

# Visibility accessories for non-professional use — Test methods and requirements

The European Standard EN 13356:2001 has the status of a  
British Standard

ICS 13.340.01

## National foreword

This British Standard is the official English language version of EN 13356:2001.

The UK participation in its preparation was entrusted by Technical Committee PH/3, Protective clothing, to Subcommittee PH/3/7, High visibility clothing, visual performance, 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.

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This British Standard, having been prepared under the direction of the Health and Environment Sector Committee, was published under the authority of the Standards Committee and comes into effect on 15 September 2001

### Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 12, an inside back cover and a back cover.

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English version

## Visibility accessories for non-professional use - Test methods and requirements

Accessoires de visualisation pour usage non-professionnel  
- Méthodes d'essai et exigences

Warn-Zubehör für den nichtprofessionellen Bereich -  
Prüfverfahren und Anforderungen

This European Standard was approved by CEN on 4 June 2001.

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## 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of an identical text or by endorsement, at the latest by January 2002, and conflicting national standards shall be withdrawn at the latest by January 2002.

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).

Annex A is normative and contains test method for brushing according to 5.3.

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.

## 0 Introduction

This European Standard relates to products primarily intended to be worn or carried by individuals to make them more conspicuous to other road users under low light levels. The products rely upon retro-reflection for their performance. The products can be regarded as aids to conspicuity that perform best in circumstances of very low ambient lighting. On lit urban roads, products conforming to EN 471 : 1994 or EN 1150 are necessary to provide conspicuity. In any circumstance in which the failure of a vehicle driver to become aware of another road user could result in the serious injury or death of that road user, only high conspicuity garments can be recommended for use. Products conforming to this European Standard have a utility when their movement and retro-reflection attract observers' attention.

## 1 Scope

This standard specifies the optical performance requirements for accessories which are to be worn, attached to or carried by people and designed for non-professional use. Visibility accessories complying with this standard are intended to signal the user's presence visually when illuminated by vehicle headlight on dark roads. This standard is not applicable to garments.

## 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 471 : 1994

High-visibility warning clothing

EN 1150

Protective clothing - Visibility clothing for non-professional use - Test methods and requirements

EN ISO 3175 : 1995

Textiles - Evaluation of stability to machine dry-cleaning (ISO 3175:1995)

EN ISO 6330 : 2000

Textiles - Domestic washing and drying procedures for textile testing (ISO 6330:2000)

CIE 17.4 :1987

International lighting vocabulary – Chapter 845: Lighting

CIE 18.2 : 1983

The basis of physical photometry

CIE 54 :1982

Retroreflection: Definition and measurement

IEC 60068-2-32

Basic environmental testing procedures – Part 2: Tests – Test Ed: Free fall

ISO 4675

Rubber- or plastics-coated fabrics - Low-temperature bend test

### 3 Terms and definitions

For the purposes of this standard the definitions for photometric terms according to CIE 17.4 : 1987, CIE 18.2 : 1983 and CIE 54 : 1982 and the following definitions apply:

#### 3.1

##### **accessory**

retroreflector to be used as an aid to enhance conspicuity and is a product other than a garment

#### 3.2

##### **type 1 - free hanging accessory**

an item suspended from a garment or part of the body which is capable of hanging freely and of being removed by a conscious action

NOTE Type 1 fasteners should be produced so that if subject to undue force they separate from the garment or body from which they are suspended.

#### 3.3

##### **type 2 - removable accessory**

an item which is temporarily attached to a garment or on to part of the body and is removable without the aid of tools. Requirements of type 2 reflectors should be specified by Table 2

#### 3.4

##### **type 3 - mounted accessory**

an item manufactured to be permanently affixed

#### 3.5

##### **flexible accessory**

accessory capable of being wound around a 25 mm mandrel in all orientations without any visible deformation

#### 3.6

##### **rigid accessory**

accessory not capable of being wound around a 25 mm mandrel in all orientations without any visible deformation

#### 3.7

##### **orientation sensitive material**

material having coefficients of retroreflection that differ by more than 15 % when measured at the two rotation angles  $\varepsilon_1 = 0^\circ$  and  $\varepsilon_2 = 90^\circ$

### 4 Requirements for accessories

#### 4.1 General requirements

The accessories shall meet requirements of area as well as retroreflection. When mounting the retroreflector on a garment, the area of the accessory shall be such so that the requirements for the retroreflective value are met. The area of a type 1 - accessory shall be between 15 cm<sup>2</sup> and 50 cm<sup>2</sup> per side. If the type 1 - accessory is only retroreflective from two sides the thickness shall be maximum 10 mm. Each type 2- and type 3 - accessory shall exceed the area of 15 cm<sup>2</sup>.

