



# SLOVENSKI STANDARD

## SIST EN 14545:2009

01-december-2009

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### Lesene konstrukcije - Spojniki (konektorji) - Zahteve

Timber structures - Connectors - Requirements

Holzbauwerke - Nicht Stifförmige Verbindungselemente - Anforderungen

Structures en bois - Connecteurs - Exigences

Ta slovenski standard je istoveten z: **EN 14545:2008**

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EUROPEAN STANDARD  
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English Version

**Timber structures - Connectors - Requirements**

Structures en bois - Connecteurs - Exigences

Holzbauwerke - Nicht stiftförmige Verbindungselemente -  
Anforderungen

This European Standard was approved by CEN on 9 August 2008.

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## Foreword

This document (EN 14545:2008) has been prepared by Technical Committee CEN/TC 124 "Timber Structures", the secretariat of which is held by SFS.

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of an identical text or by endorsement, at the latest by April 2009, and conflicting national standards shall be withdrawn at the latest by April 2009.

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 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).

For relationship with EC Directive(s), see informative Annex ZA, which is an integral part of this document.

This standard also includes two normative annexes covering corrosion protection specifications for connectors covered by this standard, and procedures for the derivation of characteristic strength properties of punched metal plate fasteners.

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, 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.

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**EN 14545:2008 (E)****1 Scope**

This European Standard specifies requirements and test methods for materials, geometry, strength, stiffness and durability aspects (i.e. corrosion protection) of connectors for use in load bearing timber structures.

Only connectors manufactured from steel are covered by this European Standard, like shear plates, split ring connectors, tooth plate connectors, punched metal plate fasteners and nailing plates. Definitions of these items are given in Clause 3.

This European Standard specifies also the evaluation of conformity procedures and includes requirements for marking of these products.

This European Standard does not cover connectors treated with fire retardants to improve their fire performance.

**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 912:1999, *Timber fasteners - Specifications for connectors for timber*

EN 1075:1999, *Timber structures - Test methods - Joints made with punched metal plate fasteners*

EN 1995-1-1:2004, *Eurocode 5: Design of timber structures - Part 1-1: General - Common rules and rules for buildings*

EN 10025-2, *Hot rolled products of structural steels - Part 2: Technical delivery conditions for non-alloy structural steels*

EN 10029, *Hot rolled steel plates 3 mm thick or above - Tolerances on dimensions, shape and mass*

EN 10051, *Continuously hot-rolled uncoated plate, sheet and strip of non-alloy and alloy steels - Tolerances on dimensions and shape*

EN 10088-1, *Stainless steels - Part 1: List of stainless steels.*

EN 10088-2, *Stainless steels - Part 2: Technical delivery conditions for sheet/plate and strip of corrosion resisting steels for general purposes*

EN 10143, *Continuously hot-dip coated steel sheet and strip - Tolerances on dimensions and shape*

EN 10204, *Metallic products - Types of inspection documents*

EN 10292, *Continuously hot-dip coated strip and sheet of steels with high yield strength for cold forming - Technical delivery conditions*

EN 10326, *Continuously hot-dip coated strip and sheet of structural steels - Technical delivery conditions*

EN 10327, *Continuously hot-dip coated strip and sheet of low carbon steels for cold forming - Technical delivery conditions*

EN 13271:2001, *Timber fasteners - Characteristic load-carrying capacities and slip-moduli for connector joints*

EN 14358:2006, *Timber structures - Calculation of characteristic 5-percentile values and acceptance criteria for a sample*

EN 26891, *Timber structures - Joints made with mechanical fasteners - General principles for the determination of strength and deformation characteristics (ISO 6891:1983)*

EN 28970:1991, *Timber structures - Testing of joints made with mechanical fasteners - Requirements for wood density (ISO 8970:1989)*

EN ISO 1461, *Hot dip galvanized coatings on fabricated iron and steel articles - Specifications and test methods (ISO 1461:1999)*

EN ISO 9001, *Quality management systems - Requirements (ISO 9001:2000)*

EN ISO 9445, *Continuously cold-rolled stainless steel narrow strip, wide strip, plate/sheet and cut lengths - Tolerances on dimensions and form (ISO 9445:2002)*

ISO 2081, *Metallic coatings - Electroplated coatings of zinc on iron or steel*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 1995-1-1:2004 and the following apply.

#### 3.1

##### connector

shear plates, split ring connectors or tooth plate connectors as defined in EN 912 and punched metal plate fasteners or nailing plates as defined below

#### 3.2

##### nailing plate

flat rectangular metal plate containing pre-punched holes through which nails or screws are inserted

NOTE Used either on the external faces of a joint to join two or more pieces of timber of the same thickness in the same plane or on one external face of a timber member for anchoring and bracing.

#### 3.3

##### punched metal plate fastener

metal plate having integral projections punched out in one direction perpendicular to the base of the plate

NOTE Used to join two or more pieces of timber of the same thickness in the same plane.

