BRITISH STANDARD

BS EN
1465 : 1995

Adhesives —
Determination of tensile lap-shear strength of rigid-to-rigid bonded assemblies

The European Standard EN 1465 : 1994 has the status of a British Standard

BSI
STANDARDS

Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee STI/52, Adhesives, upon which the following bodies were represented:

British Adhesives and Sealants Association
British Plastics Federation
British Steel Industry
Centre for Adhesive Technology
Chemical Industries Association
Contract Flooring Association
Department of the Environment (Building Research Establishment)
Department of Trade and Industry (National Physical Laboratory)
European Resin Manufacturers' Association
Federation of the Electronics Industry
Institute of Materials
Ministry of Defence
Society of Motor Manufacturers and Traders
Timber Research and Development Association
University of Bristol
Welding Institute

This British Standard, having been prepared under the direction of the Sector Board for Materials and Chemicals, was published under the authority of the Standards Board and comes into effect on 15 April 1995

The following BSI references relate to the work on this standard:
Committee reference STI/52
Draft for comment 93/506291 DC

ISBN 0 580 23948 9

Amendments issued since publication

Amd. No.	Date	Text affected

Contents

National foreword

This British Standard has been prepared by Technical Committee STI/52 and is the English language version of EN 1465 : 1994 *Adhesives — Determination of tensile lap-shear strength of rigid-to-rigid bonded assemblies*, published by the European Committee for Standardization (CEN). EN 1465 : 1994 was produced as a result of a primary questionnaire procedure (PQ) based on ISO 4587 : 1979.

ISO 4587 : 1979 was produced by international discussions in which the United Kingdom participated.

Cross-references

Publication referred to	Corresponding British Standard
ISO 527-1 : 1993	BS 2782 *Methods of testing plastics* Method 321 : 1994 *Determination of tensile properties — General principles* (Identical)
ISO 3534	BS ISO 3534 *Statistics, vocabulary and symbols* (All Parts identical)

Compliance with a British Standard does not of itself confer immunity from legal obligations.

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 1465

November 1994

ICS 83.180

Descriptors: Adhesives, adhesive bonded joints, tests, adhesion tests, tensions tests, measurement shear tests, plastics

English version

Adhesives — Determination of tensile lap-shear strength of rigid-to-rigid bonded assemblies

(ISO 4587 : 1979 modified)

Adhésifs — Détermination de la résistance au cisaillement d'assemblage rigide-rigide, collés à recouvrement simple
(ISO 4587 : 1979 modifiée)

Klebstoffe — Bestimmung der Zugscherfestigkeit hochfester Überlappunsklebungen
(ISO 4587 : 1979 modifiziert)

This European Standard was approved by CEN on 1994-11-08. 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 Central Secretariat 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 Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart 36, B-1050 Brussels

Foreword

This European Standard has been prepared by the Technical Committee CEN/TC 193, Adhesives, the secretariat of which is held by AFNOR.

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 May 1995, and conflicting national standards shall be withdrawn at the latest by May 1995.

According to the common CEN/CENELEC Rules, the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom.

1 Scope

This European Standard specifies a method for determining the tensile lap-shear strength of rigid-to-rigid bonded assemblies when tested on a standard specimen and under specified conditions of preparation and testing.

2 Normative references

This European Standard incorporates by dated or undated references, 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.

ISO 291 : 1977	*Plastics — Standard atmospheres for conditioning and testing*
ISO 527-1	*Plastics — Determination of tensile properties — Part 1: General principles*[1]
ISO 3534 : 1977	*Statistics — Vocabulary and symbols*
ISO 4588	*Adhesives — Preparation of metal surfaces for adhesive bonding*[2]
ISO 10365 : 1992	*Adhesives — Designation of main failure patterns*

3 Principle

Adhesive lap-shear bond strength is determined by stressing in shear of a single overlap joint (see figure 1) between rigid adherends by applying to the adherends a tensile force which is parallel to the bond area and to the major axis of the specimen. The reported result is the observed force or stress at rupture.

