

# Protective equipment for martial arts —

## Part 4: Additional requirements and test methods for head protectors

The European Standard EN 13277-4:2001 has the status of a  
British Standard

ICS 13.340.20; 97.220.30

## National foreword

This British Standard is the official English language version of EN 13277-4:2001.

The UK participation in its preparation was entrusted by Technical Committee PH/3, Protective clothing, to Subcommittee PH/3/11, Protective equipment for sports players, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

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### Summary of pages

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## Protective equipment for martial arts - Part 4: Additional requirements and test methods for head protectors

Equipements de protection pour arts martiaux - Partie 4:  
Exigences et méthodes d'essai complémentaires relatives  
aux protecteurs de la tête

Schutzausrüstung für den Kampfsport - Teil 4: Zusätzliche  
Anforderungen und Prüfverfahren für Kopfschützer

This European Standard was approved by CEN on 29 September 2001.

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# Contents

	page
Foreword.....	3
Introduction .....	4
1 Scope .....	4
2 Normative references .....	4
3 Terms and definitions.....	4
4 Requirements .....	4
4.1 General.....	4
4.2 Openings.....	4
4.3 Mass .....	4
4.4 Sizing.....	5
4.5 Field of vision .....	5
4.6 Restraint.....	6
4.7 Zone of protection .....	6
4.8 Impact performance.....	8
5 Test methods.....	8
5.1 General.....	8
5.2 Sampling .....	8
5.3 Conditioning.....	8
5.4 Determination of field of vision .....	8
5.5 Restraint.....	8
5.6 Zone of protection .....	9
5.7 Impact performance.....	9
5.7.1 Apparatus .....	9
5.7.2 Procedure .....	10
6 Marking .....	11
7 Information supplied by the manufacturer.....	11
Annex ZA (informative) Clauses of this European Standard addressing essential requirements or other provisions of EU Directives .....	12

## Foreword

This European Standard has been prepared by Technical Committee CEN/TC 162 "Protective clothing including hand and arm protection and lifejackets", 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 April 2002, and conflicting national standards shall be withdrawn at the latest by April 2002.

It is the fourth part of a series covering requirements for protective equipment used in martial arts. Part 1 deals with general requirements and test methods and the other parts deal with specific areas of the body.

Part 1: General requirements and test methods.

Part 2: Additional requirements and test methods for instep protectors, shin protectors and forearm protectors.

Part 3: Additional requirements and test methods for trunk protectors.

Part 4: Additional requirements and test methods for head protectors.

Part 5: Additional requirements and test methods for genital protectors and abdominal protectors.

Part 6: Additional requirements and test methods for breast protectors for females.

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 Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this standard.

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, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

## Introduction

Head protectors are an individual item of protective equipment to protect the front, the sides and the rear of the head in martial arts.

They are designed to provide a degree of safety in case of accidental contact during martial arts. Martial arts can be dangerous and severe blows to the head may cause serious injury even if the protector is fitted and used properly.

## 1 Scope

This European Standard specifies additional requirements and test methods for head protectors without face protection used in unarmed martial arts, such as Taekwondo, Karate, Kick-Boxing and similar disciplines.

It also applies to head protectors used in boxing.

## 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 960, *Headforms for use in the testing of protective helmets*.

EN 13277-1:2000, *Protective equipment for martial arts — Part 1: General requirements and test methods*.

## 3 Terms and definitions

For the purposes of this European Standard the terms and definitions given in EN 13277-1 apply.

## 4 Requirements

### 4.1 General

The general requirements for head protectors shall be the same as those given in EN 13277-1.

Head protectors shall be easy to put on and take off.

### 4.2 Openings

Head protectors shall be so designed that the ears have a connection to the environment to enable the wearer to hear as well as to prevent air pressure damage caused by blows on the ear.

The head protector may be pierced by openings that allow ventilation.

### 4.3 Mass

The maximum mass permitted shall vary with the head circumference. The relevant mass is specified in Table 1.

