



BSI Standards Publication

## **Plastics warning devices for underground cables and pipelines with visual characteristics**

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**EN 12613**

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English Version

## Plastics warning devices for underground cables and pipelines with visual characteristics

Dispositifs avertisseurs à caractéristiques visuelles, en matière plastique, pour câbles et canalisations enterrés

Warneinrichtungen aus Kunststoff mit visuellen Eigenschaften für erdverlegte Kabel und Rohrleitungen

This European Standard was approved by CEN on 13 December 2020.

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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 CEN-CENELEC Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

**CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels**



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## European foreword

This document (EN 12613:2021) has been prepared by Technical Committee CEN/TC 249 “Plastics”, the secretariat of which is held by NBN.

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of an identical text or by endorsement, at the latest by July 2021, and conflicting national standards shall be withdrawn at the latest by July 2021.

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.

This document supersedes EN 12613:2009.

The major modifications compared to the previous edition are:

- Addition of a reference to Regulation (EC) No 1907/2006 (REACH) (Clause 4);
- Addition of the apparatus for measurement of dimensional characteristics (5.3.1);
- Review of the tolerances for nominal widths greater than 1 000 mm (5.3.3);
- Deletion of the transversal rigidity (5.4.3 in EN 12613:2009), since it is not a discriminating characteristic for products with width  $\leq 500$  mm;
- Addition of a sentence to specify that the case of absence of rupture of the test specimen is considered as successful (5.5);
- The method according EN 60898-1, for the resistance of printing, is now recommended only (instead of being mandatory) and other methods are allowed (5.9);
- Review of the number of test pieces reduced from four to one. In addition, when the test is not successful, an acceptance criteria is defined for retesting (6.1);
- Extension of the tolerances on the test temperature for the products submitted to testing (6.1);
- Deletion of 6.4 of EN 12613:2009 (transversal rigidity);
- Deletion of Clause 7 of EN 12613:2009 as factory production control tests do not necessarily appear in a product standard;
- In A.2, deletion of the paragraph beginning with “IMPORTANT” (no added value);
- Review of Figure A.4 and expressing of minimum gaps between the plates and the transversal walls of the central compartment;
- Addition of Table A.2 giving the characteristics of an alternative quality of EPDM sheets (A.2.4);
- Review of tolerances for EPDM sheets (Table A.3);
- Total load values were changed to minimum values (Table A.4);
- Review of the number of test pieces (A.3);



- Review of the number of test pieces to be tested from six to three (A.5);
- Addition of a new paragraph for the acceptance criteria (A.6);
- Change of the duration of the test from 15 days to 28 days (B.3);
- Addition of a Bibliography.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

## **Introduction**

Visual warning devices are used for the manual or mechanized laying of cables and piping buried in ground such as electrical power cables, communication cables, pressure and non-pressure piping systems.

The purpose of warning devices is to warn of the presence of a pipe or a cable, when opening a trench, to indicate its orientation and to identify the equipment protected.

The warning devices are expected to last at least the lifetime of the equipment with which they are associated.

## 1 Scope

This document specifies the material, mechanical and functional (fitness for purpose) requirements for warning devices with visual characteristics manufactured from plastics, intended to indicate the presence of cables and piping systems buried in ground when opening trenches and more generally during digging work.

This document also specifies test methods.

This document is applicable to two types of visual warning devices: tapes (type 1) and meshes (type 2).

## 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 60898-1:2019, *Electrical accessories — Circuit-breakers for overcurrent protection for household and similar installations — Part 1: Circuit-breakers for a.c. operation (IEC 60898-1:2015, modified)*

EN ISO 175, *Plastics — Methods of test for the determination of the effects of immersion in liquid chemicals (ISO 175)*

EN ISO 846, *Plastics — Evaluation of the action of microorganisms (ISO 846)*

EN ISO 4892-1, *Plastics — Methods of exposure to laboratory light sources — Part 1: General guidance (ISO 4892-1)*

## 3 Terms and definitions

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

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

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

### 3.1

#### **Type 1 warning device**

strip manufactured from plastics to warn of the presence of underground cables or pipes during excavation

### 3.2

#### **Type 2 warning device**

mesh/net manufactured from plastics to warn of the presence of underground cables or pipes during excavation

### 3.3

#### **nominal width of a warning device**

$W_0$

overall width of the warning device, as declared by the manufacturer, in millimetres

### 3.4

#### **longitudinal direction**

direction corresponding to the extrusion direction, parallel to the length of the reel



## 4 Material

The material shall be made of any thermoplastic material, e.g. polyethylene (PE) or polypropylene (PP), to which are added those additives necessary for manufacturing warning devices conforming to the requirements of this document.

The use of own or external reprocessed materials or recycled materials shall be permitted for manufacturing warning devices conforming to the requirements of this document.

The material, additives, colour masterbatches and inks for printing, if added, shall have no detrimental effect on the environment.

Environmental, health and safety aspects, as well as the use of regulated substances [1] are to be taken into account for the design process of the products.

## 5 Requirements

### 5.1 Colour

The colour of the warning device shall be as agreed between the manufacturer and the purchaser.

