



SLOVENSKI STANDARD

SIST EN 302-4:2023

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Lepila za nosilne lesene konstrukcije - Preskusne metode - 4. del: Ugotavljanje vpliva krčenja lesa na strižno trdnost

Adhesives for load-bearing timber structures - Test methods - Part 4: Determination of the effects of wood shrinkage on the shear strength

Klebstoffe für tragende Holzbauteile - Prüfverfahren - Teil 4: Bestimmung des Einflusses von Holzschwindung auf die Scherfestigkeit

Adhésifs pour structures portantes en bois - Méthodes d'essai - Partie 4 : Détermination de l'influence du retrait du bois sur la résistance au cisaillement

Ta slovenski standard je istoveten z: **EN 302-4:2023**

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English Version

Adhesives for load-bearing timber structures - Test methods - Part 4: Determination of the effects of wood shrinkage on the shear strength

Adhésifs pour structures portantes en bois - Méthodes d'essai - Partie 4 : Détermination de l'influence du retrait du bois sur la résistance au cisaillement

Klebstoffe für tragende Holzbauteile - Prüfverfahren - Teil 4: Bestimmung des Einflusses von Holzschwindung auf die Scherfestigkeit

This European Standard was approved by CEN on 18 December 2022.

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

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European foreword

This document (EN 302-4:2023) has been prepared by Technical Committee CEN/TC 193 “Adhesives”, the secretariat of which is held by UNE.

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of an identical text or by endorsement, at the latest by August 2023, and conflicting national standards shall be withdrawn at the latest by August 2023.

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

This document supersedes EN 302-4:2013.

The main changes compared to the previous edition are listed below:

- a) the list of standards in the Introduction has been updated;
- b) two new standards, EN 17334 and EN 17418, have been included in the Scope;
- c) two new clauses (Terms and definitions and Symbols) have been introduced;
- d) preparation of samples with 0,3 mm and 2 mm glue line thickness has been added;
- e) a new NOTE has been added at the end of 7.2;
- f) the second paragraph in 7.6 has been changed;
- g) nominal glue line thickness has been added in 9.2 c);
- h) the Bibliography has been deleted.

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organisations 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, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

EN 302-4:2023 (E)**Introduction**

This document is one of a series dealing with adhesives for use with timber structures, and is published in support of the EN 1995 series, *Eurocode 5: Design of timber structures*. The series consists of five classification and performance requirements for adhesives for load-bearing timber structures, phenolic and aminoplastic adhesives (EN 301), one component polyurethane adhesives (EN 15425), emulsion polymer isocyanate adhesives (EN 16254), two component epoxy and polyurethane adhesives for glued in rods (EN 17334) and for on-site repair of cracked timber structures (EN 17418) and all together twelve test methods (EN 302-1, EN 302-2, EN 302-3, EN 302-4, EN 302-5, EN 302-6, EN 302-7, EN 302-8, EN 15416-1, EN 15416-3, EN 15416-4 and EN 15416-5).

These European Standards have the following titles:

EN 301, *Adhesives, phenolic and aminoplastic, for load-bearing timber structures — Classification and performance requirements*

EN 302, *Adhesives for load-bearing timber structures — Test methods:*

- *Part 1: Determination of longitudinal tensile shear strength*
- *Part 2: Determination of resistance to delamination*
- *Part 3: Determination of the effect of acid damage to wood fibres by temperature and humidity cycling on the transverse tensile strength*
- *Part 4: Determination of the effects of wood shrinkage on the shear strength*
- *Part 5: Determination of maximum assembly time under referenced conditions*
- *Part 6: Determination of the minimum pressing time under referenced conditions*
- *Part 7: Determination of the working life under referenced conditions*
- *Part 8: Static load test of multiple bond line specimens in compression shear*

EN 15416, *Adhesives for load bearing timber structures other than phenolic and aminoplastic — Test methods:*

- *Part 1: Long-term tension load test perpendicular to the bond line at varying climate conditions with specimens perpendicular to the glue line (Glass house test)*
- *Part 3: Creep deformation test at cyclic climate conditions with specimens loaded in bending shear*
- *Part 4: Determination of open assembly time under referenced conditions*
- *Part 5: Determination of minimum pressing time under referenced conditions*

EN 15425, *Adhesives — One component polyurethane (PUR) for load-bearing timber structures — Classification and performance requirements*

EN 16254, *Adhesives — Emulsion polymer isocyanate (EPI) for load-bearing timber structures — Classification and performance requirements*

EN 17334, *Glued-in rods in glued structural timber products — Testing, requirements and bond shear strength classification*

EN 17418, *Two-component epoxy and polyurethane adhesives for on-site repair of cracked timber structures — Testing, requirements and repair strength verification*

Safety statement

Persons using this document should be familiar with the normal laboratory practice, if applicable. This document cannot 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 can have a negative environmental impact. As technological advantages lead to better alternatives for these materials, they will be eliminated from this standard to the greatest extent possible.

At the end of the test, it is recommended that the users of the standard take care to carry out an appropriate disposal of the wastes, according to local regulations.

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EN 302-4:2023 (E)**1 Scope**

This document specifies a method for determining the influence of shear strength in crosswise gluing by wood shrinkage under drying conditions.

