



# SLOVENSKI STANDARD

## oSIST prEN 16448-3:2012

01-september-2012

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**Varovalna obleka - Neprebojno oblačilo - 3. del: Odpornost proti vbodu z rezilom in bodalom, zahteve in preskusne metode**

Protective Clothing - Body Armour - Part 3: Knife and Spike Resistance, Requirements and test methods

Schutzkleidung - Körperschutz - Teil 3: Widerstand gegen Messer und Dorne, Anforderungen und Prüfverfahren

Vêtement de protection - Protection du corps - Partie 3 : Résistance à couteaus et broches - exigences et méthodes d'essai

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**Ta slovenski standard je istoveten z: prEN 16448-3**

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**ICS:**

13.340.10      Varovalna obleka      Protective clothing

**oSIST prEN 16448-3:2012**      **en,fr,de**

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**DRAFT**  
**prEN 16448-3**

June 2012

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ICS 13.340.10

English Version

## Protective Clothing - Body Armour - Part 3: Knife and Spike Resistance, Requirements and test methods

Vêtement de protection - Protection du corps - Partie 3 :  
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d'essai

Schutzkleidung - Körperschutz - Teil 3: Widerstand gegen  
Messer und Dorne, Anforderungen und Prüfverfahren

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## Foreword

This document (prEN 16448-3:2012) has been prepared by Technical Committee CEN/TC 162 “Protective clothing including hand and arm protection and life jackets”, the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

This document 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 document.

EN 16448 consists of the following parts, under the general title *Protective clothing - Body armour*:

- *Part 1: General requirements*
- *Part 2: Ballistic resistance - Requirements and test methods*
- *Part 3: Knife and spike resistance - Requirements and test methods*

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## Introduction

Body armour is worn by individuals and by groups of employees who are at risk of assault. Body armour is generally designed to prevent serious and fatal injuries to the torso from the anticipated threats. Body armour can be designed to provide bullet resistance or stab resistance, or a combination of both. The wide range of threats in different operational situations, the variable risk of assault, and the ergonomic requirements of wearers, influence the specifications of body armour. This series of European Standards recognises the potentially rapidly changing needs of users and manufacturers, by being divided into separate parts for Part 1: General requirements, Part 2: Bullet resistance and Part 3: Knife stab resistance

It should be recognised that no body armour can provide complete protection from injury in all situations. However it has been found that the incidence and severity of injuries is reduced by appropriate body armour.

Personal protective equipment produced exclusively for use in National armed forces and in police forces engaged in the maintenance of law and order is excluded from the requirements of Directive 89/686, but may never-the-less, be assessed in part according to this European Standard, providing additional necessary requirements relating to specific operational needs are identified.

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.

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## 1 Scope

This European Standard specifies the minimum general requirements and test methods for body armour intended to provide torso protection against assaults by edged weapons.

The standard targets products aimed for the civilian market, for example for different types of guards.

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 16448-1, *Protective Clothing - Body Armour - Part 1: General requirements*

## 3 Terms and definitions

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

### 3.1

#### fair strike

strike that impacts the armour at an angle of incidence no greater than  $\pm 5^\circ$  from the intended angle of incidence, no closer to the edge of the protective insert than 50 mm, no closer than 50 mm from the edge of the tray holding the backing material and no closer to a previous strike than 50 mm and with the energy within the specifications required for the intended level of protection.

## 4 Requirements

The knife resistance armour shall pass the tests in this document, with the test limits according to the class of protection stated by the manufacturer.

The classes are defined in EN 16448-1.

Knife or spike resistant body armour shall also meet the requirements described in EN 16448-1.

NOTE Compliance with EN 16448-1 and -3 does not imply that the body armour provides ballistic protection. Compliance with EN 16448-1 and -2 of is necessary for ballistic protection. For dual-purpose body armour i.e. Ballistic + Stab, compliance with EN 16448-1, -2 and -3 is required.

## 5 Test methodology

### 5.1 Test equipment

The test shall be performed using a guided rail drop tube assembly, which shall enable the knife/spike missile to fall under the influence of gravity and strike the armour sample at a pre-determined point of impact. The guide rails, situated inside the tube, shall prevent the knife/spike missile from rotating about its vertical axis during its descent. These rails shall also ensure that the test implement strikes at the correct orientation so that any weakness in the armour design can be fully determined. The drop tube assembly shall be rigidly secured to a supporting wall or frame, and care shall be taken when installing the system to ensure that the tube is mounted vertically.