### 5.2 Appearance and colour fastness

The appearance, colouring and marking of the warning device shall not exhibit any change when tested in accordance with 6.2. No discoloration or change of the initial colour shall be permitted. Only a change in surface appearance (e.g. gloss/matt) shall be permitted.

For a given type of warning device (design, width), the colour fastness shall be tested for each colour.

### 5.3 Dimensional characteristics

#### 5.3.1 General

The nominal width,  $W_0$ , of the warning device shall be as agreed between the manufacturer and the purchaser.

The dimensional characteristics of the warning device shall be measured by means of:

- a) a measuring tape/metal ruler, capable of measuring to an accuracy of 1,0 mm for the width of the warning device;
- b) a metal ruler, capable of measuring to an accuracy of 0,5 mm for the internal perimeter of the openings, if relevant;
- c) a calliper gauge, capable of measuring to an accuracy of 0,1 mm, for measuring the minimum width of the strands, if relevant.

#### 5.3.2 Type 1 warning devices

Each individual value of the width shall be equal or greater than 50 mm and the outside edges of the warning device shall be straight and parallel.

The deviation of each outside edge, towards outside or inside relatively to the mean line, shall be less or equal to 2 mm.

#### 5.3.3 Type 2 warning devices

The width of the Type 2 warning device shall conform to Table 1.



Table 1 — Requirements for the width

Nominal width mm	Minimum and maximum width mm
$50 \leq W_0 < 100$	$W_0 - 0,1 W_0 \leq W \leq W_0 + 0,1 W_0$ and $W \geq 50$
$100 \leq W_0 \leq 500$	$W_0 - 10 \leq W \leq W_0 + 10$
$500 < W_0 \leq 1\,000$	$W_0 - 20 \leq W \leq W_0 + 20$
$W_0 > 1\,000$	$W_0 - 30 \leq W \leq W_0 + 30$

The internal perimeter of an opening shall be  $\leq 360$  mm.

The minimum width of the strands shall be:

- $\geq 1$  mm when the internal perimeter of the opening is  $< 160$  mm;
- $\geq 2$  mm when the internal perimeter of the opening is  $\geq 160$  mm.

It is recommended that the minimum reel length is equal or greater than 100 m or as agreed between the manufacturer and the purchaser.

5.4 Laying characteristics

5.4.1 General

For ease of use, the warning devices need sufficient flatness and longitudinal mechanical strength to maintain their shape.

5.4.2 Tensile withstand strength

When tested in accordance with 6.3, the type 1 warning device shall withstand a load of 200 N during 1 min in longitudinal direction, without starting of the separation of the weak points, if any, and shall not exhibit a reduction of more than 20 % of its width after removal of the load.

When tested in accordance with 6.3, the type 2 warning device shall withstand a load of 300 N during 1 min in longitudinal direction, without starting of the separation of the weak points, if any, and shall not exhibit a reduction of more than 20 % of its width after removal of the load.

5.4.3 Flatness

When tested in accordance with 6.4, the warning device shall not exhibit a gap between any point of the warning device and the reference surface greater than  $W_0 / 4$ .

5.5 Visual warning characteristics

The visual characteristics of the warning devices are assessed by means of a test which simulates the opening of a trench with the bucket of an excavator (see A.1).

When tested in accordance with Annex A, the warning device shall exhibit at least one single part of a minimum length of 200 mm outside of the movable plate (which simulates the bucket) and at least one single part of a minimum length of 200 mm in the frame (which simulate the trench). In the case of absence of rupture between the movable plate and at least one side of the frame, the warning device is deemed to satisfy the requirement of this subclause. The width of the visible parts of warning device shall be greater or equal to 2 mm.



## **5.6 Resistance against microorganisms**

The resistance against microorganisms shall be determined only for the warning devices made from materials other than polyethylene (PE) or polypropylene (PP).

When tested in accordance with EN ISO 846 and the test conditions as specified by the purchaser, the warning device shall not exhibit any change.

## **5.7 Resistance to UV-light**

If required, the warning device shall be resistant to UV-light. When tested in accordance with the guidance provided by EN ISO 4892-1 and its subsequent parts, and the test method and conditions as specified by the purchaser, the warning device shall conform to the requirement as specified by the purchaser.

If the warning device is not resistant to UV-light, it shall be protected by suitable packaging, as agreed between manufacturer and purchaser.

## **5.8 Temperature stability**

If required, the temperature stability of the warning device shall conform to the requirement, as agreed between the manufacturer and the purchaser.

## **5.9 Resistance of printing**

If required, the permanence of print (or printing) on the warning device should be determined in accordance with EN 60898-1:2019, 9.3. If so, it shall fulfil the requirements specified in EN 60898-1:2019, 9.3. Other test methods to assess the resistance of printing may be used by agreement between the manufacturer and the purchaser.

## **5.10 Marking**

The visual warning devices shall be marked at intervals (i.e. the free space between two consecutive marks) not exceeding 1 m.

The marking shall be legible when viewed without magnification, durable and shall include at least the following information:

- a) reference to EN 12613;
- b) name or trademark of the manufacturer;
- c) year of manufacture in figure or in code.