Table 1 — Head circumference and mass of the head protector

Head circumference mm	< 540	540 to 560	> 560 to 580	> 580
Mass g	max. 360	max. 380	max. 400	max. 420

#### 4.4 Sizing

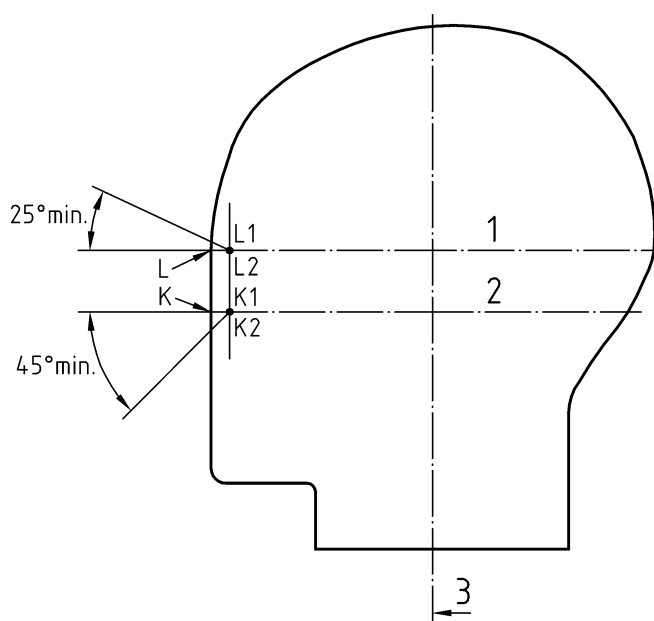
The manufacturer shall indicate in centimetres the range of head circumference of the user for which the head protector is designed.

#### 4.5 Field of vision

When tested in accordance with 5.4 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

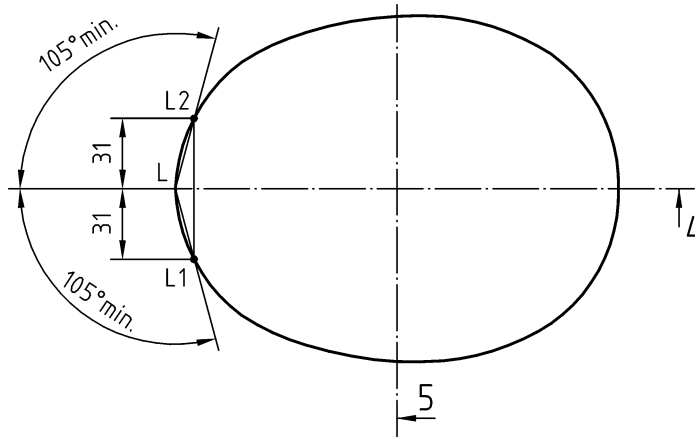
Dimensions in millimetres



#### Key

- 1 Reference plane
- 2 Basic plane
- 3 Central vertical axis

a) Section of headform in longitudinal vertical plane



**Key**

4 Longitudinal vertical median plane

5 Central transverse vertical plane

b) Section of headform in reference plane

**Figure 1 — Field of vision**

**4.6 Restraint**

A restraint system shall be provided by the manufacturer which enables the user to attach the head protector firmly without any assistance.

When attached firmly, the system shall meet the requirements defined in 4.3 of EN 13277-1:2000, excluding the third paragraph of 4.3 of EN 13277-1:2000, when tested according to 5.5 of EN 13277-4:2001.

After each individual test, the displacement of the head protector from its original position shall be less than 5 % of the head circumference.

Restraint systems shall be fitted with adjusters.

**4.7 Zone of protection**

The zone of protection begins at the lower edge of the head protector in the forehead region. Dimension  $l_1$  is measured from this edge as shown in Figure 2. The zone of protection shall cover the entire head circumference on the front, the sides and the rear of the head.

The location and dimensions of the zone of protection shall be as given in Figure 2 and Table 2.

The positioning of the head protector on the head shall be determined in the information supplied by the manufacturer.



