classes of protection appropriate to different levels of risk	4.3.12, 6.2
1.2 Innocuousness of PPE	
1.2.1 Absence of risks and other inherent nuisance factors	4.2.1.1, 4.3.4, 4.3.5, 4.3.11
1.2.1.1 Suitable constituent materials	4.2.1.1
1.2.1.2 Satisfactory surface condition of all PPE parts in contact with the user	4.2.2.1
1.2.1.3 Maximum permissible user impediment	6.2
1.3 Comfort and efficiency	
1.3.1 Adaptation to users morphology	4.2.2, 4.3.2, 4.3.3, 4.3.4, 4.3.5
1.3.2 Lightness and design strength	4.3.6, 4.3.7, 4.3.8, 4.3.10
1.3.3 Compatibility of different classes or types of PPE designed for simultaneous use	6.2
1.4 Information supplied by the manufacturer	6
2.1 PPE incorporating adjustment systems	4.3.2
2.4 PPE subject to ageing	6.2
2.9 PPE incorporating components which can be adjusted or removed by the user	4.2.2.2, 4.3.2, 6.2
2.12 PPE bearing one or more identification or recognition marks directly or indirectly relating to health and safety	5
3.5 Protection against the harmful effect of noise	4.3.12

Compliance with the clauses of this standard provides one means of conforming with the specific essential requirements of the Directive concerned and associated EFTA regulations.

Bibliography

prEN 458, Hearing protectors - Recommendations for selection, use, care and maintenance – Guidance document

EN 24869-1, Acoustics – Hearing protectors – Part 1: Subjective method for the measurement of sound attenuation (ISO 4869-1:1990)