

EN 1078:1997

Automobile sports and cycling helmets for pedal cyclists and for users of skateboards, roller skates, etc.
Casques automobiles et cyclistes, casques pour utilisateurs de planches à roulettes et de rollers, etc.

English version

Helmetts for pedal cyclists and for users of skateboards and roller skates

Casques pour cyclistes et pour utilisateurs de
planches à roulettes et de rollers, etc.

Helme für Radfahrer und für Benutzer von
Skateboards und Rollschuhen

This European Standard was approved by CEN on 1997-01-01. CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for applying this European Standard to 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 Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language may be translated under the responsibility of a CEN member into its own language and notified to the Central Secretariat, as the general rules of the official versions.

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CEN

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

Central Secretariat: rue de Stassart, 36, B-1050 Brussels

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 125, Liquid protection, the secretariat of which is held by BSI.

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of an identical text or by endorsement at the latest by August 2007, and conflicting national standards shall be withdrawn at the latest by August 2007.

This European Standard 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 Directives.

For relation to the EN 1078 series see informative Annex ZA, which is an integral part of this standard.

According to the CEN/TC 125 Internal Regulations the national standards organizations of 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 the United Kingdom.

Introduction

The protection given by a helmet depends on the circumstances of the accident and wearing a helmet can often always prevent death or long-term disability.

A proportion of the energy of an impact is absorbed by the helmet, thereby reducing the force of the blow sustained by the head. The structure of the helmet may be damaged or absorbing this energy, and any helmet that sustains a severe blow needs to be replaced even if damage is not apparent.

The technical committee which has prepared this standard realizes that it is of importance for the woman's physical and psychomotoric performance that a helmet is worn also. At the time the standard was prepared no method for measuring the ventilating capacity of a helmet was necessary. For this reason no requirements concerning ventilation or heat transmission have been introduced. Manufacturers of helmets are urged to design their helmets so encourage a flow of air over the wearer's head.

Roll-over cyclist's helmets and helmets for users of skateboards and roller skates are fitted with a retention system to retain the helmet on the head. However, there may be a foreseeable risk that helmets of young children could become trapped and thereby cause a risk of strangulation of the child. In such cases an impact protection helmet for young children (see EN 1380) should be used.

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PUBLIC RESOURCES, 95472 SRBASTOPOLOVA, CA 1005 GRAVENSTEIN HIGHWAY, SUITE 111, DR. SEPTEMBER 2013
ZABRANJENO KAMOVAVANJE I KOPIRANJE!

1 Scope

This European Standard specifies requirements and test methods for helmets worn by users of personal cycles, skateboards and roller skates.

Requirements and the corresponding methods of test are given for the following:

- construction, including field of vision;
- shock absorber properties;
- retention system properties, including chin strap and fastening device;
- marking and identification.

2 Normative references

This European Standard incorporates by reference or dated reference provisions from other publications. These normative references are cited at the appropriate places in the text and their publications are listed here for information purposes, subsequent amendments to any of these publications apply to this European Standard only when they are indicated in the dates or in the year. For dated references the latest edition of the cited document applies.

EN 953	<i>Protective helmets for use in the testing of protective costumes</i>
ISO 1577:1987	<i>Head-cushion — Measurement of strength in impact tests — Test methods</i>

3 Definitions

For the purposes of this standard, the following definitions apply.

3.1 protective helmet

An item to be worn on the head and intended to absorb the energy of an impact, thus reducing the force of injury to the head.

3.2 helmet type

Category of helmets which does not differ in such essential aspects as the materials or dimensions or construction of the shell or of the retention system or of the protective padding.

3.3 padding

3.3.1 protective padding

A material used to absorb impact energy.

3.3.2 reaction padding

A lining material provided for the wearer's comfort.

3.3.3 sizing padding

A lining material used for adjustment of the helmet size.

3.4 retention system

The complete assembly by means of which the helmet is maintained in position on the head including any devices for equalisation of the system or to enhance the wearer's comfort.

3.5 chin-strap

Part of the retention system consisting of a strap that passes under the wearer's jaw to keep the helmet in position.

3.6 basic plane of the human head

A plane at the level of the external ear opening (external auditory meatus) and the lower edge of the eye-socket (orbita).

3.7 basic plane of a forehead

The plane relative to the forehead that corresponds to the basic plane of the human head.

3.8 reference plane

A cross-section plane parallel to the basic plane of the forehead and perpendicular to which is a front view of the size of the forehead.

3.9 test area

The area of the helmet in which impact tests may be conducted which corresponds to the minimum protected area of the human head.

4 Requirements

4.1 Materials

For those parts of the helmet coming into contact with the skin, the material used should be known not to undergo appreciable deformation or contact with sweat or with substances likely to be found in materials. Materials shall not be used which are known to cause skin reactions.

4.2 Construction

The helmet normally consists of a means of absorbing impact energy and means of retaining the helmet on the head to an accident.

