SLOVENSKI STANDARD
SIST EN 10025-6:2019+A1:2023

01-februar-2023

Vroče valjani izdelki iz konstrukcijskih jekel - 6. del: Tehnični dobavni pogoji za ploščate izdelke iz konstrukcijskih jekel z visoko mejo plastičnosti v poboljšanem stanju jekla (vključno z dopolnilom A1)

Hot rolled products of structural steels - Part 6: Technical delivery conditions for flat products of high yield strength structural steels in the quenched and tempered condition

Warmgewalzte Erzeugnisse aus Baustählen - Teil 6: Technische Lieferbedingungen für Flacherzeugnisse aus Baustählen mit höherer Streckgrenze im vergüteten Zustand

Produits laminés à chaud en aciers de construction - Partie 6 : Conditions techniques de livraison pour produits plats en aciers à haute limite d'elasticité à l'état trempé et revenu

Ta slovenski standard je istoveten z: **EN 10025-6:2019+A1:2022**

ICS:

77.140.10	Jekla za toplotno obdelavo	Heat-treatable steels
77.140.50	Ploščati jekleni izdelki in polizdelki	Flat steel products and semi-products

SIST EN 10025-6:2019+A1:2023 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 10025-6:2019+A1

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ICS 77.140.10; 77.140.50

Supersedes EN 10025-6:2019

English Version

Hot rolled products of structural steels - Part 6: Technical delivery conditions for flat products of high yield strength structural steels in the quenched and tempered condition

Produits laminés à chaud en aciers de construction - Partie 6 : Conditions techniques de livraison pour produits plats en aciers à haute limite d'elasticité à l'état trempé et revenu

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This European Standard was approved by CEN on 16 June 2019 and includes Amendment 1 approved by CEN on 25 October 2022.

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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-CENELEC 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

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

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European foreword

This document (EN 10025-6:2019+A1:2022) has been prepared by Technical Committee CEN/TC 459/SC 3 “Structural steels other than reinforcements”, 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 May 2023 and conflicting national standards shall be withdrawn at the latest by May 2023.

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 supersedes ▌A1⟩ EN 10025-6:2019 ⟨A1▌.

This document includes Amendment 1 approved by CEN on 25 October 2022.

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

This document consists of the following parts, under the general title *Hot rolled products of structural steels:*

— *Part 1: General technical delivery conditions*

— *Part 2: Technical delivery conditions for non-alloy structural steels*

— *Part 3: Technical delivery conditions for normalized/normalized rolled weldable fine grain structural steels*

— *Part 4: Technical delivery conditions for thermomechanical rolled weldable fine grain structural steels*

— *Part 5: Technical delivery conditions for structural steels with improved atmospheric corrosion resistance*

— *Part 6: Technical delivery conditions for flat products of high yield strength structural steels in the quenched and tempered condition*

For a short transition period there will be a coexistence of EN 10025-1:2004 with EN 10025-2:2019 to ▌A1⟩ EN 10025−6:2019+A1:2022 ⟨A1▌, since the new EN 10025-1 has to fulfil the requirements of the CPR and will therefore be published later. For this short transition period up-to-the publication of the next edition of part 1 the following is to be taken into account for EN 10025-1:2004:

a) all dated and undated references to EN 10025-1:2004 to EN 10025-6:2004 are unchanged to this version with following exception: In 9.2.2.1 the references are 8.3.1 and 8.3.2 instead of 8.4.1 and 8.4.2;

b) Clauses 5, 12 and 13 of EN 10025-1:2004 are no longer relevant.

The main changes with respect to the previous ▌A1⟩ version EN 10025−6:2004+A1:2009 of edition EN 10025−6:2004 ⟨A1▌ are listed below:

a) part 6 is now a stand-alone standard for technical delivery conditions including the preparation of samples and test pieces, the test methods, the marking, labelling and packaging and the drawings;

b) for applications under the CPR this document and part 1 are used together;

c) requirements for elements not definded were added to 7.2.1 and 7.2.2;

d) Option 33 was added, Option 3 was renumbered to Option 24 and Option 9 was deleted;

e) Si-content in 7.2.4 was changed;

f) 7.4.3 concerning hot-dip zinc coating was modified;

g) in Tables 3 and 4 the values were extended for thicknesses up to 200 mm;

h) references were updated and document editorial revised.

A1 In comparison with the previous version EN 10025-6:2019, the following modifications have been made:

— references were updated in the European foreword;

— a sentence was added to 9.2.3.2. A1

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 organisations 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, Türkiye and the United Kingdom.

