



SLOVENSKI STANDARD SIST EN 10025-2:2005

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Hot rolled products of structural steels - Part 2: Technical delivery conditions for non-alloy structural steels

Warmgewalzte Erzeugnisse aus Baustählen - Teil 2: Technische Lieferbedingungen für unlegierte Baustähle

Produits laminés a chaud en aciers de construction Partie 2: Conditions techniques de livraison pour les aciers de construction non alliés

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77.140.10	Jekla za toplotno obdelavo	Heat-treatable steels
77.140.45	Nelegirana jekla	Non-alloyed steels
77.140.50	Ú[z aã\ ^} äå å^ \ äå] [ã å^ \ ã	Flat steel products and semi-products

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Hot rolled products of structural steels - Part 2: Technical delivery conditions for non-alloy structural steels

Produits laminés à chaud en aciers de construction - Partie
2: Conditions techniques de livraison pour les aciers de
construction non alliés

Warmgewalzte Erzeugnisse aus Baustählen - Teil 2:
Technische Lieferbedingungen für unlegierte Baustähle

This European Standard was approved by CEN on 1 April 2004.

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EN 10025-2:2004 (E)**Foreword**

This document (EN 10025-2:2004) has been prepared by Technical Committee ECISS/TC 10 "Structural steels - Grades and qualities", the secretariat of which is held by NEN.

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of an identical text or by endorsement, at the latest by May 2005, and conflicting national standards shall be withdrawn at the latest by May 2005.

This document supersedes EN 10025:1990 + A1:1993, *Hot rolled products of non-alloy structural steels - Technical delivery conditions*.

The titles of the other Parts of this European Standard are:

Part 1: General technical delivery conditions;

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.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of the EU Construction Products Directive (89/106/EEC). For relationship with the EU Construction Products Directive, see informative Annex ZA of EN 10025-1:2004.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

Part 2 of this document, in addition to Part 1, specifies the technical delivery conditions for flat and long products and semi-finished products which are meant for further processing to flat and long products of hot rolled non-alloy quality steels in the grades and qualities given in Tables 2 to 6 (chemical composition) and Tables 7 to 9 (mechanical properties) in the delivery conditions as given in 6.3. Three engineering steels are also specified in this document (see Tables 3 and 5) (chemical composition) and Table 8 (mechanical properties). This document does not apply to structural hollow sections and tubes (see EN 10210-1 and EN 10219-1).

The technical delivery conditions apply to thicknesses ≥ 3 mm and ≤ 150 mm for long products of steel grade S450J0. The technical delivery conditions apply to thicknesses ≤ 250 mm for flat and long products of all other grades and qualities. In addition for flat products of qualities J2 and K2 the technical conditions apply to thicknesses ≤ 400 mm.

Products made of steel grades S185, E295, E335 and E360 cannot be CE marked.

The steels specified in this Part 2 are not intended to be heat treated except products delivered in delivery condition +N. Stress relief annealing is permitted (see also the NOTE in 7.3.1.1 of EN 10025-1:2004). Products delivered in +N condition can be hot formed and/or normalized after delivery (see Clause 3).

NOTE 1 Semi-finished products which are to be converted to rolled finished products conforming to this document should be the subject of special agreement at the time of the enquiry and order. The chemical composition can also be agreed at the time of the order, however the values should be within the limits of Tables 2 and 3.

NOTE 2 For certain grades and product forms suitability for particular applications may be specified at the time of the enquiry and order (see 7.4.2, 7.4.3 and Table 10).

