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

ICS 83.180

British Standards

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 1464

February 2010

ICS 83.180

Supersedes EN 1464:1994, EN 1967:2002

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

This European Standard was approved by CEN on 28 December 2009.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN Management Centre or to any CEN member.

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 Management Centre has the same status as the official versions.

CEN members are the national standards bodies of 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, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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

Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. EN 1464:2010: E

Contents

Page

Foreword

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

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of an identical text or by endorsement, at the latest by August 2010, and conflicting national standards shall be withdrawn at the latest by August 2010.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 1464:1994 and EN 1967:2002.

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 EC Directive(s).

According to the CEN/CENELEC Internal Regulations, the national standards organizations 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, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

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 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[1)], 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.

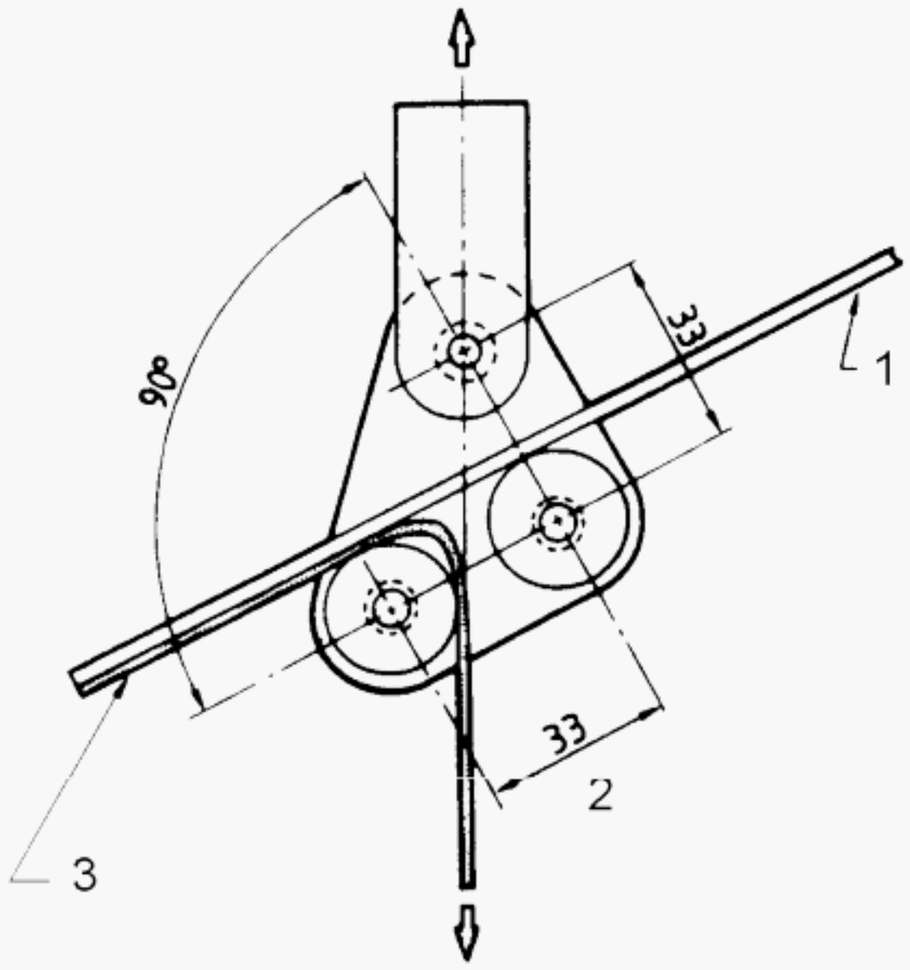
The machine shall permit the measurement and recording of the applied force with an accuracy of ± 1 %.

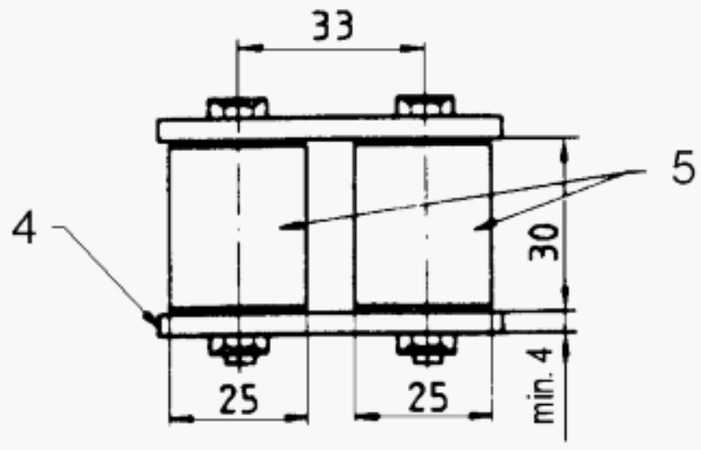
4.2 Peel test fixture, for supporting the test specimen (see Figure 1). The fixture shall be attached to one of the cross-arms of testing machine (4.1).

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.