The helmet shall be smooth and without burbling.

The helmet shall be so designed and shaped that parts of movable parts, sharp edges, protruding devices and the like are not likely to injure the user in normal use.

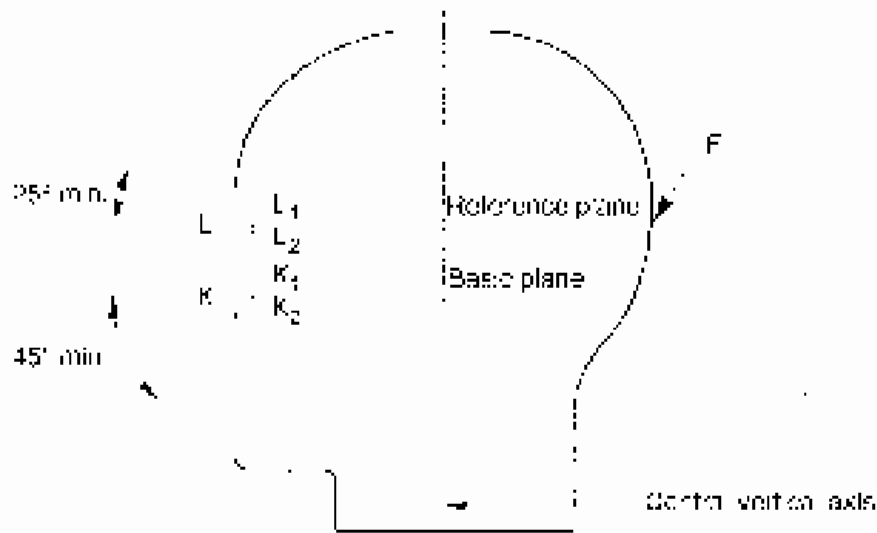
4.2.1 chin strap

- base hole width
- hole diameter
- hole spacing
- hole diameter of the hole
- hole diameter of the hole
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- hole diameter of the hole

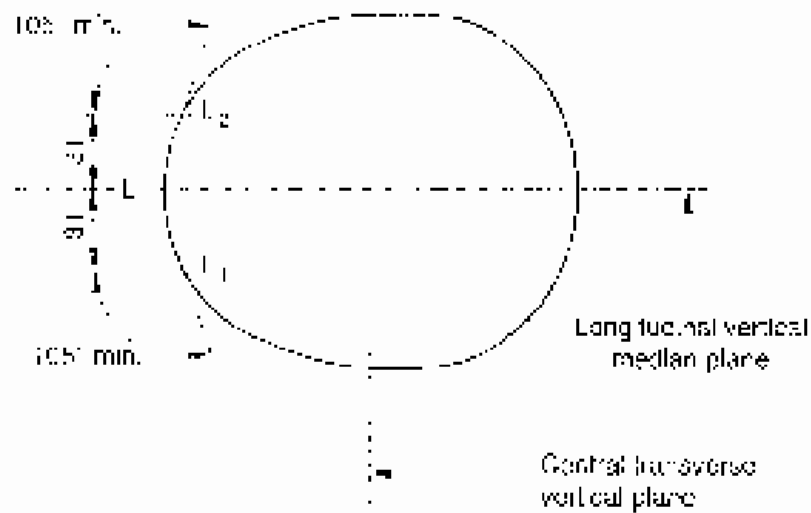
4.3 Field of vision

When tested in accordance with 5.7 users shall be in a position to see the field of vision bounded by angles as follows (see 2.2.1):

- forwards: $\geq 100^\circ$ from the longitudinal vertical median plane to the left and right-hand sides,
- upwards: $\geq 25^\circ$ from the reference plane,
- downwards: $\geq 45^\circ$ from the basic plane.



Section of headform in longitudinal vertical plane



Section of headform in reference plane

Figure 1. Field of vision

4.4 Shock absorbing capacity

The helmet shall give protection to the forehead, nose, ears, temples and crown of the head.

When tested in accordance with 5.3 and 5.4 the peak acceleration shall not, for each impact, exceed 250g for the velocity of 5.14 m/s on the 1st and 2nd and 250g^{1/3} ms on the 3rd and 4th.

NOTE: The helmet is not fully expected to protect against multiple impacts occurring.

4.5 Durability

After being tested the helmet shall not exhibit damage that could cause significant injury to the wearer (skin abrasions, points).

4.6 Retention system

4.6.1 General

Means shall be provided for retaining the helmet on the wearer's head. All parts of the retention system shall be securely attached to the helmet.

4.6.2 Chin strap

The chin strap shall not include a chin cup. Any chin strap shall be no less than 10 mm wide. Chin straps may be fitted with means of adjusting comfort for the wearer.

4.6.3 Retention device

Any retention system shall be fitted with a device to adjust and maintain tension in the system. The device shall be capable of adjustment so that the buckle does not sit on the jaw line.

4.6.4 Closure

No part of the retention system shall be easily accessible.