2 Normative references

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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, *Definition and classification of grades of steel.*

EN 10025-1:2004, *Hot rolled products of structural steels - Part 1: General technical delivery conditions.*

EN 10027-1, *Designation systems for steels - Part 1: Steel names, principal symbols.*

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

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 10163-3, *Delivery requirements for surface condition of hot-rolled steel plates, wide flats and sections – Part 3: Sections.*

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

EN 10221, *Surface quality classes for hot-rolled bars and rods - Technical delivery conditions.*

CR 10260, *Designation systems for steels - Additional symbols.*

2.2 Standards on dimensions and tolerances (see 7.7.1)

EN 10017, *Non-alloy steel rod for drawing and/or cold rolling – Dimensions and tolerances.*

EN 10024, *Hot rolled taper flange I sections - Tolerances on shape and dimensions.*

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

EN 10034, *Structural steel I and H sections - Tolerances on shape and dimensions.*

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.*

EN 10055, *Hot-rolled steel equal flange tees with radiused root and toes - Dimensions and tolerances on shape and dimensions.*

EN 10056-1, *Structural steel equal and unequal leg angles - Part 1: Dimensions.*

EN 10056-2, *Structural steel equal and unequal leg angles - Part 2: Tolerances on shape and dimensions.*

EN 10058, *Hot rolled flat steel bars for general purposes - Dimensions and tolerances on shape and dimensions.*

EN 10059, *Hot rolled square steel bars for general purposes - Dimensions and tolerances on shape and dimensions.*

EN 10060, *Hot rolled round steel bars for general purposes - Dimensions and tolerances on shape and dimensions.*

EN 10061, *Hot rolled hexagon steel bars for general purposes - Dimensions and tolerances on shape and dimensions.*

EN 10067, *Hot rolled bulb flats - Dimensions and tolerances on shape, dimensions and mass.*

EN 10162, *Cold rolled steel sections - Technical delivery conditions - Dimensional and cross-sectional tolerances.*

EN 10279, *Hot rolled steel channels - Tolerances on shape and dimensions.*

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 10306, *Iron and steel - Ultrasonic testing of H beams with parallel flanges and IPE beams*.

EN 10308, *Non-destructive testing - Ultrasonic testing of steel bars*.

EN ISO 643, *Steels – Micrographic determination of the apparent grain size (ISO 643:2003)*.

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 10025-1:2004 and the following apply.

3.1

normalizing rolling

rolling process in which the final deformation is carried out in a certain temperature range leading to a material condition equivalent to that obtained after normalizing so that the specified values of the mechanical properties are retained even after normalizing

The abbreviated form of this delivery condition is +N

NOTE In international publications for both the normalizing rolling, as well as the thermo-mechanical rolling, the expression "controlled rolling" may be found. However in view of the different applicability of the products a distinction of the terms is necessary.

3.2

as-rolled

delivery condition without any special rolling and/or heat treatment condition.

The abbreviated form of this delivery condition is +AR

3.3

thermomechanical rolling

rolling process in which the final deformation is carried out in a certain temperature range leading to a material condition with certain properties which cannot be achieved or repeated by heat treatment alone

NOTE 1 Subsequent heating above 580 °C may lower the strength values. If temperatures above 580 °C are needed reference should be made to the supplier.

NOTE 2 Thermomechanical rolling leading to the delivery condition M can include processes with an increasing cooling rate with or without tempering including self-tempering but excluding direct quenching and quenching and tempering.

NOTE 3 In some publications the word TMCP (Thermomechanical Control Process) is also used.

4 Classification and designation

4.1 Classification

4.1.1 Main quality classes

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

EN 10025-2:2004 (E)**4.1.2 Grades and qualities**

This document specifies eight steel grades S185, S235, S275, S355, S450, E295, E335 and E360. They differ in their mechanical properties.

The steel grades S235 and S275 may be supplied in qualities JR, J0 and J2. The steel grade S355 may be supplied in qualities JR, J0, J2 and K2. The steel grade S450 is supplied in quality J0.

The qualities differ in specified impact energy requirements.

4.2 Designation

4.2.1 The designation shall be in accordance with EN 10025-1.

NOTE For a list of corresponding former designations and the former designations from EN 10025:1990 and EN 10025:1990+A1:1993 see Annex A, Table A.1.

