SLOVENSKI STANDARD
SIST EN 13819-1:2021

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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

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ICS:

13.340.20 Varovalna oprema za glavo Head protective equipment

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EUROPEAN STANDARD

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English Version

Hearing protectors - Testing - Part 1: Physical test methods

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

Gehörschützer - Prüfung - Teil 1: Physikalische Prüfverfahren

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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

This document (EN 13819-1:2020) 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of an identical text or by endorsement, at the latest by May 2021, and conflicting national standards shall be withdrawn at the latest by May 2021.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 supersedes EN 13819-1:2002.

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

— all figures revised and clarified where necessary;

— flowcharts for test procedures revised and additional ones added for single tests;

— new definition 3.6 external vertical distance added;

— 4 limitation to industrial helmets eliminated, so that the test method can be applied to any carrier;

— test headforms in 4.2.2.2 updated to EN 960:2006;

— 4.2.2.3 pinna simulators: allow for 3D printing;

— Figure 5 and 13 error corrected: 5° instead of 15°;

— Table 3 specifications on adjustability of mounted earmuffs changed;

— 4.13 and 5.6 changes and relaxations on the requirements for the equipment for ignitability testing: form of steel rod and temperature measuring device;

— 5.1.3 clarification on testing schemes added in order to specify the tests to be carried out with the number of samples;

— 5.2.3 clarification for flanged earplugs added;

— Tables 6 and 7 error in title corrected;

— Figure 9 of EN 13819-1:2002 deleted;

— Annex ZA of EN 13819-1:2002 deleted.

NOTE The technical changes referred to include the significant technical changes from the EN 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 13819-1 is intended as a supplement to the specific product standards for hearing protectors.

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

1 Scope

This document 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

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 352-1:2020, *Hearing protectors — General requirements — Part 1: Earmuffs*

EN 352-2:2020, *Hearing protectors — General requirements — Part 2: Earplugs*

EN 352-3:2020, *Hearing protectors — General requirements — Part 3: Earmuffs attached to head protection and/or face protection devices*

EN 960:2006, *Headforms for use in the testing of protective helmets*

EN 13819-2:2020, *Hearing protectors — Testing — Part 2: Acoustic test methods*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 352-1, EN 352-2, EN 352-3 and the following 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
headband earmuffs
earmuffs satisfying the requirements of EN 352-1

3.2
mounted earmuffs
earmuffs fitted to a carrier (head or face protection device) by means of cup supporting arms such that the combination satisfies the requirements of EN 352-3

3.3
test height
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 5 or 6 respectively, and the top of the headband support pad or headform

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

3.4
test width
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 5 or 6 respectively

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

3.5
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 shown in Figure 8

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

3.6
external vertical distance
vertical distance between the top of the test headform on which the carrier is mounted and the highest point on the outside surface of the carrier shell

4 Earmuffs

4.1 Specimens, conditioning and scheme of testing

4.1.1 Specimens

Headband earmuffs and mounted earmuffs shall be submitted for testing in the condition in which they are offered for sale.

For headband earmuffs, 10 specimens shall be submitted and they shall be numbered 1 to 10.

For mounted earmuffs, 10 basic combination specimens (earmuffs and carriers (e.g. helmets)) shall be submitted and they shall be numbered 1 to 10 (basic).

If the same model of mounted earmuffs is to be tested with another model or size of carrier, 6 further supplementary combination specimens (earmuffs and carriers) for each model or size of carrier 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 (r.h.) 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 earmuffs shall be conditioned and tested in accordance with 4.1.3.2 to 4.1.3.10 and Figure 1 (and if applicable Figure 4).

For mounted earmuffs, 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 4.1.3.10 and Figure 2 and 3 (and if applicable Figure 4).

In the case of carriers 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 carrier 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 carrier sizes (see EN 13819-2). If the mounted earmuff 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.

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

4.1.3.2 Unpack all earmuffs completely. For products fitted with batteries, the testing is to be performed with batteries (except for water immersion and ignitability).