1 Scope

This document specifies technical delivery conditions for flat products of high yield strength alloy special steels. The grades and qualities are given in Tables 1 to 3 (chemical composition) and Tables 4 to 6 (mechanical properties) and are supplied in the quenched and tempered condition.

The steels specified in this document are applicable to hot-rolled flat products with a minimum nominal thickness of 3 mm and a maximum nominal thickness of 200 mm for grades S460, S500, S550, S620 and S690, a maximum nominal thickness of 125 mm for grades S890 and S960, in steels which, after quenching and tempering, have a specified minimum yield strength of 460 MPa to 960 MPa.

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 1011-2, *Welding — Recommendations for welding of metallic materials — Part 2: Arc welding of ferritic steels*

EN 10020:2000, *Definition and classification of grades of steel*

EN 10021, *General technical delivery conditions for steel products*

EN 10025-1, *Hot rolled products of structural steels — Part 1: General technical delivery conditions*

EN 10027-1, *Designation systems for steels — Part 1: Steel names*

EN 10027-2, *Designation systems for steels — Part 2: Numerical system*

EN 10029, *Hot-rolled steel plates 3 mm thick or above — Tolerances on dimensions and shape*

EN 10048, *Hot rolled narrow steel strip — Tolerances on dimensions and shape*

EN 10051, *Continuously hot-rolled strip and plate/sheet cut from wide strip of non-alloy and alloy steels — Tolerances on dimensions and shape*

EN 10079, *Definition of steel products*

EN 10160, *Ultrasonic testing of steel flat product of thickness equal or greater than 6 mm (reflection method)*

EN 10163-1, *Delivery requirements for surface condition of hot-rolled steel plates, wide flats and sections — Part 1: General requirements*

EN 10163-2, *Delivery requirements for surface condition of hot-rolled steel plates, wide flats and sections — Part 2: Plate and wide flats*

EN 10164, *Steel products with improved deformation properties perpendicular to the surface of the product — Technical delivery conditions*

EN 10168, *Steel products — Inspection documents — List of information and description*

EN 10204, *Metallic products — Types of inspection documents*

EN 10315, *Routine method for analysis of high alloy steel by X-ray Fluorescence Spectrometry (XRF) by using a near by technique*

CR 10320, *Optical emission analysis of low alloy steels (routine method) — Method for determination of C, Si, S, P, Mn, Cr, Ni and Cu*

EN ISO 148-1, *Metallic materials — Charpy pendulum impact test — Part 1: Test method (ISO 148-1)*

EN ISO 377, *Steel and steel products — Location and preparation of samples and test pieces for mechanical testing (ISO 377)*

EN ISO 2566-1, *Steel — Conversion of elongation values — Part 1: Carbon and low alloy steels (ISO 2566-1)*

EN ISO 6892-1:2016, *Metallic materials — Tensile testing — Part 1: Method of test at room temperature (ISO 6892-1:2016)*

EN ISO 14713-2:2009, *Zinc coatings — Guidelines and recommendations for the protection against corrosion of iron and steel in structures — Part 2: Hot dip galvanizing (ISO 14713-2:2009)*

EN ISO 14284, *Steel and iron — Sampling and preparation of samples for the determination of chemical composition (ISO 14284)*

EN ISO 15350, *Steel and iron — Determination of total carbon and sulfur content — Infrared absorption method after combustion in an induction furnace (routine method) (ISO 15350)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 10079 and the following 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
quenching
operation which consists of cooling a ferrous product more rapidly than in still air

3.2
tempering
heat treatment applied to a ferrous product generally after quench hardening or other heat treatment to bring the properties to the required level

Note 1 to entry: Tempering consists of heating to specific temperatures ($<A_{C1}$) and soaking one or more times followed by cooling at an appropriate rate.

4 Classification and designation

4.1 Classification

4.1.1 Main quality classes

The steel grades specified in this document shall be classified as alloy special steels according to EN 10020.

4.1.2 Grades and qualities

This document specifies seven steel grades. They differ in their minimum yield strength at room temperature.

All steel grades may be supplied in the following qualities as specified at the time of the order:

— with specified minimum values of impact energy at temperatures not lower than −20 °C, designated as Q;

— with specified minimum values of impact energy at temperatures not lower than −40 °C, designated as QL;

— with specified minimum values of impact energy at temperatures not lower than −60 °C, designated as QL1.

