

# Motorcyclists' protective clothing against mechanical impact —

## Part 2: Motorcyclists' back protectors — Requirements and test methods

The European Standard EN 1621-2:2003 has the status of a  
British Standard

ICS 13.340.10

## National foreword

This British Standard is the official English language version of EN 1621-2:2003.

The UK participation in its preparation was entrusted by Technical Committee PH/3, Protective clothing, to Subcommittee PH/3/9, Clothing for the protection of riders of motorcycles, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/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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The reason for this disapproval is that during discussion of this standard by BSI Committee PH/3/9, which mirrors the work of CEN Committee TC162, WG9, several UK experts expressed the opinion that the transmitted force levels given as requirements in this EN are too high.

BSI will assume no liability whatsoever for the failure on the part of any user of this standard to consider this aspect.

### Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the *BSI Catalogue* under the section entitled “International Standards Correspondence Index”, or by using the “Search” facility of the *BSI Electronic Catalogue* or of British Standards Online.

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### Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 15 and a back cover.

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English version

**Motorcyclists' protective clothing against mechanical impact -  
Part 2: Motorcyclists' back protectors - Requirements and test  
methods**

Vêtements de protection contre les chocs mécaniques pour  
motocyclistes - Partie 2: Protecteurs dorsaux - Exigences  
et méthodes d'essai

Motorradschutzkleidung gegen mechanische Belastung -  
Teil 2: Rückenprotektoren - Anforderungen und  
Prüfverfahren

This European Standard was approved by CEN on 2 July 2003.

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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 1621-2:2003) 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 February 2004, and conflicting national standards shall be withdrawn at the latest by February 2004.

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 the relationship with EU Directives, see informative annex ZA, which is an integral part of this standard.

Annex A is normative.

This European Standard is one of a series of standards as listed below:

EN 1621-1 *Motorcyclists' protective clothing against mechanical impact — Part 1: Requirements and methods of test for impact protectors*

EN 13595-1 *Protective clothing for professional motorcycle riders — Jackets, trousers and one-piece or divided suits — Part 1: General requirements*

EN 13595-2 *Protective clothing for professional motorcycle riders — Jackets, trousers and one-piece or divided suits — Part 2: Test method for determination of impact abrasion resistance*

EN 13595-3 *Protective clothing for professional motorcycle riders — Jackets, trousers and one-piece or divided suits — Part 3: Test method for determination of burst strength*

EN 13595-4 *Protective clothing for professional motorcycle riders — Jackets, trousers and one-piece or divided suits — Part 4: Test method for determination of impact cut resistance*

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, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

## Introduction

Motorcyclist's back protectors are devices worn within or on top of other protective clothing, covering at least the central part of the back from the waist to the neck. About 13% of motorcyclists injured in road accidents have an injury to this back region. However, only 0,8% of the injured riders suffer a fracture of the spine and less than 0,2% of injured riders have a serious back injury resulting in neurological damage. These serious injuries are usually caused by axial forces due to blows on the head, or bending and twisting forces on the back caused by blows to the shoulders, hips and other parts of the body. Back protectors do not provide protection from these forces. The majority of the more minor injuries are bruises and strains caused by direct blows, and back protectors can provide some protection against these. The scapula is often injured (1,3%), protection should extend to cover this area.

The performance requirements have been chosen as a best practical compromise between protection, comfort, and ergonomic requirements. Protectors that are too stiff or heavy will not be worn. The test methods are designed to provide information on protection against impacts against edges such as kerb stones. The force levels in the tests do not compare directly with the forces to which riders are exposed in accidents, but experiences have shown that products meeting the requirements of this European Standard reduce the incidence and severity of injuries.

Motorcyclists' back protectors are sometimes combined with a product such as a body belt or lumbar support designed to give support to the lower back in normal riding. These elements, within their limited size, can also provide some impact protection, in this case they are to be called 'lumbar protectors' and are also covered by this standard.

## 1 Scope

This European Standard specifies the minimum coverage to be provided by motorcyclists' back protectors worn by riders in normal traffic situations. The standard contains the requirements for the performance of the protectors under impact and details of the test methods. Requirements for sizing, ergonomic requirements, and requirements for innocuousness, labelling and the provision of information are included.

