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**Lesene konstrukcije - Razvrščanje konstrukcijskega lesa pravokotnega prečnega prereza po trdnosti - 4. del: Strojno razvrščanje - Nastavitve strojev za razvrščanje pri strojno kontroliranih sistemih**

Timber structures - Strength graded structural timber with rectangular cross section - Part 4: Machine grading - Grading machine settings for machine controlled systems

Holzbauwerke - Nach Festigkeit sortiertes Bauholz für tragende Zwecke mit rechteckigem Querschnitt - Teil 4: Maschinelle Sortierung - Einstellungen von Sortiermaschinen für maschinenkontrollierte Systeme

Structures en bois - Bois de structure de section rectangulaire classé selon la résistance - Partie 4: Classement par machine - Réglages pour les systèmes de contrôle par machine

**Ta slovenski standard je istoveten z: EN 14081-4:2005+A4:2008**

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**ICS:**

79.040	Les, hlodovina in žagan les	Wood, sawlogs and sawn timber
91.080.20	Lesene konstrukcije	Timber structures

**SIST EN 14081-4:2005+A4:2009**                      **en,fr,de**

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN 14081-4:2005+A4**

December 2008

ICS 79.120.10; 79.040

Supersedes EN 14081-4:2005+A3:2008

English Version

**Timber structures - Strength graded structural timber with  
rectangular cross section - Part 4: Machine grading - Grading  
machine settings for machine controlled systems**

Structures en bois - Bois de structure de section  
rectangulaire classé selon la résistance - Partie 4:  
Classement par machine - Réglages pour les systèmes de  
contrôle par machine

Holzbauwerke - Nach Festigkeit sortiertes Bauholz für  
tragende Zwecke mit rechteckigem Querschnitt - Teil 4:  
Maschinelle Sortierung - Einstellungen von  
Sortiermaschinen für maschinenkontrollierte Systeme

This European Standard was approved by CEN on 26 August 2005 and includes Amendment 1 approved by CEN on 28 December 2006, Amendment 2 approved by CEN on 13 August 2007, Amendment 3 approved by CEN on 7 February 2008 and Amendment 4 approved by CEN on 20 November 2008.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN Management Centre or to any CEN member.

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

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## Foreword

This document (EN 14081-4:2005+A4:2008) 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 June 2009 and conflicting national standards shall be withdrawn at the latest by June 2009.

This document includes Amendment 1, approved by CEN on 2006-12-28, Amendment 2, approved by CEN on 2007-08-13, Amendment 3, approved by CEN on 2008-02-07 and Amendment 4, approved by CEN on 2008-11-20.

This document supersedes  $\square_{A4}$  EN 14081-4:2005+A3:2008  $\square_{A4}$ .

The start and finish of text introduced or altered by amendment is indicated in the text by tags tags  $\square_{A1}$   $\square_{A1}$ ,  $\square_{A2}$   $\square_{A2}$ ,  $\square_{A3}$   $\square_{A3}$  and  $\square_{A4}$   $\square_{A4}$ .

Other parts of this European Standard are

EN 14081-1, *Timber structures — Strength graded structural timber with rectangular cross section — Part 1: General requirements*

EN 14081-2, *Timber structures — Strength graded structural timber with rectangular cross section — Part 2: Machine Grading - Additional requirements for initial type testing*

EN 14081-3, *Timber structures — Strength graded structural timber with rectangular cross section — Part 3: Machine Grading — Additional requirements for factory production control*

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 United Kingdom.

**EN 14081-4:2005+A4:2008 (E)****1 Scope**

This European Standard gives settings, derived according to the requirements given in EN 14081-2, for various combinations of strength classes or grades, grading machines and species from particular sources of growth. These settings are only applicable to timber from the sources indicated in the tables.

**2 Normative references**

The following referenced documents are indispensable for the application of this European Standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 336, *Structural timber — Sizes, permitted deviations*

EN 14081-1:2005, *Timber structures — Strength graded structural timber with rectangular cross section — Part 1: General requirements*

EN 14081-2:2005, *Timber structures — Strength graded structural timber with rectangular cross section — Part 2: Machine Grading — Additional requirements for initial type testing*

**3 Terms and definitions**

For the purpose of this European Standard the terms and definitions in EN 14081-1:2005 and EN 14081-2:2005 and the following apply.

**3.1 Speed range**

maximum and minimum throughput speeds appropriate to the critical speed for the derived settings (see 6.2.2 of EN 14081-2:2005).