4.2.2 The designation shall consist of:

- number of this document (EN 10025-2);
- steel name or the steel number; the steel name consisting of:
 - symbol S (for structural steel) or E (for engineering steel);
 - indication of the minimum specified yield strength for thickness ≤ 16 mm expressed in MPa¹⁾;
 - if applicable, the quality designation (see 4.1.2) in respect of specified impact energy values;
 - if applicable, the additional symbol C for the suitability for the particular application (see Tables 10, 11, 12 and 13).
- indication "+N or +AR", when the products are ordered and delivered in the condition +N or +AR (see 3.1, 3.2 and 6.3). The indication "+N or +AR" shall also be added to the steel number.

EXAMPLE Structural steel (S) with a specified minimum yield strength at ambient temperature of 355 MPa¹⁾, with a minimum impact energy value of 27 J at 0 °C (J0) and suitable for cold flanging (C), delivery condition normalized rolled (or as rolled):

Steel EN 10025-2 - S355J0C+N (or +AR)

or

Steel EN 10025-2 - 1.0554+N (or +AR)

5 Information to be supplied by the purchaser**5.1 Mandatory information**

The information that shall be supplied by the purchaser at the time of the order is specified in EN 10025-1.

In addition to EN 10025-1 the following information shall be supplied by the purchaser at the time of the order:

¹⁾ 1 MPa = 1 N/mm².

- g) whether products have to be submitted to specific or non-specific inspection and testing and which inspection document is required (see 8.2);
- h) whether the verification of the mechanical properties for the quality JR and the steel grades E295, E335 and E360 has to be carried out by cast or by lot (see 8.3.1.1).

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.

6 Manufacturing process

6.1 Steel making process

The steel making process shall be in accordance with EN 10025-1. If specified at the time of the order the steel making process shall be reported to the purchaser, with the exception of steel S185.

See option 1.

6.2 Deoxidation

6.2.1 The method of deoxidation shall be as given in Tables 2 and 3.

6.2.2 The deoxidation methods are designated as follows:

- a) Optional - Method at the manufacturer's discretion;
- b) FN - Rimming steel not permitted;
- c) FF - Fully killed steel containing 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 shall be reported in the inspection document.

6.3 Delivery conditions

The delivery condition of long products and continuous mill flat products can be +AR, +N or +M at the manufacturer's discretion. The delivery condition of quarto mill products can only be +AR or +N at the manufacturer's discretion.

The delivery condition +AR or +N can be ordered.

See option 19A.

If an inspection document is required (see 8.2) the delivery condition shall be indicated in it with its specific symbol (+N, +AR or +M). In case the products are ordered in the delivery condition +N or +AR the specific symbol (+N or +AR) shall be added to the designation (see 4.2.2).

EN 10025-2:2004 (E)**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 Tables 2 and 3.

7.2.2 The upper limits applicable for the product analysis are given in Tables 4 and 5.

The product analysis shall be carried out when specified at the time of the order.

See option 2.

7.2.3 The maximum carbon equivalent values for the grades S235, S275, S355 and S450, based on the ladle analysis, given in Table 6 shall apply. For the carbon equivalent value formula see 7.2.3 of EN 10025-1:2004.

7.2.4 For all S235, S275 and S355 qualities the following additional chemical requirement can be agreed at the time of the order:

- Copper-content between 0,25 % and 0,40 % on ladle analysis and between 0,20 % and 0,45 % on product analysis. In this case the maximum carbon equivalent value of Table 6 shall be increased by 0,02 %.

See option 20.

7.2.5 When products of grade S275 and S355 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 6 shall be increased as follows:

- for $Si \leq 0,030$ %, increase CEV by 0,02 %;
- for $Si \leq 0,25$ %, increase 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 7, 8 and 9.

7.3.1.2 For products ordered and supplied in the normalized or normalized rolled condition (see 6.3) the mechanical properties shall comply with Tables 7, 8 and 9 in the normalized or normalized rolled condition as well as after normalizing by heat treatment after delivery.

7.3.1.3 For products supplied as-rolled for normalizing by the purchaser the samples shall be normalized, if requested at the time of the order. The values obtained from the normalized samples shall comply with this document. The results shall be reported in the inspection document.

NOTE The results of these tests do not represent the properties of the supplied products but indicate the properties which can be achieved after correct normalizing.