



# SLOVENSKI STANDARD

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**Lestve - 2. del: Zahteve, preskušanje, označevanje**

Ladders - Part 2: Requirements, testing, marking

Leitern - Teil 2: Anforderungen, Prüfung, Kennzeichnung

Echelles - Partie 2: Exigences, essais, marquage

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Lestve

Ladders

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English Version

## Ladders - Part 2: Requirements, testing, marking

Échelles - Partie 2: Exigences, essais, marquage

Leitern - Teil 2: Anforderungen, Prüfung, Kennzeichnung

This European Standard was approved by CEN on 20 May 2010.

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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 CEN Management Centre has the same status as the official versions.

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

Management Centre: Avenue Marnix 17, B-1000 Brussels

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## Foreword

This document (EN 131-2:2010) has been prepared by Technical Committee CEN/TC 93 "Ladders", the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by December 2010, and conflicting national standards shall be withdrawn at the latest by June 2011.

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 supersedes EN 131-2:1993.

This standard is a revised version of EN 131-2:1993. Compared to the version EN 131-2:1993 the following modifications have been made:

The specifications for plastics in 4.2.3, for wood in 4.2.4 and the test methods in Clause 5 have been completely revised.

This European Standard is one of a series about ladders. The other standards of this series are listed in Clause 2 and in the Bibliography.

On stability tests and ladder classes no consensus could be reached. These issues will be addressed in the next revision.

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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, Croatia, 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 United Kingdom.

## Introduction

Due to the unhomogeneity of the material wood, special requirements have been appropriated on this item.

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## 1 Scope

This European Standard specifies the general design features, requirements and test methods for portable ladders.

It does not apply to step stools or ladders for specific professional use such as firebrigade ladders, roof ladders and mobile ladders.

It does not apply to ladders used for work on or near live electrical systems or installations. For this purpose EN 61478 applies.

NOTE For insulating ladders for use on or near low voltage electrical installations in the range below 1000 V a.c or 1 500 V d.c. EN 50528 is under preparation.

This European Standard is intended to be used in conjunction with EN 131-1.

For single or multiple hinge joint ladders EN 131-4 applies.

## 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 59, *Glass reinforced plastics — Measurement of hardness by means of a Barcol impressor*

EN 131-1:2007, *Ladders — Part 1: Terms, types, functional sizes*

EN 131-3, *Ladders — Part 3: User Instructions*

EN 204, *Classification of thermoplastic wood adhesives for non-structural applications*

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

EN 385, *Finger jointed structural timber — Performance requirements and minimum production requirements*

EN 386:2001, *Glued laminated timber — Performance requirements and minimum production requirements*

EN 391:2001, *Glued laminated timber — Delamination test of glue lines*

EN 392, *Glued laminated timber — Shear test of glue lines*

EN 408, *Timber structures — Structural timber and glued laminated timber — Determination of some physical and mechanical properties*

EN 844-9:1997, *Round and sawn timber — Terminology — Part 9: Terms relating to features of sawn timber*

EN 1310, *Round and sawn timber — Method of measurement of features*

EN 61478, *Live working — Ladders of insulating material (IEC 61478:2001)*

EN ISO 179-1, *Plastics — Determination of Charpy impact properties — Part 1: Non-instrumented impact test (ISO 179-1:2000)*

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EN ISO 527-1, *Plastics — Determination of tensile properties — Part 1: General principles (ISO 527-1:1993 including Corr 1:1994)*

EN ISO 527-2, *Plastics — Determination of tensile properties — Part 2: Test conditions for moulding and extrusion plastics (ISO 527-2:1993 including Corr 1:1994)*

EN ISO 3834-1, *Quality requirements for fusion welding of metallic materials — Part 1: Criteria for the selection of the appropriate level of quality requirements (ISO 3834-1:2005)*

EN ISO 3834-2, *Quality requirements for fusion welding of metallic materials — Part 2: Comprehensive quality requirements (ISO 3834-2:2005)*

EN ISO 3834-3, *Quality requirements for fusion welding of metallic materials — Part 3: Standard quality requirements (ISO 3834-3:2005)*

EN ISO 3834-4, *Quality requirements for fusion welding of metallic materials — Part 4: Elementary quality requirements (ISO 3834-4:2005)*

EN ISO 4892-2:2006, *Plastics — Methods of exposure to laboratory light sources — Part 2: Xenon-arc lamps (ISO 4892-2:2006)*

EN ISO 6892-1, *Metallic materials — Tensile testing — Part 1: Method of test at room temperature (ISO 6892-1:2009)*

EN ISO 14125, *Fibre-reinforced plastic composites — Determination of flexural properties (ISO 14125:1998)*

EN ISO 14731, *Welding coordination — Tasks and responsibilities (ISO 14731:2006)*

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**3 Terms and definitions**

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For the purposes of this document, the terms and definitions given in EN 131-1:2007 and the following apply.