4.1.3.3 For headband earmuffs, each specimen shall be weighed and the mean mass of the 10 specimens shall be reported to the nearest gram.

4.1.3.4 For mounted earmuffs, each specimen (left and right earmuff without the carrier) shall be weighed and the mean mass of the 10 specimens shall be reported to the nearest gram.

4.1.3.5 In the case of mounted earmuffs, the earmuffs shall be attached to the carriers in accordance with the earmuffs manufacturer's instructions. The cups/cup supporting arms shall be set to the position with the least amount of stress (in-use, stand-by, parking etc.) as defined by the manufacturer.

4.1.3.6 All specimens shall be conditioned for a minimum of 4 h in the atmosphere specified in 4.1.2.

4.1.3.7 The scheme of testing for specimens 1 to 6 (headband earmuffs and mounted earmuffs, 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 specimens are mounted earmuffs which incorporate a stand-by position, test in accordance with 4.9 (includes cup supporting arm flexing);

e) for earmuffs which rely on plastic parts to provide the headband force, test each specimen in accordance with 4.10 or 4.11;

f) if 4.10 or 4.11 were performed, 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;

g) condition each specimen for (24 ± 1) h, measured from the time of removal from the water bath in f) or in case of earmuffs which do not rely on plastic parts to provide the headband force condition each specimen for a minimum of 4 h, measured from the end of the headband flexing in d), under the conditions specified in 4.1.2, and then measure the headband force in accordance with 4.4;

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

h) for mounted earmuffs set the cups/cup supporting arms to the mid-point of the range of their adjustment, set in the position with the least amount of stress (in-use, stand-by, parking etc.).

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

a) measure the insertion loss of each cup of each specimen in accordance with EN 13819-2:2020, 4.1;

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 mounted earmuffs, both basic and supplementary specimens 5 and 6, shall be continued as follows:

a) if appropriate, test both specimens or, in the case of mounted earmuffs, both basic (only) specimens, in accordance with 4.12;

b) assess both specimens, or, in the case of mounted earmuffs, both basic and supplementary specimens, for compliance with EN 352-1:2020, 4.2 or EN 352-3:2020, 4.2, as appropriate;

c) test both specimens in accordance with 4.13. If for supplementary combinations new materials are introduced each combination shall also be tested in accordance with 4.13.

4.1.3.10 The scheme of testing for specimens 1 to 4, or, in the case of mounted earmuffs, both the basic and, if required by EN 352-3:2020, 4.3.4, the supplementary specimens 1 to 4, shall be continued as follows:

Measure the sound attenuation of the specimens in accordance with EN 13819-2:2020, 4.2.

