PD CEN/TS 17946:2023

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Helmets for S-EPAC riders

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The UK participation in its preparation was entrusted to Technical Committee PH/6, Head protection.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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Helmets for S-EPAC riders

Helme für S-EPAC-Benutzer

This Technical Specification (CEN/TS) was approved by CEN on 12 June 2023 for provisional application.

The period of validity of this CEN/TS is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the CEN/TS can be converted into a European Standard.

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European foreword

This document (CEN/TS 17946:2023) has been prepared by Technical Committee CEN/TC 158 "*Head protection*", the secretariat of which is held by SIS.

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.

CEN/TS 17946 is largely based on NTA 8776:2016-12, a document issued and adopted by Dutch standard organization NEN that sets requirements for S-EPAC helmets. CEN/TS 17946 was originally proposed as a European standard, but as multiple EU member states oblige users of all types of L1e-B categorized vehicles to wear (only) a helmet that conforms to UNECE Regulation 22, the form of a CEN Technical Specification was chosen to allow member states the choice whether or not to adopt this document.

'In order to be allowed to be used on S-EPACs on public roads and to place on the market in the Netherlands, manufacturers are obliged by Dutch law to affix a mark of approval to the S-EPAC helmet. The terms of use of the mark of approval are to be found in the certification scheme NCS 8776 see Annex B.

Working Group 15 of CEN/TC 158 has reviewed NTA 8776:2016-12 and decided to fully adopt its requirements into CEN/TS 17946. The only addition to NTA 8776:2016-12 is that in CEN/TS 17946 requirements for integrated visors into S-EPAC-helmets are adopted. An integrated visor is optional for a S-EPAC-helmet as specified in this document. The requirements for integrated visors are largely based on EN 1938 *Personal eye protection — Goggles for motorcycle and moped users*.

CEN/TS 17946 contains requirements for helmets for use by speed electrically power assisted bicycles (S-EPACs). The S-EPAC is a product for which the European bicycle industry and consumers have identified the need to provide users with a suitable helmet. In the new European regulation No 168/2013 on the approval and market surveillance of two- or three-wheel vehicles and quadricycles the S-EPAC is classified as an L1e-B two-wheel moped. Although the electric power assistance will support the S-EPAC user up to the speed of 45 km/h, the S-EPAC will require a considerable pedaling effort from the user.

The challenge for the bicycle and helmet industry therefore was to come up with a set of requirements for an S-EPAC helmet that would provide an enhanced safety level compared to the EN 1078:2012+A1:2012 bicycle helmet as a result of the higher speeds, but would likewise provide the same comfort level for use in physical effort.

The bicycle and helmet industry together with other relevant stakeholders (government, test institutes) made use of existing knowledge on head protection (a whole range of existing helmet standards, literature and testing results) and defined requirements that are at the limits of the current technical possibilities in the context of developing a ventilated, lightweight helmet with an increased safety level.

The result was NTA 8776:2016-12, a modified version of EN 1078:2012+A1:2012 *Helmets for pedal cyclists and for users of skateboards and roller skates.* Significant modifications compared to EN 1078:2012+A1:2012 are related to the shock absorbing capacity and test area. The test area is enlarged in order to provide more protection of the temporal and occipital area of the head. For the impact test the fall velocities are increased.

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

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Introduction

The protection given by a helmet depends on the circumstances of the accident and wearing a helmet cannot 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 in absorbing this energy and any helmet that sustains a severe blow needs to be replaced even if damage is not apparent.

At the time this document was prepared, no standardized method for measuring the ventilating capacity of a helmet was recognized. For that reason no requirements concerning ventilation or heat transmission have been introduced. Manufacturers of helmets are urged to design their helmets to encourage a flow of air over the wearer's head.

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1 Scope

This document specifies requirements and test methods for helmets worn by users of speed electrically power assisted bicycles (S-EPACs). This document also specifies requirements and test methods for integrated visors in helmets worn by users of S-EPACS.

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

— construction, including field of vision;

— shock absorbing properties;

— retention system properties, including chin strap and fastening devices;

— marking and information.

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 167:2001, *Personal eye-protection — Optical test methods*

EN 168:2001, *Personal eye-protection — Non-optical test methods*

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

EN 1811, *Reference test method for release of nickel from products intended to come into direct and prolonged contact with the skin*

EN 1836:2005+A1:2007, *Personal eye-equipment — Sunglasses and sunglare filters for general use and filters for direct observation of the sun*

EN ISO 4007:2018, *Personal protective equipment — Eye and face protection — Vocabulary (ISO 4007:2018)*

EN ISO 13688:2013,[1] *Protective clothing — General requirements*

ISO 11664-1:2007, *Colorimetry — Part 1: CIE standard colorimetric observers*

ISO 11664-2:2007, *Colorimetry — Part 2: CIE standard illuminants*

ISO 6487, *Road vehicles — Measurement techniques in impact tests — Instrumentation*

3 Terms and definitions

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

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

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

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

[1] As impacted by EN ISO 13688:2013/A1:2021.

