



SLOVENSKI STANDARD
SIST EN 13819-1:2003

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Varovala sluha - Preskušanje - 1. del: Fizikalne preskusne metode

Hearing protectors - Testing - Part 1: Physical test methods

Gehörschützer - Prüfung - Teil 1: Physikalische Prüfverfahren

Protecteurs individuels contre le bruit - Essais - Partie 1: Méthodes d'essai physique

Ta slovenski standard je istoveten z: EN 13819-1:2002

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ICS:

13.340.20 Varovalna oprema za glavo Head protective equipment

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English version

Hearing protectors - Testing - Part 1: Physical test methods

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Méthodes d'essai physique

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Prüfverfahren

This European Standard was approved by CEN on 9 September 2002.

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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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Foreword

This document (EN 13819-1:2002) 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of an identical text or by endorsement, at the latest by June 2003, and conflicting national standards shall be withdrawn at the latest by June 2003.

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 standard.

In this European Standard the annex A is informative.

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.

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Introduction

This standard for "Hearing Protectors - Testing : Part 1 - Physical test methods", specifies procedures for the testing of personal hearing protection devices in relation to Directive 89/686/EEC - Personal Protective Equipment.

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 and consists of two Parts:

Part 1: Physical test methods

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 EN 352-5, for ear-muffs with audio communications in EN 352-6 and for level-dependent ear-plugs in EN 352-7.

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

This standard is intended as a supplement to the specific product standards for hearing protectors.

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

If deviations from the procedures specified in this standard are necessary, these deviations are specified in the hearing protection standard.

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1 Scope

This European Standard EN 13819-1 specifies physical 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

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 352-1:2002, *Hearing protectors - General requirements - Part 1: Ear-muffs*

EN 352-2: 2002, *Hearing protectors - General requirements - Part 2: Ear-plugs*

EN 352-3:2002, *Hearing protectors - General requirements - Part 3: Ear-muffs attached to an industrial safety helmet*

EN 960:1994, *Headforms for use in the testing of protective helmets*

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

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3 Terms and definitions

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For the purposes of this European Standard, the following terms and definitions apply, in addition to those given in EN 352 parts 1, 2 and 3..

3.1

headband ear-muffs

ear-muffs satisfying the requirements of EN 352-1.

3.2

helmet mounted ear-muffs

ear-muffs fitted to a helmet such that the combination satisfies the requirements of EN 352-3.

3.3

test height ¹⁾

vertical distance between the axis through the centres of the mounting holes of the pinna simulators in the mounting fixture or test headform shown in Figures 3 or 4 respectively, and the top of the headband support pad or headform.

¹⁾ The dimensions given in Tables 1, 2, 3, 4, 5, 6 and 7 correspond with the definitions given in 3.3, 3.4 and 3.5 (as appropriate)

3.4
test width¹⁾

horizontal distance between the vertical axes through the centres of the mounting holes for the pinna simulators in the mounting fixture or test headform shown in Figure 3 or 4 respectively.

3.5
test depth¹⁾

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 shown in Figure 3.

3.6
wearing height

vertical distance from the lower edge of the headband of the helmet to the highest point of the test headform on which the helmet is mounted.

NOTE The headband of the helmet is defined in EN 397 as "The part of the harness completely or partly surrounding the head above the eyes at approximately the largest horizontal circumference of the head".

4 Ear-muffs

4.1 Specimens, conditioning and scheme of testing

4.1.1 Specimens

Headband ear-muffs and helmet mounted ear-muffs shall be submitted for testing in the condition in which they are offered for sale.

For headband ear-muffs, 10 specimens shall be submitted and they shall be numbered 1 to 10.

For helmet mounted ear-muffs, 10 basic combination specimens (ear-muffs and helmets) shall be submitted and they shall be numbered 1 to 10 (basic).

If the same model of helmet mounted ear-muffs is to be tested with another model or size of helmet, 6 further supplementary combination specimens (ear-muffs and helmets) for each model or size of helmet shall be submitted. These shall be numbered (in sets) 1 to 6 (supplementary).

