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**Adhesives — Determination of strength  
of bonded joints using a bending-shear  
method**

*Adhésifs — Détermination de la résistance à la déformation sous contrainte  
de cisaillement de joints collés*



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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 15108 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 11, *Products*.

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# Adhesives — Determination of strength of bonded joints using a bending-shear method

## 1 Scope

This International Standard describes a procedure for the determination of the strength of adhesive joints, using a bending-shear method. The method can only be used for comparing adhesives, and the results cannot be used for design purposes.

## 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 291:1997, *Plastics — Standard atmospheres for conditioning and testing*.

ISO 4587:1995, *Adhesives — Determination of tensile lap-shear strength of rigid-to-rigid bonded assemblies*.

ISO 4588:1995, *Adhesives — Guidelines for the surface preparation of metals*.

ISO 5893:1993, *Rubber and plastics test equipment — Tensile, flexural and compression types (constant rate of traverse) — Description*.

ISO 7500-1:—<sup>1)</sup>, *Metallic materials — Verification of static uniaxial testing machines — Part 1: Tensile/compression testing machines*.

ISO 10365:1992, *Adhesives — Designation of main failure patterns*.

ISO 13895:1996, *Adhesives — Guidelines for the surface preparation of plastics*.

## 3 Principle

A bonded lap-joint is loaded in the centre of the bonded area until the joint breaks or until the maximum load is reached. The maximum load recorded is taken as the strength of the assembly.

1) To be published. (Revision of ISO 7500-1:1986)

## 4 Apparatus

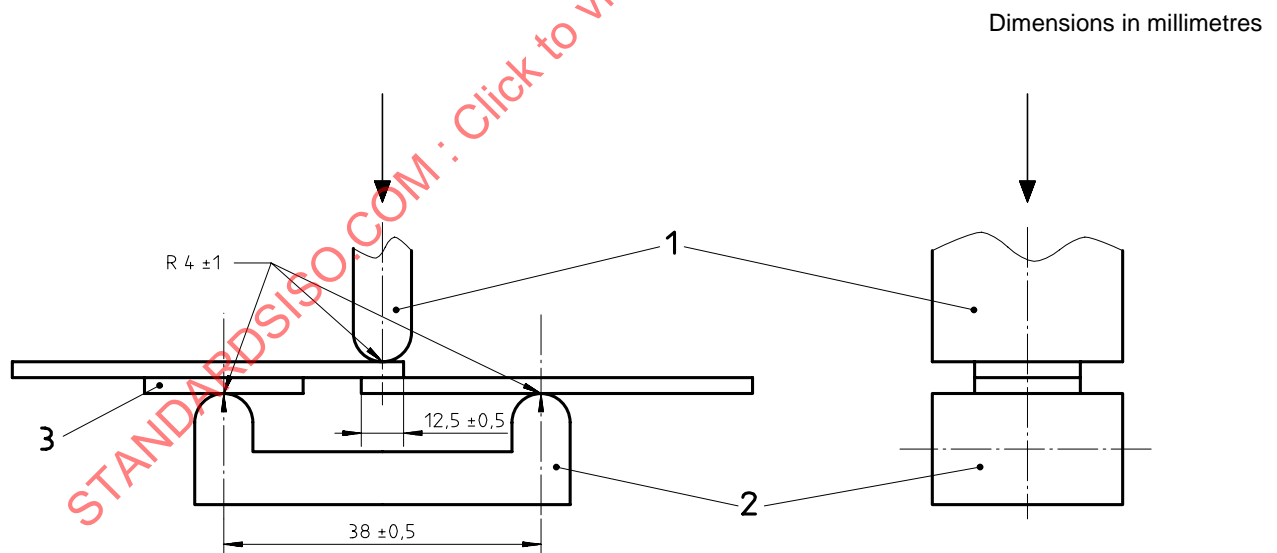
**4.1 Tensile-testing machine**, operating in the compression mode, capable of maintaining a pre-determined constant crosshead rate. The machine shall be capable of determining a maximum load. The measured strength shall lie between 15 % and 85 % of the full-scale capacity of the load-measuring device. The machine shall permit the measurement and recording of the applied force with an accuracy of  $\pm 1$  %.

The equipment shall be calibrated regularly in accordance with ISO 7500-1, or in accordance with ISO 5893 in the case of rubber or plastic adherends.

NOTE — It is recommended that the machine 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. It is also recommended that inertialess equipment be used.

**4.2 Supporting base and load-application element**, as shown in figure 1. The load-application element and supporting base shall be made of the same material and have the same radius of curvature at their load-bearing extremities. The contact between the load-application element and the specimen and between the supporting base and the specimen or spacer plate (4.3) shall be uniform over the whole width of the specimen, and the load-application element and supporting base shall be wider than the specimen.

**4.3 Spacer plate**, as shown in figure 1, to compensate for the difference in height between the two ends of the specimen due to the overlap of the adherends. The width and thickness of the spacer plate shall be the same as those of the adherends, and the length shall not exceed 12,5 mm.