NOTE: It is not considered to be opening a closure if it is not accessible to the wearer.

4.6.5 Strength

When tested in accordance with 5.5, the dynamic extension of the retention system shall not exceed 50 mm and the residual extensibility shall not exceed 20 mm. For this purpose, extension and force/alignment of the retaining device.

Damage to the retention system shall be measured provided that the above requirement is not met.

NOTE: In this test, a force of the testing device will be measured and a marked capacity expansion will be observed to estimate the force/alignment of the retention system and separate equipment.

4.6.6 Effectiveness

When tested in accordance with 5.6 the helmet shall not come off the headform.

4.6.7 Ease of release

Following the strength test in accordance with 5.5 and with the helmet still aligned, it shall be possible to open the retention system with one hand.

5 Testing

5.1 Headforms

The headforms used shall comply with EN 1077. The sizes in table 1 shall be used, except for determination of shock absorbing capacity, for which only sizes A, B, C, V and G are available.

For determination of retention systems, ease of release and ease of release, the headforms used shall comply with EN 1077 at level chosen from the basic plans.

Table 1. Sizes of headforms

Code letter	Inside circumference of helmet mm
A	590
B	620
C	640
V	660
K	700
M	680
G	650

5.2 Inspection and determination of mass

Inspect the helmet to ascertain whether it is suitable for its intended purpose and fulfil the general requirements to 4.2.

Determine the mass of 10 helmets of the same size selected for testing. Calculate and record the mean value being rounded up to the nearest 10g and the size of the helmet.

5.3 Number of samples and sequence of tests

For each helmet type, four helmets for each headform size test five within the mass group of claimed head size range shall be set aside for testing.

The sequence of tests performed on each helmet shall be: the tests performed on the same sample are given in Table 2.

Table 2. Sequence of test and tests per sample

Performance test	Sequence of test	Sample number		
Retention system effectiveness (5.6)	1st	1	—	—
Shock absorbing capacity (6.4)	2nd	1	2	3
Retention system strength (5.5)	3rd	—	2	1

The 5th helmet sample is reserved as a reference sample, and may be used by the test laboratory to clear up doubt about any of the performance requirements.

5.1 Determination of shock absorbing capacity

5.1.1 Test area

- Take a headform of appropriate size and mark a point *H*, midway between point *V* defined in EN 1060 and point *F* (see figures 1 and 2).
- Place the helmet on the headform. Apply a vertical load of 50 N on the crown of the helmet or onto its shell close the helmet on the headform. Position the head edge of the helmet to meet the upward field of vision specified in 4.2.6 in the manufacturer's normal wearing position, if this is defined by the manufacturer, and results in greater than the specified upward vision.
- Draw the *AA'* line for the *AA'* plane on the helmet.
- Draw a line on the subject, parallel to and spaced not less than 20 mm above the *AA'* line (give two as an angle measurement datum line).
- Mark the helmet at points *B* and *B'*. These marks are the sideways horizontal projection of point *B* on the lateral surface of the helmet.
- Draw a line *BB'* on the helmet passing through *B* and *B'*, the line being angled 15° towards rearward. *B* and *B'* are of the helmet relative to the datum line (see figure 2).

The test area is the line drawn in (i) for test area for impacts on the helmet shell. The area above the line *BB'* on the test area for impacts on the ear protectors and point *W* being the intersection of the lines marked to accordance with (a) and (c) above.

5.1.2 Conditioning

5.1.2.1 High temperature conditioning

The helmet shall be exposed to a temperature of $(+30 \pm 2)^\circ\text{C}$ for not less than 1 h and not more than 6 h.

5.1.2.2 Low temperature conditioning

The helmet shall be exposed to a temperature of $(-20 \pm 2)^\circ\text{C}$ for not less than 4 h and not more than 6 h.

5.1.2.3 Zero humidity drying

The outer surface of the padding will be exposed successively to

- ultraviolet radiation by a 125 W xenon-arc lamp at a distance of 18 mm at a angle of 25° to the normal;
- spraying, by 4 l to 6 l, with water at ambient temperature at the rate of 1 litre.

Note: A second round of drying is repeated at points A and B, and is used as an alternative to the first round of drying (5.1.2.4).

