

SLOVENSKI STANDARD

SIST EN 14081-4:2009

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SIST EN 14081-4:2005+A4:2009

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

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Holzbauwerke - Nach Festigkeit sortiertes tragende Zwecke mit rechteckigem Querschnitt - Teil 4: Maschinelle Sortierung - Einstellung von sortiermaschinenkontrollierte Systeme

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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 14081-4:2009

ICS:

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

SIST EN 14081-4:2009

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 14081-4

May 2009

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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 7 April 2009.

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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
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Foreword

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 November 2009, and conflicting national standards shall be withdrawn at the latest by November 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

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 the United Kingdom.

EN 14081-4:2009 (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 document. 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 purposes of this document, the terms and definitions given in EN 14081-1:2005, 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)
$E_{t,mean}$	characteristic mean tensile modulus of elasticity parallel to grain (in N/mm ²)
$E_{0,mean}$	characteristic mean bending modulus of elasticity parallel to grain (in N/mm ²)
E_{dyn}	value of dynamic modulus of elasticity (in N/mm ²)
E_{mod}	model value of modulus of elasticity (units as stated)
F	force (units as stated)
$f_{t,k}$	characteristic tensile strength (in N/mm ²)

$f_{m,k}$	characteristic bending strength (in N/mm ²)
f_{mod}	model value of strength (in N/mm ²)
I	indicating property (units as stated)
P	pressure (units as stated)
t	thickness of timber cross section (in mm)
v_c	conveyer speed (in m/sec)
ρ_k	characteristic value of density (in kg/m ³)
ρ_{mod}	model value of density (in kg/m ³)
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 15 give settings for certain grades, timber species and types of grading machine.

The accepted grading machines and settings in this European Standard are based on initial type testing (ITT) and initial type calculation (ITC). When additional ITT and ITC documentation from the manufacturers has been evaluated by CEN/TC124/TG1 and the accepted values are given in an ITT report, which is the basis for certification by the Notified Bodies overseeing the producers factory production control (FPC). Those ITT reports may be used as ITT documentation before the information they contain becomes available in an amendment or revision of this European Standard, EN 14081-4.

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

Source country or countries	Source mark ^{a)}	Species	Permitted timber sizes ^{b)} (mm)	Grade ^{c)} 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_n</i> ≤ 75 60 ≤ <i>b_n</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_n</i> × <i>t_n</i> . (Note. For timber with a thickness to tolerance class 1, i.e. sawn, <i>t_n</i> in the following equations is the target <i>t_n</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	
				C16	1,24	
		Pine <i>Pinus nigra</i> <i>Pinus sylvestris</i>	35 ≤ <i>t_n</i> ≤ 75 60 ≤ <i>b_n</i> ≤ 300	C24	2,79	
C16	1,91					
C16	1,34					
Chile	CL	Radiata pine <i>Pinus radiata</i>	35 ≤ <i>t_n</i> ≤ 50 60 ≤ <i>b_n</i> ≤ 300	C27	3,03	
				C16	1,43	
				C24	2,32	
				C16	2,09	
				C16	0,92	

a) See Clause 7.3 in EN 14081-1:2005

b) Timber sizes shall be to EN 336

c) Grades prefixed by C are strength classes given in EN 338

Table 1-3 - Settings for Cook Bolinder (Tecmach) machine types SG-AR, SG-AF and SG-TF (continued)

Source country or countries	Source mark ^{a)}	Species	Permitted timber sizes ^{b)} (mm)	Grade ^{c)} or grade combination	Model value Force F (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"> - Air temperature between +10°C and +35°C - Relative humidity in the air: $\leq 85 \%$ - Timber temperature: $\geq -10 \text{ °C}$ - Timber mean moisture content: $> 10 \%$ - Maximum feed speed: 100 m/min <p>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> $a_n = 830,7 t_n^{-1,299} \quad (\text{mm})$ $P_n = 4,412 F_n / t_n^{0,61} \quad (\text{bar})$ $F_n = \frac{F b_n t_n^{1,701}}{(413,9 t_n + 57273)}$
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"> - Air temperature between +10°C and 35°C - Relative humidity in the air: $< 85 \%$ - Timber temperature: $> -10 \text{ °C}$ - Timber mean moisture content: $> 10 \%$ - Maximum feed speed: 100 m/min <p>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> $a_n = 830,7 t_n^{-1,299} \quad (\text{mm})$ $P_n = 4,412 F_n / t_n^{0,61} \quad (\text{bar})$ $F_{n,C30} = (96,2979 - 0,489321 t_n) a_n b_n t_n^3 / (1,3189433 \cdot 10^9)$ $F_{n,C18} = (54,4979 - 0,489321 t_n) a_n b_n t_n^3 / (1,3189433 \cdot 10^9)$