Information other than the above shall be in accordance with the purchaser's specification.

# **6 Test methods**

## **6.1 Test pieces and test conditions**

One test piece shall be tested for each test, i.e. the determination of the colour fastness (6.2), the determination of the tensile withstand strength (6.3) and the determination of the flatness (6.4).

When the test piece does not satisfy the relevant requirement, then the test shall be repeated by using two other test pieces. In this case, these two test pieces shall satisfy the relevant requirement, in order to declare the test successful.

Unless otherwise specified, conditioning and testing shall be performed at  $(23 \pm 5) ^\circ\text{C}$ .



6.2 Determination of the colour fastness

Three separate tests shall be carried out in accordance with:

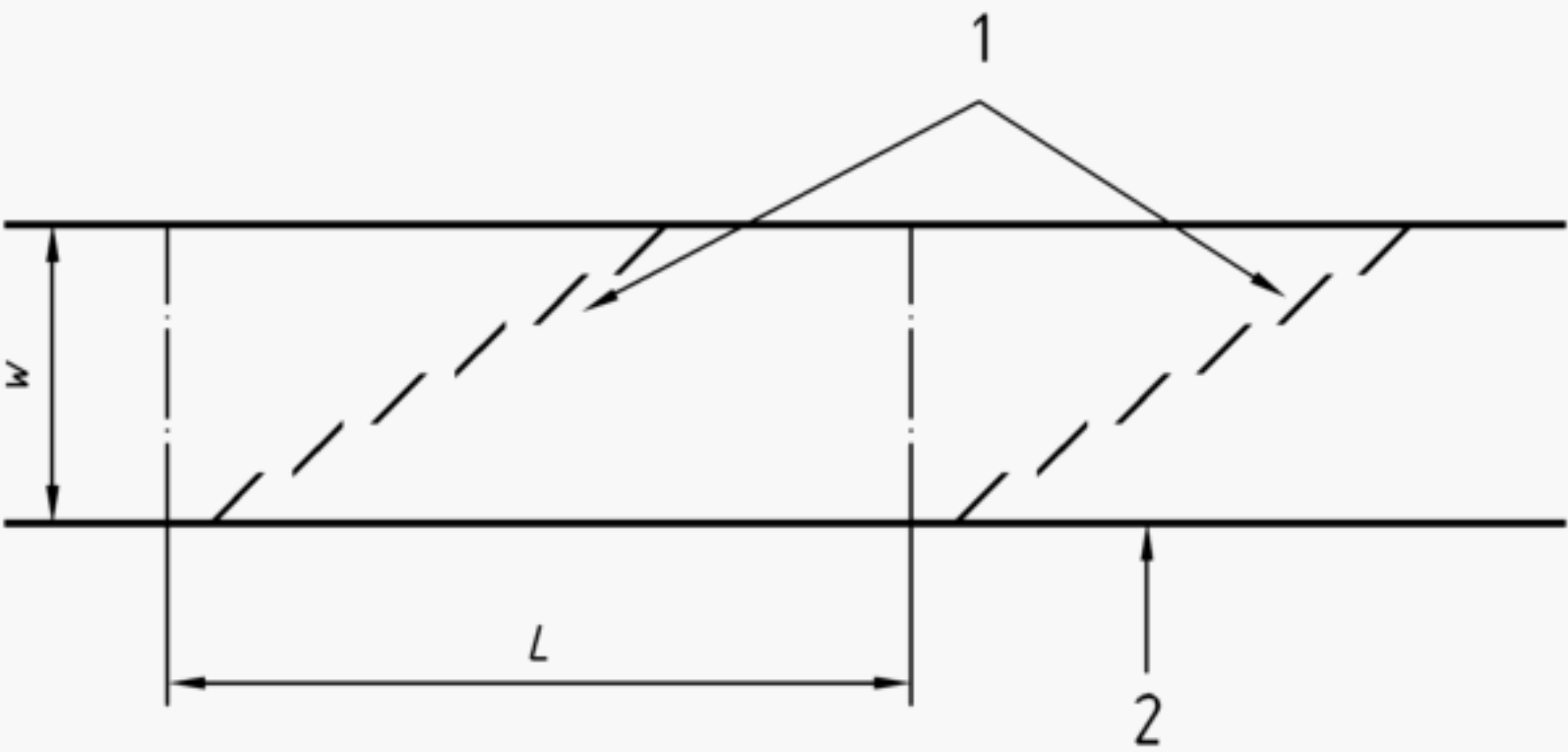
- a) Annex B, by immersion in an aqueous solution with 20 % by mass of ammonium sulphide;
- b) EN ISO 175, by immersion in nitric acid with a concentration of 10 % by mass;
- c) EN ISO 175, by immersion in a sodium carbonate solution with a concentration of 20 % by mass.

6.3 Determination of the tensile withstand strength

6.3.1 Test pieces

The length of the test pieces used to determine the tensile withstand strength depends on the presence or not of weak points on the warning device.

If the warning device has weak points distributed at repeated intervals (see Figure 1), the length of the test pieces  $L$  shall be such that the test pieces each include a complete sequence of weak points distributed along their entire width  $W$ . If the warning device has no weak points, the length of the test pieces shall be greater than or equal to 500 mm.