### 5.2 Knife/Spike missile

The knife/spike missile shall consist of a separate steel and alloy knife and spike holders of mass  $0,65 \text{ kg} \pm 6,5 \text{ g}$  (including the knife or spike) housed in a nylon missile casing of mass  $1,25 \text{ kg} \pm 13 \text{ g}$ . The

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casing shall be designed to ensure minimal friction between the missile and the inner walls of the tube during its falling motion (figure 1). The missile length shall be sufficient to ensure that part of the body remains inside the drop tube throughout a test drop impact. The nylon body shall be replaced if it becomes damaged in a way that may influence the friction between the missile and the falling tube or the missile and the inner parts of the missile, or in any other way may affect the test results

The knife/spike holder shall be free to slide vertically within the nylon body casing. However, sandwiched between the base of the knife/spike holder and the nylon casing, shall be two 50 mm diameter discs of Plastazote® foam. As the knife/spike holder is forced into the casing under load, the foam is increasingly compressed.



Figure 1 — Knife missile

### 5.3 The engineered test knife and spike

The engineered test implements used in this standard are described as P1/B for the knife and SP/B for the spike (figures 2 and 3). Each armour sample shall be tested using either the P1/B knife for knife resistance or both the P1/B and SP/B for knife and spike resistance. Detailed manufacturing drawings of each of the test implements are given in Annex A.

<https://standards.iteh.ai/catalog/standards/sist/32ac2a8-7129-4698-acd2-53040420956/standard/prEN-16448-3-2012>

A certificate of the steel used in the knives shall be available from the manufacturer.

NOTE The engineered test knife has been designed by British HOSDB to replicate the broad spectrum of knives used in assaults on Police Officers. The spike represents a typical spiked implement that is considered to be a greater threat to Prison Officers than to Police Officers.