**3.1**  
**thermoset plastic**  
plastic that has been cured by heat or by other means such as radiation, catalysts, etc., into a substantially infusible and insoluble state

[EN ISO 472:2001]

**3.2**  
**composite material**  
crosslinkable resin-based material with a continuous reinforcement fibre as filler (e.g. fibreglass)

**3.3**  
**thermoplastic material**  
plastic material other than thermoset plastic or composite with or without filler and with or without reinforcement

**3.4**  
**maximal total load**  
maximum weight that the ladder is designed to support when set up in accordance with the manufacturer's instruction



## 4 Requirements

### 4.1 General

The requirements are based upon a maximum total load of 150 kg.

Ladders are determined to be used by one person at a time but this excludes any person footing (stabilising) the ladder.

### 4.2 Materials

#### 4.2.1 Aluminium — alloy

All load bearing parts made of aluminium alloy shall have an elongation  $A_5$  at rupture measured according to EN ISO 6892-1 of minimum 5 %.

All load bearing parts made of aluminium alloy shall have a thickness of at least 1,2 mm.

#### 4.2.2 Steel

If cold rolled steel or a special alloy-steel is used the ratio between 0,2 % yield-stress and ultimate strength ( $R_p 0,2/R_m$ ) shall be lower than 0,92.

All load bearing parts made of steel shall have a thickness of at least 1,0 mm.

#### 4.2.3 Plastics

Glass-fibre reinforced plastics shall be protected against penetration of water and dirt. The surface shall be smooth. The fibres shall be embedded. The Barcol hardness according to EN 59 shall be at least 35.

The test methods and acceptance criteria for defining the characteristics of the composite and reinforced thermoplastic materials are given in 5.16. They apply to the load-bearing elements (stiles, climbing supports, platforms) of the structure of ladders at time of use. Thermoplastic materials without reinforcements shall not be used for load bearing-elements.

The minimum thickness for load-bearing elements made of thermoset plastics and composite material is 2 mm.

When using plastics materials, ageing and temperature resistance shall be taken into account.

#### 4.2.4 Timber

##### 4.2.4.1 Different kind of timber

For stiles, stanchions, braces, rungs and steps the types of timber to be used shall have a bulk density greater than or equal to  $450 \text{ kg/m}^3$  for softwoods and  $690 \text{ kg/m}^3$  for hardwoods. The bulk density shall be measured with a moisture content of 15 %.

Examples of suitable species of wood are:

##### Softwood:

Fir (*Abies alba*)  
Larch (*Larix decidua*)  
Spruce (*Picea abies*)  
Pine (*Pinus sylvestris*)

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Oregon pine (*Pseudotsuga menziesii*)  
Hemlock (*Tsuga heterophylla*)

**Hardwood:**

Beech (*Fagus sylvatica*)  
Ash (*Fraxinus excelsior*)  
Oak (*Quercus robur*)  
Robinia (*Robinia pseudoacacia*)

Other types of timber having at least the same quality as the mentioned above are permitted too.

The following species of wood are not permitted for the production of ladders:

Parana Pine (*Araucaria angustifolia* O.Ktze.)  
Hem Fir (*Abies magnifica*) and  
Corsican Pine (*Pinus nigra* Arnold).

**4.2.4.2 General requirements**

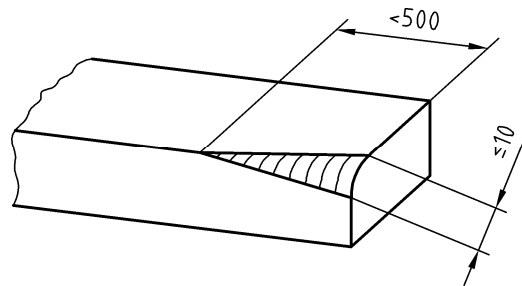
The general requirements are given in Table 1.