- Key**
- 1 weak points
  - 2 warning device
  - $L$  length of the test piece
  - $W$  width of the warning device

Figure 1 — Warning device including weak points

6.3.2 Apparatus

**Suitable apparatus** (e.g. a tensile testing machine), consisting of a frame allowing fixing at its upper part of grips fitted to receive the end of the warning device and which height is sufficient to hang the test pieces.

6.3.3 Procedure

Fix each end of the test piece to the upper and lower grips, the width of grips being at least equal to this of the tested warning device in order to maintain the whole width of test piece.

Measure the width of the test piece before applying the test load.

Hang the upper grips to the frame.

Hang the load, as specified in 5.4.2, to the lower grips in such a manner that a pre-load shall be applied to the test piece over a time period of 10 s.

Maintain the load applied to the test piece during 1 min.

Check visually the test piece during the application of the load and measure the width of the test piece after its removal.

#### **6.4 Determination of the flatness**

The test piece shall be 10 m long.

Record the nominal width,  $W_0$ , of the warning device.

Spread the test piece on a reference flat surface with holding each end without stretching.

1 min after spreading the test piece, measure the maximum gap, expressed in millimetres, between the test piece and the reference flat surface.

### **7 Test report**

The test report shall include the following information:

- a) reference to EN 12613;
- b) description of the visual warning device tested (type, colour, nominal width);
- c) results of the test for the determination of the colour fastness (see 5.2);
- d) results of the test for the determination of the tensile withstand strength (see 5.4.2);
- e) results of the test for the determination of the flatness (see 5.4.3);
- f) results of the test for the determination of visual characteristics (see 5.4), including:
  - 1) number of test pieces tested,
  - 2) for each test piece:
    - i) the length of the longest single part (length  $\geq$  200 mm and width  $\geq$  2 mm) visible outside of the movable plate,
    - ii) the length of the longest single part (length  $\geq$  200 mm and width  $\geq$  2 mm) visible in the frame,
  - 3) ambient temperature during testing;
- g) result of test for the resistance against microorganisms test (see 5.6), if applicable;
- h) result of test for the resistance to UV-light (see 5.7), if applicable;
- i) result of test for the temperature stability (see 5.8), if applicable;
- j) result of test for the permanence of printing (see 5.9), if applicable;



- k) any factors which could have affected test results, such as incidents or any operational details not specified in this document;
- l) date of test.

## **Annex A** (normative)

### **Determination of visual warning characteristics by simulation of trench opening**

#### **A.1 Principle**

A length of warning device is placed on a horizontal fixed frame with three compartments, the central part of which can accept a movable plate that is guided vertically. The warning device is placed between two layers of flexible material to which evenly distributed vertical loads are applied and it is held in position by its ends.

The frame and the movable plate simulate a trench and an excavator bucket respectively. The loads applied to the warning device simulate the dead load and the soil compaction.

When the movable plate is raised sharply at a given speed and to a predefined height, the warning device is subjected to an excavating action that simulates opening a trench with an excavator bucket. The assessment of the dimensions (length and width) of the parts of the warning device that are visible outside the movable plate and in the central compartment of the frame can be used to characterize the ability of the warning device to fulfil its visual function.