**4.2 Specific requirements for different types of accessories**

**4.2.1 General**

Depending on the type of accessories, the requirements below supplement the general requirements in 4.1.

**4.2.2 Photometric requirements**

The accessories shall achieve the minimum retroreflective values given either in Table 1 or Table 2.

**Table 1 - Minimum coefficient of luminous intensity R (CIL) for free hanging type 1- accessories**

coefficient of luminous intensity R in mcd/lx

Observation angle $\alpha$	Entrance angle $\beta$		
	$\beta_1 = 0^\circ$ $\beta_2 = \pm 5^\circ$	$\beta_1 = \pm 10^\circ$ $\beta_2 = 0^\circ$	$\beta_1 = 0^\circ$ $\beta_2 = \pm 20^\circ$
0,2° (12')	560	350	280
0,33° (20')	400	250	200
1,5° (1°30')	20	10	10

**Table 2 - Minimum coefficients of specific retroreflection value R' for type 2 and type 3 - accessories**

retroreflective value R' in cd/lx m<sup>2</sup>

Observation angle $\alpha$	Entrance angle $\beta$ (Measurement only + entrance angle $\beta_1$ )	
	$\beta_1 = + 5^\circ$ $\beta_2 = 0^\circ$	$\beta_1 = + 20^\circ$ $\beta_2 = 0^\circ$
0,2° (12')	110	80
0,33° (20')	80	60
1,5° (1°30')	4	3

The minimum area for type 2 and type 3 accessories shall meet the minimum CIL value  $R = 400$  mcd/lx in all directions around the person at  $\alpha = 0,33^\circ$ ,  $\beta_1 = + 5^\circ$ .

**4.2.3 Abrasion resistance (brushing resistance)**

After testing in accordance with 5.3, the photometric requirements given in Table 1 or Table 2 shall be met.

**4.2.4 Washing and dry cleaning requirements**

After testing in accordance with 5.4.2 or 5.4.3, the photometric requirements given in Table 1 or Table 2 shall be met.



#### 4.2.5 Durability against heat

After testing in accordance with 5.6, the photometric requirements given in Table 1 or Table 2 shall be met.

#### 4.2.6 Low temperature requirements (folding)

After testing in accordance with 5.5.1, the photometric requirements given in Table 1 or Table 2 shall be met.

#### 4.2.7 Exposure to water

After testing in accordance with 5.7.1, the photometric requirements given in Table 1 or Table 2 shall be met and no visible water penetration is allowed.

#### 4.2.8 Influence of rainfall

During the test in accordance with 5.7.2, the photometric requirements given in Table 1 or 2 shall be met at the entrance angle  $\beta_1 = +5^\circ$  and  $\beta_2 = 0^\circ$  and the observation angle  $\alpha$  is  $0,2^\circ$ .

If material is orientation sensitive when dry, measurements shall be made at the rotation angle which gave the lowest measured performance when dry.

## 5 Testing

### 5.1 General

The samples tested in accordance with 5.2 shall be exposed as specified in Table 3 and Table 4 depending on the types of accessories. After exposure each test specimen shall fulfil the photometric requirements given in Table 1 for type 1 accessories or Table 2 for type 2 and type 3 accessories (at the entrance angle  $\beta_1 = +5^\circ$  and  $\beta_2 = 0^\circ$  and observations angle  $\alpha = 0,2^\circ$ ).

Preconditioning in accordance with EN 471 : 1994.