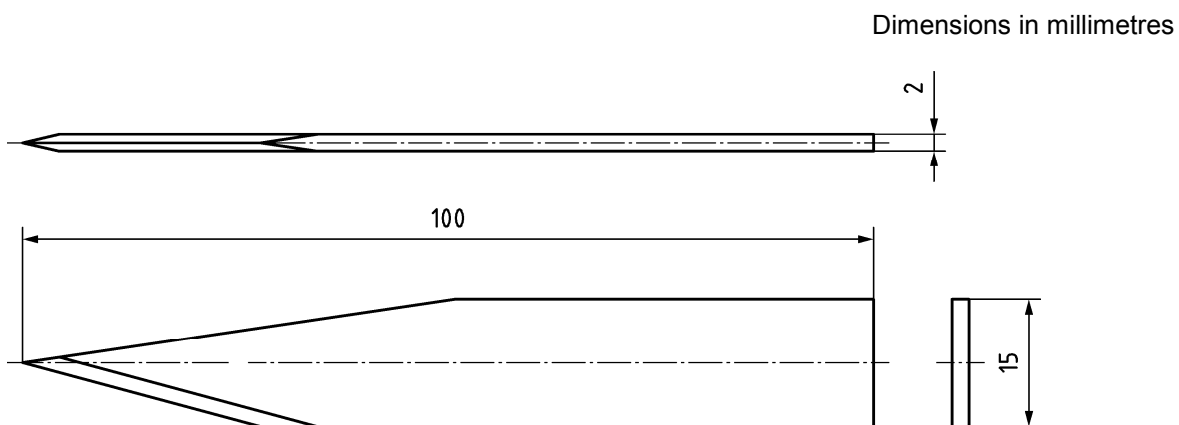


Figure 2 — P1B knife

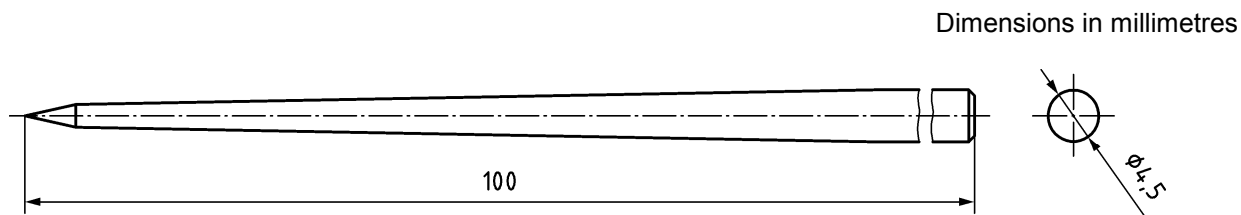


Figure 3 — SP/B spike

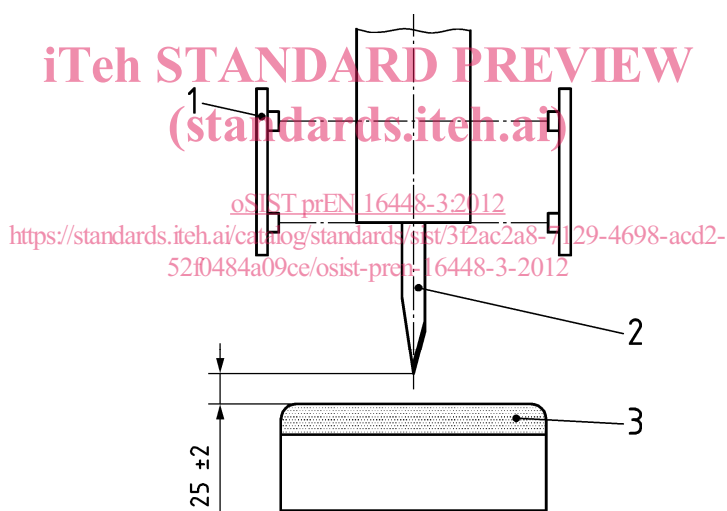
### 5.4 Velocity measurement

A suitable method of accurately measuring the velocity of the missile at  $25 \text{ mm} \pm 2 \text{ mm}$  before impact shall be employed (figure 4). Recommended types of equipment for velocity measurement include:

- Photoelectric light screens; 100.0 4.5
- Laser/light sensor diode light screens.

If light screens are used the base length of the timing sensors shall be a maximum of 50 mm. The measuring equipment shall be calibrated so that it is capable of measuring the velocity to an accuracy of  $\pm 0,2 \text{ m/s}$ .

Dimensions in millimetres



#### Key

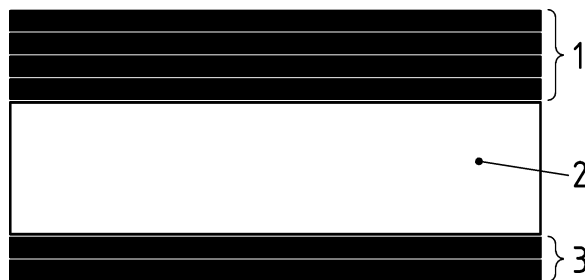
- 1 Velocity Measuring Equipment
- 2 Knife or Spike
- 3 Body Armour Mounted on Composite Backing Material

Figure 4 — Typical Test Apparatus for Knife and Spike Testing

### 5.5 The Composite Backing Material

The composite backing material is supplied in packs measuring 400 mm x 33 mm and consists (from the strike face down) of four layers of 6 mm RA110 neoprene, followed by a single 30 mm layer of 33 kg/m<sup>3</sup> Plastazote® foam, backed by 2 layers of 6 mm natural rubber to BS 2494D (figure 5).

A list of suggested manufacturers and suppliers is given in Annex C.

**Key**

- 1 4 Layers of 6 mm RA110 Neoprene
- 2 1 Layer 30 mm Plastazote® foam
- 3 2 Layers of 6 mm 2494D Rubber

**Figure 5 — Composite Backing Material****6 Preparation of test equipment****6.1 Selecting test knife/spike**

For compliance testing, a total of 40 P1/B test knives shall be selected at random for knife resistant testing. If spike resistance is required, 10 SP/B spikes shall be selected in addition to the knives. A new knife/spike shall be used for each test strike. A visual check shall be made to ensure the overall finish of the knife/spike is clean and free from rough edges, and that it meets the general requirements of the technical specification given in Annex A.

In particular the knife shall be visually inspected to ensure that:

- the edge and tip are undamaged;
- the edge and tip are geometrically centred on the knife, not off-centred;
- the edge is grinded all the way;
- there are no visual sign of burning to the tip.

**NOTE** Signs of burning on the tip may indicate that the temperature of the metal has been too high during grinding, which might affect the hardening.

**6.2 The tip sharpness test**

Prior to testing, the knife/spike shall first be subjected to a tip-sharpness test

This standard addresses two methods of assessing tip sharpness:

The first method consists of a standard Rockwell Hardness Testing Machine, Mitutoyo model ATK-F1000, with a modified indenter holder to accept the knife or spike. The machine shall be pre-set to give minor and major loads of 3 kg and 5 kg respectively as detailed in Annex B.2.

The knife/spike shall first be wiped with heavy duty degreaser solvent wipes<sup>1</sup> to remove any traces of lubricant and allowed to dry. From this point onwards, care shall be taken to not soil the blade again, for example by handling them wearing clean cotton/linen gloves. The tip sharpness shall then be tested by applying the load

<sup>1</sup> Suitable degreasing wipes can be purchased using the order code: 28635 or 70683 from: [www.screwfix.com](http://www.screwfix.com). Free phone: 0500 414141.