

# Adhesives — Determination of peel resistance of adhesive bonds — Floating roller method

ICS 83.180

## National foreword

This British Standard is the UK implementation of EN 1464:2010. It supersedes BS EN 1464:1995 and BS EN 1967:2002 which are withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PRI/52, Adhesives.

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English Version

## Adhesives - Determination of peel resistance of adhesive bonds - Floating roller method

Adhésifs - Détermination de la résistance au pelage des  
assemblages - Méthode des galets mobiles

Klebstoffe - Bestimmung des Schälwiderstandes von  
Klebungen - Rollenschälversuch

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## Foreword

This document (EN 1464:2010) has been prepared by Technical Committee CEN/TC 193 “Adhesives”, the secretariat of which is held by AENOR.

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## 1 Scope

This European Standard specifies a floating roller method for the determination of the peel resistance of adhesive bonds between one rigid adherend and one flexible adherend when tested under specified conditions of preparation and testing.

NOTE The use of the floating roller produces more constant numerical data than other peel methods, but it should not be expected that the flexible adherend will conform to the surface of the roller.

**SAFETY STATEMENT**— Persons using this document should be familiar with the normal laboratory practice, if applicable. This document does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user to establish appropriate safety and health practices and to ensure compliance with any regulatory conditions.

**ENVIRONMENTAL STATEMENT** — It is understood that some of the material permitted in this standard may have negative environmental impact. As technological advantages lead to acceptable alternatives for these materials, they will be eliminated from this standard to the extent possible.

At the end of the test, the user of the standard should take care to carry out an appropriate disposal of the wastes, according to local regulation.

## 2 Normative references

The following referenced documents are indispensable for the application 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 923:2005, *Adhesives — Terms and definitions*

EN ISO 291, *Plastics - Standard atmospheres for conditioning and testing (ISO 291:2008)*

EN ISO 10365, *Adhesives - Designation of main failure patterns (ISO 10365:1992)*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 923:2005 and the following apply.

**3.1 peel resistance**  
average force per unit test specimen width, measured along the bond line, required to separate progressively the two members of a bonded test specimen under specified conditions of test

NOTE It is expressed in newtons per millimetre of width (N/mm).

**3.2 wet-peel resistance**  
peel resistance after application of water containing a wetting agent

## 4 Apparatus

**4.1 Tensile testing machine**<sup>1)</sup>, capable of maintaining a pre-determined constant crosshead rate to be reported in the test report (preferred rate: 100 mm/min).

It shall be provided with a suitable self-aligning grip to hold the test specimen. The jaws of this grip shall firmly engage the outer 25 mm of the end of the flexible adherend. The grip and attachments shall be so constructed that they will move into alignment with the test specimen as soon as the force is applied, so that the flexible member of the test specimen will coincide with the direction of the applied pull through the centre line of the grip assembly.

The machine shall be autographic, giving a chart that can be read in terms of millimetres of crosshead movement as one coordinate and applied force as the other coordinate. All equipment shall be calibrated regularly. It is recommended that equipment should be essentially free of inertial forces during use.

The machine shall permit the measurement and recording of the applied force with an accuracy of  $\pm 1$  %.

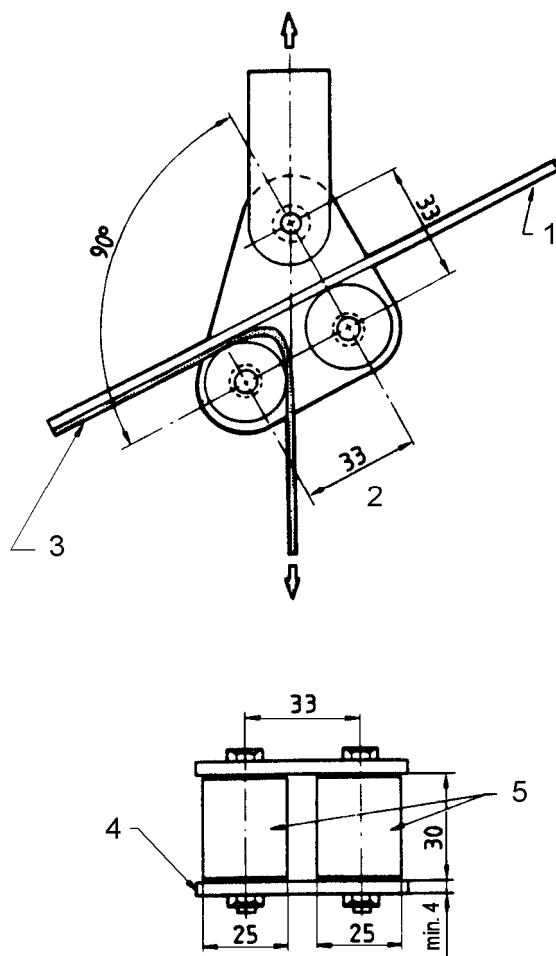
**4.2 Peel test fixture**, for supporting the test specimen (see Figure 1). The fixture shall be attached to one of the cross-arms of testing machine (4.1).

