SLOVENSKI STANDARD
oSIST prEN 10025-6:2014

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Vroče valjani izdelki iz konstrukcijskih jekel - 6. del: Tehnični dobavni pogoji za ploščate izdelke iz konstrukcijskih jekel z veliko plastično trdnostjo v kaljenem in popuščenem stanju

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 Stählen mit höherer Streckgrenze im vergüteten Zustand

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

Ta slovenski standard je istoveten z: **prEN 10025-6**

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

oSIST prEN 10025-6:2014 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

WHITE DRAFT
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ICS 77.140.10; 77.140.50

Will supersede EN 10025-6:2004+A1:2009

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 des aciers à haute limite d'élesticité à l'état trempé et revenu

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This draft European Standard is submitted to ECISS/COCOR before submission to CEN members for formal vote. It has been drawn up by the Technical Committee ECISS/TC 103.

If this draft becomes a European Standard, 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.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Page

Foreword

This document (prEN 10025-6:2014) has been prepared by Technical Committee ECISS/TC 103 “Structural steels other than reinforcements”, the secretariat of which is held by DIN.

This document is currently submitted to the COCOR Vote.

This document will supersede EN 10025-6:2004:2004+A1:2009.

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

The titles of the other parts of this document are:

Part 1: General;

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

1 Scope

Part 6 of this document, in addition to part 1, 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 as given in 6.3.

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 150 mm for grades S460, S500, S550, S620 and S690, a maximum nominal thickness of 100 mm for grades S890 and S960, in steels which, after quenching and tempering, have a specified minimum yield strength of 460 MPa[1)] to 960 MPa[1)].

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.

2.1 General Standards

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*

prEN 10025-1:2014, *Hot rolled products of structural steels — Part 1: General*

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

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

EN 10079:2007, *Definition of steel products*

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: Plates 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 ISO 14713-2:2009, *Guidelines and recommendations for the protection against corrosion of iron and steel structures – Zinc coating – Part 2: Hot dip galvanizing (ISO 14713-2:2009)*

1) 1 MPa = 1 N/mm².

2.2 Standards on dimensions and tolerances (see 7.7.1)

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 uncoated plate, sheet and strip of non-alloy and alloy steels — Tolerances on dimensions and shape*

2.3 Standards on testing

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

EN ISO 148-1, *Metallic materials – Charpy pendulum impact test – Part 1: Test method (ISO 148-1:2009)*

EN ISO 6892-1, *Metallic materials – Tensile testing – Part 1: Method of test at room temperature (ISO 6892-1:2009)*

EN ISO 14284, *Steel and iron – Sampling and preparation of samples for the determination of chemical composition (ISO 14284:1996)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in prEN 10025-1:2014 and the following apply.

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 the grades can be delivered 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 The designation shall be in accordance with prEN 10025-1.

4.2.2 The designation shall consist of:

— the number of this document (prEN 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[1)];

  — 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[1)] and with a specified minimum value of impact energy at -40 °C (L):

Steel prEN 10025-6 – S460QL

or

Steel prEN 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;

c) number of the relevant part of this document;

d) steel name or the steel number (see 4.2.2);

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

f) additional requirements of inspection and testing as specified in prEN 10025-6;

g) type of inspection document according to EN 10204 (see 8.2);

h) all required options (see 5.2).

1) 1 MPa = 1 N/mm².

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 g)).

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.

6.2 Deoxidation or grain size

The steels specified in this document shall be fully killed. The steels shall have a fine grain structure containing nitrogen binding elements in amounts sufficient to bind the nitrogen.

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 following requirements apply when sampling, preparation of test pieces and testing specified in Clauses 8, 9 and 10 are carried out.

7.2 Chemical composition

7.2.1 The chemical composition determined by ladle analysis shall comply with the specified values of Table 1. On special request of the purchaser the manufacturer shall inform the purchaser at the time of the order which of the alloying elements appropriate to the steel grade required will be deliberately added to the material to be delivered.