The provision of this European Standard may not fully cover the needs of particular protectors (e.g. inflatable protector or other types of protector).

## 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 below. In the case of dated references, subsequent amendments to, or revisions of, any of these publications, apply to this European Standard only when incorporated into it by amendment or revision. In the case of undated references the latest edition of the publications referred to applies (including amendments).

EN 340, *Protective clothing — General requirements*.

EN 1621-1:1997, *Motorcyclists' protective clothing against mechanical impact — Part 1: Requirements and test methods for impact protectors*.

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

ISO 7000, *Graphical symbols for use on equipment — Index and synopsis*.

## 3 Terms and definitions

For the purposes of this European Standard, the following terms and definitions apply:

### 3.1 general

#### 3.1.1 motorcyclist's back protectors

motorcyclist's back protectors are specific devices worn on the back that are intended to reduce the severity of injuries caused by impacts

#### 3.1.2 motorcyclist's lumbar protector

motorcyclist's back protector with dimensions limited to cover the lumbar region; intended to reduce the severity of injuries caused by impacts

#### 3.1.3 zone of protection

the zone of protection is a specific area of the protective equipment that is intended to provide protection and this area is subject to specific testing

NOTE The minimum dimensions of the zones of protection will normally be marked on test specimens during the test procedures.

**3.2  
body dimensions**

the following body dimensions should be adequate for the designation of back protectors (see Figure 1)

**3.2.1  
waist to shoulder**

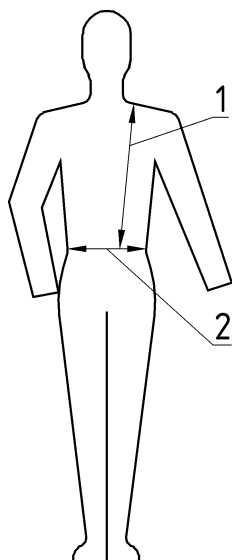
the maximum vertical length measured posteriorly from the waist to the junction of the shoulder to the neck

NOTE This is an indication of torso length.

**3.2.2  
waist line**

the maximum horizontal girth measured during normal breathing with the subject standing upright and the tape measure passed around the body in the plane of the waist, 50mm above the supra-cristal plane which is at the level of the highest points of the iliac crests

NOTE The dimension of 50 mm refers to a subject of 1,78 m tall and should be scaled pro rata with the height of the actual subject.



**Key**  
1 – Waist to shoulder  
2 – Waist line

**Figure 1 — Body dimensions**

**4 Requirements**

**4.1 General**

Motorcyclists' back protectors shall meet an overall requirement that they are safe to use, comfortable to wear and fit for their purpose.

**4.2 Innocuousness**

Construction materials and incorporated substances shall not endanger those coming into contact with them. The manufacturer shall include in the information a declaration that to his knowledge no harmful substances are contained in the product. The manufacturer shall give guidance on the safe destruction and disposal of the products and of any hazards that could arise during mechanically disrupting or incinerating the product.



### 4.3 Minimum dimensions of zones of protection

Motorcyclists' back protectors shall have a minimum zone of protection which shall be related to the size of the user (see EN 340). The minimum dimensions of the zone of protection shall be determined from Tables 1 and 2.