^{a)} See Clause 7.3 in EN 14081-1:2005

^{b)} Timber sizes shall be to EN 336

^{c)} Grades prefixed by C are strength classes given in EN 336

Table 2-1 -Settings for Computermatic and Micromatic machines

Source country or countries	Source mark ^{a)}	Species	Permitted timber sizes ^{b)} (mm)	Grade ^{c)} 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>	$35 \leq t_n \leq 75$ $60 \leq b_n \leq 300$	C24	6,35	Requirements for grading: - Relative humidity in the air: $\leq 85\%$ - Timber temperature: $\geq -10\text{ }^\circ\text{C}$ - Timber mean moisture content: $> 10\%$ - Maximum feed speed: 105 m/min The following equations shall be used to calculate settings for the target size $b_n \times t_n$. (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). $F_n = 0,0101 b_n t_n^2$ (N) $a_n = \frac{36,71a(0,00567t_n + 0,7846)}{t_n(0,9851 \times 10^{-5} t_n b_n + 0,91)}$ (Bits) Actual deflection settings are determined from $a_n/0,19$ rounded to the nearest whole number. Refer to calibration tables for machine to convert Force F_n to pressure setting
				C16	13,78	
		Pine <i>Pinus nigra</i> <i>Pinus sylvestris</i>	$35 \leq t_n \leq 75$ $60 \leq b_n \leq 300$	C24	6,10	
				C16	8,90	
Chile	CL	Radiata pine <i>Pinus radiata</i>	$35 \leq t_n \leq 50$ $60 \leq b_n \leq 300$	C27	5,62	
				C16	11,86	
				C24	7,35	
				C16	8,13	
				C16	18,52	

a) See Clause 7.3 in EN 14081-1:2005

b) Timber sizes shall be to EN 336

c) Grades prefixed by C are strength classes given in EN 338

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

Source country or countries	Source mark ^{a)}	Species	Permitted timber sizes ^{b)} (mm)	Grade ^{c)} 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"> - Relative humidity in the air: $\leq 85 \%$ - Timber temperature: $\geq -10 \text{ }^\circ\text{C}$ - Timber mean moisture content: $> 10 \%$ - Maximum feed speed: 105 m/min <p>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.</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 a_n shall be rounded to the nearest whole number of Bits (Bits are units of 0,19mm). If the actual thickness t_a exceeds the target thickness t_n by more than 1 mm then the pressure shall be increased by</p> $\left(\frac{t_a}{t_n} \right)^3$
<p>^{a)} See Clause 7.3 in EN 14081-1:2005 ^{b)} Timber sizes shall be to EN 336 ^{c)} Grades specified by C are strength classes given in EN 338</p>						

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Table 2-3 - Settings for Computermatic and Micromatic machines (continued)

Source country or countries	Source mark ^{a)}	Species	Permitted timber sizes ^{b)} (mm)	Grade ^{c)} or grade combination	Model value Deflection <i>a</i> (mm)	Comments and additional requirements
Finland Norway Sweden Estonia Latvia Russia ^{d)} 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 C27 C30 C35 C27 C16 C30 C18	9,82 6,21 4,75 3,40 5,85 8,92 4,75 9,82	<p>Requirements for grading: - Relative humidity in the air: $\leq 85 \%$ - Timber temperature: $\geq -10 \text{ }^\circ\text{C}$ - Timber mean moisture content: $> 10 \%$ - Maximum feed speed: 105 m/min</p> <p>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.</p> $F_n = 0,0101b_n t_n^2 \quad (\text{N})$ $a_n = \frac{50a}{t_n} \left(\frac{t_n}{50} \right)^{0,186} \left(\frac{b_n}{150} \right)^{-0,0901} / 0,19 \quad (\text{Bits})$ <p>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</p> $\left(\frac{t_a}{t_n} \right)^3$
Finland Norway Sweden Latvia	FI NO SE LV	Pine <i>Pinus</i> <i>Sylvestris</i>		C30 C24 C18 C35 C24 C18 C40 C27	4,46 5,49 8,92 3,40 4,94 7,96 2,83 5,49	

a) See Clause 7.3 in EN 14081-1:2005
 b) Timber sizes shall be to EN 336
 c) Grades specified by C are strength classes given in EN 338
 d) Settings apply only to timber grown west of the Ural mountain range and north of the 55^o line of latitude in Russia

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Table 2-4 - Settings for Computermatic and Micromatic machines (continued)