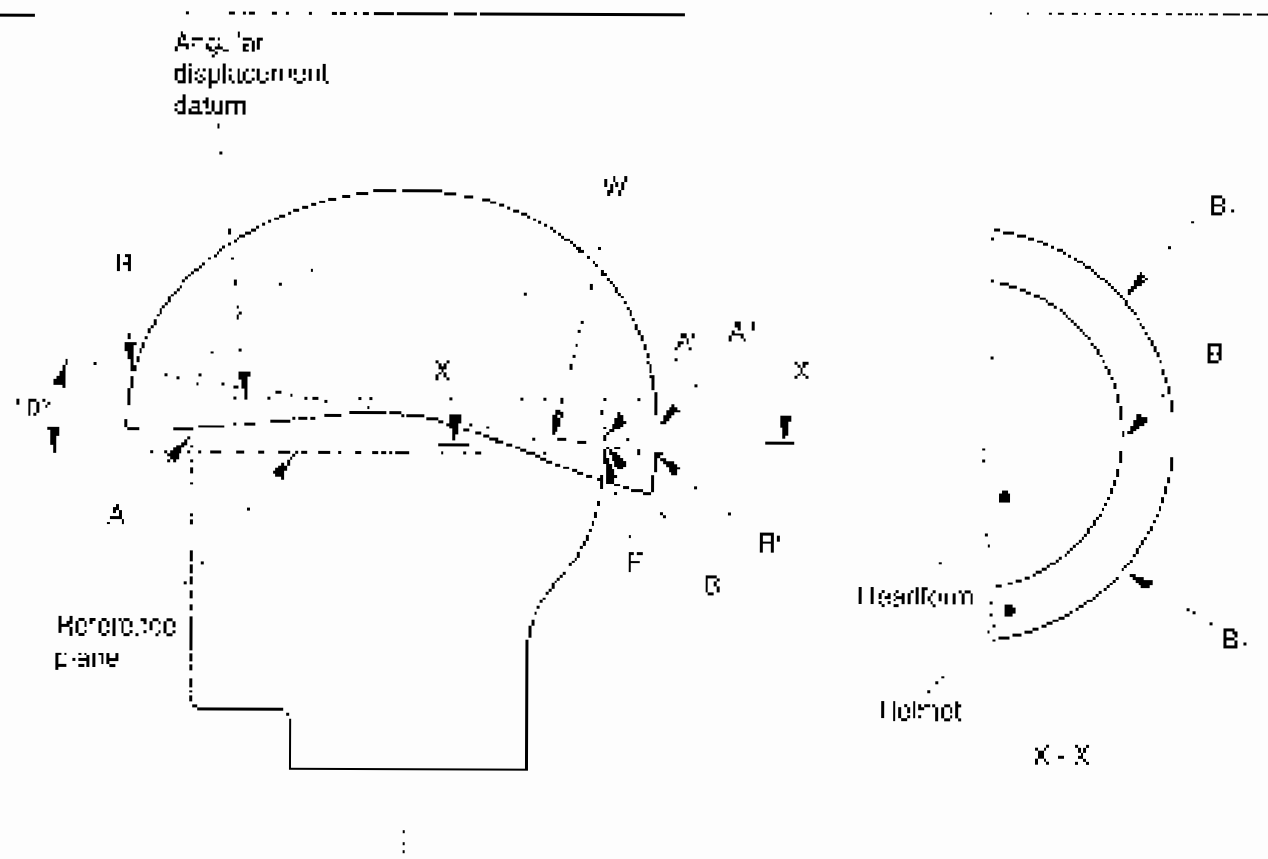


Figure 2. Deflation of test area

5.4.3 Apparatus

5.4.3.1 Description

The test apparatus shall consist:

- an analytical flat-topped base;
- a fine fall guidance system;
- a mobile system supporting the headform;
- a metal headform filled with liquid material (water or oil);
- an accelerometer output reading and/or conditioning system;
- a system by which the point of impact can be brought into correspondence with the centre of the steel.

The principle is shown in figure 3.

5.4.3.2 Base

The base shall be made of flat and made of steel or concrete or a combination of these materials and have a mass of at least 40 kg.

No part of the base or such shall induce a static frequency liable to affect the measurements.

5.4.3.3 Anvil

A flat steel anvil having a circular surface, sized at (190 ± 5) mm diameter.

A steel anvil supporting a kerstone pad having two faces each of thickness of $(25,5 \pm 2,5)$ mm, the vertical one resting above a striking edge with a radius of $(7,5 \pm 2,5)$ mm. The height shall be not less than 50 mm and the length not less than 125 mm.

5.4.3.4 Mobile system and guides

The mobile system supporting the headform shall be such that its mass centre is determined by the mass centre of acceleration. The centre of gravity of the headform shall also be such that any point of the headform shall be positioned vertically above the centre of the steel.