**4 Symbols**

$a$	deflection (in mm)
$b$	width of timber cross section (in mm)
$F$	force (units as stated)
$I$	indicating property (units as stated)
$P$	pressure (units as stated)
$t$	thickness of timber cross section (in mm)
$E_{t,mean}$	characteristic mean tensile modulus of elasticity parallel to grain (in N/mm <sup>2</sup> )
$f_{t,k}$	characteristic tensile strength (in N/mm <sup>2</sup> )
$\rho_k$	characteristic value of density (in kg/m <sup>3</sup> )

subscripts

n for setting being calculated

a actual size measured as the average dimension of a batch

## 5 Settings for timber strength grading machines

Tables 1 to 11 give settings for certain grades, timber species and types of grading machine.

Settings for other grades, species or grading machines shall be added when the relevant information is sent to, and assessed by, CEN/TC 124.

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**Table 1 — Settings for Cook Bolinder (Tecmach) machine types SG-AR, SG-AF and SG-TF**

Source country or countries	Source mark <sup>a</sup>	Species	Permitted timber sizes <sup>b</sup> (mm)	Grade <sup>c</sup> or grade combination	Model value Force <i>F</i> (kN)	Comments and additional requirements
UK Ireland	GB IE	Spruce <i>Picea abies</i> <i>Picea sitchensis</i>	35 ≤ <i>t<sub>n</sub></i> ≤ 75 60 ≤ <i>b<sub>n</sub></i> ≤ 300	C24	2,68	Requirements for grading: - Air temperature between + 10 °C and + 35 °C; - Relative humidity in the air ≤ 85 %; - Timber temperature ≥ - 10 °C; - Timber mean moisture content > 10 %; - Maximum feed speed: 150 m/min.  The following equations shall be used to calculate settings for the target size <i>b<sub>n</sub></i> × <i>t<sub>n</sub></i> . (NOTE For timber with a thickness to tolerance class 1, i.e. sawn, <i>t<sub>n</sub></i> in the following equations is the target <i>t<sub>n</sub></i> + 1 mm.)  $a_n = 830,7 t_n^{-1,299}$ (mm)  $P_n = 4,412 F_n / t_n^{0,61}$ (bar)  $F_n = \frac{F b_n t_n^{1,701}}{(413,9 t_n + 57273)}$ (kN)
				C16	2,27	
		Pine <i>Pinus nigra</i> <i>Pinus sylvestris</i>	35 ≤ <i>t<sub>n</sub></i> ≤ 75 60 ≤ <i>b<sub>n</sub></i> ≤ 300	C24	2,79	
				C16	1,91	
Chile	CL	Radiata pine <i>Pinus radiata</i>	35 ≤ <i>t<sub>n</sub></i> ≤ 50 60 ≤ <i>b<sub>n</sub></i> ≤ 300	C27	3,03	
				C16	1,43	
				C24	2,32	
				C16	2,09	
				C16	0,92	

<sup>a</sup> See 7.3 in EN 14081-1:2005.

<sup>b</sup> Timber sizes shall be according to EN 336.

<sup>c</sup> Grades prefixed by C are strength classes given in EN 338.

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Table 1 — Settings for Cook Bolinder (Tecmach) machine types SG-AR, SG-AF and SG-TF (continued)

Source country or countries	Source mark <sup>a</sup>	Species	Permitted timber sizes <sup>b</sup> (mm)	Grade <sup>c</sup> or grade combination	Model value $f_{\text{mod}}$	Comments and adjustments for size
Estonia Finland Latvia Norway <sup>d</sup> Russia <sup>d</sup> Sweden Poland	EE FI LV NO RU SE PL	Spruce <i>Picea abies</i>	$30 \leq t_n \leq 75$ $60 \leq b_n \leq 300$	C18	20,8	Requirements for grading: - Air temperature between + 10 °C and + 35 °C; - Relative humidity in the air $\leq 85$ %; - Timber temperature $\geq - 10$ °C; - Timber mean moisture content $> 10$ %; - Maximum feed speed: 150 m/min.
		C24		20,8		
		C27		21,8		
		C30		28,5		
		C35		46,5		
		C24		20,0		
		C40		54,5		
Finland Norway Sweden Latvia	FI NO SE LV	Pine <i>Pinus sylvestris</i>		C30	30,6	The following equations shall be used to calculate settings for the target size $b_n \times t_n$ . (NOTE For timber with a thickness to tolerance class 1, i.e. sawn, $t_n$ in the following equations is the target $t_n + 1$ mm.)  $P_n = 4,412 F_n / t_n^{0,61}$ (bar)  $F_n = (5,5 I_n a_n b_n t_n^3) 10^{-12}$ (kN)  $a_n = 830,7 t_n^{-1,299}$  $I_n = \left[ \frac{4228}{t_n^{0,22} b_n^{0,24}} \right] f_{\text{mod}}^{0,79}$
			C18	23,8		

<sup>a</sup> See 7.3 in EN 14081-1:2005.

<sup>b</sup> Timber sizes shall be according to EN 336.

<sup>c</sup> Grades prefixed by C are strength classes given in EN 338.

