



**International  
Standard**

**ISO 34257**

**Adhesives — Wood adhesives —  
Determination of tensile strength of  
lap joints at elevated temperature  
(WATT '91)**

*Adhésifs — Adhésifs pour bois — Détermination de la résistance  
en traction à température élevée des joints à recouvrement (essai  
WATT '91)*

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted (see [www.iso.org/directives](http://www.iso.org/directives)).

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This document was prepared by European Committee for Standardization as EN 14257:2019, and drafted in accordance with its editorial rules. It was assigned to Technical Committee ISO/TC 61, *Plastics*, subcommittee SC 11, *Products* and adopted under the “fast-track procedure”.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

# Adhesives — Wood adhesives — Determination of tensile strength of lap joints at elevated temperature (WATT '91)

**SAFETY STATEMENT** — — Persons using this document should be familiar with the normal laboratory practice, in principle. 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 determine any regulatory conditions.

## 1 Scope

This document specifies a method for testing the strength of wood adhesives at 80 °C.

**NOTE** The procedure described is based on a test developed in Germany known originally as the WATT '91 test. It uses the test piece described in ISO 19210.

## 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.

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

ISO 19210, *Adhesives — Wood adhesives for non-structural applications — Determination of tensile shear strength of lap joints*

EN 923, *Adhesives — Terms and definitions*

## 3 Terms and definitions

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

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

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

## 4 Principle

A symmetrical bonded lap joint between two wooden adherents is subjected to a period of heating at controlled temperature and then strained to rupture by a longitudinal force parallel to the grain.

The heating test is carried out on thin (0,1 mm) glue lines.

## 5 Apparatus

**5.1** Tensile testing machine, as described in ISO 5893, capable of maintaining a constant strain rate. The jaws shall be mounted in such a way as to permit self-alignment whilst the test pieces are being pulled.

5.2 Fan assisted oven, capable of maintaining a temperature of  $(80 \pm 2) ^\circ\text{C}$ .

## 6 Sample preparation

### 6.1 Preparation of the test pieces

Prepare 20 test pieces in accordance with the procedure described in ISO 19210.

### 6.2 Conditioning of the bonded assemblies

After bonding and pressing, condition the assembly for a minimum of seven days in a standard atmosphere of either  $(20 \pm 2) ^\circ\text{C}$ ,  $(65 \pm 5) \%$  relative humidity [20/65] or  $(23 \pm 2) ^\circ\text{C}$ ,  $(50 \pm 5) \%$  relative humidity [23/50].

## 7 Test procedure

Place each test piece, in a preheated fan oven, at  $(80 \pm 2) ^\circ\text{C}$ , for  $(60 \pm 2)$  min and then test it to fracture in a tensile testing machine.

In order to allow time for removal and testing it can be helpful to place the test pieces into the oven at set intervals, and to remove them in sequence after each has been in the oven for 1 h.

Whilst in the oven, the test pieces shall be well spaced in the circulating air.

The time between removal of the test piece from the oven and the start of the test (beginning of the application of the load) shall be  $(9 \pm 1)$  s.

Test the test pieces in a tensile testing machine.

Clamp the ends of the test pieces in the jaws of the tensile testing machine up to a length of 40 mm to 50 mm. Ensure that the force is applied centrally and in the plane of the bond. Load the test piece until rupture. Record the applied maximum force  $F_{\text{max}}$  in newtons (N).

For comparative tests of adhesives conduct the test at a rate of traverse of approximately 50 mm/min for thermoplastic adhesives or 6 mm/min to 12 mm/min for thermosetting adhesives respectively.

## 8 Calculation and expression of the results

Calculate the hot strength,  $\tau$ , of the joint in  $\text{N}/\text{mm}^2$  using [Formula \(1\)](#):

$$\tau = \frac{F_{\text{max}}}{A} = \frac{F_{\text{max}}}{l_2 \cdot b} \quad (1)$$

where

$F_{\text{max}}$  is the maximum force in Newton (N);

$A$  is the area of bonded test surface in square millimetres ( $\text{mm}^2$ );

$l_2$  is the length of the bonded test surface in millimetres (mm);

$b$  is the width of the bonded test surface in millimetres (mm).

NOTE  $l_2$  and  $b$  are defined in ISO 19210.