
Lesene konstrukcije - Po trdnosti razvrščen konstrukcijski les pravokotnega prečnega prereza - 2. del: Strojno razvrščanje - Dodatne zahteve za preskušanje tipa (vključno z dopolnilom A1)

Timber structures - Strength graded structural timber with rectangular cross section - Part 2: Machine grading; additional requirements for type testing

Holzbauwerke - Nach Festigkeit sortiertes Bauholz für tragende Zwecke mit rechteckigem Querschnitt - Teil 2: Maschinelle Sortierung; zusätzliche Anforderungen an die Erstprüfung

Structures en bois - Bois de structure à section rectangulaire classé pour sa résistance - Partie 2 : Classement mécanique par machine; exigences supplémentaires concernant les essais de type

Ta slovenski standard je istoveten z: EN 14081-2:2018+A1:2022

ICS:

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

SIST EN 14081-2:2018+A1:2022 **en,fr,de**

EUROPEAN STANDARD

EN 14081-2:2018+A1

NORME EUROPÉENNE

EUROPÄISCHE NORM

June 2022

ICS 79.040

Supersedes EN 14081-2:2018

English Version

Timber structures - Strength graded structural timber with rectangular cross section - Part 2: Machine grading; additional requirements for type testing

Structures en bois - Bois de structure à section
rectangulaire classé pour sa résistance - Partie 2 :
Classement mécanique par machine; exigences
supplémentaires concernant les essais de type

Holzbauwerke - Nach Festigkeit sortiertes Bauholz für
tragende Zwecke mit rechteckigem Querschnitt - Teil
2: Maschinelle Sortierung; zusätzliche Anforderungen
an die Erstprüfung

This European Standard was approved by CEN on 13 August 2018 and includes Amendment 1 approved by CEN on 13 March 2022.

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-CENELEC 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-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of 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, Turkey and United Kingdom.



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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Contents	Page
European foreword.....	4
Introduction	6
1 Scope.....	7
2 Normative references.....	7
3 Terms and definitions	7
4 Symbols and abbreviations	9
5 Requirements for strength grading machines.....	10
6 Derivation of settings for machine control systems.....	11
6.1 Requirements on sampling.....	11
6.2 Requirements for grading process, destructive testing and calculation of grade determining properties	12
6.2.1 Grading process	12
6.2.2 Destructive testing.....	12
6.2.3 Calculations of grade determining properties	12
6.3 Requirements for a setting area	13
6.3.1 General.....	13
6.3.2 Standardized areas.....	13
6.4 Requirements for the derivation and verification of machine settings.....	13
6.4.1 Derivation of machine settings	13
6.4.2 Verification of machine settings	14
6.5 Fixed settings.....	16
6.6 Reporting	16
7 Additional verification requirements for a new grading machine or a change in scope of existing grading machines for machine control systems	18
7.1 Repeatability.....	18
7.2 Machine installation check.....	18
8 Derivation of settings for output control systems	19
8.1 General.....	19
8.2 Initial machine settings.....	19
8.3 Verification of machine settings	19
8.3.1 Sampling.....	19
8.3.2 Destructive testing and calculation of characteristic values.....	19
8.3.3 Requirements for verification of machine settings	19
8.4 Report.....	19
9 Requirements for adaptive settings	20
9.1 Method	20
9.2 Conditions.....	21
Annex A (informative) Guidelines for sampling a growth area for deriving machine settings	22
Annex B (informative) Prediction limit method	23
B.1 General.....	23
B.2 Model determination	23

B.3	Settings calculation	24
Annex C (normative) Determination of the global cost matrix		25
C.1	Introduction	25
C.2	Optimum grading	25
C.3	IP grading	25
C.4	Calculation of size matrix	26
C.5	Calculation of elementary cost matrix	26
C.5.1	Introduction	26
C.5.2	Factors for wrongly upgraded pieces	26
C.5.3	Factors for wrongly downgraded pieces	27
C.5.4	Examples of elementary cost matrices for C, T and D classes	27
C.6	Calculation of a global cost matrix	30
Annex D (informative) Settings for C and T-classes		31
Bibliography		36

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN 14081-2:2018+A1:2022](https://standards.iteh.ai/catalog/standards/sist/1d9f3eda-b01b-49bb-83aa-0fb11861489b/sist-en-14081-2-2018a1-2022)

<https://standards.iteh.ai/catalog/standards/sist/1d9f3eda-b01b-49bb-83aa-0fb11861489b/sist-en-14081-2-2018a1-2022>

EN 14081-2:2018+A1:2022 (E)

European foreword

This document (EN 14081-2:2018+A1:2022) has been prepared by Technical Committee CEN/TC 124 "Timber structures", the secretariat of which is held by AFNOR.