**Table 3 - Test exposure for rigid accessories**

Exposure	Test sample									
	1		2		3		4			
5.3 Abrasion test (brushing)	x									
5.5.2 Free fall test (according to IEC 60068-2-32)			x							
5.6 High temperature test	x		x		x		x			
5.7.1 Influence of water (water immersion)			X <sup>a</sup>		x					
5.7.2 Influence of rainfall (Type 3)							x			
5.2 Photometric testing	x		x		x		x			
<sup>a</sup> for type 1 only										

**Table 4 - Test exposure for flexible accessories**

Exposure	Test sample								
	1		2		3		4		5
5.3 Abrasion test (brushing)	x								
5.4.2 Washing (only Typ 3)							x		
5.5.1 Folding			x						
5.6.2 Temperature variation for flexible accessories					x				
5.7.2 Influence of rainfall									x
5.2 Photometric testing	x		x		x		x		

**5.2 Photometric testing**

**5.2.1 Principle**

The performance of the accessories shall be determined by the procedures given in CIE 54 : 1982.

**5.2.2 Mounting of sample**

The sample shall be mounted to a goniometer table in the position which is intended to be worn by the user. If it is not possible to define this position, the retroreflector shall be tested at the most unfavourable rotation angle  $\epsilon_0$  determined when measured at  $\alpha = 0,33^\circ$  and  $\beta_1 = + 5^\circ$ .

Type 3 accessory shall be applied in form of a test sample of minimum size of 25 cm<sup>2</sup>.

**5.2.3 Conditioning**

The sample shall be conditioned for at least 24 h at a temperature of  $(23 \pm 2)^\circ\text{C}$  and a relative humidity of  $(50 \pm 5)\%$ .

**5.3 Abrasion test (brushing)**

The test shall be carried out with a polyamide brush with size according to annex A. The brush is of a PA 6.6 quality with diameter  $(0,25 \pm 0,025)$  mm, arranged in 56 sections with each  $(165 \pm 5)$  stems. The length of the stems shall be  $(14 \pm 1)$  mm. The total brush shall weigh  $(450 \pm 5)$  g.

The brush shall be mounted in a machine which provides a back and forth going movement in one dimension. The test sample is mounted horizontally. The direction of the movement shall be transverse the length of the brush. The brush shall be moved back and forth  $(30 \pm 3)$  times/min for 10 min. The change of the direction of the brush shall be outside of the sample area.

## 5.4 Washing and dry cleaning test

### 5.4.1 General

The accessory shall be mounted as intended on a sample of background fabric 400 mm x 400 mm, per instructions from the manufacturer. In case of tapes with a width of less than 100 mm several are placed next to each other. The background fabric shall be of 65 % polyester and 35 % cotton with an area weight of 230 g/m<sup>2</sup> to 250 g/m<sup>2</sup>. The test sample shall be washed or dry cleaned 5 times, according to the manufacturers instruction.

### 5.4.2 Washing

The samples shall be washed in accordance with Method 5A of EN ISO 6330 : 2000, and dried in accordance with the manufacturers instructions.

### 5.4.3 Dry cleaning

The test samples shall be dry cleaned in accordance with Method 9.1 of EN ISO 3175 : 1995.

## 5.5 Low temperature test

### 5.5.1 Folding

The test sample shall be exposed and folded in accordance with ISO 4675 at a temperature of  $(-20 \pm 5)^{\circ}\text{C}$ .

### 5.5.2 Free fall test (according to IEC 68-2-32)

The sample shall be conditioned at the temperature of  $(-30 \pm 2)^{\circ}\text{C}$  for 4 hours. Immediately after the sample is dropped down onto a steel plate from the height of 0,5 m. The test shall be repeated ten times.

After the test the sample shall meet the immersion of water test 5.7.1. and photometric test 5.1. During the free fall test the sample is without hanging and fixing elements if they are separable from the retro-reflector unit.

## 5.6 High temperature test

### 5.6.1 Preconditioning of rigid accessories

The sample shall be placed in an oven at temperature  $(65 \pm 2)^{\circ}\text{C}$  for 24 h.

### 5.6.2 Exposure to temperature variation for flexible accessories

The test shall be carried out in accordance with 7.4.4 of EN 471 : 1994.