#### **A.2 Apparatus**

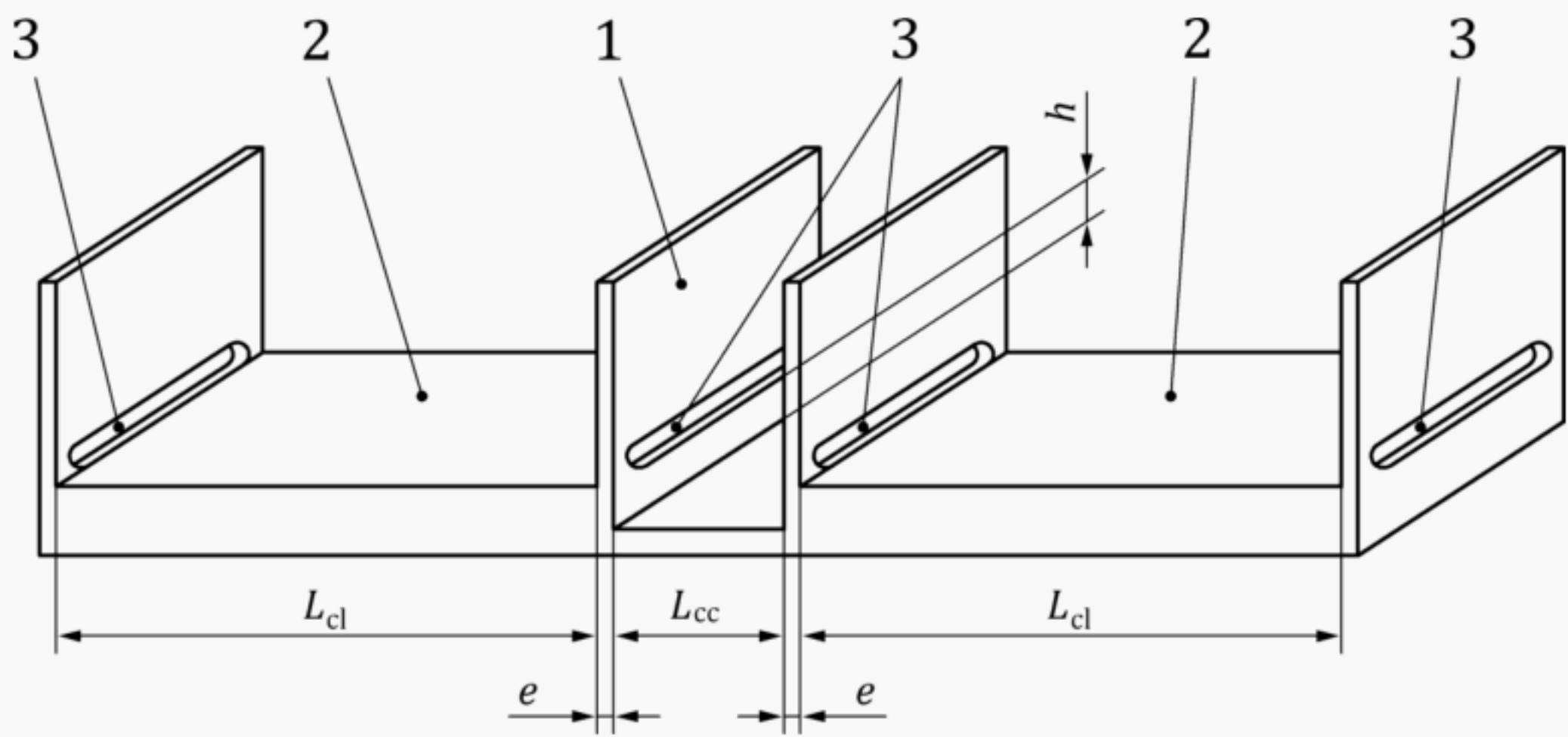
**SAFETY PRECAUTIONS — The apparatus shall conform to the applicable safety rules and personal protection regulations.**

**A.2.1 Fixed frame** comprising three compartments, made of rigid material capable of withstanding the loads generated during the test, according to the schematic diagram illustrated in Figure A.1. The vertical transverse walls on each side and at the ends of the central compartment have openings that are between 550 mm and 600 mm long and between 30 mm and 50 mm high; their edges are rounded to ensure that the warning device is not damaged as the movable plate is raised. The vertical transverse walls on each side of the central compartment are used to guide the movable plate.

**A.2.2 Movable plate**, according to the schematic diagram illustrated in Figure A.2. The edges of the bearing face of the movable plate shall not exhibit any sharp edges and shall be rounded to ensure that the warning device is not damaged as the movable plate is raised. The movable plate shall position itself in the central compartment of the frame. See Figures A.3 and A.4.

The width of the movable plate,  $l_p$ , shall be equal to at least 500 mm or to the maximum width of the warning device under test (maximum nominal width 500 mm) so that the test piece can be placed on the movable plate without being folded.

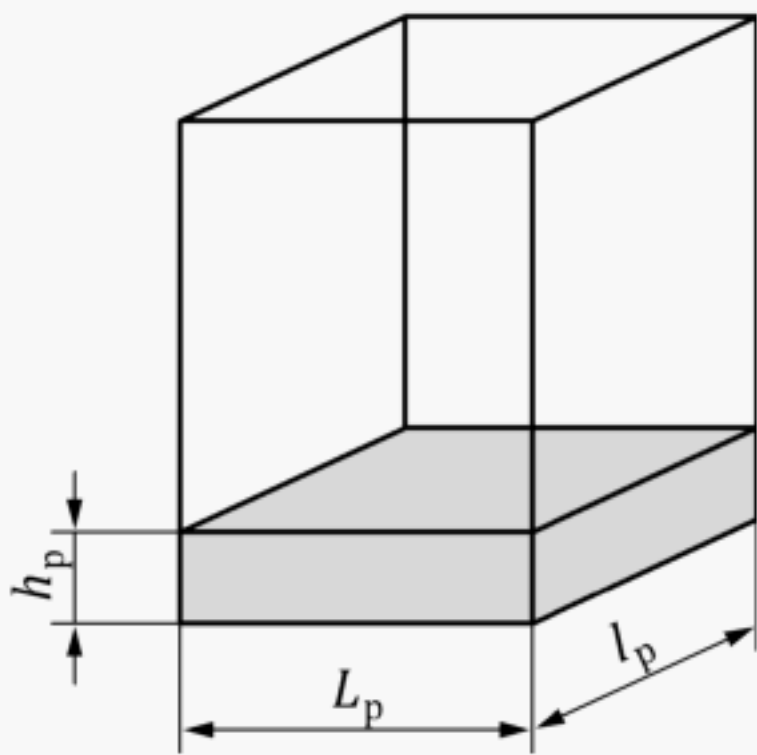




- Key**
- 1 central compartment
  - 2 lateral compartment
  - 3 openings

Dimensions		Values mm
$L_{cl}$	length of the lateral compartments	$1\,500 \pm 20$
$L_{cc}$	length of the central compartment	$450 \pm 5$
$e$	thickness of the transverse walls of the central compartment	$22 \pm 2$
$h$	distance between the frame surface in the central compartment and the bottom edge of an opening	$100 \pm 10$