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3.1
speed electric power assisted cycle
S-EPAC
cycle designed to pedal having a mass in running order ≤ 35 kg, fitted with pedals enabling the vehicle to be propelled solely by the rider's muscular leg power, and having an auxiliary propulsion power added to the driver's pedal power which is less than or equal to four times the actual pedal power and does not exceed 4 000 W, whereby the output of the auxiliary propulsion is cut off at a vehicle speed ≤ 45 km/h

Note 1 to entry: The S-EPAC is classified as vehicle category L1e-B in EU regulation No 168/2013. The defining requirements for the S-EPAC is found in Commission Delegated Regulation (EU) No 3/2014 and subject to changes made into this Commission Delegated Regulation.

3.2
protective helmet
item to be worn on the head and intended to absorb the energy of an impact, thus reducing the risk of injury to the head

3.3
helmet type
category of helmets which does not differ in such essential respects as the materials or dimensions or construction of the helmet, of the retention system or of the protective padding

3.4
protective padding
material used to absorb impact energy

3.5
comfort padding
lining material provided for the wearer's comfort

3.6
sizing padding
lining material used for adjustment of the helmet size

3.7
retention system
complete assembly by means of which the helmet is maintained in position on the head including any devices for adjustment of the system or to enhance the wearer's comfort

3.8
chin strap
part of the retention system consisting of a strap that passes under the wearer's jaw to keep the helmet in position

3.9
basic plane of the human head
plane at the level of the external ear opening (external auditory meatus) and the lower edge of the eye sockets (orbits)

3.10
basic plane of a headform
plane relative to the headform that corresponds to the basic plane of the human head

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3.11
reference plane
construction plane parallel to the basic plane of the headform at a distance from it which is a function of the size of the headform

3.12
test area
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 alteration from contact with sweat or with substances likely to be found in toiletries.

The material used in those parts of the helmet coming, or that can come into contact with the skin, shall not be known to cause skin disorders or other adverse effects on health in accordance with, EN ISO 13688:2013[1], 4.2.

4.2 Construction

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

The helmet should be durable and withstand handling. The helmet shall be so designed and shaped that parts of it (visor, rivets, ventilators, edges, fastening device and the like) do not to injure the user in normal use.

NOTE Helmets should:

— have low weight;

— be ventilating;

— be easy to put on and take off;

— be usable with spectacles;

— not significantly interfere with the ability of the user to hear traffic noise.

4.3 Field of vision

When tested in accordance with 5.7 there shall be no occultation in the field of vision bounded by angles as follows (see Figure 1):

— horizontally: min. 105° from the longitudinal vertical median plane to the left and right hand sides;

— upwards: min. 25° from the reference plane;

— downwards: min. 45° from the basic plane.

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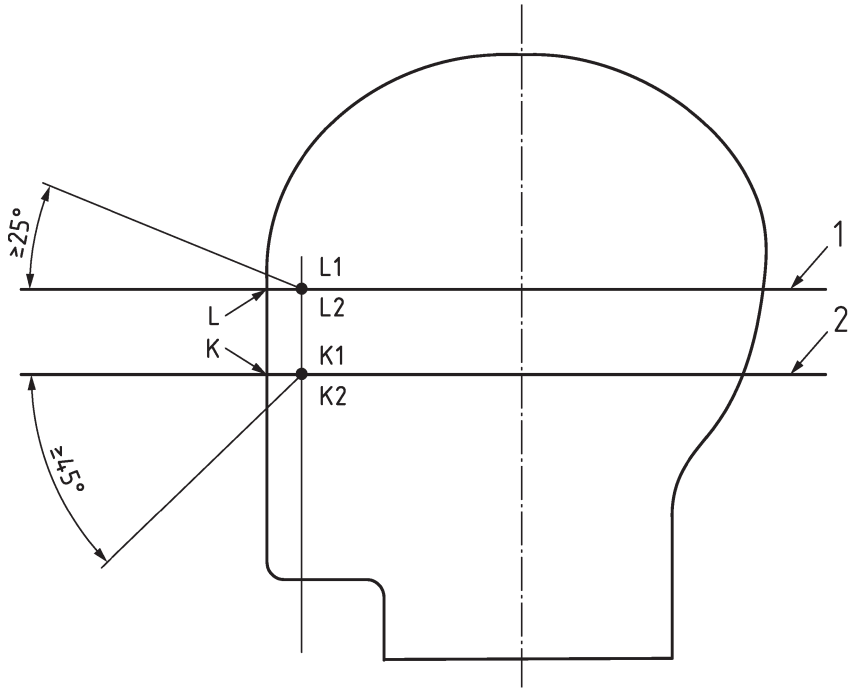
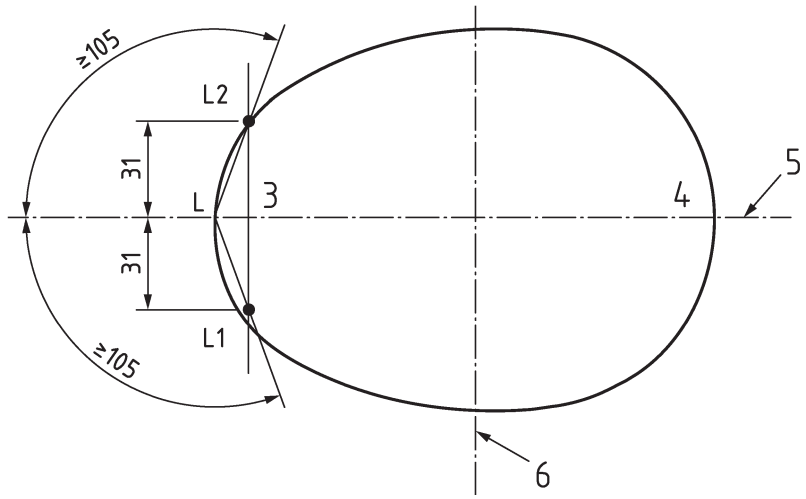
Dimensions in millimetres