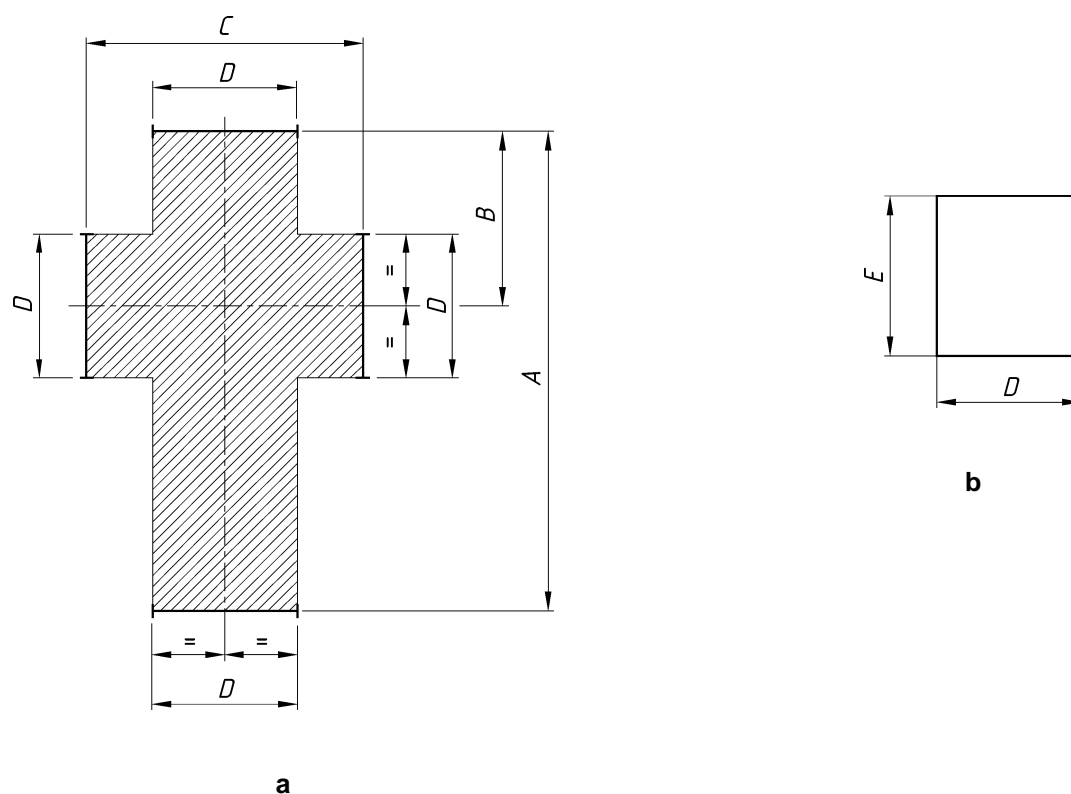


Figure 2 – Minimum dimensions of zones of protection

Table 1 — Dimensions of minimum zone of protection for back protector

Dimensions in Figure 2a			
A	B	C	D
72%	29%	44%	29%
All dimensions are referred to waist to shoulder length (100%) of the user			

Table 2 — Dimensions of minimum zone of protection for lumbar protector

Dimensions in Figure 2b	
E	D
32%	29%
All dimensions are referred to waist to shoulder length (100%) of the user	

## EN 1621-2:2003 (E)

The dimensions and position of the zone of protection, relative to the coverage provided by the whole product, shall be given in the information supplied by the manufacturer (see 8).

### 4.4 Sizing and size marking

Motorcyclists' back protectors shall be marked with their sizing using a pictogram according to EN 340. The I in a book pictogram ISO 7000-1641 shall also be used. The pictograms are to be placed on the product and on the package in which it is supplied.

### 4.5 Ergonomic Requirements

When examined and tested according to annex A, back protectors shall be found satisfactory for the use intended and as indicated in the information supplied by the manufacturer.

### 4.6 Level of impact performance

Motorcyclists' back protectors shall be impact tested with an impactor designed to represent the hazards of impacts with edges such as kerbstones. The impactor shall be mounted on the appropriate guided falling mass. The specified impact energy shall be within a limit deviation of  $\pm 3\%$ .

**Level 1 protectors:** The average peak force recorded below the anvil in the tests described in 6.4 shall be below 18kN, and no single value shall exceed 24kN.

**Level 2 protectors:** The average peak force recorded below the anvil in the tests described in 6.4 shall be below 9kN, and no single value shall exceed 12kN.

## 5 Test Equipment - Apparatus

### 5.1 Dropping apparatus

The apparatus shall be such that a mass ("falling weight") can be released in order to drop along a guided vertical path onto the sample placed on a test anvil. The centre of the mass of the falling weight shall lie over the centre of the anvil.