4.1.2 Conditioning and testing atmosphere

All specimens shall be conditioned and tested in an atmosphere having a temperature of (22 ± 5) °C and a relative humidity of not more than 85 %, unless required otherwise by the test procedure.

4.1.3 Scheme of testing

4.1.3.1 The 10 headband ear-muffs shall be conditioned and tested in accordance with 4.1.3.2 to 4.1.3.9 and Figure 1.

For helmet mounted ear-muffs, except as specified in the following paragraph, the scheme of testing for the 10 basic combination specimens and, if applicable, the sets of 6 supplementary combination specimens, shall be as given in 4.1.3.2 to 4.1.3.9 and Figure 2.

¹⁾ The dimensions given in Tables 1, 2, 3, 4, 5, 6 and 7 correspond with the definitions given in 3.3, 3.4 and 3.5 (as appropriate)

In the case of helmets supplied in more than one size, one selected size shall be used for testing in a basic combination (except for sound attenuation testing). All other helmet sizes shall be tested in a supplementary combination (except for sound attenuation testing). Sound attenuation testing shall be performed using the complete range of available helmet sizes (see EN 13819-2). If the helmet mounted ear-muff incorporates a means to adjust the headband force, the force shall be adjusted to its minimum setting for all stages of conditioning and testing, unless otherwise specified.

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

4.1.3.2 Unpack all ear-muffs completely.

4.1.3.3 For helmet mounted ear-muffs, each specimen shall be weighed and the mean mass of the 10 specimens shall be reported to the nearest gram.

4.1.3.4 In the case of helmet mounted ear-muffs, the ear-muffs shall be attached to the helmets in accordance with the ear-muffs manufacturer's instructions. The cups/support arms shall be set to the mid-point of the range of their adjustment and set in the position (in-use, stand-by, parking etc) as received from the manufacturer.

4.1.3.5 All specimens shall be conditioned for not less than 4 h in the atmosphere specified in 4.1.2.

4.1.3.6 For headband ear-muffs, each specimen shall be weighed and the mean mass of the 10 specimens shall be reported to the nearest gram.

4.1.3.7 The scheme of testing for specimens 1 to 6 (headband ear-muffs and helmet mounted ear-muffs, basic and supplementary sets) shall be as follows:

- a) Test each specimen in accordance with 4.2, 4.3, 4.4 and 4.5;
- b) Test each specimen in accordance with 4.6, unless (optional) 4.7 is to be performed;
- c) Optionally, test each specimen in accordance with 4.7;
- d) Test each specimen in accordance with 4.8 or, if the specimen is helmet mounted ear-muffs which incorporate a stand-by position, test in accordance with 4.9 (includes support arm flexing);
- e) 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;
- f) Test each specimen in accordance with 4.10, unless (optional) 4.11 is to be performed;
- g) Optionally, test each specimen in accordance with 4.11;
- h) 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;
- i) Condition each specimen for 24 h \pm 10 min, measured from the time of removal from the water bath in h), under the conditions specified in 4.1.2, and then immediately measure the headband force in accordance with 4.4;

NOTE For multiple size range models, use the setting of width and height which gave the highest headband force in 4.4;

- j) For helmet mounted ear-muffs set the cups/support arms to the mid-point of the range of their adjustment, set in the position (in-use, stand-by, parking etc.) as received from the manufacturer.

4.1.3.8 The scheme of testing for all 10 headband ear-muffs specimens or, in the case of helmet mounted ear-muffs, all 10 basic specimens, shall be continued as follows:

- a) Measure the insertion loss of each cup of each specimen in accordance with EN 13819-2:2002, 4.1;

EN 13819-1:2002 (E)

b) Calculate the standard deviation of insertion loss for all 20 cups, using (N-1) weighting for the sample data.