a) Section of headform in longitudinal vertical plane



b) Section of headform in reference plane

Key

1 reference plane
2 basic plane
3 front
4 back
5 longitudinal vertical median plane
6 central transverse vertical plane

NOTE 1 Longitudinal vertical median plane – equivalent to EN 960:2006, 2.8 “vertical longitudinal plane”.

NOTE 2 Central transverse vertical plane – equivalent to EN 960:2006, 2.9 “vertical transverse plane”.

Figure 1 — Field of vision

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4.4 Shock absorbing capacity

The helmet shall give protection to the forehead, rear, sides, 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 250 g for the velocity of $6{,}5\ ^{+0{,}1}_{0}$ m/s on the flat anvil, and $5{,}42\ ^{+0{,}1}_{0}$ m/s on the kerbstone anvil.

NOTE These are theoretically equivalent to 2 154 mm and 1 497 mm drop heights respectively.

4.5 Durability

After being tested the helmet shall not exhibit damage that could cause significant injury to the wearer (sharp edges, 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 15 mm wide. Chin straps may be fitted with means of enhancing comfort for the wearer.

4.6.3 Fastening 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 bone.

4.6.4 Colour

No part of the retention system shall be coloured green.

It is recommended that the opening mechanism be marked with red or orange colour.

4.6.5 Strength

When tested in accordance with 5.5, the dynamic extension of the retention system shall not exceed 35 mm and the residual extension shall not exceed 25 mm. For this purpose, extension includes slippage of the fastening device.

Damage to the retention system shall be accepted provided that the above requirements are met.

NOTE In this test, slippage of the fastening device can be measured and recorded separately from other contributions to the extension but this is for information only and is not subject to a separate requirement.

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 load still applied, it shall be possible to open the release system with one hand.

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4.7 Integrated visors

If an integrated visor is included in the S-EPAC helmet the integrated visor shall comply with the requirements in Annex C.

5 Testing

5.1 Headforms

The headforms used shall comply with EN 960:2006. The sizes in Table 1 shall be used, except for determination of shock absorbing capacity, for which only size designations 495, 535, 575, 605 and 625 shall be used.

For determination of retention system strength and ease of release, the headforms used shall comply with EN 960:2006 at least down from the basic plane.

NOTE Table 1 also gives the EN 960:1994 equivalent letter codes to the EN 960:2006 size designations for headforms with similar nominal dimensions. These are as given in EN 960:2006, Annex C. The EN 960:2006 size designation approximates to the circumference of the headform at the reference plane, in mm.

Table 1 — Sizes of headforms

Size designation (EN 960:1994 equivalent)	Inside circumference of helmet Mm
495 (A)	500
515 (C)	520
535 (E)	540
555 (G)	560
575 (J)	570
585 (K)	580
605 (M)	600
625 (O)	620

5.2 Inspection and determination of mass

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

Determine the mass of the helmets of the same size submitted for testing. Calculate and record the mean value in g rounded off to the nearest 10 g, stating the size of the helmet.

5.3 Number of samples and sequence of tests

For each helmet type, four helmets for each headform size that fits within the manufacturers' claimed head size range shall be submitted for testing.

The sequence of tests performed on each helmet size and the tests performed on the same sample are given in Table 2.

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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 (5.4)	2nd	1	2	3
Retention system strength (5.5)	3rd	—	2	3

The fourth sample is reserved as a reference sample, which can be used by the test laboratory in case of doubt about any of the performance requirements.