### 5.2 Bar impactor

A bar impactor which shall be rectangular with a length,  $h_1$ , equal to  $(160 \pm 2)$  mm, a width,  $h_2$ , at the top, equal to  $(50 \pm 1)$  mm and with a radius hemispherical face, R, equal to  $(12,5 \pm 0,1)$  mm shall be provided, see Figure 3. The mass of the impactor and guided mass shall be  $(5\ 000 \pm 50)$  g and its kinetic energy on impact shall be  $(50 \pm 1.5)$  J.

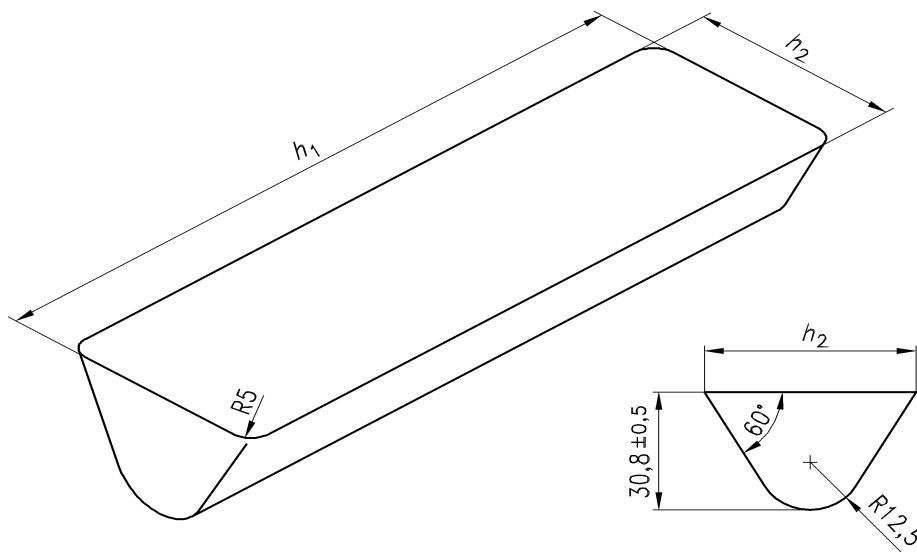


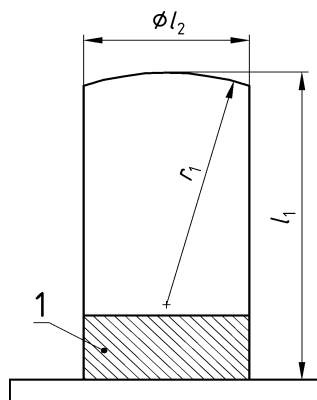
Figure 3 — Bar impactor

### 5.3 Anvil

#### 5.3.1 General

The anvil shall be made of polished steel with the following dimensions  $l_1$  equal to  $(190 \pm 20)$  mm,  $l_2$  equal to  $(100 \pm 2)$  mm and  $r_1$  equal to  $(150 \pm 5)$  mm, see Figure 4.

The anvil shall be attached through a piezoelectric load cell or equivalent force transducer to a mass of at least 1 000 kg. The load cell or force transducer shall be preloaded to the manufacturer's instructions.



#### Key

1 load cell

Figure 4 — Anvil

NOTE The anvil is designed to represent the back.

### 5.3.2 Force measurement instrumentation

The anvil shall be mounted so that during impact testing the whole force between the anvil and the massive base of the apparatus passes through a quartz force transducer in line with its sensitive axis. The force transducer shall have a calibrated range of not less than 50kN and a lower threshold of less than 0,5kN. The output of the force transducer shall be processed by a charge amplifier and displayed and recorded on suitable instruments. The recording system shall show a continuous force with a time record, or shall have a peak force detection capability. Digital sampling systems shall have a minimum rate of 10kHz. The measuring system including the drop assembly shall have a frequency response in accordance with channel frequency class (CFC) 1 000 of ISO 6487.

### 5.3.3 Tolerance and uncertainty

Measuring instruments or their independent working components unless otherwise specified shall have an error limit of  $\pm 2\%$  of the pass/fail level of the characteristic being measured.