The 25 mm diameter rollers on the test fixture shall roll freely. The angle determined by the rollers and the use of dual roller bearings are critical and the rollers shall therefore be carefully maintained.

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1) See for instance ISO 5893:2002, *Rubber and plastics test equipment — Tensile, flexural and compression types (constant rate of traverse) — Specification*.

Dimensions in millimetres



**Key**

- 1 Rigid adherend
- 2 Peeling zone
- 3 Flexible adherend
- 4 Mild steel
- 5 Dual roller bearing type

**Figure 1 — Peel test fixture for supporting test specimens**

**5 Test specimens**

**5.1** Test specimens of the dimensions shown in Figure 2 may be prepared individually or cut from bonded panels. Laminated test panels, or individual test specimens, shall consist of two adherends properly prepared and bonded together.

**5.2** The adherends and the surface treatment shall be in accordance with the intended application and process.

The adhesive shall be applied in accordance with the manufacturer's recommendations to obtain an optimum bond with minimum of variations.

**NOTE** Direct comparison of different adhesives can be made only when test specimen construction, adherend materials and dimension and test conditions are identical.



**5.3** The thickness of the flexible adherend shall be  $(0,5 \pm 0,02)$  mm and that of the rigid adherend shall be  $(2,5 \pm 0,1)$  mm in the case of metals, or thicker if other adherends are used in order to reduce the deformation of the rigid adherend.

**5.4** If the test specimens are cut from the bonded panels (see Figure 2) it shall not be deleterious to the bond.

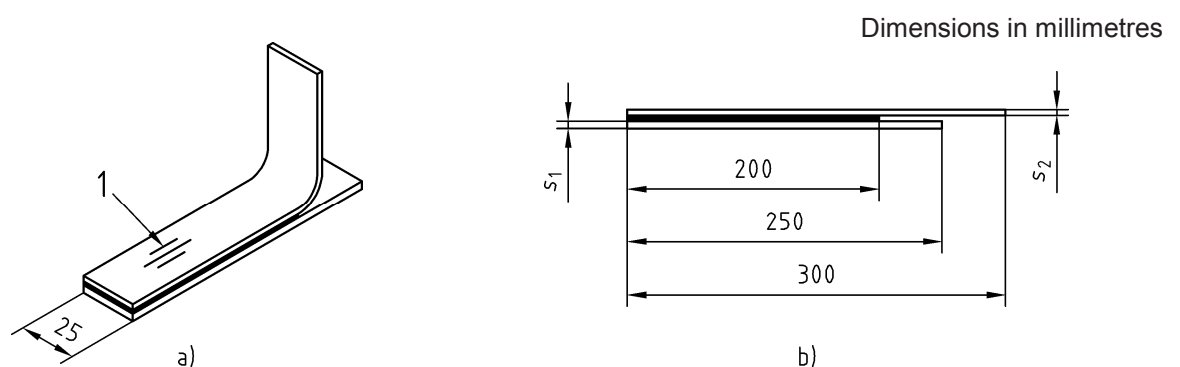
The width shall be either:

- a) 25 mm (the preferred width); or
- b) any other convenient width, provided that the test equipment is suitably adapted and the width is stated in the test report.

**NOTE** The method of cutting the test specimens is dependent upon the adherend and adhesive compositions. Milling and band-sawing are two methods commonly used for this purpose.