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 2022, and conflicting national standards shall be withdrawn at the latest by December 2022.

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 includes Amendment 1 approved by CEN on 13 March 2022.

This document supersedes A1 EN 14081-2:2018 A1.

The start and finish of text introduced or altered by amendment is indicated in the text by tags A1 A1.

This document has been prepared under a Standardization Request given to CEN by the European Commission and the European Free Trade Association.

Compared to EN 14081-2:2010+A1:2012, the following main modifications have been made:

- new definitions added in Clause 3;
- new requirements for sampling, settings areas and minimum cross-section area;
- introduction of standardized areas;
- method for deriving settings is no longer normative, since several methods may be used; an example of a method is given in Annex B;
- new method for verification of settings;
- cost matrix requirements are changed, to better allow settings that aim for reduced reject rather than yield in the highest grade;
- new method for output control systems;
- introduction of adaptive settings;
- introduction of fixed settings.

This standard is part of a series of standards on *Timber structures — Strength graded structural timber with rectangular cross section* ("EN 14081") that includes:

- *Part 1: General requirements;*
- *Part 2: Machine grading; additional requirements for type testing;*
- *Part 3: Machine grading; additional requirements for factory production control.*

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 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, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

iTeh STANDARD PREVIEW (standards.iteh.ai)

[SIST EN 14081-2:2018+A1:2022](https://standards.iteh.ai/catalog/standards/sist/1d9f3eda-b01b-49bb-83aa-0fb11861489b/sist-en-14081-2-2018a1-2022)

<https://standards.iteh.ai/catalog/standards/sist/1d9f3eda-b01b-49bb-83aa-0fb11861489b/sist-en-14081-2-2018a1-2022>

Introduction

Machine grading is in common use in a number of countries. There are two basic systems, referred to as “output control” and “machine control”. Both systems require a visual override inspection to cater for performance reducing characteristics that are not automatically sensed by the machine.

The output control system is suitable for use where the grading machines are situated in sawmills grading limited sizes, species and grades in repeated production runs of around one working shift or more. This enables the system to be controlled by testing timber specimens from the daily output. These tests together with statistical procedures are used to monitor and adjust the machine settings to maintain the required strength properties for each strength class. With this system it is permissible for machine approval requirements to be less demanding and for machines of the same type to have non-identical performance.

The machine control system was developed in Europe. Because of the large number of sizes, species and grades used it was not possible to carry out quality-control tests on timber specimens drawn from production. The system relies therefore on the machines being strictly assessed and controlled, and on considerable research effort to derive the machines settings, which, under basic machine control operation, remain constant for all machines of the same type.

Additional factory production control requirements are given in EN 14081-3.

This standard provides a new approach, applicable to both machine control and output control systems, which permits fine adjustment of settings on a grading machine based on continuous monitoring of Indicating Property (IP) data during grading. This approach is called “adaptive settings”.

The acceptability of grading machines and the derivation of settings rely on statistical procedures and the results will therefore depend on the method used. For this reason this document gives appropriate statistical procedures.

Grading assignments to strength classes are based on grading reports. When these grading reports are evaluated and approved by CEN/TC 124 /WG 2 /TG 1, they become Approved Grading Reports (AGR).

The requirements in this European Standard are based on machines in current use and on future types of machines as far as these can be foreseen. It is recognized that additional clauses or standards may be required if unforeseen developments take place.

Since the previous version of this European Standard (EN 14081-2:2010+A1:2012), grading settings work, and research data, have provided more information about the variation in wood properties. Several new rules were created by CEN/TC 124 /WG 2 to update the procedures and ensure safety of grading – particularly of settings covering many countries, and are referenced in the guidance paper (see Annex A). This new version of the standard updates the procedures according to the guidance paper.

1 Scope

This document specifies requirements, additional to those of EN 14081-1, for type testing of machine graded structural timber with rectangular cross-sections shaped by sawing, planing or other methods, and having deviations from the target sizes corresponding to EN 336. This includes requirements for strength grading machines.