Table 1 — General requirements

Hard-wood	Soft-wood	Criteria	Requirements
X	X	<b>1. Wane</b>	Only permitted for stiles on one edge for a max. depth of 10 mm with a max. length of 500 mm. It is not permitted for rungs (see Figure 1).
X	X	<b>2. Width of annual rings</b>	< 4 mm Pitch pine: < 6 mm at a bulk density of 550 kg/m <sup>3</sup> . For ring porous hardwoods < 1 mm not permitted e.g. oak ( <i>Quercus</i> sp.), ash ( <i>Fraxinus</i> sp.) robinia ( <i>Robinia</i> sp.).
X	X	<b>3. Slope of annual rings</b>	A deviation of the slope of annual rings from the longitudinal edges of the wood of 100 mm per 1 000 mm maximum is admissible (see Figure 2). Local deviation e.g. at knot positions, are neglected.
X	X	<b>4. Shakes</b>	
		— splits <sup>a</sup>	not permitted
		— checks <sup>a</sup>	< 100 mm length
		Lightning/frost shakes, Ring shake	not permitted
		<b>5. Colour</b>	
	X	Blue stain	Permitted
	X	Red streaks	permitted up to 25 % of the surface
	X	Red rot, brown rot	not permitted
X		Red heart of beech, brown heart of ash	Permitted
X		Doty wood	not permitted
X	X	<b>6. Reaction wood</b>	admissible until $\frac{1}{5}$ of the cross section or of the surface
X	X	<b>7. Pith</b>	not permitted
X		<b>8. Defects caused by insects</b>	not permitted
X	X	<b>9. Mistletoe traces</b>	not permitted
	X	<b>10. Resin pockets</b>	
		not continuous	permitted until 4 mm width and 1,5 × width of the stiles (see Figure 3)

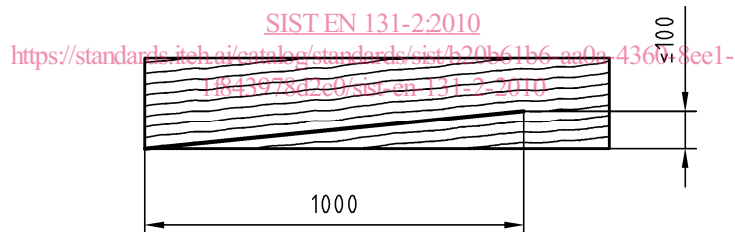
		Continuous	not permitted
X	X	<b>11. Spiral grain</b>	A deviation of the grain direction from the longitudinal edges of the wood of not more than 50 mm per 1 000 mm, measured either with the help of shrinkage shakes or the scratching method is admissible (see Figure 4). The measurement is to be carried out in two faces perpendicular to each other. The largest deviation is decisive. In the case of rungs and steps, the grain ends, with the exception of knots, shall be at the rung or step ends.
<sup>a</sup> Definitions see EN 844-9:1997			

Dimensions in millimetres



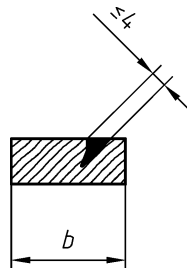
**Figure 1 — Admissible wane**  
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Dimensions in millimetres

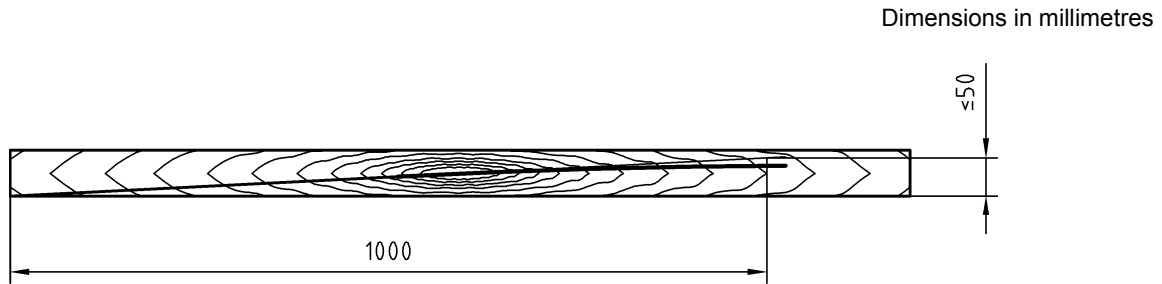


**Figure 2 — Admissible deviation of the slope of annual rings to the longitudinal edges**

Dimensions in millimetres



**Figure 3 — Admissible resin pockets**



**Figure 4 — Admissible deviation of the grain direction related to the longitudinal edges (spiral grain)**

#### 4.2.4.3 Knots

##### 4.2.4.3.1 Knots in stiles and supporting elements

Traversing splay knots<sup>1)</sup> are not permitted on any section of stiles or supporting elements (see Figure 5).