4 Apparatus

4.1 *Testing machine*, so selected that the rupture of the specimen falls between 10 % and 80 % of the full-scale capacity. In addition, the response time of the machine shall be short enough not to affect the accuracy with which the force applied at the time of rupture can be measured. The recorded force shall not differ from the true applied force by more than 1 %. The machine shall be capable of applying a tensile force that increases at a steady rate (see note 1). It shall be provided with a suitable pair of self-aligning grips to hold the specimen. The grips and attachments (see note 2) shall be so constructed that they will move into alignment with the test specimen as soon as the load is applied, so that the long axis of the test specimen will coincide with the direction of the applied force through the centre line of the grip assembly.

NOTE 1. Where equipment does not allow for constant rate of load application, a rate of jaw separation shall be used which approximates the rate of loading (see ISO 527-1).

NOTE 2. Grips that operate by bolting through the adherends shall be avoided since such grips give rise to undesirable stress concentration.

4.2 *Jig*, for accurately locating adherends during bonding.

5 Specimens

5.1 Unless otherwise specified, test specimens shall conform to the form, dimensions, and alignment as shown in the figure 1. The recommended length (L) of overlap is (12,5 ± 0,25) mm.

NOTE 1. The choice of dimensions other than those shown in the figure may result in difficulties in the interpretation of results.

NOTE 2. This overlap is intended for aluminium alloys and materials of similar or higher moduli of elasticity (E) and tensile yield strength.

Example. For AA 2024-T3 or AECMA AL-P 13 PL (T3): E = 68 000 MPa

Tensile yield strength at 0,2 % offset = 290 MPa.

5.2 The test joints may be prepared either individually or from slotted or unslotted panels (see figure 1). Each method is equally suitable either for development or for comparative tests. If strength values are to be determined for design calculations of flat bonded joints, it is preferable to prepare the test joints from unslotted panels. In choosing the type of preparation, account should also be taken of whether the test joint will be damaged by mechanical working. Special care shall be taken in preparing individual specimens to ensure proper alignment and that bond thicknesses are as uniform as possible.

[1] At present at the stage of draft international standard (revision of ISO/R 527-1 : 1966).
[2] Revision in progress.

5.3 The adherend surface shall be properly treated to obtain an optimum bond. Surface treatments shall be in accordance with manufacturers' instructions or the appropriate European Standard. The adhesive shall be applied and cured according to the recommendations of the manufacturer of the adhesive. In the absence of such recommendations, the procedure shall be such as to achieve an optimum bond with minimum variations. In any case, the use of a jig to ensure the correct overlap and accurate alignment of the adherends is recommended.

If metallic adherends are used, the surfaces shall be prepared according to ISO 4588 unless otherwise specified. For all adherends the method used for surface preparation shall be reported.

5.4 The number of test specimens will depend on the precision required, but reliance should not be placed on fewer than six observations.

6 Conditioning and testing atmosphere

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

7 Procedure

Locate the test specimen symmetrically in the grips, with each grip (50 ± 1) mm from the nearest edge of the overlap. A shim may be used in the grips so that the applied force will be in the plane of the adhesive bond.

Operate the machine so that the stress or strain on the test joint increases at a constant (i.e. steady) rate. This rate shall be such that the average joint will be broken in a period of (65 ± 20) s.

Record the highest force during rupture as the breaking force of that specimen. Results from test specimens that rupture in the adherend shall be discarded except for routine testing.

8 Expression of results

Express the results of the tests as the arithmetic mean and coefficient of variation of the breaking force in newtons or the breaking stress in megapascals of the valid test specimens.

NOTE. It is suggested that the following criteria for repeatability and reproductibility should normally be observed for test results obtained using this European Standard:

a) the repeatability (see ISO 3534) (i.e. the difference between any two breaking forces obtained with one sample of adhesive by the same operator in a given test room or laboratory) should be less than 2,5 times the standard deviation.

b) the reproductibility (see ISO 3534) (i.e. the difference between the mean breaking forces obtained with one sample of adhesive on the same system in different test rooms or laboratories) should be less than 20 % of the arithmetic mean of the individual mean values.