<sup>d</sup> Settings apply only to timber grown west of the Ural mountain range in Russia.

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Table 1 — Settings for Cook Bolinder (Tecmach) machine types SG-AR, SG-AF and SG-TF (continued)

Source country or countries	Source mark <sup>a</sup>	Species	Permitted timber sizes <sup>b</sup> (mm)	Grade <sup>c</sup> or grade combination	Model value Force <i>F</i> (kN)	Comments and adjustments for size
Spain	ES	Scots pine <i>Pinus sylvestris</i>	$35 \leq t_n \leq 75$ $60 \leq b_n \leq 300$	C27 C16	2,84 1,71	<p>Requirements for grading:</p> <ul style="list-style-type: none"> <li>- Air temperature between + 10 °C and + 35 °C;</li> <li>- Relative humidity in the air ≤ 85 %;</li> <li>- Timber temperature ≥ - 10 °C;</li> <li>- Timber mean moisture content &gt; 10 %;</li> <li>- Maximum feed speed: 100 m/min.</li> </ul> <p>The following equations shall be used to calculate settings for the target size <math>b_n \times t_n</math>. (NOTE For timber with a thickness to tolerance class 1, i.e. sawn, <math>t_n</math> in the following equations is the target <math>t_n + 1</math> mm.)</p> $a_n = 830,7 t_n^{-1,299}$ $P_n = 4,412 F_n / t_n^{0,61}$ $F_n = \frac{F b_n t_n^{1,701}}{(413,9 t_n + 57273)}$
Spain	ES	Corsican pine <i>Pinus nigra</i>	$40 \leq t_n \leq 70$ $100 \leq b_n \leq 200$	C30 C18	Not relevant as all settings shall be calculated using equations in comments column	<p>Requirements for grading:</p> <ul style="list-style-type: none"> <li>- Air temperature between + 10 °C and 35 °C;</li> <li>- Relative humidity in the air &lt; 85 %;</li> <li>- Timber temperature &gt; - 10 °C;</li> <li>- Timber mean moisture content &gt; 10 %;</li> <li>- Maximum feed speed: 100 m/min.</li> </ul> <p>The following equations shall be used to calculate settings for the target size <math>b_n \times t_n</math>. (NOTE For timber with a thickness to tolerance class 1, i.e. sawn, <math>t_n</math> in the following equations is the target <math>t_n + 1</math> mm.)</p> $a_n = 830,7 t_n^{-1,299}$ $P_n = 4,412 F_n / t_n^{0,61}$ $F_n C30 = (96,297 9 - 0,489 321 t_n) a_n b_n t_n^3 / (1,318 943 3 \times 10^9)$ $F_n C18 = (54,497 9 - 0,489 321 t_n) a_n b_n t_n^3 / (1,318 943 3 \times 10^9)$

<sup>a</sup> See 7.3 in EN 14081-1:2005.  
<sup>b</sup> Timber sizes shall be according to EN 336.  
<sup>c</sup> Grades prefixed by C are strength classes given in EN 338.

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Table 2 — Settings for Computermatic and Micromatic machines

Source country or countries	Source mark <sup>a</sup>	Species	Permitted timber sizes <sup>b</sup> (mm)	Grade <sup>c</sup> or grade combination	Model value Deflection a (mm)	Comments and additional requirements
UK Ireland	GB IE	Spruce <i>Picea abies</i> <i>Picea sitchensis</i>	35 ≤ t <sub>n</sub> ≤ 75 60 ≤ b <sub>n</sub> ≤ 300	C24	6,35	Requirements for grading: - Relative humidity in the air ≤ 85 %; - Timber temperature ≥ - 10 °C; - Timber mean moisture content > 10 %; - Maximum feed speed: 105 m/min.  The following equations shall be used to calculate settings for the target size b <sub>n</sub> × t <sub>n</sub> . (NOTE For timber with a thickness to tolerance class 1, i.e. sawn, t <sub>n</sub> in the following equations is the target t <sub>n</sub> + 1 mm.)  $F_n = 0,010 \cdot 1 \cdot b_n \cdot t_n^2 \quad (N)$  $a_n = \frac{36,71a(0,00567t_n + 0,7846)}{t_n(0,9851 \times 10^{-5} t_n b_n + 0,91)}$  Actual deflection settings are determined from a <sub>n</sub> /0,19 rounded to the nearest whole number. Refer to calibration tables for machine to convert force F <sub>n</sub> to pressure setting
				C16	7,49	
		C16	13,78			
		Pine <i>Pinus nigra</i> <i>Pinus sylvestris</i>	35 ≤ t <sub>n</sub> ≤ 75 60 ≤ b <sub>n</sub> ≤ 300	C24	6,10	
C16	8,90					
Chile	CL	Radiata pine <i>Pinus radiata</i>	35 ≤ t <sub>n</sub> ≤ 50 60 ≤ b <sub>n</sub> ≤ 300	C27	5,62	
				C16	11,86	
				C24	7,35	
				C16	8,13	
				C16	18,52	

<sup>a</sup> See 7.3 in EN 14081-1:2005.