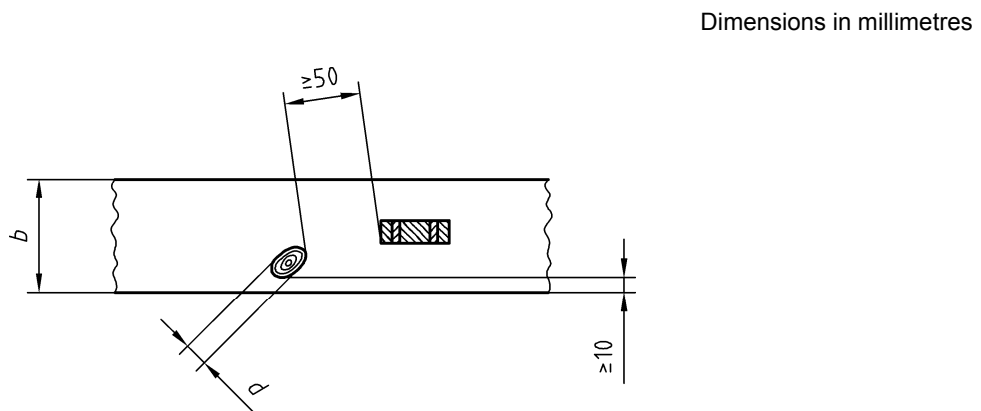
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**Figure 5 — Inadmissible knot**  
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Pin knots<sup>2)</sup> (including black pin knots) with a diameter of less than or equal to 5 mm are permitted.

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In the upper and lower third of the stile or supporting element, one sound, intergrown knot<sup>1)</sup>, of diameter  $d$ , less than or equal to  $0,2 \times b$  (the width of the stile) is permitted per metre. The diameter of the knot is measured in accordance with EN 1310. The knot shall be a minimum of 10 mm from the edges of the stile or supporting element and a minimum of 50 mm from any rung holes, tenons and milled recesses for treads. (see Figure 6).



**Figure 6 — Admissible knot**

1) Definitions see EN 844-9:1997

2) Pin knots are knots having approximately a circular cross section

For ladders made of laminated wood the above mentioned number, size and position of knots are allowed over the total length of the ladder.

#### 4.2.4.3.2 Knots in rungs, steps, braces

Intergrown pin knots up to a maximum diameter of 3 mm are admissible.

#### 4.2.4.4 Moisture content (Related to the kiln-dry weight) at time of manufacture

The moisture content shall be determined by means of hygrometer; in critical or referee cases in accordance with the oven-dry method. The moisture content of the wood is to be chosen according to the equilibrium moisture content resulting from open air drying, normally in Europe 12 % to 20 %.

The moisture content of the rungs and steps shall be lower than that of the stiles at time of production.

#### 4.2.4.5 Laminated wood

##### a) Finger jointed wood

Finger jointed wood shall be in accordance with EN 385.

The result of the bending test of the finger jointing shall be in accordance with EN 385 and EN 408. The result of this test shall be in minimum 35 N/mm.

##### b) Laminated wood

The use of laminated wood is accepted if the following requirements are satisfied:

- The wood used conforms with the requirements of 4.2.4.1 to 4.2.4.4 inclusive.
- The test of adhesive lines integrity and strength in laminated wood shall be in accordance with EN 391:2001, method A or B and EN 392. The result of this test shall be in accordance of the requirements on EN 386:2001, Table 1 and Table 2.

#### 4.2.4.6 Adhesives

Adhesives shall conform with the following requirements:

For connection stile — rung: Requirement according to EN 204, class D3;

For laminated wood: Requirement according to EN 301, type 1 or EN 204, D4.

### 4.3 Design

There shall be no shear points or squeeze points when the ladder is used according to the manufacturer's instructions.

NOTE Shear or squeeze points exist if the distance between two accessible parts relative to each other is less than 18 mm and more than 7 mm in any position during movement (see EN 581-1).

All connections should be durable and have a strength corresponding to the strain (see also Clause 5). The connections should be designed in a manner that arising notch tensions remain low.

Screws and nuts shall be secured against loosening, e.g. by means of self locking or mechanically locked safety devices.

Nails are allowed only if their function is related to the production process, e.g. fixation during the drying of glues.