#### 3.4

##### plate thickness

nominal steel plate thickness including the thickness of any corrosion protection coating

#### 3.5

##### stiffness (slip modulus)

the value of  $k_{ser}$  defined in EN 26891, calculated per fastener and per shear plane

### 4 Symbols and abbreviations

For the purposes of this standard, the symbols and abbreviations given in EN 1995-1-1:2004, EN 14358:2006, EN 13271:2001, EN 912:1999 and the following ones apply.

$A_{80}$  percentage elongation (%)  
 $d_c$  connector diameter defined in EN 13271 (mm)

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$f_{a,\alpha,\beta,k}$	characteristic punched metal plate anchorage capacity (N/mm <sup>2</sup> )
$f_{v,\alpha,k}$	characteristic punched metal plate shear capacity (N/mm)
$f_{t,k}$	characteristic punched metal plate tension capacity (N/mm)
$f_{c,k}$	characteristic punched metal plate compression capacity (N/mm)
$k_{ser}$	slip modulus per shear plane per fastener (N/mm <sup>3</sup> )
$k_s$	statistical constant defined in EN 14358
$k_1, k_2, \alpha_0$	constants used to characterise the shape of the punched metal plate anchorage capacity
$k_v, \gamma_0$	constants used to characterise the shape of the punched metal plate shear capacity
$l$	overall connector length (mm)
$t_p$	metal plate thickness (mm)
$w$	overall connector width (mm)
$\alpha$	maximum bend angle (degrees)
$\rho_k$	characteristic timber density (kg/m <sup>3</sup> )
$\rho_m$	mean timber density (kg/m <sup>3</sup> )

**5 Dimensions and tolerances****5.1 Method of measurement and accuracy**

Length and width of the connectors shall be measured using a device capable of achieving an accuracy of  $\pm 0,5$  mm.

Thickness and diameter shall be measured using a calibrated device capable of achieving an accuracy of  $\pm 1$  %.

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**5.2 Length**

Where appropriate, the overall length of the connector shall be measured and the result declared.

When sampled in accordance with Tables 2, 3 and 4 and Tables 5, 6 and 7 and measured, the overall length shall be within  $-1$  mm/+ 2 mm or  $-1$  %/+ 2 %, whichever is the greater, of its declared value.

**5.3 Width**

Where appropriate, the overall width of the connector shall be measured and the result declared.

When sampled in accordance with Tables 2, 3 and 4 and Tables 5, 6 and 7 and measured, the overall width shall be within  $-1$  mm/+ 2 mm or  $-1$  %/+ 2 %, whichever is the greater, of its declared value.

**5.4 Diameter**

Where appropriate, the connector diameter shall be measured and the result declared.

Where tolerances on diameter are not otherwise given in EN 912, when sampled in accordance with Tables 2 and 4 and Tables 5 and 7 and measured to an accuracy of 0,01 mm, the nominal diameter shall be within  $\pm 2,5$  % of its declared value.

**5.5 Thickness**

Where appropriate, the thickness of the connector shall be measured and the result declared.

When sampled in accordance with Tables 2, 3 and 4 and Tables 5, 6 and 7 and measured, the plate thickness shall be within the tolerances specified for the parent plate material being used.



## 5.6 Other dimensions

Where appropriate, other dimensions, e.g. tooth length, etc., shall be measured and result declared. When sampled in accordance with Tables 2 and 3 and measured these dimensions shall be within greater of  $\pm 0,75$  mm or  $\pm 2,5$  % of the specified values given.

## 6 Requirements

### 6.1 Shear plates, split ring and toothed-plate connectors

#### 6.1.1 Materials

For shear plates, split ring connectors and toothed-plate connectors manufactured from steel specified in EN 912, the minimum material specifications shall be as given in that standard.

#### 6.1.2 Geometry

For shear plates, split ring connectors and toothed-plate connectors specified in EN 912, the geometric values specified (i.e. dimensions and tolerances) shall be as given in that standard.

#### 6.1.3 Mechanical strength and stiffness

For joints formed using shear plates, split ring connectors and toothed-plate connectors specified in EN 912, the following characteristics shall be determined according to EN 13271 for:

- a) mechanical strength: as characteristic load bearing capacity, and
- b) mechanical stiffness: as slip modulus.

NOTE The equations for the load-bearing capacity of joints made with the connectors covered by EN 912 are given in EN 1995-1-1.

#### 6.1.4 Corrosion protection

For shear plates, split ring connectors and toothed-plate connectors covered by EN 912, the corrosion protection specifications shall be as given in that standard and shall be declared as appropriate service class according to EN 1995-1-1.

Examples of minimum corrosion protection or material specifications for different service classes are given in EN 1995-1-1.

### 6.2 Punched metal plate fasteners

#### 6.2.1 Materials

Punched metal plate fasteners shall be formed from the steel specifications given in Table 1 and shall have a minimum elongation ( $A_{80}$ ) of 16 %.