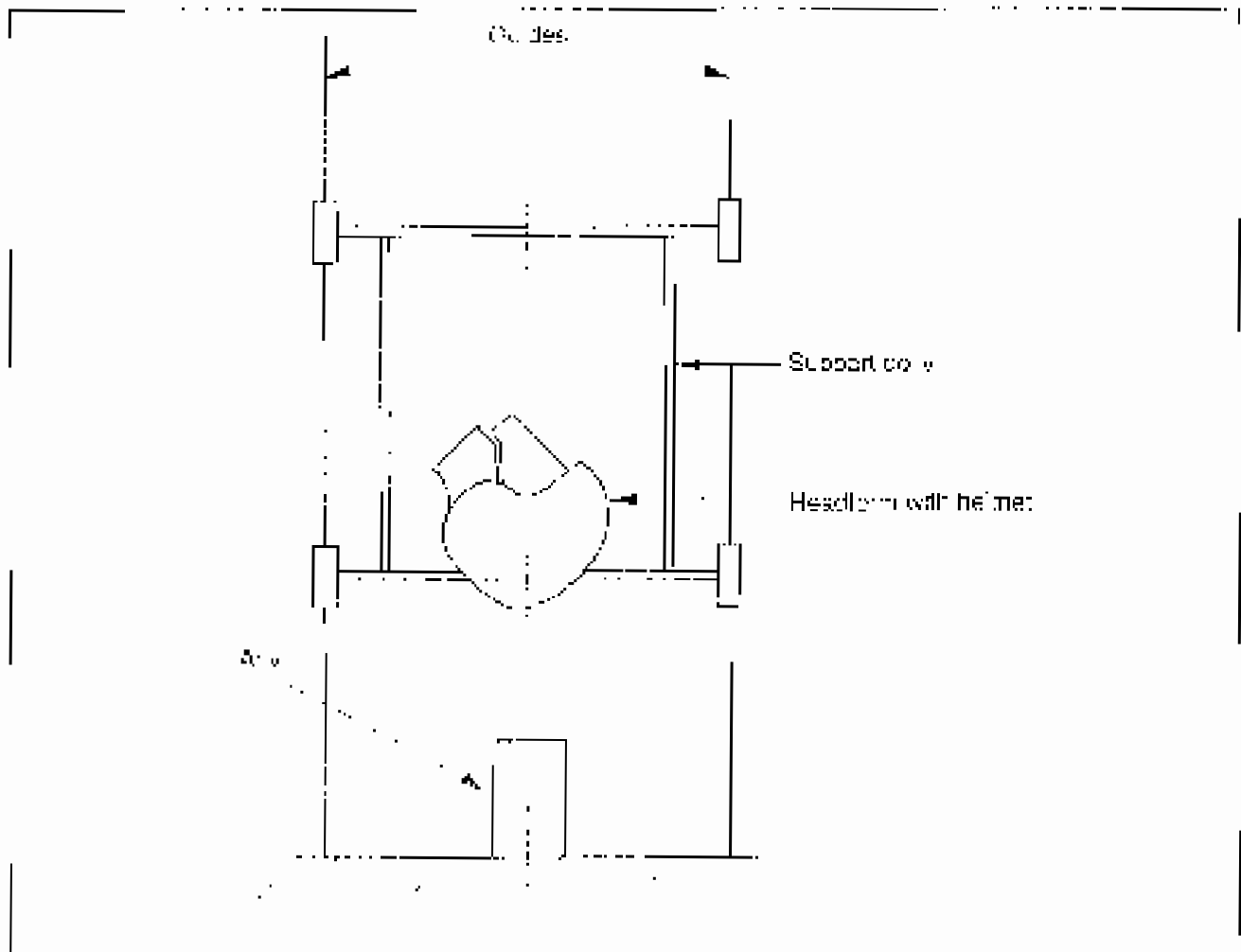


Figure 3. Principle of apparatus for determination of shock absorbing capacity

5.4.3.5 Determination of retention system assembly

The bidirectional acceleration shall be capable of increasing and decreasing velocity from up to 200 g and \pm 5 ms and minimum shall be 30 g.

The measuring system, including the drop assembly, shall have a frequency response in an octave with channel frequency class (CFC) 1000 of 18,0687 – 1087.

The measuring system shall include equipment to detect the velocity of the headform.

5.4.3.6 Headforms

The headform to be used shall comply with EN 960 (see 5.1).

5.4.4 Procedure

The testing shall be carried out in accordance with table 3.

Table 3. Test parameters

Sample number	Conditioning	Anvil
1	High temperature	Overturning
	No conditioning	Flat
2	Low temperature	Flat
	No conditioning	Keystone
3	No conditioning	Keystone
	No conditioning	Flat

When the first impact with the helmet material, all fracture defects within 5 mm from removal of the helmet from the conditioning chamber.

Repeat the failure criteria specified by the test laboratory to prevent worst case conditions. Use the adjustment level while strictly following the instructions given in the series of tests or a specific crushing impact or multiple weak area (ie. wrinkles, buttons, openings, buckles or webbing supports) which fall within the test area. The impact scars on each sample shall be separated by a minimum distance of 75 mm along the strike. The impact scar shall be centred over the centre of the anvil.

The helmet shall then be turned so that the vertical axis is in the horizontal plane over 2 the test area (see figure 2).

In the event of there being no helmet material at the impact site, then the major normalised and average the energy of each impact to the area where initial failure occurred. It may be made at the setting stage for re-impact. The result shall be deemed a failure, without extending the test.

Measure the velocity of the helmet headform at a distance not exceeding 60 mm prior to impact to an accuracy of 1 %.