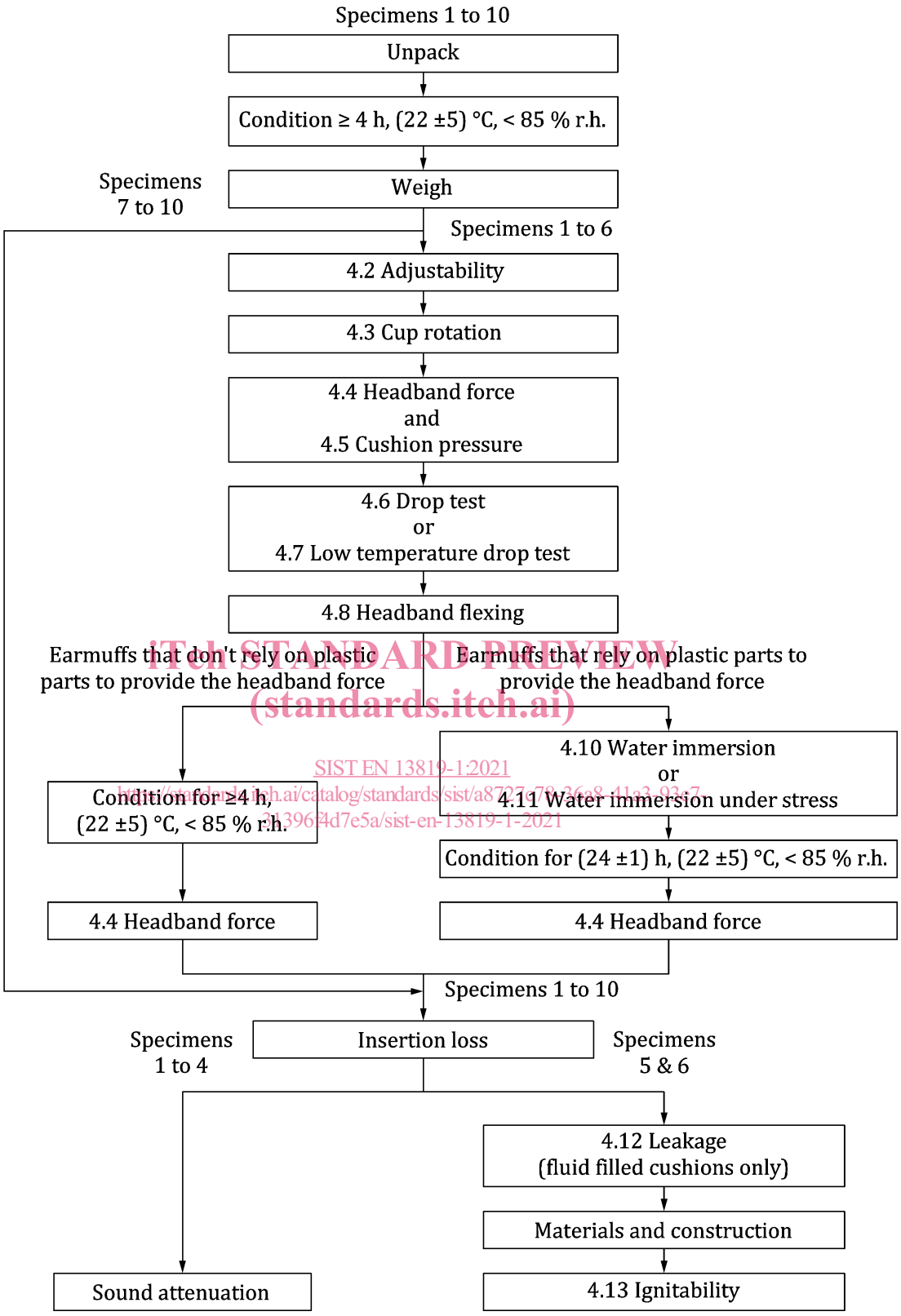


Figure 1 — Testing scheme flow chart for headband earmuffs