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Table 1 – Minimum steel specifications

Type	Reference	Minimum specification
Mild steel plate or strip	EN 10327	DX51D
	EN 10326	S220GD
	EN 10292	HX220YD
Austenitic stainless steel plate	EN 10088-2	X5CrNiTi 18-10

### 6.2.2 Geometry

Punched metal plate fasteners shall be produced from steel having a plate thickness  $t_p$  of minimum 0,9 mm and of maximum 3,0 mm. The tolerance on the plate thickness shall be in accordance with EN 10143 for mild steel or EN ISO 9445 for stainless steel.

### 6.2.3 Mechanical strength and stiffness

The characteristics of the punch metal plate fasteners shall be determined in accordance with Annex B, based on tests performed in accordance with Annex A of EN 1075:1999. They are as follows for:

a) mechanical anchorage-, tension-, compression- and shear strength, as:

- 1) characteristic plate anchorage capacity, [SIST EN 14545:2009](https://standards.iteh.ai/catalog/standards/sist/c63677c8-aafa-4527-9ad0-d597b29d57ac/sist-en-14545-2009)
- 2) characteristic plate tension capacity,
- 3) characteristic plate compression capacity, and
- 4) characteristic plate shear capacity; and

b) mechanical stiffness, as:

- 1) plate slip modulus, and
- 2) nail root ductility.

### 6.2.4 Corrosion protection

Punched metal plate fasteners for use in structural timber applications shall either be made of a material which is inherently corrosion resistant, or require corrosion protection coating. The material or coating shall be declared in accordance with the relevant specification given in Annex A.

Examples of minimum corrosion protection or material specifications for different service classes are given in EN 1995-1-1.

## 6.3 Nailing plates

### 6.3.1 Materials

Nailing plates shall be manufactured from mild steel plate or strip according to EN 10025-2 or EN 10326, or from austenitic stainless steel plate in accordance with EN 10088-2. For plates produced from mild steel, the minimum steel specification shall be S235JR according to EN 10025-2, or S220GD according to EN 10326.

### 6.3.2 Geometry

Nailing plates shall be produced from steel having a nominal plate thickness  $t_p$  of not less than 0,9 mm. The tolerance on the plate thickness shall be in accordance with EN 10051 or EN 10029 where the parent material is to EN 10025-2, or EN 10143 where the parent material is to EN 10326, or EN ISO 9445 for cold-rolled stainless steel materials to EN 10088-2.

Tolerances on the hole size/positioning shall be as follows:

- hole diameter:  $\pm 0,2$  mm;
- hole spacing:  $\pm 0,5$  mm.

Tolerances on the length and width shall be in accordance with 5.2 and 5.3, respectively.

### 6.3.3 Mechanical strength and stiffness

The following characteristics of the nailing plates shall be determined on the parent material according to standards in 6.3.1 for:

- a) mechanical strength: as characteristic yield strength, and
- b) mechanical stiffness: as minimum percentage elongation after fracture.

NOTE For those holes in which nails are inserted, provided that the nail spacing rules given in EN 1995-1-1 are respected, the capacity of joints made with nailing plates may be calculated using the equations for nailed steel-to-timber joints in EN 1995-1-1.

### 6.3.4 Corrosion protection

Nailing plates for use in structural timber applications shall either be made of a material, which is inherently corrosion resistant, or require a corrosion protection coating. The material or coating shall be declared in accordance with the relevant specification given in Annex A.

Examples of minimum corrosion protection or material specifications for different service classes are given in EN 1995-1-1.

**EN 14545:2008 (E)****7 Evaluation of conformity****7.1 General**

The conformity with the requirements of this standard shall be demonstrated by:

- initial type testing,
- factory production control by the manufacturer, including product assessment.

For the purposes of testing, the products may be grouped into families, where it is considered that the results for one or more characteristics from any one product within the family are representative for that same characteristic(s) for all the products within that same family.

**7.2 Initial type testing (ITT)****7.2.1 General**

Initial type testing shall be performed to show conformity with this standard. Tests previously performed in accordance with the provisions of this standard (i.e same product, characteristic(s), test method, sampling procedure, system of attestation of conformity, etc.) may be taken into account for the ITT purpose. In addition, initial type testing shall be performed at the beginning of the production of a new product type or at the beginning of a new method of production where this may affect the declared values of the product's stated characteristics.

All characteristics in Clause 6 shall be subject to initial type testing.

Whenever a change occurs in the product, the raw material or supplier of the components, or the production process, which would change significantly one or more of the characteristics, the initial type testing shall be repeated for the appropriate characteristic(s).

**7.2.2 Sampling, testing and conformity criteria****7.2.2.1 Sampling procedure**

The method of sampling shall be as defined in Tables 2 to 4, as appropriate.

**7.2.2.2 Testing and compliance criteria**

The number of test samples to be tested (or assessed) and the compliance criteria shall be in accordance with Tables 2 to 4, as appropriate:

- Table 2, for shear plate, split ring and toothed plate connectors,
- Table 3, for punched metal plate fasteners,
- Table 4, for nailing plates.

The results of all initial type tests shall be recorded and held by the manufacturer for at least 10 years after the last date of production of the product(s) to which they apply.