5.5 Determination of retention system strength and ease of release

5.5.1 Apparatus

5.5.1.1 Drop rigging

The test apparatus shall comprise:

- a mass to level the helmet with function and level;
- a helmet equipped with a locking device comprising a guide, an arrest device and a drop weight;
- a retention system cushion measuring system.

A suitable apparatus is shown in figure 4.

5.5.1.2 Headform

The headform to be used shall comply at least with 2 the base parts with EN 960 (see 5.1).

5.5.1.3 Locking device

The locking device shall consist of a chin strap strap with a mould or square guide bar. The bar shall have a 90° end stop.

The chin strap fitting shall consist of two sets of bars end with a diameter of (30 ± 1) mm and have a contact surface of (7×4) mm.

The guide bar shall be provided with a cylindrical weight having a mass of $(1 \pm 0,2)$ kg and allow for a drop of the weight of (30 ± 1) mm. The mass of the entire locking apparatus including the 4 kg weight shall be $(5 \pm 0,5)$ kg.

5.5.1.4 Retention device

A device measuring the vertical displacement of the chin strap fitting shall be included.

5.5.2 Procedure

Place the helmet on the headform. Fasten the chin strap under the strap bar so that the mass test assembly hangs freely on the retention system. Place a pre-load bucket of $(2 \pm 0,5)$ kg on the helmet. Then use the drop weight and allow it to fall and impact the end stop.

During the test measure the dynamic displacement of the chin strap strap.

After 2 min measure the average displacement with the drop weight still on the end stop.

An action which forces the system can be released by one hand.

5.6 Determination of retention system effectiveness

5.6.1 Apparatus

The apparatus shall comprise:

- a drop weight with a mass of $(100 \pm 0,1)$ kg;
- a guiding system with a total mass of $(10 \pm 0,1)$ kg allowing the drop weight to drop in a vertical line to;
- a flexible strap and a break attached to the guiding system running over a pulley with a diameter of 100 mm. The extension of the strap shall be less than 10 mm under a load of 300 N;
- headform according to EN 960 (see 5.1);
- a case to hold the headform.

Figure 5 shows the principle of the apparatus.