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 384, *Structural timber — Determination of characteristic values of mechanical properties and density*

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

EN 14358, *Timber structures — Calculation and verification of characteristic values*

EN 13556, *Round and sawn timber — Nomenclature of timbers used in Europe*

EN ISO 3166-1, *Codes for the representation of names of countries and their subdivisions — Part 1: Country code (ISO 3166-1)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1

assigned grade

grade to which a piece of timber is assigned when using the appropriate setting for that specific grade

3.2

characteristic value

representative value of a material property used for design, which is based either on 5-percentile values (e.g. strength properties and density) or on a mean value (e.g. modulus of elasticity)

3.3

critical feed speed

speed, within the intended usable range, at which the grading machine is least accurate in measuring its indicating property

3.4

depth

in the case of bending, the cross sectional dimension parallel to the direction of loading, and in the case of tension, the width

EN 14081-2:2018+A1:2022 (E)

3.5

grade combination

set of one or more grades plus reject graded together

3.6

grade determining property (GDP)

mechanical or physical property, for which a particular value of that property is required for the material to be assigned to that grade

Note 1 to entry: E.g. bending strength, mean MOE and density for the C and D strength classes of EN 338.

3.7

growth area

source from which timber is intended to be strength graded

3.8

indicating property (IP)

measurement or combination of measurements made by the grading machine, used in estimating one or more of the grade determining properties, and upon which the settings are based

3.9

optimum grade

grade to which a piece of timber is assigned, such that the highest possible yield is obtained in the highest grade when using the GDPs as the indicating properties

3.10

p-percentile

value for which the probability of getting lower values is p %

3.11

sample

number of ungraded specimens of one timber species or species combination, one timber source, with sizes and quality representative of the timber population (of the species/species combination from the timber source)

3.12

setting (S)

value of the parameters used to set the machine to grade timber, which are mathematically related to the indicating property

3.13

setting area

combination of countries and / or standardized areas for which the same settings are valid

Note 1 to entry: a setting area is usually part of a test area.

3.14

standardized area

countries that can be combined to one setting area without further justification

3.15

test area

combination of countries and / or standardized areas from which timber is to be tested to obtain a setting area

Note 1 to entry: test area is part of a growth area.

3.16**thickness**

lesser dimension perpendicular to the longitudinal axis of a piece of timber

3.17**timber source**

identifiable geographical origin of a species or species combination from which timber is, or is intended to be, strength graded

3.18**width**

larger dimension perpendicular to the longitudinal axis of a piece of timber

4 Symbols and abbreviations

For the purposes of this document, the following symbols and abbreviations apply.

a_{DENS}	slope in the DENS formula
a_{MOE}	slope in the MOE formula
a_{MOR}	slope in the MOR formula
b	thickness for edgewise bending and width for flatwise bending
b_{DENS}	intercept in the DENS formula
b_{MOE}	intercept in the MOE formula
b_{MOR}	intercept in the MOR formula
c	load configuration constant
$DENS$	density
$DENS_{req}$	required density
E	modulus of elasticity parallel to grain
$E_{optimum}$	optimum modulus of elasticity
$E_{assigned}$	assigned modulus of elasticity
f_0	measured first-mode longitudinal resonant frequency
f	strength
$f_{k,assigned}$	assigned characteristic strength
$f_{assigned}$	assigned strength
$f_{k,optimum}$	optimum characteristic strength
$f_{optimum}$	optimum strength
F	force
h	depth
IP	indicating property
$IP_{mean,ref,grade}$	mean value of IP of the reference sample

EN 14081-2:2018+A1:2022 (E)

$IP_{mean,prod,grade}$	running value of IP
l	span
MOE	modulus of elasticity parallel to the grain
MOE_{req}	required MOE
MOR	bending strength
MOR_{req}	required MOR
r	correlation coefficient between IP and grade determining property in the whole ungraded data set which is used for determination of initial settings
S_{adapt}	adaptive setting
$s_{\delta,DENS}$	standard error of density estimates
S_{DENS}	setting for DENS
S_{ini}	initial setting
S_{MOE}	setting for MOE
$s_{\delta,MOR}$	standard error of MOR estimates
s_{δ}	standard error of the estimate
S_{MOR}	setting for MOR
t	a factor from Student's t-distribution
u	timber moisture content
β_{ach}	achieved safety index
β_{tar}	target safety index
δ	generic deformation
μ	mean value
ρ	timber density

5 Requirements for strength grading machines

The machine shall be of a type that meets the requirements given in Clauses 6 and 7 if it is part of a machine control system, or Clause 8 if it is a part of an output control system. It shall be installed and set up according to the manufacturer's specification and to any additional requirements resulting from the tests given here. The following information shall be provided in the manufacturer's specification for the machine:

- specification and description of the mechanical and electrical operation of the machine, and the software used by the machine to grade timber (this includes information on data processing such as smoothing of the output signals);
- range of environmental conditions under which the machine will operate;
- installation, maintenance and operating instructions;