It is applicable for the following applications:

- a) for assessing the compliance of adhesives with EN 301, EN 15425, EN 16254, EN 17334 and EN 17418;
- b) for assessing the suitability and quality of adhesives for load-bearing timber structures;
- c) for determining if the adhesive is capable of withstanding stresses due to wood shrinkage without unacceptable loss of strength.

This test is intended primarily to obtain performance data for the classification of adhesives for load-bearing timber structures according to their suitability for use in defined climatic environments. This test is carried out on Norway spruce (*Picea abies* L.).

This method is not intended to provide data for structural design and does not necessarily represent the performance of the bonded member in service.

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.

EN 301, *Adhesives, phenolic and aminoplast, for load-bearing timber structures - Classification and performance requirements*

EN 384:2016+A2:2022, *Structural timber - Determination of characteristic values of mechanical properties and density*

EN 13183-1, *Moisture content of a piece of sawn timber - Part 1: Determination by oven dry method*

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

ISO 6344-2, *Coated abrasives - Determination and designation of grain size distribution - Part 2: Macrogrit sizes P12 to P220*

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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/>

3.1**glue line**

adhesive layer between the wood members

3.2

thick glue line

glue line of nominal thickness in the range of 0,3 mm to 2,0 mm at the time of bonding

Note 1 to entry: Thick glue lines are achieved by using spacers, grooves or similar devices when two plain members are glued together.

4 Symbols

| | |
|--------------------|---|
| A | bonded test surface, in mm^2 |
| f_v | shear strength, in N/mm^2 |
| $F_{c,\text{max}}$ | maximum compression load at failure, in N |
| t | nominal glue line thickness (0,3 mm, 0,5 mm or 2 mm) |
| α | angle of annual ring orientation to the surfaces 35° to 55° |
| U_m | mean moisture content |
| U_1 | moisture content of the first cover piece |
| U_2 | moisture content of the second cover piece |
| U_3 | moisture content of the core piece |

5 Principle

A crosswise double joint with 0,3 mm, 0,5 mm or 2 mm thick glue line is submitted to a dry storage treatment and then strained to failure by a compressive shear force.

6 Apparatus

6.1 Testing machine, which shall be either:

- capable of maintaining a constant rate of loading of (20 ± 5) kN/min; or
- capable of maintaining a constant crosshead speed as specified in ISO 5893.

6.2 Climatic cabinets, which shall be capable of maintaining the bonded assemblies under the following conditions:

- (40 ± 2) °C and a relative humidity of (30 ± 2) % and an air speed of $(0,7 \pm 0,15)$ m/s measured in the centre of an empty cabinet;
- (20 ± 2) °C and a relative humidity of (65 ± 5) %;
- (20 ± 2) °C and a relative humidity of (75 to 80) %.

7 Method

7.1 General

7.1.1 Selection of timber

Use Norway spruce (*Picea abies* L.) having a density of (450 ± 25) kg/m^3 measured at 12 % moisture content as determined by oven drying (according to EN 13183-1).

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7.1.2 Preparation of cover pieces

From three boards with a length of at least 1 200 mm, prepare three pairs of solid Norway spruce cover pieces that are knot-free, straight grained with growth rings that are approximately tangential to the face and have a radius of 60 mm to 140 mm. The cover pieces shall be:

- a) 400 mm in length;
- b) 140 mm in width; and
- c) $(20 \pm 0,5)$ mm in thickness

after conditioning, measurement of moisture content (oven dry method according to EN 13183-1) and final preparation. Each matching pair of cover pieces is intended for the production of a specimen.

7.1.3 Preparation of core pieces

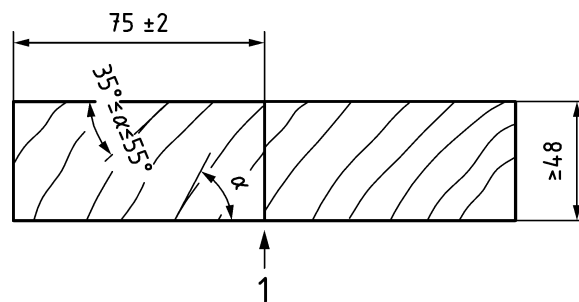
Prepare three laminated spruce core pieces that are knot-free, straight-grained and with annual rings at an angle of 35° to 55° relative to the surface (see Figure 1). The dimensions of the core pieces shall be:

- a) 400 mm in length;
- b) 140 mm in width; and
- c) $(40,0 \pm 0,5)$ mm in thickness

after conditioning, measurement of moisture content (oven dry method according to EN 13183-1) and final preparation.

These laminated core pieces shall be produced of two boards with a width of (75 ± 2) mm, and a thickness of at least 48 mm. The two boards shall be bonded together longitudinally with a phenol-resorcinol-formaldehyde (PRF) adhesive which passed EN 301 (used according to the adhesive manufacturer's instructions), with an annual ring orientation as indicated in Figure 1.

Dimensions in millimetres



Key

- 1 PRF adhesive glue line
- α angle of annual ring orientation to the surfaces

Figure 1 — Cross-section of the laminated Norway spruce core piece before planing and cutting to the required dimensions of 140 mm wide by $(40,0 \pm 0,5)$ mm thick

7.1.4 Conditioning

Condition the core and cover pieces such that the average moisture content of all three pieces used in an assembly is $(17,5 \pm 0,5)$ %. Individual core and cover pieces may have a moisture content of (17 ± 1) %, as determined by the oven-dry method, according to EN 13183-1.