For each of the required sequences of measurements performed in accordance with this standard a corresponding estimate of the uncertainty of the final result shall be determined. On request, this uncertainty ( $U_m$ ) shall be given in the test report in the form  $U_m = \pm X$ . It shall be used in determining whether a "Pass" performance has been achieved. If the final result plus  $U_m$  is above the maximum Pass level, the sample shall be deemed to have failed.

## 6 Test Method

### 6.1 Samples for technical examination and ergonomic testing

Back protectors shall be supplied by the manufacturer or his agent complete with labels, or copies of the proposed labels, and the information supplied by the manufacturer that shall be supplied with the products. At least three samples of back protectors shall be supplied for testing. If a manufacturer offers a size range one sample shall be from the mid-point and one from the largest and smallest sizes.

### 6.2 Preconditioning and testing atmosphere

Back protectors shall be preconditioned and tested to the requirements as described in EN 1621-1:1997, subclause 6.1..

### 6.3 Measurement and marking of back/lumbar protectors

The required dimensions of the minimum zone of protection of the back/lumbar protector shall be determined from their stated torso length, which shall correspond to Table 1 or Table 2, as applicable. Templates, see Figure 1, for the minimum zone of protection shall be prepared from stiff but flexible material such as coated fabric or card. The templates shall be accurately prepared (tolerances  $\pm 5\%$ ). The templates shall be used to mark the perimeter of the minimum zone of protection onto the outside of the back/lumbar protector with a felt tip pen or similar marker. The correspondence between the lines marked on the back/lumbar protector by the template and the extent of the protective structures shall be determined. Any apparent weak points, or points which appear to offer reduced protection, shall also be marked.

### 6.4 Procedures for impact testing

Back protectors marked with the perimeter line of the minimum zone of protection and the examination marks according to 6.3, and that have been pre-conditioned according to 6.2 shall be used.

Normally whole back protectors shall be tested. The sample shall be placed onto the centre of the anvil outside surface upward. If it is necessary to reduce their size to fit within the test equipment the minimum zone of protection may be cut into and partially removed for testing. Care should be taken to ensure that the cutting and removal of parts of the back protector do not effect its performance during the impact tests. Cut edges shall be bound with adhesive tape to retain the normal relationship between components of the protector.

## 6.5 Number of tests

A minimum of five impacts shall be carried out on each type of construction present using the equipment described in clause 5. The impacts shall be distributed over the protectors. The centres of the impacts shall be more than 90mm apart. A series of at least five impacts shall be carried out, one shall be  $(40 \pm 5)$  mm from the perimeter line of the zone of protection, one shall be  $(60 \pm 5)$  mm from the perimeter line and one shall be at the centre of the zone of protection. At least two single impacts shall also be made on all visually identified weak points and /or in the direction found to be more severe.

The same test cycle shall be applied to other size if some contraction parameter is different (e.g. thickness).

## 6.6 Test results

Individual peak transmitted forces shall be reported and the average peak force shall be calculated and reported

## 6.7 Test report

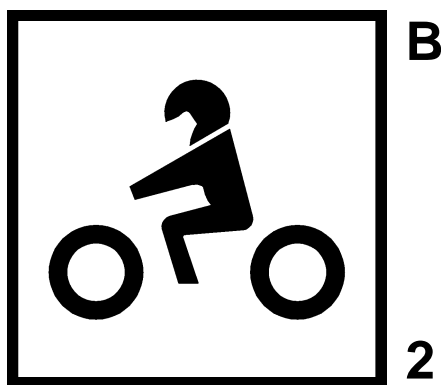
The test report shall include the following information:

- a) identification of the back protector, including source and date of receipt;
- b) the method used by reference to this European Standard;
- c) results of the test;
- d) if relevant, any deviations from the method specified in this European Standard;
- e) any unusual features observed during the test;
- f) date of test;
- g) identification of the laboratory carrying out the test.