4.1.3.9 The scheme of testing for specimens 5 and 6, or, in the case of helmet mounted ear-muffs, both basic and supplementary specimens 5 and 6, shall be continued as follows:

- a) If appropriate, test both specimens or, in the case of helmet mounted ear-muffs, both basic (only) specimens, in accordance with 4.12;
- b) Assess both specimens, or, in the case of helmet mounted ear-muffs, both basic and supplementary specimens, for compliance with EN 352-1:2002, 4.2 or EN 352-3:2002, 4.2, as appropriate;
- c) Test both specimens, or, in the case of helmet mounted ear-muffs, both the basic and, if required by EN 352-3:2002, 4.3.4, the supplementary specimens, in accordance with 4.13.

4.1.3.10 The scheme of testing for specimens 1 to 4, or, in the case of helmet mounted ear-muffs, both basic and supplementary specimens 1 to 4, shall be continued as follows:

Measure the sound attenuation of the specimens in accordance with EN 13819-2:2002, 4.2.

4.2 Adjustability

4.2.1 Principle

The ability of the ear-muffs to be adjusted to fit specified test dimensions is assessed using a suitable mounting fixture (headband ear-muffs) or test headforms (helmet mounted ear-muffs).

4.2.2 Apparatus

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4.2.2.1 Mounting fixture

The outline of an example is shown in Figure 3. [SIST EN 13819-1:2003](https://standards.iteh.ai/catalog/standards/sist/cc7a1eac-9df3-4114-915f-71c38bcfdc83/sist-en-13819-1-2003)
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4.2.2.2 Test headforms

These shall be in accordance with the dimensions given in EN 960:1994, for sizes B, J and N. Details are given in Figure 4.

4.2.2.3 Pinna simulators

The required dimensions are shown in Figure 5.

4.2.2.4 Non-planar cushion adaptor

For ear-muffs with non-planar cushions, the manufacturer shall supply suitable adaptors which shall be fitted to the mounting fixture, such that, when the ear-muffs are then fitted to the mounting fixture, and with the plates of the latter set parallel, the centres of the openings of the ear-muffs cushions lie on the horizontal axis through the centre of the force transducer.

4.2.3 Procedure

4.2.3.1 Headband ear-muffs

4.2.3.1.1 Fit the pinna simulators to the plates of the apparatus so that their longer axes are vertical for over-the-head and under-the-chin ear-muffs or so that their shorter axes are vertical for behind-the-head ear-muffs.

4.2.3.1.2 Adjust the cups/headband to their longest position and, if the ear-muffs incorporate a means to adjust the headband force, adjust the force to its maximum setting.

4.2.3.1.3 Place the ear-muffs on the fixture so that the headband is vertical and the pinna simulators are enclosed by the cushions.

4.2.3.1.4 Adjust the separation of the plates and the height of the headband support to correspond in turn and as appropriate with each of the combinations of dimensions of width and height respectively shown in Table 1 or Table 2, as appropriate.

4.2.3.1.5 For each of the combinations of dimensions of width and height respectively, check whether the range of adjustment of the cups/headband and of the width between the cushions enable the ear-muffs to be fitted so that:

- a) for over-the-head ear-muffs, the internal apex of the headband touches the headband support pad, or, for behind-the-head or under-the-chin ear-muffs, the internal apex of the headband touches or lies beyond the headband support pad;

NOTE For those ear-muffs, which, because of their design, cannot be assessed correctly by this method (for example, those behind-the-head ear-muffs where the headband is designed to pass only around the back of the neck), this test is performed using the appropriate test headforms as specified in EN 960:1994, sizes B, J and N (full headforms, including chin and neck), fitted with pinna simulators at the heights given in figure 4 appropriate to the ear-muff size range.

- b) the contact between the cushions and the plates of the fixture is continuous insofar as it provides an unbroken barrier between the inside and outside perimeters of the cushions.

NOTE Discontinuity in contact between the cushions and the plates is acceptable in the region where the pinna simulator mounting area (46 mm x 10 mm) lies on the plates.