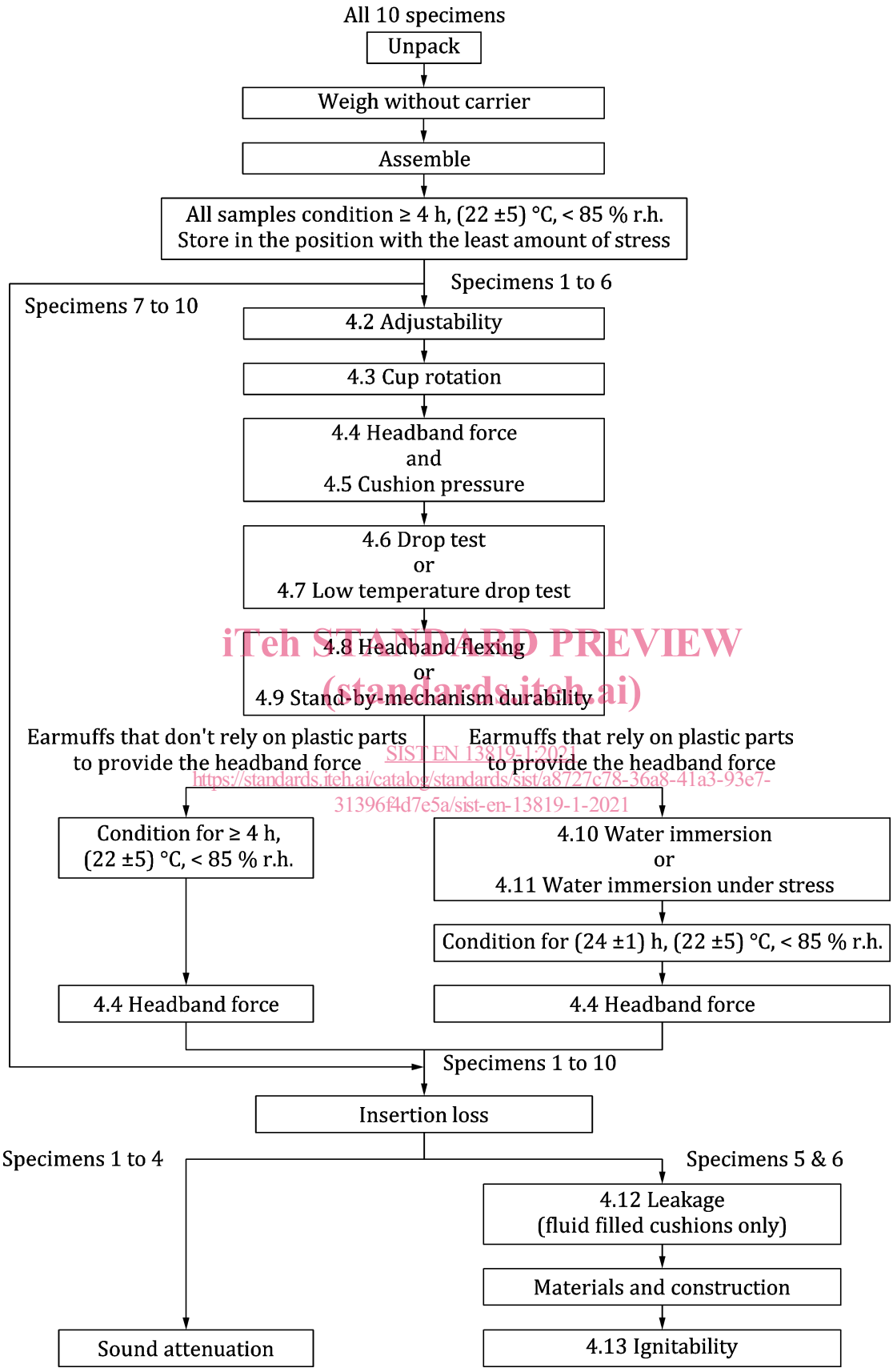


Figure 2 — Testing scheme flow chart for mounted earmuffs – basic combinations

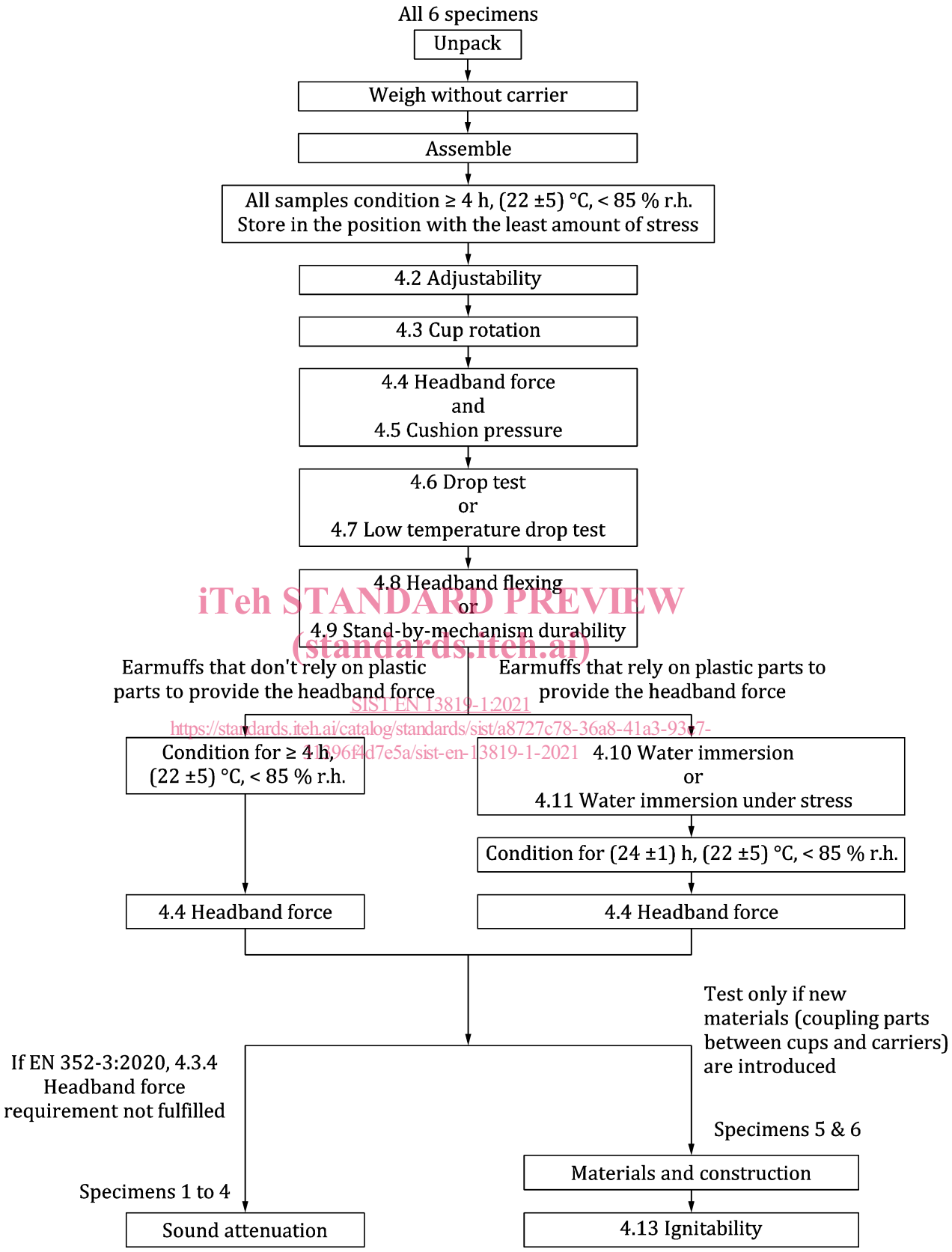
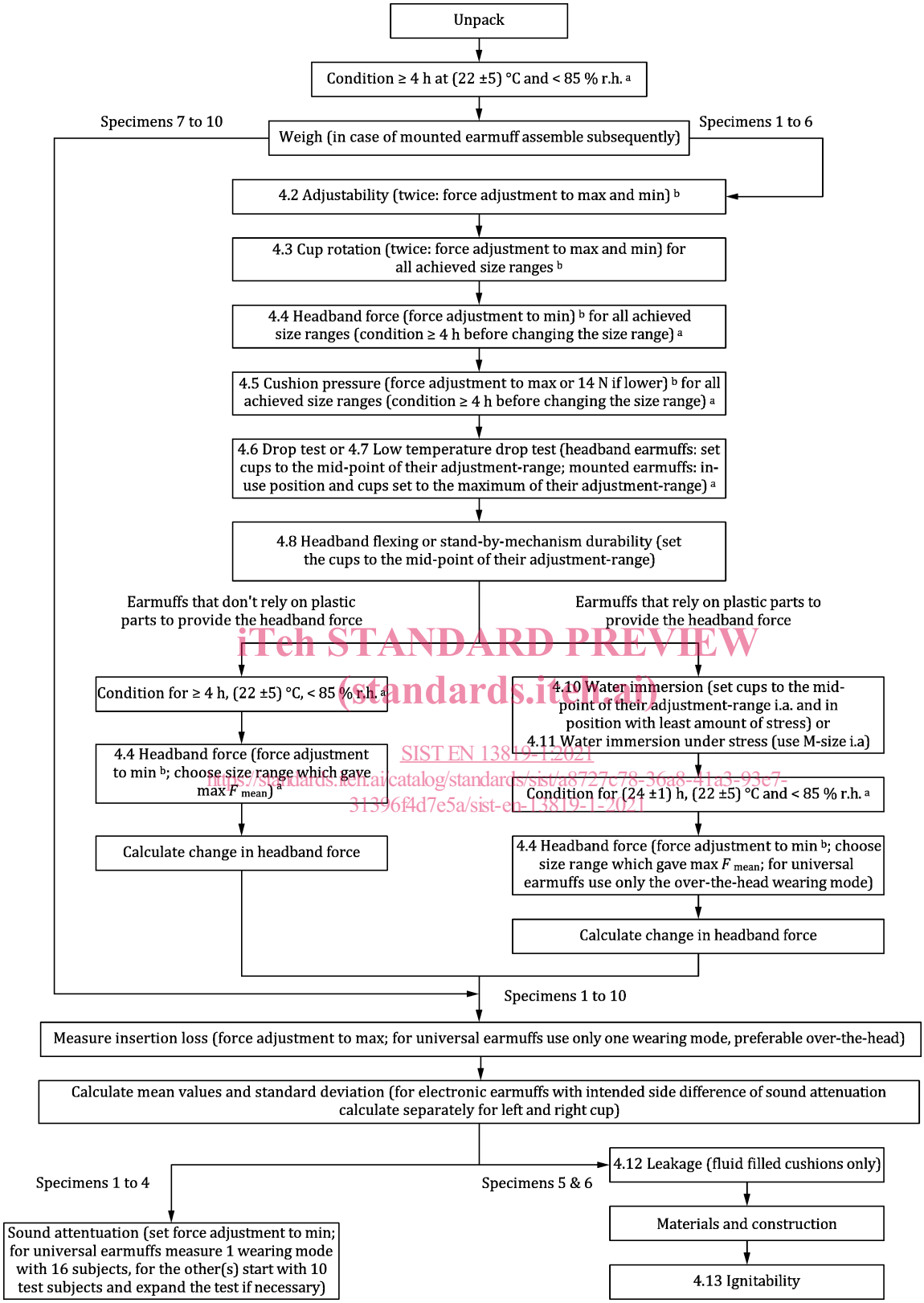