See option 29.

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

7.2.2 The 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.

For elements not defined in tables 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 ladle analysis, given in Table 3 shall apply. For the carbon equivalent value formula see 4.4 of prEN 10025-1:2014.

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.

NOTE The maximum stress-relief temperature should be at least 30 °C below the tempering temperature. As this temperature is normally not known in advance it is commended that the purchaser if he intends to perform a post weld heat 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 at the time of the order.

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

7.3.2 Impact properties

7.3.2.1 The verification of the impact energy value shall be carried out in accordance with prEN 10025-1.

Furthermore the verification of the impact energy value shall be carried out, unless otherwise agreed (see 7.3.2.2 and 7.3.2.3) with longitudinal test pieces for:

— Q at -20 ºC;

— QL at -40 ºC;

— QL1 at -60 ºC.

7.3.2.2 Another temperature (given in Tables 5 and 6) may be agreed at the time of the order.

See option 3.

7.3.2.3 The impact properties shall be verified on transverse V-notch test pieces.

See option 30.

7.3.3 Improved deformation properties perpendicular to the surface

If agreed at the time of the order the products shall comply with one of the requirements of EN 10164.

See option 4.

7.4 Technological properties

7.4.1 Weldability

The steels specified in this document do not have unlimited suitability for the various welding processes, since the behaviour of a steel during and after welding depends not only on the material but also on the dimensions and shape and on the manufacturing and service conditions of the components.

General requirements for arc welding of the steels specified in this document shall be as given in EN 1011-2.

NOTE With increasing product thickness and strength level cold cracking can occur. Cold cracking is caused by the following factors in combination:

— the amount of diffusible hydrogen in the weld metal;

— a brittle structure of the heat affected zone;

— significant tensile stress concentrations in the welded joint

7.4.2 Formability and flame straightening

7.4.2.1 General

NOTE Recommendations regarding hot forming, cold forming and flame-straightening are laid down in CEN/TR 10347.

7.4.2.2 Hot-forming

Hot forming is not recommended for quenched and tempered steels as the necessary heat treatment after hot forming is very difficult to reproduce.

7.4.2.3 Cold formability

7.4.2.3.1 General

NOTE Cold forming leads to reduction in the ductility. Furthermore it is necessary to draw the attention to the risk of brittle fracture in connection with hot-dip zinc coating.

7.4.2.3.2 Flangeability

If specified at the time of the order plates and wide flats ordered and supplied in the quenched and tempered condition with a nominal thickness ≤ 16 mm are suitable for flanging without cracking with the indicative values for the inside minimum bend radii for cold forming as given in Annex A.

See option 11a.

7.4.3 Hot-dip zinc-coating

EN ISO 1461 should be used to specify coating requirements. EN ISO 14713-2 provides further guidance, including information on the influence of various factors, including steel chemical composition, on the coating formation.

Option 5 can be used to order steels with a chemical composition required for hot-dip zinc coating. When option 5 is implemented, the purchaser and manufacturer shall agree with a steel composition (ladle analysis) of silicon and phosphorous according to either Category A (or steels satisfying the formula Si ≤ 0.03 % and Si+2.5P ≤ 0.09 %) or Category B (limited to 0.14 % < Si ≤ 0.25 %) or Category D (limited to 0.25 % < Si ≤ 0.35 %) with required values as cited by the ranges given in EN ISO 14713-2:2009, Table 1, column 2.

NOTE 1 EN ISO 14713-2:2009, Table 1, gives guidance on typical coating characteristics associated with certain steel compositions on the basis of the surface composition of silicon and phosphorous.

The maximum carbon equivalent shall be increased by 0,02 or by 0,01 (see 7.2.4).

See option 5.

NOTE 2 Products quenched in water may be susceptible to stress corrosion cracking after hot-dip zinc-coating.

NOTE 3 In some cases steels above S460 may be sensitive to cracking during galvanizing and therefore special care should be taken.