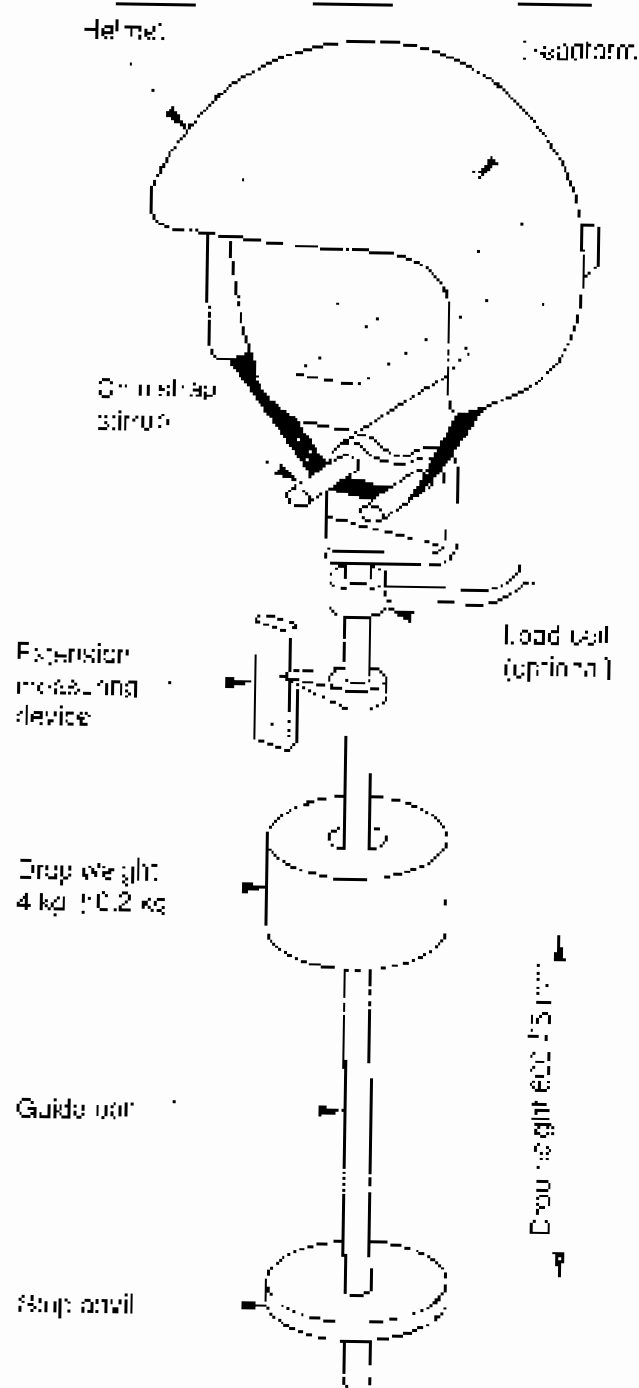
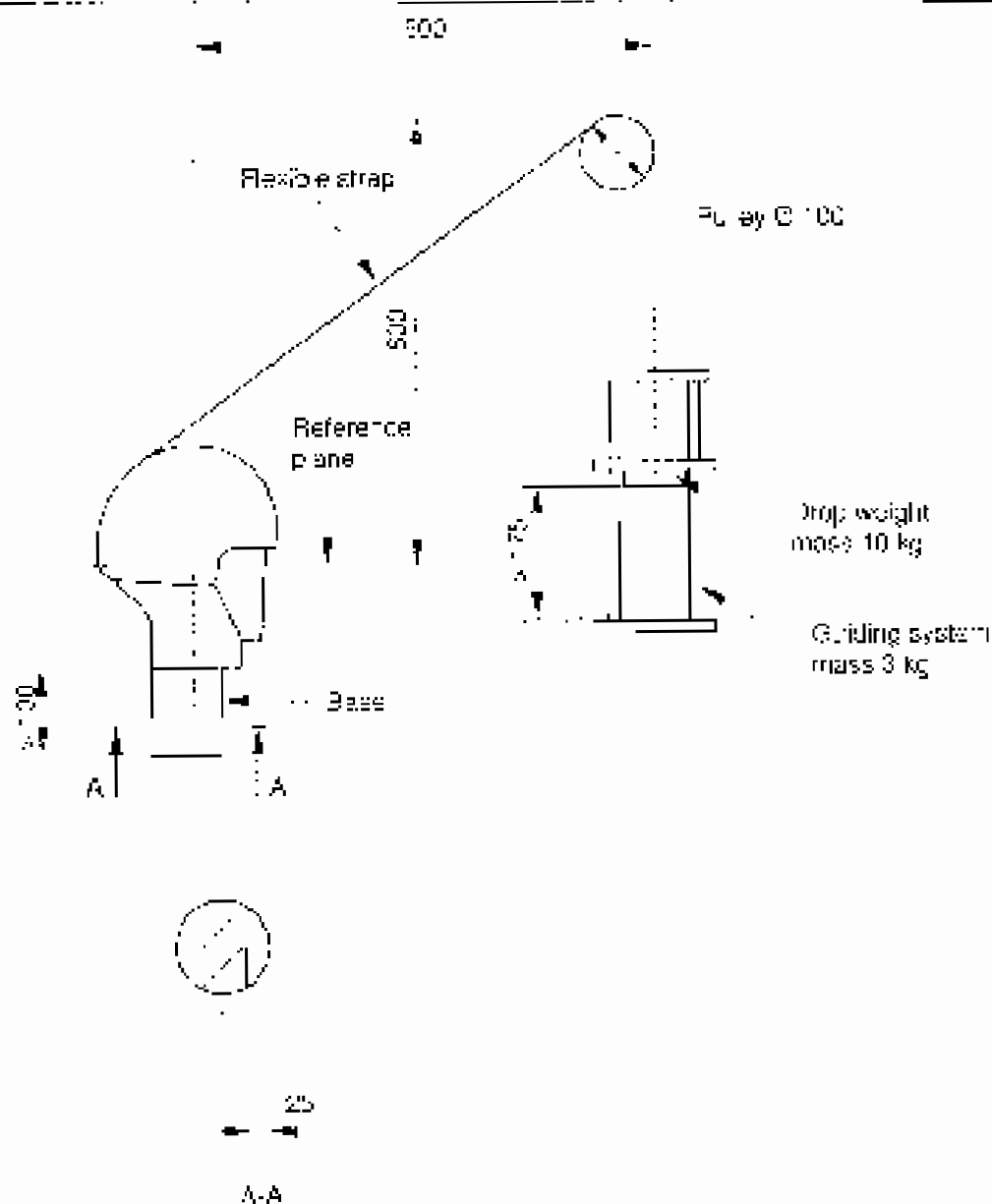


Figure 4. Example of an apparatus for testing of retention system strength



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Figure 3. Apparatus for testing of the retention system effectiveness

5.6.2 Procedure

Put the helmet according to the manufacturer's instructions on the appropriate headform which shall be analysed and the longitudinal and vertical axes measured for the field of type.

Adjust the retention system to be as tight as possible. Hook the strap to the rear of the helmet.

Release the ring weight and allow it to fall through a distance of (150 ± 7) mm.

Observe whether or not the helmet passes etc.

5.7 Determination of field of vision

To carry out the test, the test laboratory shall select the size of visors (field of view) of the test helmet in accordance with the reference.

Place the test helmet on a headform approximately 570 mm in height and apply a load of 50 N on the crown of the helmet to cause it to stabilize the helmet form as follows:

- wear harness that is of head, neck and jaw of the helmet; and
- align the helmet with the vertical median plane of the headform.

Adjust the helmet on the headform according to the manufacturer's instructions. It is noted that the position concerning the helmet compliance with the requirements for field of vision in 4.3.