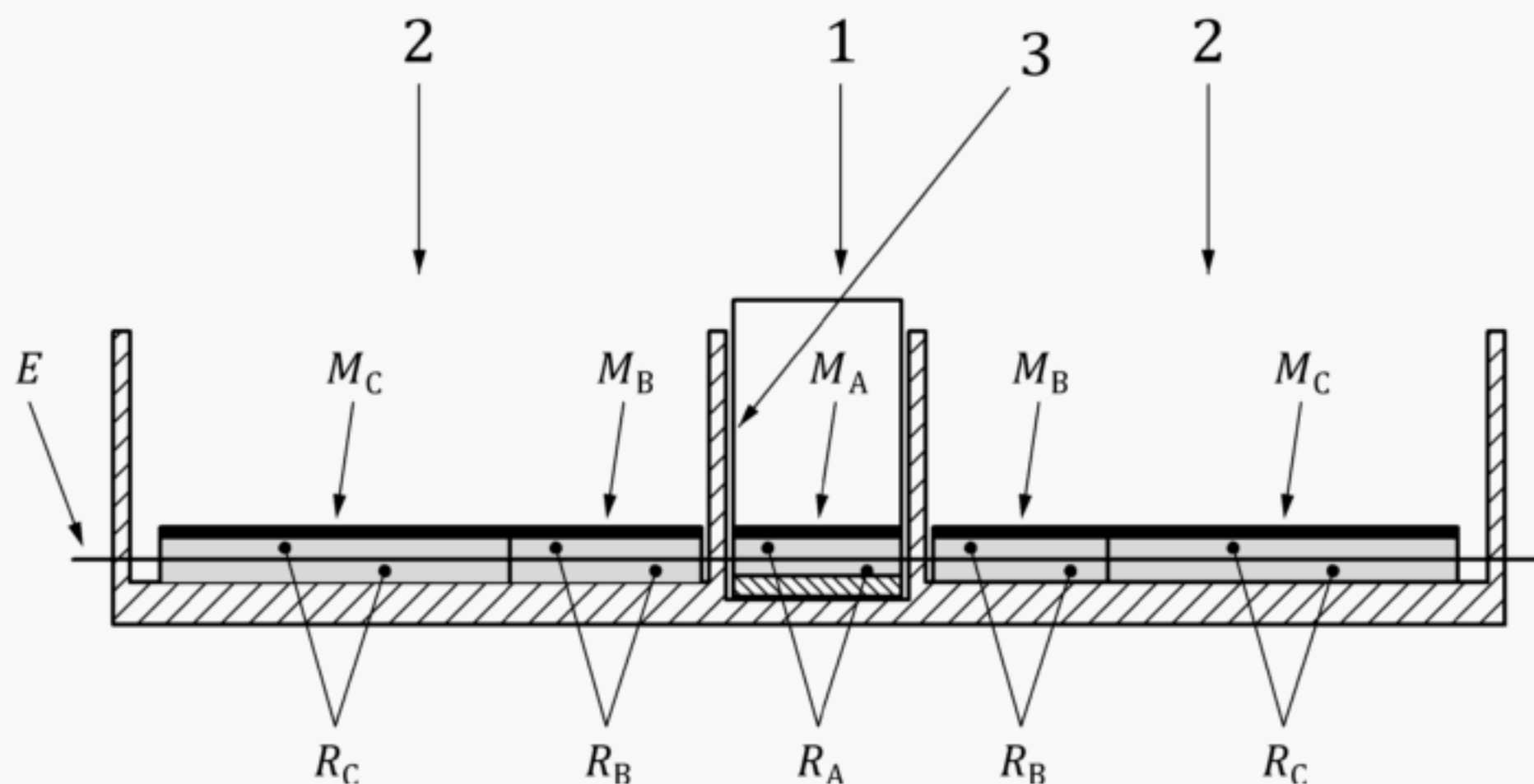
Figure A.1 — Schematic view of a fixed frame