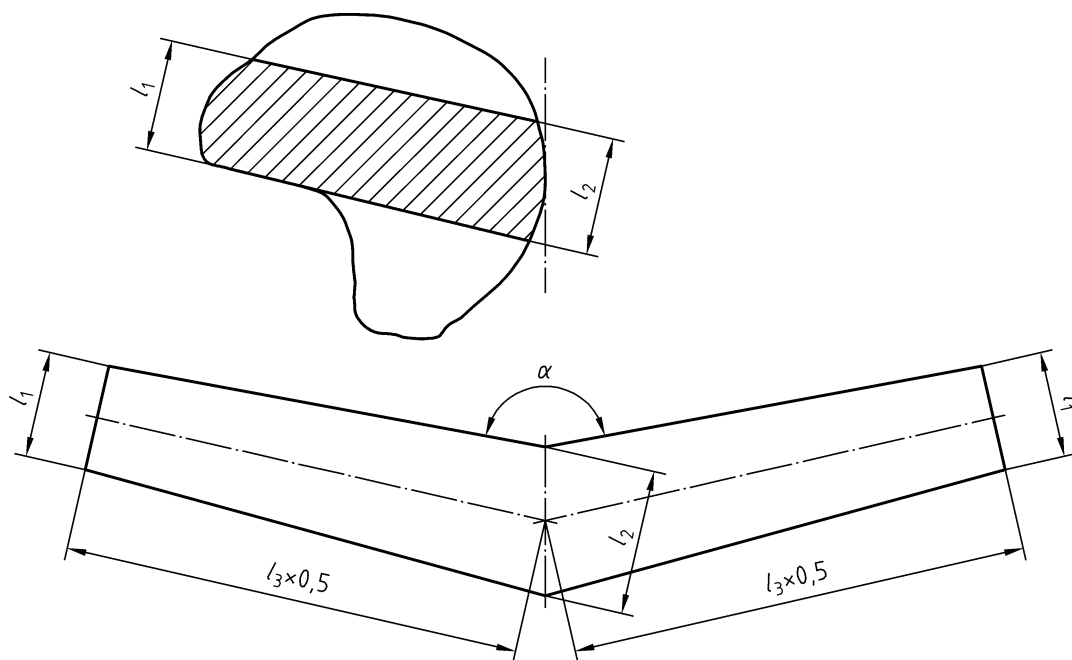


Figure 2 — Location of the zone of protection of head protectors

Table 2 — Dimensions of the zone of protection of head protectors

Dimensions in millimetres

Head circumference (indicated by the manufacturer)	$l_1$	$l_2$	$l_3$	$a$
	min.	min.	min.	
520	30	40	500	$(110^{+20}_0)^\circ$
530	30	40	510	
540	35	45	520	
550	35	45	530	
560	35	45	540	
570	40	50	550	
580	40	50	560	
590	45	55	570	
600	45	55	580	
610	45	55	590	
620	45	55	600	

If the manufacturer indicates a range of head circumference the greatest value of this range for  $l_1$ ,  $l_2$  and  $l_3$  specified in Table 2 applies.

NOTE Figure 2 shows the head protector stretched out. After closing the head protector on the head  $l_3$  is identical with the head circumference.

## 4.8 Impact performance

Head protectors conform to this European Standard if the maximum peak force is below 2 kN when tested in accordance with 5.7.

## 5 Test methods

### 5.1 General

If no special test methods are specified, the requirements of this standard are to be tested by measurement, visual inspection, tactile examination etc.

For the tests new, unused protectors shall be used.

### 5.2 Sampling

Sampling shall be carried out in accordance with 5.1 of EN 13277-1:2000.

### 5.3 Conditioning

Conditioning is carried out in accordance with 5.2 of EN 13277-1:2000.

### 5.4 Determination of field of vision

Place the head protector on a headform of appropriate size.

The headform shall comply with EN 960.

Ascertain that the vertical median plane of the head protector coincides with the vertical median plane of the headform.

Adjust the head protector on the headform according to the manufacturer's instructions.

In that position, determine, using angle templates or other means of assessing angles of vision, whether the head protector complies with the requirements for field of vision in 4.5.

### 5.5 Restraint

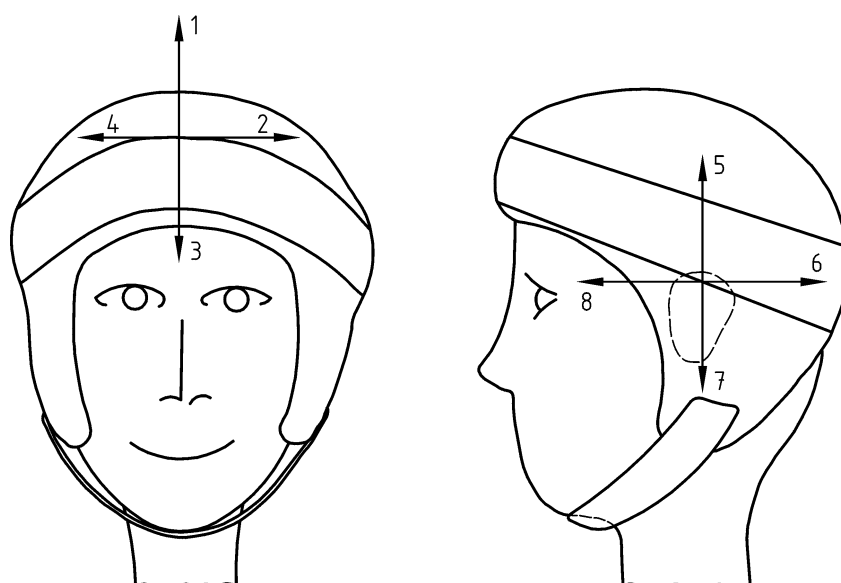
The head protector shall be attached to the head of a test person of appropriate head circumference according to the manufacturer's size declaration.