5.8 Test report

The test report shall contain at least the following information:

- a) a description details of the helmets including size or sizes;
- b) results of the test in accordance with 5.2 to 5.6;
- c) date of testing;
- d) name of the test laboratory.

6 Marking

Each helmet shall be marked in such a way that the following information is easily visible by the user and is likely to remain legible throughout the life of the helmet:

- a) the number of this European standard;
- b) the name or trade name of the manufacturer of the design of the helmet;
- c) the designation, which shall be one or more of the following: helmet type or type lists, semi-rigid or rigid shell etc;

or the size or sizes range of the helmet provided as the manufacturer's information for the head form in the helmet is not easy to fit.

The weight of the helmet (the average mass in g) determined according to 5.2.1:

in grams and quantity of material in m:

In a label, carrying the instructions "This helmet should not be used by children while climbing or doing other activities where there is a risk of hanging or the child gets trapped with the helmet".

In addition, if the helmet has a component made of material which can be used as a bicycle helmet by a motor vehicle (e.g. always obtaining this), marks in order to allow the user to add it, the helmet shall carry an appropriate warning.

7 Information supplied by the manufacturer

With every helmet, the following information in the language of the country of use shall be given as follows:

- a) that the helmet can only protect if it fits well and that it must be replaced by different sizes and checked by the retailer, because and comfortable on the head;
- b) that the helmet should be adjusted to fit the user's head and, in particular, that they should cover the ears, the buckle position and so on; that the buckles and the straps used are designed to be both comfortable and firm;
- c) that the helmet shall be positioned on the head to ensure the intended protection is provided (e.g. that it should be placed so as to protect the forehead and not be pushed up to cover the eyes of the user);
- d) that the helmet should always be worn against a injury;
- e) that a helmet subjected to a normal impact should be discarded and destroyed;
- f) a statement of the danger of reaching or removing any of the normal components parts of the helmet (e.g. chin strap) as recommended by the manufacturer and that helmets should not be adapted for the purpose of fitting accessories in a way not recommended by the manufacturer.

Annex A (informative)

Alternative procedure for artificial ageing

The heated and treated isofluorid ageing should be exposed to the radiation of a xenon arc lamp. The radiol energy of the lamp should be filtered, to provide a spectral power distribution that closely approximates that of natural daylight.

The helmet should be fixed on a cylindrical holder concentric to the lamp and which rotates at a speed of 1 to 5 mm² around its axis.

Each helmet which will subsequently be tested for soot absorption should be oriented so that the area of exposure should be defined as possible as long. The plane perpendicular to the axis at this point should be treated to a half of the total area of the helmet.

The radiol energy in terms of the plane of 1 m² test area should be either measured or calculated from information provided by the manufacturer of the test apparatus. The exposure interval should be sufficient so that the exposed surfaces should receive a total energy of 1 J/cm² over the wavelength range 300 nm to 800 nm.

The samples should be exposed vertically in the test region of the source that gives a uniformity below 10% in all directions with a cycle of 18 min spraying and 102 min without spraying. During the 18 min cycles the period of radiation variability should be 20% or less.

The temperature within the test chamber should be measured with a black standard thermometer placed at the same distance from the lamp as the exposed test parts of the helmets. The temperature should be maintained at 20 ± 3 °C.

All other test and calibration conditions for the apparatus should be in accordance with Method A of ISO 4822:1993 and ISO 15921.

NOTE 1: As all test results are measured under test conditions of 20 ± 3 °C, the results may be adjusted to other temperatures using the correction factor of 1,05.

NOTE 2: The position of the lamp may vary over the course of the test period in order to give the best results.

NOTE 3: The arrangement of the specimens on the sample tray should follow the arrangement of the specimens on the sample tray in the spray gun. The parameters for the spray gun should be given in the spray gun's operating manual by the supplier.

Annex ZA (informative)

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

This European Standard has been prepared under a mandate given to CEN by the European Commission for the European Free Trade Association and specifies essential requirements of EU Directives 80/609/EEC.

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

The following clauses of this standard fully satisfy the requirements of Directive 80/609/EEC, annex II:

EU Directive 80/609/EEC, annex II	Clauses of this standard
1.1 Design category	1.1 to 4.6
1.2 Intrinsic aspects of PPE	4.1, 4.5
1.3 Visibility and efficiency	3.1, 4.2, 4.3
1.4 Characteristics related to the technical file	7
2.1 PPE having adjusting adjustment devices	4.6
2.2 PPE related to gender	5.4, 2.4
2.3 PPE which may be coupled up during use	4.6
2.4 PPE through a connecting device which can be adjusted or removed by the user	4.6
2.5 PPE having one or more identification or recognition marks directly or indirectly relating to their use, safety	3
3.1 Protection against mechanical impact	4.4, 4.5

Conformity with the clauses of this standard provides an element of conformity with the specific essential requirements of the Directives concerned and associated EFTA regulations.