Figure 3 — Testing scheme flow chart for mounted earmuffs – supplementary combinations



Key

a store in position with least amount of stress

b use adaptors for non-planar cushions, if applicable (i.a.)

Figure 4 — Testing scheme flow chart for earmuffs with adjustable headband force (headband and mounted earmuffs)

4.2 Adjustability

4.2.1 Principle

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

4.2.2 Apparatus

4.2.2.1 Mounting fixture

The outline of an example is shown in Figure 5.

4.2.2.2 Test headforms

The test headforms shall be in accordance with the dimensions given in EN 960:2006, for sizes 505, 575 and 615 above the reference plane only and modified for width. Details are given in Figure 6 and examples of mounted pinnas in Figures 7 and 8.

NOTE Additional parts of the headforms of EN 960:2006 can be used to support correct mounting of carriers (e.g. the neck part).

4.2.2.3 Pinna simulators

The required dimensions are shown in Figure 10. A mounted pinna simulator is shown in Figure 11. Alternatively, pinna simulators can be produced by 3D printing. An example is shown in Figure 12.

4.2.2.4 Non-planar cushion adaptor

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

4.2.3 Procedure

4.2.3.1 Headband earmuffs

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 earmuffs or so that their shorter axes are vertical for behind-the-head earmuffs (see Figure 7 resp. Figure 8 as examples).

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

4.2.3.1.3 Place the earmuffs 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 with each of the combinations of dimensions of width and height respectively shown in Table 1 or Table 2, as appropriate.