5.4 Determination of shock absorbing capacity

5.4.1 Test area

a) Place the helmet on a headform of appropriate size designation. Apply a vertical load of 50 N on the crown of the helmet in order to stabilize the helmet on the headform. Position the front edge of the helmet to meet the upward field of vision specified in 4.3 or to the manufacturer's normal wearing position, if this is detailed by the manufacturer and results in greater than the specified upward vision.

b) Draw a line on the helmet in accordance with Figure 2 and Table 3. The oblique section of the line is defined by the left end of 'a' and the intersection of the 38,5 mm section of the line and the outer edge of the headform.

The area above the line drawn in b) is the test area for impacts onto the flat anvil and kerb anvil.

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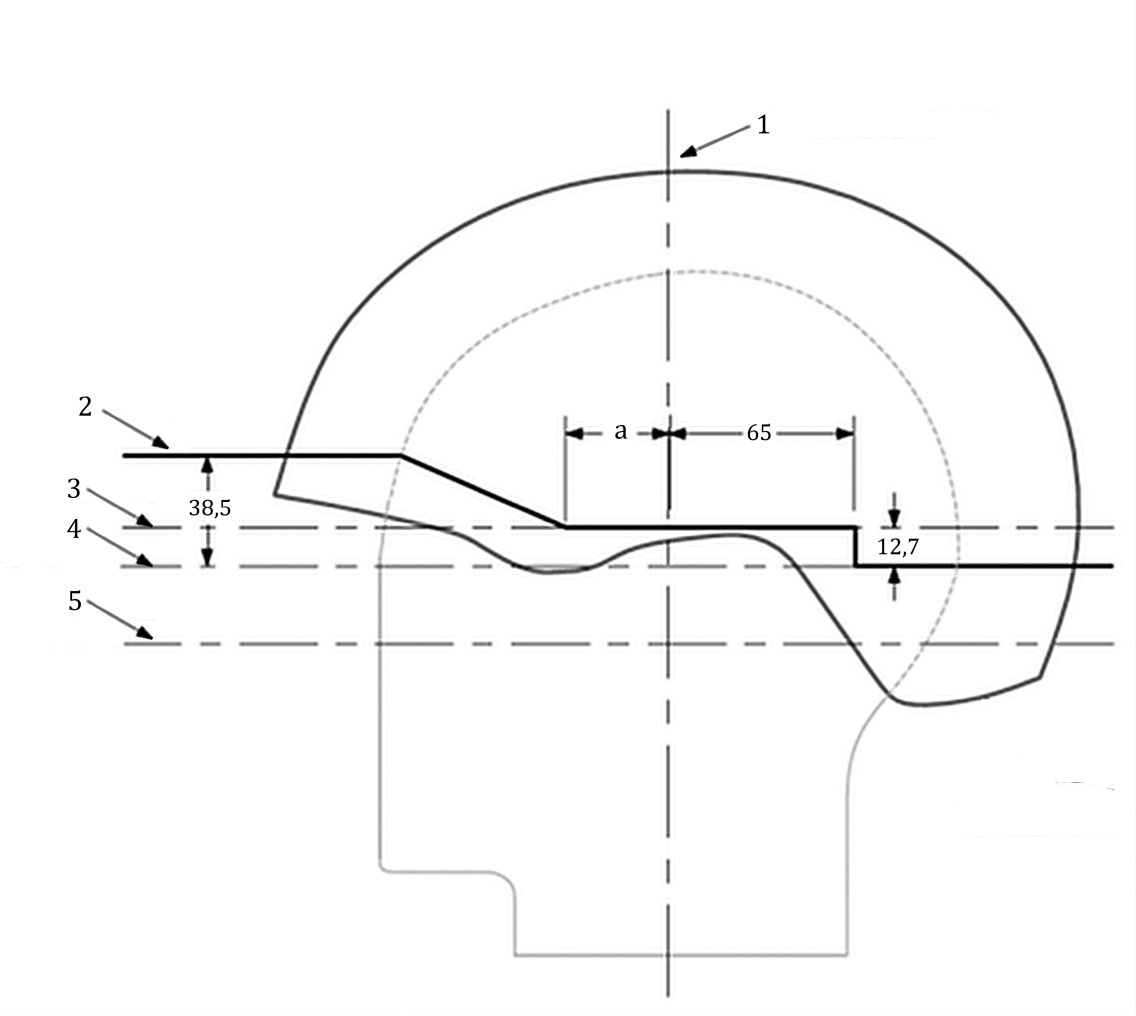
Dimensions in millimetres



Key

1 central and vertical axis
2 test line
3 AA' plane
4 reference plane
5 basic plane
a line dimension for different sizes, see Table 3

NOTE Helmet outline is a generalized representation.

Figure 2 — Definition of test area

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