SLOVENSKI STANDARD
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Varovala sluha - Preskušanje - 2. del: Akustične preskusne metode

Hearing protectors - Testing - Part 2: Acoustic test methods

Gehörschützer - Prüfung - Teil 2: Akustische Prüfverfahren

Protecteurs individuels contre le bruit - Essais - Partie 2: Méthodes d'essai acoustique

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13.340.20 Varovalna oprema za glavo Head protective equipment

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EUROPEAN STANDARD

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Hearing protectors - Testing - Part 2: Acoustic test methods

Protecteurs individuels contre le bruit - Essais - Partie 2 : Méthodes d'essai acoustique

Gehörschützer - Prüfung - Teil 2: Akustische Prüfverfahren

This European Standard was approved by CEN on 24 February 2020.

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

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European foreword

This document (EN 13819-2:2020) has been prepared by Technical Committee CEN/TC 159 “Hearing protectors”, the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by May 2021, and conflicting national standards shall be withdrawn at the latest by May 2021.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document will supersede EN 13819-2:2002.

In comparison with the previous edition, the following technical modifications have been made:

— 4.2.3 some details on the test procedure for the sound attenuation of earplugs and custom moulded earplugs added;

— 4.3 of EN 13819-2:2002 (Sound level effective to the ear (earmuffs only)) deleted;

— Annex ZA of EN 13819-2:2002 deleted.

The technical changes referred to include the significant technical changes from the European Standard revised but is not an exhaustive list of all modifications from the previous edition.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

This document specifies procedures for the testing of personal hearing protection devices in relation to Regulation (EU) 2016/425 - Personal Protective Equipment.

A series of standards EN 352 describes product requirements of hearing protectors:

— EN 352-1, *Hearing protectors — General requirements — Part 1: Earmuffs*

— EN 352-2, *Hearing protectors — General requirements — Part 2: Earplugs*

— EN 352-3, *Hearing protectors — General requirements — Part 3: Earmuffs attached to head protection and/or face protection devices*

— EN 352-4, *Hearing protectors — Safety requirements — Part 4: Level-dependent earmuffs*

— EN 352-5, *Hearing protectors — Safety requirements — Part 5: Active noise reduction earmuffs*

— EN 352-6, *Hearing protectors — Safety requirements — Part 6: Earmuffs with safety-related audio input*

— EN 352-7, *Hearing protectors — Safety requirements — Part 7: Level-dependent earplugs*

— EN 352-8, *Hearing protectors — Safety requirements — Part 8: Entertainment audio earmuffs*

— EN 352-9, *Hearing protectors — Safety requirements — Part 9: Earplugs with safety-related audio input*

— EN 352-10, *Hearing protectors — Safety requirements — Part 10: Entertainment audio earplugs*

Test methods for these requirements are described in the series of standards EN 13819:

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

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

— EN 13819-3, *Hearing protectors — Testing — Part 3: Supplementary acoustic test methods*

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

EN 13819-2 is intended as a supplement to the specific product standards for hearing protectors.

4.1 specifies a method of measuring the insertion loss of earmuffs using an acoustic test fixture.

4.2 specifies a method of measuring the sound attenuation of hearing protectors using human test subjects.

The performance requirements are given in the hearing protector product standard.

1 Scope

This document specifies acoustic test methods for hearing protectors. The purpose of these tests is to enable assessment of the performance of the hearing protector as specified in the appropriate product standard.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN ISO 4869-1:2018, *Acoustics — Hearing protectors — Part 1: Subjective method for the measurement of sound attenuation (ISO 4869-1:2018)*

EN ISO 4869-2:2018, *Acoustics — Hearing protectors — Part 2: Estimation of effective A-weighted sound pressure levels when hearing protectors are worn (ISO 4869-2:2018)*

EN ISO 4869-3:2007, *Acoustics — Hearing protectors — Part 3: Measurement of insertion loss of ear-muff type protectors using an acoustic test fixture (ISO 4869-3:2007)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1
acoustic test fixture
ATF
device that approximates certain dimensions of an average adult human head and is used for measuring the insertion loss of earmuffs

[SOURCE: EN ISO 4869-3:2007, 3.4, modified – The words “and is used for measuring the insertion loss of earmuffs” have been added. The note has been deleted.]