<sup>b</sup> Timber sizes shall be according to EN 336.

<sup>c</sup> Grades prefixed by C are strength classes given in EN 338.

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Table 2 — Settings for Computermatic and Micromatic machines (continued)

Source country or countries	Source mark <sup>a</sup>	Species	Permitted timber sizes <sup>b</sup> (mm)	Grade <sup>c</sup> or grade combination	Model value IP = $f_{mod}$	Comments and additional requirements
Norway	NO	Sitka spruce <i>Picea Sitchensis</i>	$33 \leq t_n \leq 53$ $88 \leq b_n \leq 218$	C30 C18	38,8 27,9	<p>Requirements for grading:</p> <ul style="list-style-type: none"> <li>- Relative humidity in the air <math>\leq 85</math> %;</li> <li>- Timber temperature <math>\geq -10</math> °C;</li> <li>- Timber mean moisture content <math>&gt; 10</math> %;</li> <li>- Maximum feed speed: 105 m/min.</li> </ul> <p>The following equations shall be used to calculate settings for the target size <math>b_n \times t_n</math> where <math>b_n</math> and <math>t_n</math> are target dimensions.</p> <p>Refer to calibration tables for machine to convert <math>F_n</math> to pressure setting.</p> $F_n = 0,0101 \cdot b_n \cdot t_n^2 \quad (\text{N})$ $a_n = \frac{8063 \cdot t_n^{-0,814} \cdot b_n^{0,152}}{f_{mod} \cdot \left( 1 - \frac{2,14 \cdot t_n^{0,186} \cdot b_n^{0,152}}{f_{mod}} \right)} \quad (\text{Bits})$ <p>Actual deflection setting <math>a_n</math> shall be rounded to the nearest whole number of Bits (Bits are units of 0,19 mm).</p> <p>If the actual thickness <math>t_a</math> exceeds the target thickness <math>t_n</math> by more than 1 mm then the pressure shall be increased by</p> $\left( \frac{t_a}{t_n} \right)^3$

<sup>a</sup> See 7.3 in EN 14081-1:2005.

<sup>b</sup> Timber sizes shall be according to EN 336.

<sup>c</sup> Grades specified by C are strength classes given in EN 338.

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Table 2 — Settings for Computermatic and Micromatic machines (continued)

Source country or countries	Source mark <sup>a</sup>	Species	Permitted timber sizes <sup>b</sup> (mm)	Grade <sup>c</sup> or grade combination	Model value Deflection <i>a</i> (mm)	Comments and additional requirements
Finland Norway Sweden Estonia Latvia Russia <sup>d</sup> Poland	FI NO SE ES LV RU PL	Spruce <i>Picea</i> <i>Abies</i>	$30 \leq t_n \leq 75$ $60 \leq b_n \leq 300$	C24	9,82	Requirements for grading: - Relative humidity in the air $\leq 85$ %; - Timber temperature $\geq -10$ °C; - Timber mean moisture content $> 10$ %; - Maximum feed speed: 105 m/min.  The following equations shall be used to calculate settings for the target size $b_n \times t_n$ where $b_n$ and $t_n$ are target dimensions.  Refer to calibration tables for machine to convert $F_n$ to pressure setting.  $F_n = 0,0101b_n t_n^2 \quad (\text{N})$ $a_n = \frac{50a}{t_n} \left( \frac{t_n}{50} \right)^{0,186} \left( \frac{b_n}{150} \right)^{-0,0901} / 0,19 \quad (\text{Bits})$  Actual deflection settings $a_n$ shall be rounded to the nearest whole number of Bits (Bits are units of 0,19 mm).  If the actual thickness $t_a$ exceeds the target thickness $t_n$ more than 1 mm then the pressure shall be increased by $\left( \frac{t_a}{t_n} \right)^3$
				C27	6,21	
				C30	4,75	
				C35	3,40	
				C27	5,85	
				C16	8,92	
				C30	4,75	
				C18	9,82	
				C30	4,46	
				C24	5,49	
Finland Norway Sweden Latvia	FI NO SE LV	Pine <i>Pinus</i> <i>Sylvestris</i>		C18	8,92	
				C35	3,40	
				C24	4,94	
				C18	7,96	
				C40	2,83	
				C27	5,49	

<sup>a</sup> See 7.3 in EN 14081-1:2005.  
<sup>b</sup> Timber sizes shall be according to EN 336.  
<sup>c</sup> Grades specified by C are strength classes given in EN 338.  
<sup>d</sup> Settings apply only to timber grown west of the Ural mountain range in Russia.