SLOVENSKI STANDARD
SIST EN 10083-3:1997

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Jekla za poboljġanje - 3. del: Tehniļ ni dobavni pogoji za borova jekla

Quenched and tempered steels - Part 3: Technical delivery conditions for boron steels

Vergütungsstähle - Teil 3: Technische Lieferbedingungen für Borstähle

Aciers pour trempe et revenu - Partie 3: Conditions techniques de livraison des aciers au bore

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Descriptors: iron- and steel products, hot rolled products, metal bars, metal plates, steel strips, strips, quenching (cooling), tempering, designation, specifications, delivery condition, surface condition, grades : quality, chemical composition, inspection, tests, marking

English version

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

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Foreword

This European Standard was prepared by the Technical Committee ECISS/TC 23 "Steels for heat treatment, alloy steels and free-cutting steels – Qualities" of which the secretariat is held by DIN.

When the European Committee for Iron and Steel Standardization (ECISS) was formed and its programme of work drawn up, Technical Committee TC 23 was requested to replace Euronorm 83-70 "Quenched and tempered steels; quality specifications" by a European Standard.

During the work on EN 10 083 - Quenched and tempered steels - Part 1: Technical delivery conditions for special steels - and Part 2: Technical delivery conditions for non-alloy quality steels - it was decided to prepare a standard for boron-alloy quenched and tempered steels as Part 3 of EN 10 083.

For the steels covered by EN 10 083-3, no documentation currently exists for the mechanical properties in the quenched and tempered condition. Therefore, all users of this European Standard are urgently requested to collect the corresponding documents so that the relevant specifications can be included in the next edition of EN 10083-3.

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of an identical text or by endorsement, at the latest by March 1996, and conflicting national standards shall be withdrawn at the latest by March 1996.

According to the CEN/CENELEC Internal Regulations, the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom.

1 Scope

1.1 This European Standard gives the technical delivery conditions for

- semi-finished products, hot formed, for example blooms, billets, slabs (see notes 3 and 4),
- bars (see note 3),
- rod,
- wide flats,
- hot rolled sheet/plate and strip,
- hammer and drop forgings (see note 3)

manufactured from the boron-alloy quenched and tempered steels listed in table 3 (see note 5), and supplied in one of the heat treatment conditions given for the different types of products in table 1, lines 2 to 3 and in one of the surface conditions given in table 2.

The steels are generally intended for the fabrication of quenched and tempered or austempered (see note 2) machine parts.

This European Standard is not applicable to steels for cold heading.

NOTE 1

EURONORMS and European Standards on similar steel grades are listed in annex B.

NOTE 2

For purposes of simplification, the term "quenched and tempered", unless otherwise indicated, is also used for the "austempered" condition.

NOTE 3

Hammer-forged semi-finished products (blooms, billets, slabs etc.) and hammer-forged bars are included under "semi-finished products" and "bars" and not under "hammer and drop forgings" in the following.

NOTE 4

Special agreements shall be made when ordering unformed continuously cast semi-finished products.

NOTE 5

In accordance with EN 10 020, the steels covered by this European Standard are alloy special steels.

1.2 In special cases, variations in these technical delivery conditions or additions to them may form the subject of an agreement at the time of enquiry and order (see annex A).

1.3 In addition to the specifications of this European Standard, the general technical delivery conditions specified in EN 10 021 are applicable unless otherwise specified below.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 10 003-1	Metallic materials - Hardness test - Brinell - Part 1: Test method
EURONORM 18[1)]	Selection and preparation of samples and test pieces for steel and iron and steel products
EURONORM 23[1)]	End quench hardenability test for steel (Jominy test)
EURONORM 103[1)]	Microscopic determination of the ferritic or austenitic grain size of steels
EURONORM 104[1)]	Determination of the depth of decarburization of non-alloy and low-alloy structural steels
EN 10 020	Definition and classification of grades of steel
EN 10 021	General technical delivery conditions for steel and iron and steel products
EN 10 052	Vocabulary of heat treatment terms for ferrous products
EN 10 079	Definition and classification of steel products
EN 10 109-1	Metallic materials - Hardness test - Part 1: Rockwell methods (scales A, B, C, D, E, F, G, H, K) and methods N and T (scales 15N, 30N, 45N, 15T, 30T, 45T)

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1) It may be agreed at the time of ordering, until this EURONORM has been adopted as a European Standard, that either this EURONORM or a corresponding national standard may be applied.