**Key**

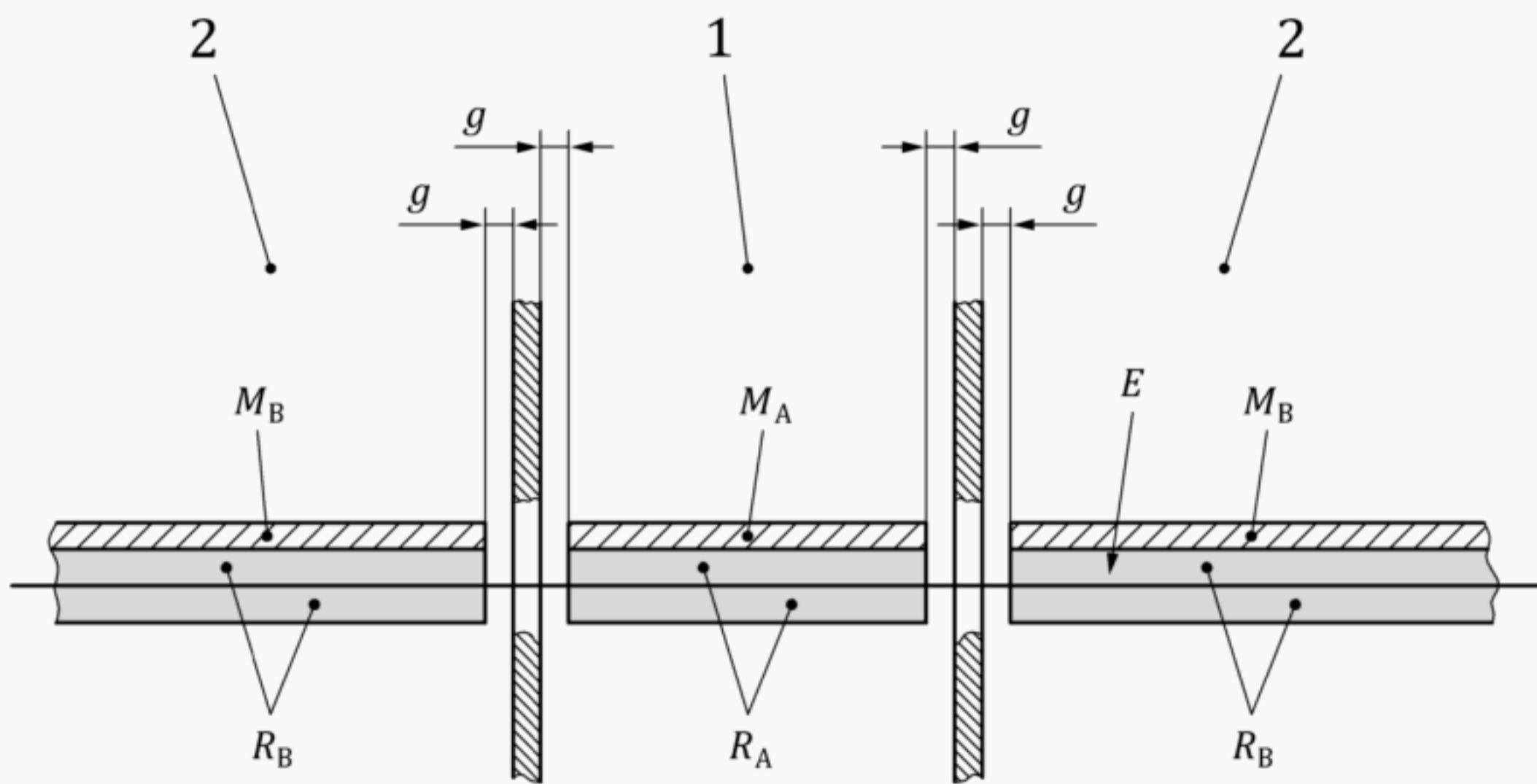
Dimensions		Values mm
$L_p$	length of the movable plate	$410 \pm 2$
$l_p$	width of the movable plate	See A.2.2
$h_p$	distance between the lower surface of the movable plate and its upper surface	$100 \pm 10$

Figure A.2 — Schematic view of a movable plate



- Key**
- 1 central compartment
  - 2 lateral compartment
  - 3 movable plate
  - E* test piece
  - $R_A, R_B, R_C$  EPDM sheets
  - $M_A, M_B, M_C$  bearing plates

**Figure A.3 — Fixed frame and movable plate assembly - EPDM sheets and bearing plates**



- Key**
- 1 central compartment
  - 2 lateral compartment
  - E* test piece
  - $R_A, R_B$  EPDM sheets
  - $M_A, M_B$  bearing plates
  - g* gap between the transverse wall and the edge of the bearing plate

**Figure A.4 — Position of the plates in the central compartment**



**A.2.3 Lifting device**, capable of lifting the movable plate vertically at a speed of  $(15 \pm 5)$  m/min, over a distance between 800 mm and 850 mm.

**A.2.4 Set of 10 soft cellular EPDM sheets** with the characteristics as specified in Table A.1. As an alternative, EPDM sheets with the characteristics specified in Table A.2 may be used provided that a correlation between the test results obtained by using EPDM sheets conforming to Table A.1 and those obtained by using EPDM sheets conforming to Table A.2 can be demonstrated.

**Table A.1 — Characteristics of EPDM sheets**

Characteristics	Specifications
Material	Cellular EPDM
Description	Soft cellular rubber with closed cells
Density	130 kg/m <sup>3</sup> to 170 kg/m <sup>3</sup>
Cell dimension	0,1 mm to 0,5 mm
Hardness	$(10 \pm 5)$ Shore A
Thickness	$(25 \pm 2)$ mm

**Table A.2 — Characteristics of alternative EPDM sheets**

Characteristics	Specifications
Material	Cellular EPDM
Density	(110 to 170) kg/m <sup>3</sup>
Hardness	$(40 \pm 5)$ shore 00
Thickness	$(25 \pm 2)$ mm

The dimensions of the EPDM sheets shall be as specified in Table A.3.