The test positions and test directions are shown in Figure 3. The test directions shall be as shown by arrows 1 to 8. They shall be tangential to the head protector.

One test position shall be within the front side on the vertical symmetrical plane and on the upper edge of the zone of protection.

The other test position shall be as close as possible near the ear within the zone of protection.

The test force to be applied shall be 20 N in each position.



## Key

1 to 8 Order of the test directions

**Figure 3 — Test positions and test directions at head protectors**

## 5.6 Zone of protection

To measure the zone of protection the head protector shall be prepared in such a way that the zone of protection is stretched out with a flat surface. If the construction of the head protector does not ensure this stretching the head protector shall be cut.

When testing according to 5.5 of EN 13277-1:2000, the template shall be placed on the inside of the head protector within the zone of protection.

When the position of best coverage of the template is found the outline of the template shall be marked on the head protector.

## 5.7 Impact performance

### 5.7.1 Apparatus

The principle of impact testing is shown in Figure 4.

A flat horizontal steel plate with a width of at least 300 mm, a length of at least 350 mm and a thickness of at least 20 mm shall be used as a support of the sample. In the centre of the flat plate there shall be a cylindrical hole with a diameter of  $(106 \pm 2)$  mm.

A cylindrical anvil with a diameter of  $(100 \pm 2)$  mm, a thickness of at least 20 mm with a flat upper surface shall be mounted on a load cell.

The surface of the anvil facing the striker shall be in level with the surface of the flat plate with a tolerance of  $\pm 1$  mm.

A compression ring made of steel with a mass of  $(10 \pm 0,1)$  kg,  $(140 \pm 4)$  mm internal and  $(260 \pm 4)$  mm external diameter shall be used to fix the sample to the support.

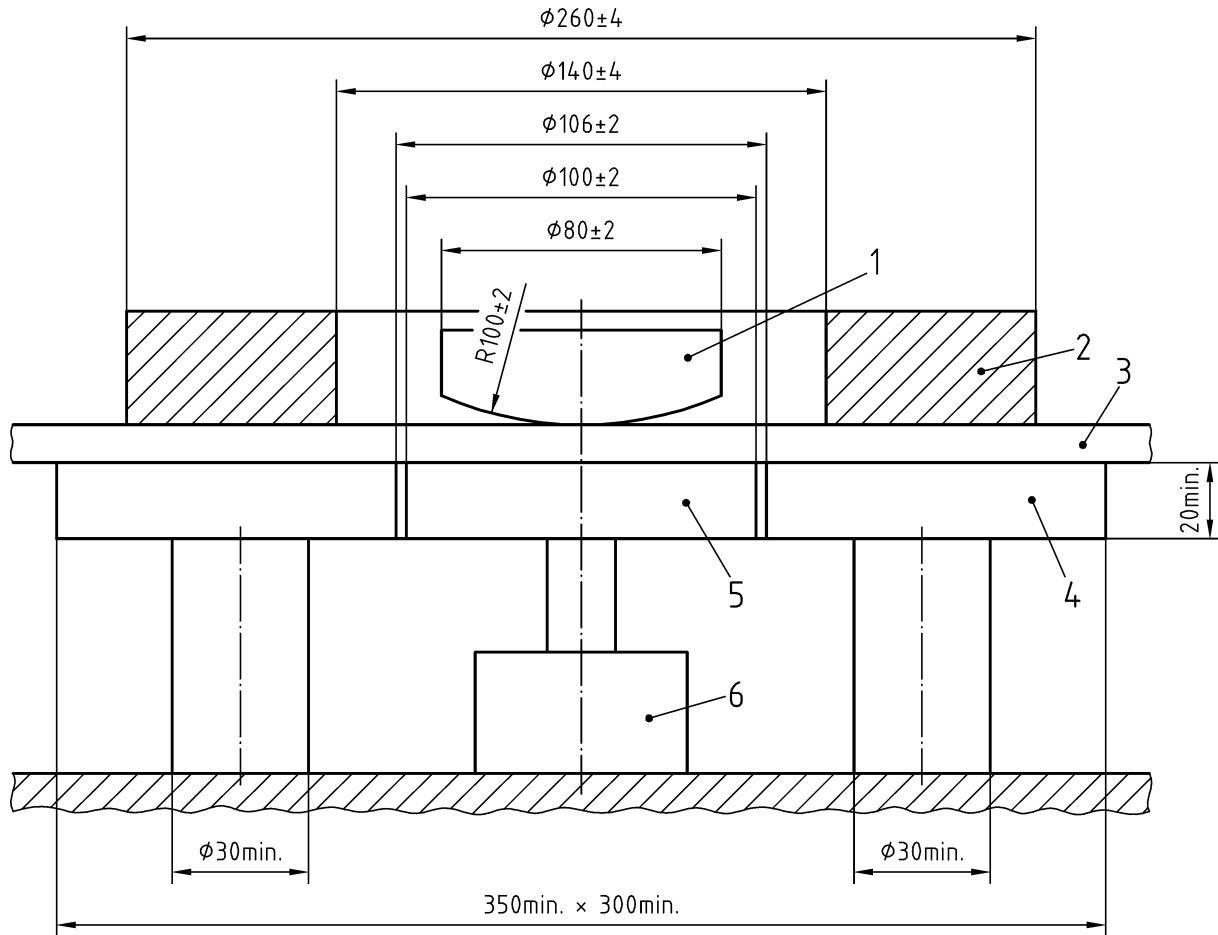
The striker shall be able to fall freely in the vertical axis of the anvil with a tolerance of  $\pm 2$  mm. The striker shall be guided in such a way, that it will always reach at least 95 % of the freefall velocity. A means of measuring the velocity of the striker at the point of impact shall be provided.