### Key

- 1 Load-application element
- 2 Supporting base
- 3 Spacer plate

Figure 1 — Specimen-holding fixture

## 5 Specimens

### 5.1 Adherend material

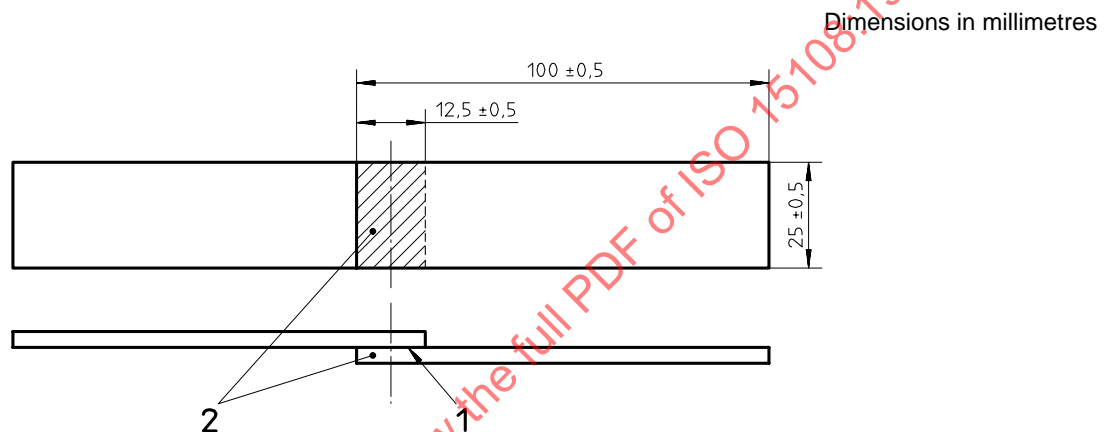
The adherends shall be made of metal, rigid plastic, rigid fibre-reinforced plastic, wood or wood-based material.

### 5.2 Shape and dimensions

Specimens shall be as shown in figure 2.

The adherends shall be of sufficient thickness to ensure breakage of the bond prior to the specimen bottoming out in the fixture. The adherend dimensions, including the thickness, shall be reported in the test report.

NOTE — For metal adherends, a thickness of 1,6 mm is recommended.



#### Key

- 1 Bond line
- 2 Bonded zone

Figure 2 — Test specimen

### 5.3 Cleaning and surface treatment of adherends

The cleaning and surface treatment of the adherends shall be in accordance with the instructions of the adherend manufacturer and/or adhesive manufacturer, and/or shall be chosen from the methods described in ISO 4588 in the case of metals or ISO 13895 in the case of plastics.

### 5.4 Preparation of specimens

Prepare the specimens in accordance with the procedure described in ISO 4587. Apply and cure the adhesive in accordance with the manufacturer's recommendations. Control the bond line thickness by appropriate means, such as glass spheres or wire spacers. When using glass spheres, the content shall not exceed 0,5 % of the mass of the adhesive. When using wire spacers, prepare the specimens in such a way that the final test piece does not include the area containing the wire.

The bond line thickness shall be reported in the test report.

### 5.5 Conditioning and testing atmosphere

Condition and test the specimens in one of the standard atmospheres specified in ISO 291.

## 5.6 Number of specimens

Prepare and test at least five specimens.

## 6 Procedure

Centre a specimen horizontally on the supporting base, and bring the load-application element into contact with the specimen at the centre of the bonded area. Load the specimen at a constant crosshead rate in the range of 1 mm/min to 100 mm/min until the joint breaks.

NOTE 1 The preferred crosshead rate is 10 mm/min.

Record the maximum load reached during the test.

NOTE 2 Further information can be derived from an autographic trace made during the test. For instance, the load/deflection curve may be integrated to calculate the total energy to failure.

Determine the failure pattern in accordance with ISO 10365.

Repeat the procedure for the other specimens.

## 7 Expression of results

For each specimen, determine the strength as the maximum load, in newtons, divided by the area of the bonded joint, in square millimetres. Calculate the average strength, in megapascals (1 MPa = 1N/mm<sup>2</sup>).

## 8 Precision

The precision of this test method is not known because inter-laboratory data are not available. When inter-laboratory data are obtained, a precision statement will be added at the following revision.

## 9 Test report

The test report shall include the following information:

- a) a reference to this International Standard;
- b) all details necessary for identification of the adhesive tested, including type, source and manufacturer's code number;
- c) all details necessary for identification of the adherends used, including their dimensions and the method of preparing the surfaces prior to bonding;
- d) the bond line thickness;
- e) the atmosphere used for conditioning and testing;
- f) the number of specimens tested;
- g) the crosshead rate;
- h) the average strength, expressed in megapascals;
- i) the failure pattern for each test piece;
- j) the date of the test.