4.2 Designation

4.2.1 For the steel grades covered by this document the steel names shall be allocated in accordance with EN 10027-1; the steel numbers shall be allocated in accordance with EN 10027-2.

4.2.2 The designation shall consist of:

— the number of this document (EN 10025-6);

— the steel name or the steel number; the steel name consisting of:

  — the symbol S (for structural steel);

  — the indication of the minimum specified yield strength for thickness ≤ 50 mm expressed in MPa;

  — the delivery condition Q;

  — the capital letter L or L1 for the quality with specified minimum values of impact energy at temperatures not lower than −40 °C or −60 °C.

EXAMPLE Structural steel (S) quenched and tempered (Q), with a specified minimum yield strength at room temperature of 460 MPa and with a specified minimum of impact energy at −40 °C (L):

EN 10025-6 – S460QL

Or

EN 10025-6 - 1.8906

5 Information to be supplied by the purchaser

5.1 Mandatory information

The following information shall be supplied by the purchaser at the time of the order:

a) quantity to be delivered;

b) product form and the number of the standard for dimensions and tolerances (see 2.2);

c) nominal dimensions and tolerances on dimensions and shape (see 7.7.1);

d) steel designation (see 4.2.2);

e) additional requirements of inspection and testing and all required options (see 5.2 and Clause 13);

f) type of inspection document according to EN 10204 (see 8.1).

5.2 Options

A number of options are specified in Clause 13. In the event that the purchaser does not indicate his wish to implement any of these options, the supplier shall supply in accordance with the basic specification, see 5.1 a) to d) and f).

6 Manufacturing process

6.1 Steel making process

The steel making process is at the discretion of the manufacturer with the exclusion of the open hearth (Siemens-Martin) process.

See ***Option 1,*** Clause 13 (details of manufacturing process).

6.2 Deoxidation and grain structure

Steels of EN 10025-6 shall:

— be fully killed;

— have a fine grain structure;

— contain nitrogen binding elements in amounts sufficient to bind the available nitrogen (for example min. 0,020 % total aluminium). The usual guideline is a minimum aluminium to nitrogen ratio of 2:1, when no other nitrogen binding elements are present. Such other elements and their content (% mass) shall be reported in the inspection document (see Table 1).

6.3 Delivery conditions

The products shall be supplied in the quenched and tempered condition (Q) as defined in Clause 3.

NOTE Direct quenching after hot-rolling followed by tempering is considered equivalent to conventional quenching and tempering.

7 Requirements

7.1 General

The requirements in 7.2 and 7.3 apply for sampling, preparation of test pieces and testing specified in Clauses 9 and 10.

7.2 Chemical composition

7.2.1 The chemical composition determined by heat analysis shall comply with the specified values of Table 1.

For elements not defined in the table for the chemical composition for heat analysis, limit values of Table 1 of EN 10020:2000 shall apply as maximum values.

7.2.2 The upper limits applicable for the product analysis are given in Table 2. The product analysis shall be carried out when specified at the time of the order.

See ***Option 2***, Clause 13 (product analysis).

For elements not defined in the table for the chemical composition for product analysis, limit values of Table 1 of EN 10020:2000 shall apply as maximum values.

7.2.3 The maximum carbon equivalent values based on the heat analysis, given in Table 3 shall apply.

For determining the carbon equivalent value the following IIW (International Institute of Welding) formula shall be used:

$$CEV = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Ni + Cu}{15}$$

7.2.4 When products are supplied with a control on Si e.g. for hot-dip zinc-coating so that there could be a need to increase the content of other elements like C and Mn to achieve the required tensile properties, the maximum carbon equivalent values of Table 3 shall be increased as follows:

— for Si ≤ 0,04 %, increase the value of the CEV by 0,02;

— for Si ≤ 0,25 %, increase the value of the CEV by 0,01.

7.3 Mechanical properties

7.3.1 General

7.3.1.1 Under the inspection and testing conditions as specified in Clauses 8, 9 and 10 and in the delivery condition as specified in 6.3 the mechanical properties shall comply with the values given in Tables 4, 5 and 6.

The maximum stress-relief temperature should be at least 30 °C below the tempering temperature and not be held for more than 1 h. As this temperature is normally not known in advance it is recommended that the purchaser if he intends to perform a stress relief treatment to contact the steel producer. If the purchaser intends to stress relief the products at higher temperatures or for longer times than mentioned above the minimum values of the mechanical properties after such a treatment should be agreed upon at the time of the order.

7.3.1.2 For the products specified in this document the nominal thickness applies.