EN 10 163-2	Delivery conditions for surface finish of hot rolled steel products (plates, wide flats and sections) - Part 2: Plates and wide flats
EN 10 204	Steel and steel products - Types of inspection documents
EN 10 221	Surface quality classes for hot-rolled bars and rods - Technical delivery conditions

3 Definitions

3.1 Boron-alloy quenched and tempered steels

For the purposes of this standard, boron-alloy quenched and tempered steels are alloyed with a small percentage by mass of boron to improve the hardenability. They are usually supplied in the hot formed condition and after quenching and tempering have good toughness at a given tensile strength.

3.2 Product form

The definitions in EN 10 079 are applicable for product form.

3.3 Types of heat treatment

The definitions in EN 10 052 are applicable for the types of heat treatment mentioned in this European Standard.

3.4 Unalloyed and alloy steel

The definitions in EN 10 020 are applicable for classification into unalloyed and alloy steels.

4 Designation and ordering

4.1 In accordance with the following examples, the standard designation for a steel specified in this EN consists of

- the term "steel",
- the number of this EN,
- the name or material number for the steel grade (see table 3),
- if appropriate, the symbol for the hardenability requirements (see 5.2.3).

Example 1: Steel EN 10083-3- 20MnB5
or
Steel EN 10083-3- 1.5530

Example 2: Steel EN 10083-3- 20MnB5+H
or
Steel EN 10083-3 - 1.5530 + H

4.2 The information in the relevant dimensional standard is applicable to the standard designation of the products.

4.3 The order shall contain all the information necessary to describe the required products and their condition (see table 2) and testing clearly. If additional or special requirements are to be met, the relevant clause number from annex A shall be given as a symbol to indicate this, if necessary, with details.

5 Requirements

5.1 Manufacturing process

5.1.1 General

The manufacturing process of the steel and of the products is left to the discretion of the manufacturer with the restrictions given by the requirements in 5.1.2 and 5.1.3.

5.1.2 Deoxidation

All steels shall be treated so that the boron improves hardenability.

5.1.3 Heat treatment and surface condition at delivery

5.1.3.1 Normal condition at delivery

Unless otherwise agreed at the time of enquiry and order, the products shall be delivered in the untreated, i.e. hot formed, condition.

5.1.3.2 Particular heat treatment condition

If agreed at the time of enquiry and order, the products shall be delivered in the agreed heat treatment condition (see table 1).

5.1.3.3 Particular surface condition

If agreed at the time of enquiry and order, the products shall be supplied in one of the special surface conditions given in lines 3 to 7 of table 2.

5.2 Chemical composition, hardenability and mechanical properties

5.2.1 The steels are supplied with hardenability requirements (see table 1, column 10) unless the quenched and tempered condition has been ordered. Special agreements shall be made for wide flats, hot rolled sheet and strip with regard to testing.

5.2.2 If the steel is ordered in the quenched and tempered condition, i.e. if the symbols given in table 3 and not those given in table 5 are used -, the chemical composition requirements specified for the particular heat treatment condition in table 1, column 9, shall apply (see footnote 2) to table 3). In this case, the hardenability values given in table 5 are for guidance purposes only. The mechanical properties shall be the subject of agreement.

5.2.3 If the steel is ordered with hardenability requirements using the symbols given in table 5, the hardenability values given in this table apply in addition to those in table 1, column 9. [See footnote 2) in table 3].

5.3 Shearability of semi-finished products and steel bars

Under suitable conditions (avoiding local stress peaks, pre-heating, application of blades with a profile adapted to that of the product, etc.) steel grades 20MnB5, 30MnB5, 38MnB5 and 27MnCrB5-2 are shearable in the untreated condition.

Steel grades 33MnCrB5-2 and 39MnCrB6-2 are shearable under suitable conditions if they are supplied in the "treated for shearability" condition with a hardness of 255 HB max.