It is stressed that these criteria are offered for guidance; failure to meet one or other of the requirements does not of itself imply failure to comply with this European Standard.

9 Test report

The test report shall include the following particulars:

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 bonding process, including method of application of adhesive, drying or precuring 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, including dimensions and construction of the test specimen, with nominal overlap of the joint, whether individual or of panel construction, whether slotted or unslotted panels, conditions used for cutting individual test specimens, number of test panels represented, and number of individual test specimens;

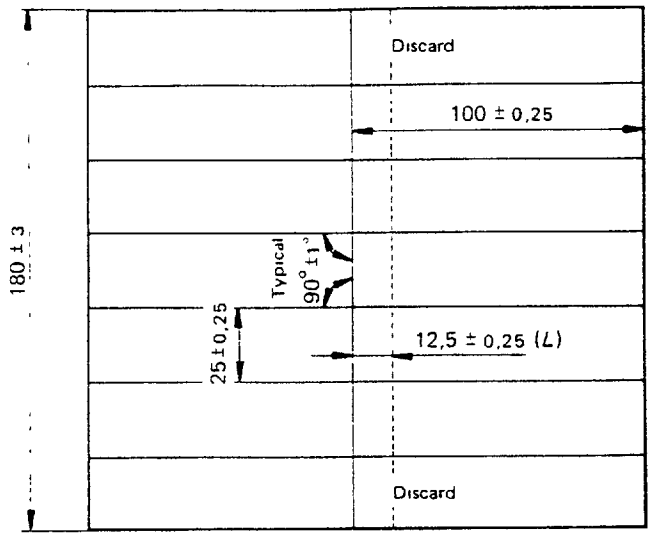
g) conditioning procedure prior to testing, and test atmosphere;

h) the rate of loading or rate of jaw separation;

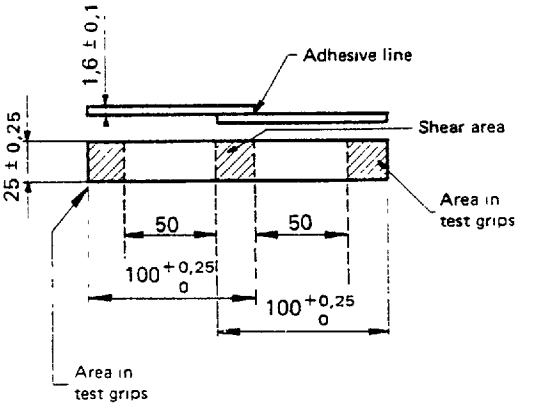
j) the individual breaking force or stress test results, the arithmetic mean and the coefficient of variation of the mean, together with information about the spread of results;

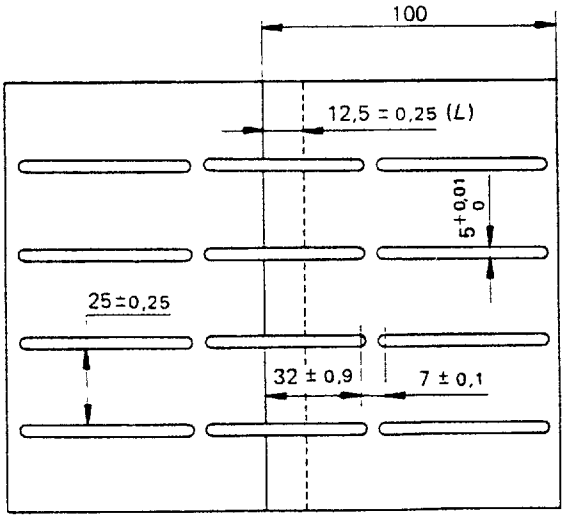
k) type of failure according to ISO 10365;

l) any operating deviations or difficulties that may have affected the results.



Standard test panel





Optional panel (slotted)

Dimensions in millimetres

Figure 1. Forms and dimensions of test panels

List of references

See national foreword.

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BSI — British Standards Institution

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London
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9504 – 5 – 0.35k – FP

ISBN 0 580 23948 9

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