## 7 Marking

Motorcyclists back protectors shall be permanently and conspicuously marked with at least the following:

- a) the number of the specific European Standard, (EN 1621-2);
- b) The name or trade mark of the manufacturer or his authorised representative in the European Union or country where the product is placed on the market;
- c) identification of the product type, commercial name or code;
- d) the size designation of the item, (waist to shoulder length as described in 4.4);
- e) a pictogram showing the performance level and a type of protector, "B" for back protector, or "L" for lumbar protector (a suitable Pictogram is shown in Figure 5).



## EN 1621-2

Figure 5 — Pictogram

### 8 Information Supplied by the Manufacturer

Motorcyclists back/lumbar protectors shall be supplied with information and instructions for fitting and use. These are an essential part of protective equipment. They shall contain at least the following information in the official language(s) of the state or region in which they are placed on the market. The following information should be given on the product whenever practical.

- 1) The name and address of the manufacturer or his authorised representative;
- 2) the type of use for which the protectors are intended including any relevant restrictions;
- 3) the hazards specific to motorcycling against which some protection is given;
- 4) the hazards specific to motorcycling against which protection is NOT given;
- 5) international care label symbols (Negative labels are important);
- 6) all the information required in section 7: Marking;
- 7) how to adjust the back/lumbar protector;
- 8) performance recorded during technical tests;
- 9) a warning about any changes in environmental conditions, such as temperature, that would significantly reduce the performance of the back/lumbar protector;
- 10) the dimensions of the Zone of protection, relative to the coverage provided by the whole product;
- 11) a warning that no back/lumbar protector can offer full protection against injury;
- 12) a specific warning that spinal injuries will not be prevented by the back/lumbar protector;
- 13) a warning about any contamination, alteration to the back/lumbar protector, or misuse that would dangerously reduce the performance of the back/lumbar protector;
- 14) a declaration that no harmful substances are contained in the product;

- 15) instructions for caring for and cleaning the back/lumbar protector;
- 16) instructions concerning inspection and repair of the back/lumbar protector, when to replace it and how to decide if it no longer provides adequate protection;
- 17) instructions for the safe destruction and disposal of the back/lumbar protectors and of any hazards that could arise during mechanically disrupting or incinerating the product.

## Annex A (normative)

### Ergonomic Tests

#### A.1 General

The back protector is examined visually to assess torsional and bending flexibility to ensure no restriction in movement. The back protector should also be examined visually for design features that may cause problems and any sharp edges.

The back protector is then put on by an assessor of suitable size and with experience of riding a motorcycle who then carries out the following tests.

#### A.2 Tests

- 1) can you get on and off a Motorcycle;
- 2) can you comfortably reach the controls of the Motorcycle;
- 3) can you turn your head and torso when on a Motorcycle;
- 4) does the adjustment system cause discomfort;
- 5) does the adjustment system securely hold the protector in place;
- 6) can you pick something up from the floor by bending forward.

#### A.3 Test report

The test report shall include the following:

- 1) Reference to this test method of this annex;
- 2) description of the test protector;
- 3) name, sex and dimensions of the assessor,(Waist to Shoulder length);
- 4) any deviations from the specified procedure;
- 5) specific reasons for failure of any of the ergonomic tests.



## 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 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.

**Table ZA.1 — Relationship between this European Standard and Directive 89/686/EEC**

Clauses of this European Standard	Directive 89/686/EEC, Annex II
	1 General requirements applicable to PPE
4.5 and annex A	1.1 Design Principles
annex A	1.1.1 Ergonomics
4.3; 4.6	1.1.2 Levels and classes of protection
	1.1.2.1 Highest level of protection possible
	1.1.2.2 Classes of protection appropriate to different levels of risk
4.2	1.2 Innocuousness
annex A	1.2.1.1 Suitable constituent materials
	1.2.1.3 Maximum permissible user impediment
4.3 – 6.3	1.3 Comfort and efficiency
	1.3.1 Adaption to user morphology
8	1.4 Information supplied by the manufacturer
4.5 and annex A	2.1 PPE incorporating adjustment systems
4.4 and 7	2.12 PPE bearing one or more identification or recognition marks directly or indirectly relating to health and safety
4.6 - 6.4	3.1 .1 Impact caused by falling or projecting objects and collision of parts of the body with obstacles

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

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