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 ± 0,02) mm and that of the rigid adherend shall be (2,5 ± 0,1) mm in the case of metals, or thicker if other adherends are used in order the 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

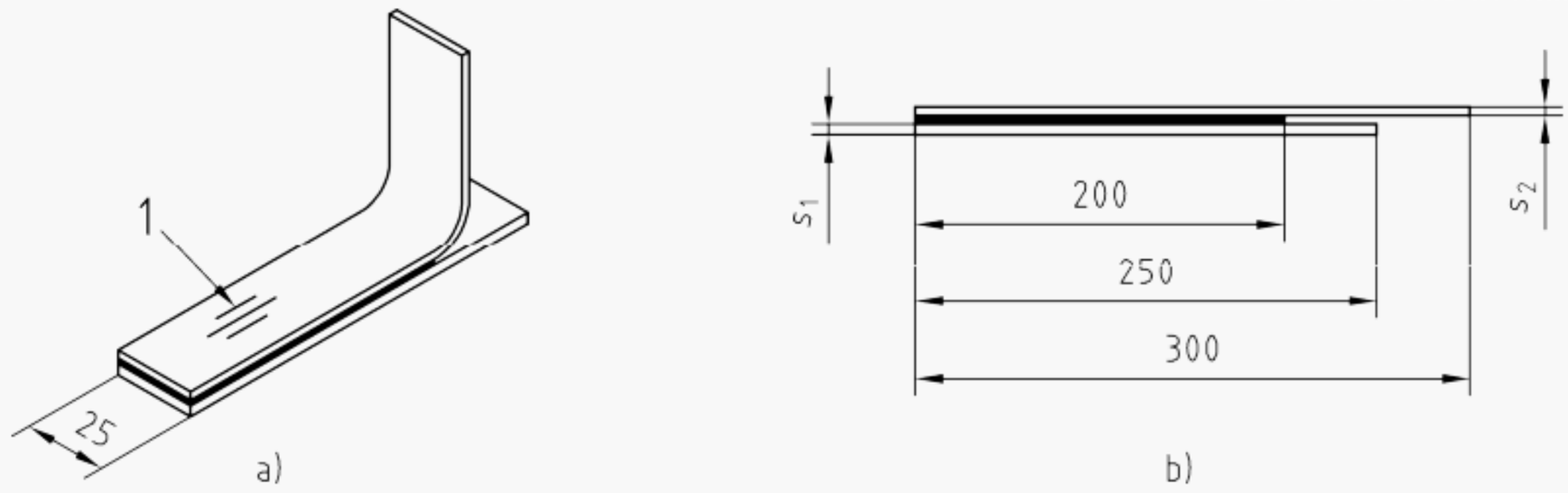
b) any other convenient width, provided that the test equipment is suitably adapted and the width is stated in the test report.

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.

Dimensions in millimetres



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 ± 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 a 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 ± 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 chard paper surrounded by the curve and the base line (abscissa) and weigh it. Determine the area by dividing its mass by the previously determine 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.

BSI - British Standards Institution

BSI is the independent national body responsible for preparing British Standards. It presents the UK view on standards in Europe and at the international level. It is incorporated by Royal Charter.

Revisions

British Standards are updated by amendment or revision. Users of British Standards should make sure that they possess the latest amendments or editions.

It is the constant aim of BSI to improve the quality of our products and services. We would be grateful if anyone finding an inaccuracy or ambiguity while using this British Standard would inform the Secretary of the technical committee responsible, the identity of which can be found on the inside front cover. Tel: +44 (0)20 8996 9000. Fax: +44 (0)20 8996 7400.

BSI offers members an individual updating service called PLUS which ensures that subscribers automatically receive the latest editions of standards.

Buying standards

Orders for all BSI, international and foreign standards publications should be addressed to Customer Services. Tel: +44 (0)20 8996 9001. Fax: +44 (0)20 8996 7001 Email: orders@bsigroup.com You may also buy directly using a debit/credit card from the BSI Shop on the Website http://www.bsigroup.com/shop

In response to orders for international standards, it is BSI policy to supply the BSI implementation of those that have been published as British Standards, unless otherwise requested.

Information on standards

BSI provides a wide range of information on national, European and international standards through its Library and its Technical Help to Exporters Service. Various BSI electronic information services are also available which give details on all its products and services. Contact Information Centre. Tel: +44 (0)20 8996 7111 Fax: +44 (0)20 8996 7048 Email: info@bsigroup.com

Subscribing members of BSI are kept up to date with standards developments and receive substantial discounts on the purchase price of standards. For details of these and other benefits contact Membership Administration. Tel: +44 (0)20 8996 7002 Fax: +44 (0)20 8996 7001 Email: membership@bsigroup.com

Information regarding online access to British Standards via British Standards Online can be found at http://www.bsigroup.com/BSOL

Further information about BSI is available on the BSI website at http://www.bsigroup.com.

Copyright

BSI Group
Headquarters 389
Chiswick High Road,
London, W4 4AL, UK
Tel +44 (0)20 8996 9001
Fax +44 (0)20 8996 7001
www.bsigroup.com/
standards