**Table A.3 — Dimensions of EPDM sheets**

Name	Dimensions mm × mm	Number
$R_A$	$410 (+0/-30) \times l_p (\pm 20)$	2
$R_B$	$410 (+0/-30) \times l_p (\pm 20)$	4
$R_C$	$1\,000 (\pm 20) \times l_p (\pm 20)$	4

A first set of five EPDM sheets shall be laid flat on the bearing surface of each of the three compartments (see Figure A.3).

The second set of five EPDM sheets shall be laid flat on the test piece, as specified in the procedure (see A.5).

**A.2.5 Set of 5 bearing plates** made of rigid material (metal or plywood); their dimensions shall be as specified in Table A.4. These plates shall be placed on the EPDM sheets and exert a uniform pressure on these sheets so that the minimum total loads, including those exerted by the dead loads of the bearing plates conform to those specified in Table A.4.

Table A.4 — Dimensions of bearing plates and loads

Name	Dimensions mm × mm	Number	Minimum total load applied by each bearing plate N
$M_A$	$410 (\pm 5) \times l_p (\pm 20)$	1	1 500
$M_B$	$410 (\pm 5) \times l_p (\pm 20)$	2	1 500
$M_C$	$1\,000 (\pm 20) \times l_p (\pm 20)$	2	600

**A.2.6 Load devices** used to apply evenly distributed loads to the bearing plates, as specified in Table A.4.

**A.2.7 Devices used to secure** the test piece and arranged at each end of the frame and capable of holding the ends of the length of warning device in place when the central flat area is suddenly raised.

**A.3 Test pieces**

Cut three test pieces, approximately 5 m long.

In case of retesting (see A.6), cut three additional test pieces, approximately 5 m long.

**A.4 Conditioning and test temperature**

The test pieces shall be conditioned at an ambient temperature  $\geq 10\text{ }^{\circ}\text{C}$ .

The test shall be carried out at an ambient temperature  $\geq 10\text{ }^{\circ}\text{C}$ , at least 24 h after the warning device tested was manufactured.

**A.5 Procedure**

Record the test temperature.

Place the movable plate in the central compartment of the frame and centre it in its housing.

Place the first set of five EPDM sheets on the bearing surface of the two lateral compartments and the movable plate (see Figure A.3).

Place the test piece in the frame as shown in Figure A.3 and secure its ends with appropriate devices.

Place the second set of five EPDM sheets on the test piece in the two lateral compartments and in the central compartment of the fixed frame.

Place the five bearing plates in the three compartments; the gap,  $g$ , on each side of the transverse walls of the central compartment shall be greater than 5 mm.

Apply the loads specified in Table A.4 to the bearing plates, using the load devices and distributing them uniformly.

Raise the movable plate using the lifting equipment at a speed of  $(15 \pm 5)\text{ m/min}$  up to a height between 800 mm and 850 mm.



For each test specimen, measure and record:

- a) the length of the longest single part visible (longer than 200 mm and wider than 2 mm) outside the movable plate;
- b) the length of the longest single part visible (longer than 200 mm and wider than 2 mm) in the central compartment of the frame.

Test successively the three test pieces.

## **A.6 Acceptance criteria**

When the three test pieces satisfy the requirement specified in 5.5, then the test shall be declared as successful.

When two test pieces do not satisfy the requirement specified in 5.5, then the test shall be declared as unsuccessful.

When one of the three test pieces does not satisfy the requirement specified in 5.5, then the test shall be repeated on further three test pieces. In this case, in order to declare the test successful, the three additional test pieces shall satisfy the requirement specified in 5.5.

## **A.7 Test conditions for warning devices wider than 500 mm**

If the nominal width is greater than 500 mm, the warning device shall be cut according to its longitudinal direction in several parts, the widths of which are equal and compatible with the dimensions of the apparatus (maximum width = 500 mm).

EXAMPLE 1 Width of the warning device = 1 m; width of each part to be tested = 0,50 m.

EXAMPLE 2 Width of the warning device = 1,20 m; width of each part to be tested = 0,30 m or 0,40 m.

Each part of the warning device shall be submitted to testing according to this annex and shall fulfil the requirement as specified in 5.5.

## **Annex B** (normative)

### **Chemical resistance to ammonium sulphide**

#### **B.1 Apparatus**

**B.1.1 Glass container**, containing an aqueous solution with 20 % by mass ammonium sulphide.

#### **B.2 Preparation of test pieces**

Cut two test pieces in the tested warning device of at least an area of 100 cm<sup>2</sup>.

#### **B.3 Procedure**

Place one of the test pieces in the glass container containing the ammonium sulphide solution. At least 75 % of the surface area of the test piece shall be immersed in the test liquid.

Keep closed the glass container in a dark chamber for 28 days at a temperature between 15 °C and 25 °C.

Keep the second test piece in a separate dark chamber for the same duration at the same temperature.

Remove the first test piece after 28 days, rinse it and wipe dry.

Compare the two test pieces and record any discoloration or change of the initial colour other than a change in lustre (or surface appearance).



## **Bibliography**

- [1] Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC





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## BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