**5.5** The unbounded end of the flexible adherend shall be bent perpendicular to the rigid adherend for clamping in the grip of the testing machine.

**5.6** The number of specimens to be tested shall be as specified in the material specification or, if not so specified, shall be not less than five.



**Key**

- a) angled
- b) not angled
- 1 direction of rolling
- $s_1$  thickness of the rigid adherend
- $s_2$  thickness of the flexible adherend

**Figure 2 — Test specimen**

## 6 Conditioning and testing atmosphere

The test specimens shall be conditioned and tested in one of the standard laboratory atmospheres specified in EN ISO 291.

## 7 Procedure

### 7.1 Dry peel test

Insert the test specimen into the peel test fixture (4.2) as shown in Figure 1, with the unbounded end of the flexible adherend gripped in the jaw of the testing machine (4.1). Peel the specimen at a constant crosshead separation rate of  $(100 \pm 5)$  mm/min, unless otherwise specified. If the rigid adherend bends or is distorted

during the test, it is recommended that the specimen be redesigned with a rigid adherend stiff enough to ensure even peeling.

During the peel test, make an autographic recording of force versus crosshead movement (force versus distance peeled) over a length of at least 115 mm of the bond line disregarding the first 25 mm of peel.

Disregard the results if failure occurs outside the peeling zone as defined in Figure 1.

## 7.2 Wet peel test

Insert the test specimen into the peel test fixture (4.2) as shown in Figure 1, with the unbounded end of the flexible adherend gripped in the jaw of the testing machine (4.1). Peel the specimen at a constant crosshead separation rate of  $(100 \pm 5)$  mm/min, unless otherwise specified. If the rigid adherend bends or is distorted during the test, it is recommended that the specimen be redesigned with a rigid adherend stiff enough to ensure even peeling.

Stop the crosshead after peeling about 75 mm of the bonded length. Then apply several drops of water containing a wetting agent (for example 0,5 % to 1,0 % of a detergent) to the crack opening. After the application of this liquid the peeling process shall be immediately commenced. The test shall be continued until the complete sample is peeled.

An autographic recording of force versus crosshead movement (force versus distance peeled) shall be made.

Disregard the results if failure occurs outside the peeling zone as defined in Figure 1.

## 8 Expression of results

Determine from the autographic curve, for at least 115 mm of peeling (disregarding the first 25 mm and the last 25 mm), the average peeling resistance, in newtons per millimetre (N/mm) of the test specimen width, required to separate the adherends. The average force may be determined from the curve by one of the following methods:

- a) a planimeter;
- b) a gravimetric method, as follows:

Cut out the area of the chart paper surrounded by the curve and the base line (abscissa) and weigh it. Determine the area by dividing its mass by the previously determined mass per surface area of the chart paper.

Divide the area thus found by the length of the base line (corresponding to 80 mm peeling length), to obtain the average height of the curve (and hence the average peeling force);

- c) by drawing the best straight line through the peeling curve using a straight edge;
- d) by any other method such as computer assisted.

Also record the maximum and minimum forces for each individual specimen.

## 9 Test report

The test report shall include the following information:

- a) a reference to this European Standard;

- b) identification of the adhesive tested, including type, source, manufacturer's code number, batch or lot number, form, etc.;
- c) identification of adherends, including material, thickness, width and surface preparation;
- d) description of the bonding process, including method of application of adhesive, drying or pre-curing conditions (where applicable), and curing time, temperature and pressure;
- e) average thickness (as precisely as practicable) of the adhesive layer after formation of the bond;
- f) complete description of the test specimen, whether individual or panel, including dimensions and construction of the test specimen, conditions used for cutting individual test specimens, number of test panels represented and number of individual test specimens (when edge specimens are tested they shall be designated "edge specimens");
- g) conditioning procedure prior to testing and the test conditions;
- h) if the crosshead separation rate is other than 100 mm/min, the actual crosshead separation used;
- i) method of determining the average force;
- j) average, maximum and minimum peeling force values, in newtons per millimetre (N/mm) of test specimen width, for each individual specimen (edge samples shall be reported separately);
- k) type of failure according to EN ISO 10365.

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