
Vročje valjani izdelki iz konstrukcijskih jekel - 4. del: Tehnični dobavni pogoji za termomehansko obdelana valjana variva drobnozrnata konstrukcijska jekla (vključno z dopnilom A1)

Hot rolled products of structural steels - Part 4: Technical delivery conditions for thermomechanical rolled weldable fine grain structural steels

Warmgewalzte Erzeugnisse aus Baustählen - Teil 4: Technische Lieferbedingungen für thermomechanisch gewalzte schweißgeeignete Feinkornbaustähle

Produits laminés à chaud en aciers de construction - Partie 4 : Conditions techniques de livraison pour les aciers de construction soudable à grains fins obtenus par laminage thermomécanique

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gewalzte schweißgeeignete Feinkornbaustähle

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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EN 10025-4:2019+A1:2022 (E)**European foreword**

This document (EN 10025-4:2019+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of an identical text or by endorsement, at the latest by June 2023 and conflicting national standards shall be withdrawn at the latest by June 2023.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 10025-4:2019 **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** edition EN 10025-4:2004 **A1** are listed below:

- a) part 4 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 defined 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) key to Figure A.1 was updated;
- h) steel grade S500M was added;
- i) Annex B concerning the corresponding EURONORMS deleted;
- j) references were updated and document editorial revised.

A1 In comparison with the previous version EN 10025-4:2019, 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.

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<https://standards.iteh.ai/catalog/standards/sist/155a06c9-2e25-4330-8a48-1efdf456edae/sist-en-10025-4-2019a1-2023>

EN 10025-4:2019+A1:2022 (E)**1 Scope**

This document specifies technical delivery conditions for flat and long products of hot rolled weldable fine grain structural steels in the thermomechanical rolled condition in the grades and qualities given in Tables 1 to 3 (chemical composition) and Tables 4 to 6 (mechanical properties) in thickness ≤ 150 mm.

The steels specified in this document are especially intended for use in heavily loaded parts of welded structures such as, bridges, flood gates, storage tanks, water supply tanks, etc., for service at ambient and low temperatures.

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 10017, *Steel rod for drawing and/or cold rolling — Dimensions and tolerances*

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

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

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

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 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 strip and plate/sheet cut from wide 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 and steel wide flats 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 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 10163-3, *Delivery requirements for surface condition of hot-rolled steel plates, wide flats and sections — Part 3: Sections*
- 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 10279, *Hot rolled steel channels — Tolerances on shape, dimensions and mass*
- 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 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*
- CEN/TR 10347, *Guidance for forming of structural steels in processing*
- EN 10363, *Continuously hot-rolled patterned steel strip and plate/sheet cut from wide strip — Tolerances on dimensions and shape*
- EN 10365, *Hot rolled steel channels, I and H sections — Dimensions and masses*
- 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)*

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EN ISO 9443, *Surface quality classes for hot-rolled bars and wire rod (ISO 9443)*

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

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 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**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 to entry: Thermomechanical rolling can include processes with an increasing cooling rate with or without tempering including self-tempering but excluding direct quenching and quenching and tempering.

Note 2 to entry: In some publications the word TMCP (Thermomechanical Control Process) is also used.

3.2**fine grain steels**

steels with fine grain structure with an equivalent index of ferritic grain size ≥ 6

Note 1 to entry: For the determination of grain sizes see EN ISO 643.

4 Classification and designation**4.1 Classification****4.1.1 Main quality classes**

All steel grades specified in this document shall be classified as alloy special steels according to EN 10020 except grade S275 which is a non-alloy quality steel.

4.1.2 Grades and qualities

This document specifies five steel grades S275, S355, S420, S460 and S500. 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 M;
- with specified minimum values of impact energy at temperatures not lower than -50 °C , designated as ML.

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:

- number of this document (EN 10025-4);
- steel name or the steel number; the steel name consisting of:
 - symbol S (for structural steel);
 - indication of the minimum specified yield strength for thickness ≤ 16 mm expressed in MPa;
 - delivery condition M;
 - capital letter L for the quality with specified minimum values of impact energy at temperatures not lower than -50 °C.

EXAMPLE Thermomechanical rolled structural steel (S) with a specified minimum yield strength at room temperature of 355 MPa and with a specified minimum impact energy at -50 °C:

EN 10025-4 - S355ML

Or

EN 10025-4 - 1.8834

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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).

EN 10025-4:2019+A1:2022 (E)**6.2 Deoxidation and grain structure**

Steels of EN 10025-4 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 thermomechanical rolled condition as defined in Clause 3.

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 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 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 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.