Source country or countries	Source mark ^{a)}	Species	Permitted timber sizes ^{b)} (mm)	Grade or grade combination	Model value Deflection <i>a</i> (mm)	Comments and additional requirements
Finland Norway Sweden Estonia Latvia Russia ^{c)} Poland	FI NO SE ES LV RU PL	Spruce <i>Picea</i> <i>Abies</i>	$30 \leq t_n \leq 75$ $60 \leq b_n \leq 300$	TR26	6,21	<p>Requirements for grading:</p> <ul style="list-style-type: none"> - Relative humidity in the air: $\leq 85\%$ - Timber temperature: $\geq -10\text{ °C}$ - Timber mean moisture content: $> 10\%$ - Maximum feed speed: 105 m/min <p>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.</p> $F_n = 0,0101b_n t_n^2 \quad (\text{N})$ $a_n = \frac{50a}{t_n} \left(\frac{t_n}{50} \right)^{0,186} \left(\frac{b_n}{150} \right)^{-0,0901} / 0,19 \quad (\text{Bits})$ <p>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</p> $\left(\frac{t_a}{t_n} \right)^3.$ <p>TR26 is a UK grade for trussed rafters. Its primary characteristic values are: $f_{m,k} = 28,3 \text{ N/mm}^2$, $E_{0,mean} = 11,0 \text{ kN/mm}^2$, $\rho_k = 370 \text{ kg/m}^3$ Other characteristic values can be calculated from the equations given in EN 384.</p>
Finland Norway Sweden Latvia	FI NO SE LV	Pine <i>Pinus</i> <i>Sylvestris</i>				

^{a)} See Clause 7.3 in EN 14081-1:2005

^{b)} Timber sizes shall be to EN 336

^{c)} Settings apply only to timber grown west of the Ural mountain range and north of the 55⁰ line of latitude in Russia

Table 3-1 - Settings for Raute Timgrader machines (Model given in TG1/1007/06)

Source country or countries	Source mark ^{a)}	Species	Permitted timber sizes ^{b)} (mm)	Grade ^{c)} or grade combination	Model value f_{mod}	Comments and additional requirements
Finland Norway Sweden Estonia. Latvia Russia ^{d)} Poland	FI NO SE ES LV RU PL	Spruce <i>Picea abies</i>	$30 \leq t_n \leq 50$ $60 \leq b_n \leq 225$	C45 C30 C18 C40 C30 C18 C35 TR26 C18	56,5 34,1 22,0 53,4 34,3 22,0 44,6 34,1 22,0	Requirements for grading: - Air temperature between +10°C and +50°C - Relative humidity in the air: <= 85 % - Timber temperature: >= -10 °C - Timber mean moisture content: > 10 % - Feed speed between 48 m/min and 124 m/min - Cupped timber shall not be graded The following equation shall be used to calculate settings $F_n = 0,002792 t_n^{2,093} b_n^{0,740} f_{mod}^{0,630} a$ where F_n is the indicating property in N (to obtain the indicating property in kilopond F_n shall be divided by 9,81), t_n is the target thickness in mm, b_n is the target width in mm (Note: For timber with a thickness to tolerance class 1, i.e. sawn, t_n in the above equation is the target $t_n + 1$ mm) and f_{mod} is given in the 6th column of this table for each grade. a is the pre-set deflection in mm and shall be: a = 1,6 mm for $47 \leq t_n \leq 50$ mm a = 2,0 mm for $36 \leq t_n \leq 37$ mm a = 1,7 mm for $44 \leq t_n \leq 46$ mm a = 2,1 mm for $34 \leq t_n \leq 35$ mm a = 1,8 mm for $41 \leq t_n \leq 43$ mm a = 2,2 mm for $32 \leq t_n \leq 33$ mm a = 1,9 mm for $38 \leq t_n \leq 40$ mm a = 2,3 mm for $30 \leq t_n \leq 31$ mm The pre-set pressure shall be 23 Bar The settings for C35-TR26-C18 can also be used for C35-C24-C18 The characteristic values for the TR26 grade are: $f_{m,k} = 28,3$ N/mm ² , $E_{0,mean} = 11,0$ kN/mm ² , $\rho_k = 370$ kg/m ³ Other characteristic values can be calculated from the equations given in EN 384.
Finland Norway Sweden Latvia Russia ^{d)}	FI NO SE LV RU	Pine <i>Pinus sylvestris</i>	$30 \leq t_n \leq 50$ $60 \leq b_n \leq 225$	C45 C30 C18 C40 C30 C18 C35 TR26 C18	56,5 34,1 22,0 53,4 34,3 22,0 44,6 34,1 22,0	

a) See Clause 7.3 in EN 14081-1:2005
b) Timber sizes shall be to EN 336
c) Grades prefixed by C are strength classes given in EN 338
d) Settings apply only to timber grown west of the Urals and north of the 55 degree line of latitude