3.2
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

[SOURCE: EN ISO 4869-3:2007, 3.5, modified — The words “mean”, “in a specified sound field under specified conditions” and “with other conditions identical” have been added. “with the hearing protector present” has been replaced by “with the hearing protector on”.]

3.3
sound attenuation
mean difference in decibels between the threshold of hearing with and without the hearing protector in place, for a panel of test subjects, for a given test signal

[SOURCE: EN ISO 4869-1:2018, 3.8, modified — The words “mean” and “in decibels” have been added. The words “for a test subject” have been replaced by “for a panel of test subjects”.]

4 Test methods

4.1 Insertion loss (earmuffs only)

4.1.1 Principle

The insertion loss of each cup of the earmuffs is measured at specified one-third-octave band centre frequencies.

4.1.2 Apparatus

The required equipment, including a suitable acoustic test fixture and test site, is described in EN ISO 4869-3. For mounted earmuffs, a supporting pad, an example of which is shown in Figure 1, shall be fitted to the acoustic test fixture in order adequately to support the complete mounted earmuff in position.

4.1.3 Procedure

Follow the procedure given in EN ISO 4869-3, subject to the following modifications:

a) either the random incidence sound field or the plane progressive wave sound field shall be used. When using the plane progressive wave sound field, if the requirement for insertion loss is not satisfied, the test shall be repeated using the random incidence sound field. If the requirement for insertion loss is then satisfied, this shall be deemed to be the definitive result;

b) the insertion loss shall be measured at all one-third-octave bands from 250 Hz to 8 000 Hz;

c) in the case of universal earmuffs the insertion loss shall be measured in only one mode of wearing, preferably over-the-head;

d) if means to adjust the headband force is incorporated, the force shall be adjusted to its maximum setting;

e) in the case of mounted earmuffs, for a given model of earmuffs fitted to more than one size of the same model of carrier, insertion loss shall be tested using only one size of carrier;

f) in the case of headband or mounted earmuffs with electronic supplementary functions that show – as purposely intended by the manufacturer – different sound attenuation on left and right cups, mean and standard deviation shall be reported separately for left and right cups.

4.1.4 Report

For each centre frequency and for each cup, individual values of insertion loss shall be reported in accordance with 4.1.3 b). For all cups, the mean value and standard deviation at each frequency shall also be reported in accordance with 4.1.3 b).

4.2 Sound attenuation

4.2.1 Principle

The attenuation of the hearing protector is measured at specified one-third-octave band centre frequencies.

4.2.2 Apparatus

The required apparatus, including test sites and sound field, is specified in EN ISO 4869-1.

4.2.3 Procedure

4.2.3.1 Measure the sound attenuation of defined specimens in accordance with EN ISO 4869-1:2018, Clause 4.

4.2.3.2 If means to adjust the headband force is incorporated, adjust the force to its minimum setting.

4.2.3.3 In the case of earplugs, supply each subject with a separate pair of earplugs of appropriate size. If different sizes are available, choose the size that gives the best fit.

4.2.3.4 In case earplugs are provided in different versions that are considered to be equal with respect to attenuation, one measurement should be performed and the samples used for that measurement should include all of the versions.

NOTE Examples of different versions could be earplugs offered in different colours, with different handgrips or with and without a connecting cord.

4.2.3.5 In the case of custom moulded earplugs, impression taking shall be carried out by a trained specialist. A trained specialist should have the appropriate qualification and knowledge of taking ear impressions safely and accurately.

4.2.3.6 In the case of custom moulded earplugs that are provided by the manufacturer to be used with a special cream that eases insertion and improves the fitting the sound attenuation shall be measured without this cream.

4.2.3.7 In the case of mounted earmuffs which do not fit all size ranges according to EN 13819-1:2020, 4.2, ask each test subject if the specimen fits. If it does fit, perform the test. If it does not fit, reject the subject from the panel and provide a replacement for him/her.

4.2.3.8 In the case of universal earmuffs and headband earplugs with different modes of wearing, provide sound attenuation values for each intended mode of wearing. Perform the measurement in one mode, using 16 test subjects. Perform the measurements in the other modes using an abbreviated procedure, as follows:

a) perform the measurement first using only ten test subjects;

b) calculate the values H, M and L in accordance with EN ISO 4869-2 with $\alpha = 1$;

c) compare the values of H, M and L calculated for the first mode of wearing with those calculated in 4.2.3.8 b);