4.2.3.1.6 If the ear-muffs incorporate a means to adjust the headband force, adjust the force to its minimum setting and repeat steps 4.2.3.1.4 and 4.2.3.1.5.

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**Table 1 — Test dimensions – adjustability
(over-the-head and under-the-chin ear-muffs)**

Test height mm	Test width mm		
	125	145	155
115	S	S/M	--
130	S/M	S/M/L	M/L
140	--	M/L	L
M indicates ear-muffs of 'medium' size range; S indicates ear-muffs of 'small' size range; L indicates ear-muffs of 'large' size range; -- indicates no requirement.			

**Table 2 — Test dimensions - adjustability
(behind-the-head ear-muffs)**

Test depth mm	Test width mm		
	125	145	155
75	S	S/M	--
90	S/M	S/M/L	M/L
105	--	M/L	L
M indicates ear-muffs of 'medium' size range; S indicates ear-muffs of 'small' size range; L indicates ear-muffs of 'large' size range; -- indicates no requirement.			

NOTE 1 The dimensions given in Tables 1 and 2 have been chosen to cover appropriate combinations of the head width, head height and head depth of the 5th, 50th and 95th percentiles of the adult population.

NOTE 2 If non-planar cushion adaptors are fitted to the mounting fixture, test width is the dimension between the two outermost points of the cushion adaptors measured along the horizontal axis through the centre of the force transducer.

4.2.3.2 Helmet mounted ear-muffs

4.2.3.2.1 Fit the pinna simulators to the side plates of the test headforms so that their longer axes are vertical and coincident with the transverse vertical axis of the headform. Adjust their vertical position as necessary to correspond with the test heights given in Table 3.

4.2.3.2.2 Adjust the harness of the helmet to give the minimum wearing height and the maximum external vertical distance, in accordance with the helmet manufacturer’s instructions.

NOTE This adjustment assumes continuing compliance of these dimensions with the requirements of EN 397.

4.2.3.2.3 If the helmet mounted ear-muffs incorporates a means to adjust the headband force, adjust the force to its maximum setting.

4.2.3.2.4 Place the helmet mounted ear-muff on each headform in turn, in the as-worn position, and so that the pinna simulators are enclosed by the cushions. Maintain the helmet in position by the application of a force of nominally 50 N acting along the vertical axis.

4.2.3.2.5 For each of the combinations of dimensions of width and height respectively shown in Table 3, check whether the adjustment of the cups/support arms and of the width between the cushions enable the helmet mounted ear-muff to be fitted to the fixture so that:

- a) the contact between the cushions and the plates of the headform is continuous insofar as it provides an unbroken barrier between the inside and outside perimeters of the cushions;

NOTE Discontinuity in contact between the cushions and the plates is acceptable in the region where the pinna simulator mounting area (46 mm x 10 mm) lies on the plates and in any region where the headband of the helmet harness lies under the cushions.

- b) the stand-by position of the ear-muffs is not induced.

4.2.3.2.6 If the helmet mounted ear-muffs incorporate a means to adjust the headband force, adjust the force to its minimum setting and repeat steps 4.2.3.2.4 and 4.2.3.2.5.

Table 3 — Test dimensions – adjustability (helmet mounted ear-muffs)

Test height mm	Test width mm		
		125	145
115	S	S/M	M/L
130	S/M	S/M/L	M/L
140	--	M/L	L
Corresponding EN 960 test headform	B	J	N
M indicates ear-muffs of 'medium' size range. S indicates ear-muffs of 'small' size range. L indicates ear-muffs of 'large' size range. -- indicates no requirement.			

NOTE 1 The dimensions given in Table 3 have been chosen to cover appropriate combinations of the head width and head height of the 5th, 50th and 95th percentiles of the adult population.

NOTE 2 If non-planar cushion adaptors are fitted to the mounting fixture, test width is the dimension between the two outermost points of the cushion adaptors measured along the horizontal axis through the centre of the force transducer.

4.2.4 Report

Report the observations noted in accordance with 4.2.3.1.5 or 4.2.3.2.5.