5.4 Structure

5.4.1 Unless otherwise agreed at the time of enquiry and order, the grain size shall be left to the discretion of the manufacturer. If a fine grain structure is required in accordance with a reference treatment, special requirement A.1 shall be ordered.

5.4.2 The steels shall have a degree of purity corresponding to the special steel quality (see annex D and tables 6 to 8).

5.5 Internal soundness

Requirements for internal soundness may be agreed upon at the time of enquiry and order, e.g. on the basis of non-destructive tests (see annex A, subclause A.3).

5.6 Surface quality

5.6.1 All products shall have a smooth finish appropriate to the shaping processes applied.

5.6.2 Minor surface imperfections which may occur also under normal manufacturing conditions, such as scores originating from rolled-in scale in the case of hot-rolled products, shall not be regarded as defects.

5.6.3 Where appropriate, requirements relating to the surface quality of the products shall be agreed on at the time of enquiry and order, if possible with reference to European Standards.

NOTE 1

EN 10 163-2 specifies requirements for the surface quality of hot-rolled sheet/plate and wide flats.
EN 10 221 contains surface quality classification for hot-rolled bars and rods.

NOTE 2

Bars and rod for cold heading and cold extrusion are contained in EURONORM 119.

NOTE 3

It is more difficult to detect and eliminate surface discontinuities from coiled products than from cut lengths. This should be taken into account when agreements are made on surface quality.

5.6.4 Requirements on a permissible depth of decarburization may be made at the time of enquiry and order.

NOTE

The depth of decarburization shall be determined using the micrographic method described in EURONORM 104.

5.6.5 If suitability of bars and rod for bright drawing is required, this shall be agreed at the time of enquiry and order.

5.6.6 The removal of surface defects by welding is only permitted with the approval of the customer or his representative.

Until a relevant European Standard is published, the process and permissible depth of defect removal, where appropriate, shall be agreed at the time of enquiry and order.

5.7 Dimensions, tolerances on dimensions and shape

The nominal dimensions, tolerances on dimensions and shape tolerances for the product shall be agreed at the time of enquiry and order if possible, with reference to the dimensional standards applicable (see annex C).

5.8 Cast separation

The products shall be delivered separated by cast.

6 Testing and conformity of products to the requirements

6.1 Testing procedures and types of documents

6.1.1 Products complying with this European Standard shall be ordered and delivered with one of the inspection documents as specified in EN 10 204. The type of document shall be agreed upon at the time of enquiry and order. If the order does not contain any specification of this type, a test certificate shall be issued.

6.1.2 If, in accordance with the agreements made at the time of enquiry and order, a test certificate is to be issued, it shall contain the following information:

a) the confirmation that the material complies with the requirements of the order;

b) the results of the cast analysis for all the elements specified in table 3 for the steel grade concerned.

6.1.3 If, in accordance with the order agreements, an inspection certificate or inspection report is to be issued, the specific test described in 6.2 shall be carried out and the results shall be confirmed in the test document.

In addition, the test document shall contain the following information:

a) the manufacturer's results for the cast analysis of all elements specified in table 3 for the steel grade concerned;

b) the results of inspections and tests ordered as a result of supplementary requirements (see annex A);

c) the symbol letters or numbers relating the test documents, test pieces and products to each other.

6.2 Specific inspection and testing

6.2.1 Verification of hardenability, hardness and mechanical properties

6.2.1.1 For steels ordered with a symbol H (see table 5), unless otherwise agreed, only the hardenability requirements according to table 5 shall be verified.

For steels ordered without hardenability requirements, i.e. without the symbol H, the hardness requirements or mechanical property given in table 1, column 9.2 for the relevant heat treatment condition shall be verified.

NOTE

If agreed at the time of enquiry and order, verification of the hardenability may also be provided by calculation. Indication of the calculation method may also be agreed upon in this case.

6.2.1.2 The scope of testing, sampling conditions and the test methods to be applied for verification of the requirements shall be as given in table 9.

6.2.2 Visual and dimensional inspection

A sufficient number of products shall be inspected to ensure compliance with the specification.