## 5.7 Exposure to water

### 5.7.1 Influence of water (water immersion)

The sample pretested according to 5.5.2 shall be immersed with the retroreflective side up into water with temperature  $(50 \pm 5)^{\circ}\text{C}$ . The top point of the sample shall be minimum 20 mm under the surface of the water. After 10 min the sample is turned around so that the retroreflective side is turned down wards. Allow it to stay for another 10 min. The sample is immediately hereafter transferred to another basin with temperature  $(25 \pm 5)^{\circ}\text{C}$ , and the procedure is repeated.

Photometric measuring before and after the test gives basis for determination of any occurred changes. The measuring is done 15 min after having removed sample from water and hung it vertically. Sample shall also be checked for possible water penetration.

### **5.7.2 Influence of rainfall**

The sample shall be tested in accordance with 7.5 of EN 471 : 1994.

## **6 Marking**

The accessories shall be marked with the following:

- name of the manufacturer or code
- type number

The marking shall be:

- on the product itself or labels attached to the product or to the smallest packaging unit;
- affixed so as to be legible;
- durable for the appropriate number of cleaning processes, where appropriate.

The marking shall be large enough to convey immediate understanding and to allow the use of readily legible characters.

NOTE The use of numbers not smaller than 2 mm is recommended. Numbers are recommended to be black on white background.

## **7 Manufacture information for use**

The instruction for use shall include the following information:

- a) Name, trade mark or other means of identification of the manufacturer or his authorized representative;
- b) Designation of the product type, commercial name or code;
- c) Number of this specific standard (EN 13356);

Accessories shall be supplied to the customer with information written at least in the official language(s) of the state of destination. All information shall be unambiguous.

The following minimum information shall be given:

- d) Fixing; how to attach;
- e) Necessary warnings of misuse;
- f) Limitations on use (e. g. environment);
- g) Storage; how to store correctly.

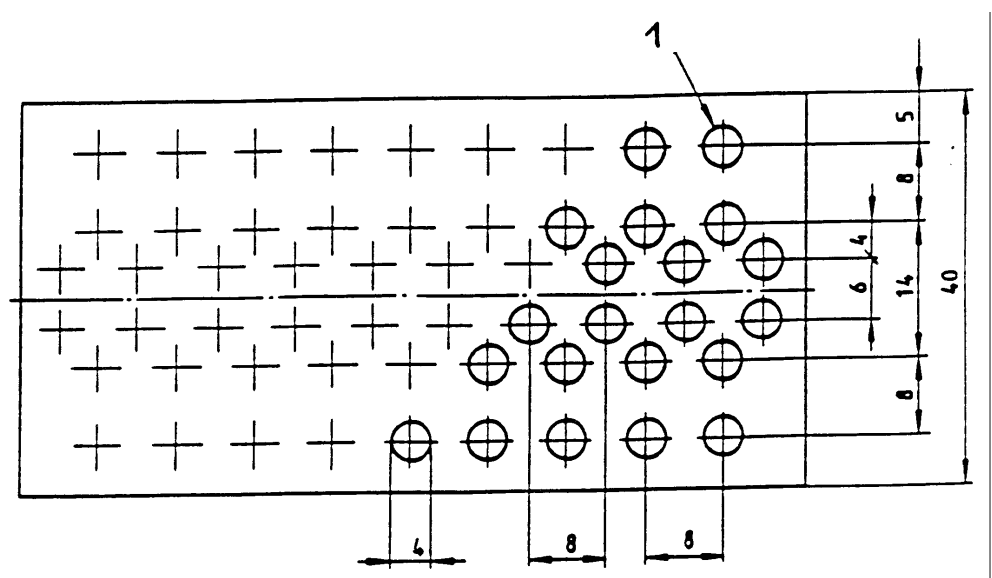
## Annex A (normative)

### Test method for brushing according to 5.3

#### A.1 Apparatus

A polyamide brush shown in Figure A.1 shall be used.

Dimensions in millimetres



#### Key

1 56 sections placed in six rows

Figure A.1 - Design of the brush

## 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	clauses of this standard
1.1 Design principles	3, 4
1.2 Innocuousness of PPE	4
1.3 Comfort and efficiency	4
1.4 Information supplied by the manufacturer	6 and 7
2.4 PPE subject to ageing	4 and 7
2.5 PPE which may be caught up during use	3.2
2.13 PPE in the form of clothing capable of signalling the user's presence visually	4

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



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