To measure the maximum peak force an electronic measurement device with the following characteristics shall be used:

**EN 13277-4:2001 (E)**

- Measurement frequency: 2 000 Hz minimum
- Accuracy class of the load cell: 0,2
- Load: 10 kN maximum

Dimensions in millimetres



**Key**

- 1 Striker
- 2 Compression ring
- 3 Head protector
- 4 Steel plate
- 5 Anvil
- 6 Load cell

**Figure 4 — Principle of impact testing of head protectors**

**5.7.2 Procedure**

The head protector shall be placed on the flat support so that the test positions to be tested shall be above the centre of the anvil. It shall be fixed with the compression ring.

The compressing ring shall be placed flat so that the anvil is situated in the centre of the ring with a tolerance of  $\pm 5$  mm.

The head protector shall be moved on the support in order to reach every test position to be tested.

If it is not possible to press the head protector flat with the compression ring, stiffening structures of the head protector shall be cut, until it is possible to place it flat.

The gap between the head protector and the compression ring shall be filled with parts of the same type of the protector in such a way that the compression ring is placed horizontally.

The parts of the head protector used for filling shall be placed in such a way that they are not within a radius of 40 mm around the striker axis.

Three impacts with an energy of 3 J shall be carried out on each of three test positions with an interval of 2 min ± 15 s between impacts.

The test positions shall be so selected to include the positions on the head protector where the worst test results are assumed to be likely.

No other position previously tested shall be within a circle of 80 mm around the test position to be tested. If positions are selected to be impacted less than 80 mm distant from each other, at least two protectors of the same type shall be selected for impact testing.

## **6 Marking**

Marking shall be carried out in accordance with clause 6 of EN 13277-1:2000.

## **7 Information supplied by the manufacturer**

Requirements for the information to be supplied by the manufacturer shall be in accordance with clause 7 of EN 13277-1:2000.

## 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 and the European Free Trade Association and supports essential requirements of EU Directive 89/686/EEC.

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

The following clauses of this standard are likely to support requirements of Directive 89/686/EEC, Annex II:

EU-Directive 89/686/EEC, Annex II	Clause of this standard
1.1.1 Ergonomics	4.1, 4.2, 4.4, 4.6, 4.7
1.2 Innocuousness	4.2
1.3 Comfort and efficiency	4.3, 4.4
1.4 Information supplied by the manufacturer	6, 7
2.1 PPE incorporating adjustment systems	4.1, 4.6
2.2 PPE enclosing the parts of the body to be protected	4.2
2.3 PPE for the face, eyes and respiratory tracts	4.5
2.4 PPE subject to ageing	7
3.1 Protection against mechanical impact	4.6, 4.7, 4.8
3.3 Protection against physical injury	4.6, 4.8

Compliance with the clauses of this European Standard provides one means of conforming with the specific essential requirements of the Directives concerned and associated EFTA regulations.



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