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Cold formed welded steel structural hollow sections - Part 3: Technical delivery conditions for mechanical engineering purposes

Kaltgeformte geschweißte Hohlprofile für den Stahlbau - Teil 3: Technische Lieferbedingungen für Anwendungen im Maschinenbau

Profils creux de construction en acier, soudés et formés à froid - Partie 3 : Conditions techniques de livraison pour des applications de construction mécanique

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Cold formed welded steel structural hollow sections - Part 3: Technical delivery conditions for mechanical engineering purposes

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This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 459/SC 3.

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

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European foreword

This document (prEN 10219-3:2019) has been prepared by Technical Committee CEN/TC 459 “ECISS - European Committee for Iron and Steel Standardization[1]”, the secretariat of which is held by AFNOR.

This document is currently submitted to the CEN Enquiry.

This standard consists of the following parts:

— EN 10219-1, Cold formed welded steel structural hollow sections - Part 1: Technical delivery conditions

— EN 10219-2, Cold formed welded steel structural hollow sections - Part 2: Tolerances, dimensions and sectional properties

— EN 10219-3, Cold formed welded steel structural hollow sections - Part 3: Technical delivery conditions for mechanical engineering purposes

It forms part of a series of standards on hollow sections together with EN 10210-1 to −3.

[1] Through its subcommittee SC 3 “Structural steels other than reinforcements” (secretariat: DIN).

1 Scope

This part of this standard specifies the technical delivery conditions for electric welded and submerged arc welded cold formed structural steel hollow sections for mechanical engineering purposes of circular, square, rectangular or elliptical forms and applies to structural hollow sections formed cold without subsequent heat treatment other than the heat treatment of the weld line.

NOTE 1 The requirements for tolerances, dimensions and sectional properties can be found in EN 10219-2.

NOTE 2 The attention of users is drawn to the fact that whilst cold formed grades in EN 10219-3 can have equivalent mechanical properties to hot-finished grades in EN 10210-3 the sectional properties of square and rectangular hollow sections in EN 10219-2 and EN 10210-2 are not equivalent.

NOTE 3 A range of steel grades is specified in this document and the user can select the grade most appropriate to the intended use and service conditions. The grades and mechanical properties, but not the final supply condition of cold formed hollow sections are generally comparable with those in EN 10025-2, EN 10025-3, EN 10025-4, EN 10025-5, EN 10025-6, EN 10149-2 and EN 10149-3.

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 1011-1, *Welding - Recommendations for welding of metallic materials - Part 1: General guidance for arc welding*

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 10021, *General technical delivery conditions for steel products*

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

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

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

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

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

prEN 10219-2:—, *Cold formed welded steel structural hollow sections - Part 2: Tolerances, dimensions and sectional properties*

CEN/TR 10261, *Iron and steel - European standards for the determination of chemical composition*

EN 10266, *Steel tubes, fittings and structural hollow sections - Symbols and definitions of terms for use in product standards*

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 643, *Steels - Micrographic determination of the apparent grain size (ISO 643:2012)*

EN ISO 1461, *Hot dip galvanized coatings on fabricated iron and steel articles - Specifications and test methods (ISO 1461)*

EN ISO 2566-1, *Steel - Conversion of elongation values - Part 1: Carbon and low alloy steels (ISO 2566-1:1984)*

EN ISO 4885, *Ferrous materials - Heat treatments - Vocabulary (ISO 4885:2018)*

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

EN ISO 9606-1, *Qualification testing of welders - Fusion welding - Part 1: Steels (ISO 9606-1 including Cor 1 and Cor 2)*

EN ISO 9712, *Non-destructive testing - Qualification and certification of NDT personnel (ISO 9712)*

EN ISO 10893-2, *Non-destructive testing of steel tubes - Part 2: Automated eddy current testing of seamless and welded (except submerged arc-welded) steel tubes for the detection of imperfections (ISO 10893-2)*

EN ISO 10893-3, *Non-destructive testing of steel tubes - Part 3: Automated full peripheral flux leakage testing of seamless and welded (except submerged arc-welded) ferromagnetic steel tubes for the detection of longitudinal and/or transverse imperfections (ISO 10893-3)*

EN ISO 10893-6, *Non-destructive testing of steel tubes - Part 6: Radiographic testing of the weld seam of welded steel tubes for the detection of imperfections (ISO 10893-6)*

EN ISO 10893-7, *Non-destructive testing of steel tubes - Part 7: Digital radiographic testing of the weld seam of welded steel tubes for the detection of imperfections (ISO 10893-7)*

EN ISO 10893-8, *Non-destructive testing of steel tubes - Part 8: Automated ultrasonic testing of seamless and welded steel tubes for the detection of laminar imperfections (ISO 10893-8)*

EN ISO 10893-9, *Non-destructive testing of steel tubes - Part 9: Automated ultrasonic testing for the detection of laminar imperfections in strip/plate used for the manufacture of welded steel tubes (ISO 10893-9)*

EN ISO 10893-10, *Non-destructive testing of steel tubes - Part 10: Automated full peripheral ultrasonic testing of seamless and welded (except submerged arc-welded) steel tubes for the detection of longitudinal and/or transverse imperfections (ISO 10893-10)*

EN ISO 10893-11, *Non-destructive testing of steel tubes - Part 11: Automated ultrasonic testing of the weld seam of welded steel tubes for the detection of longitudinal and/or transverse imperfections (ISO 10893-11)*

[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)*

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

EN ISO 15607, *Specification and qualification of welding procedures for metallic materials - General rules (ISO 15607)*

EN ISO 15609-1, *Specification and qualification of welding procedures for metallic materials - Welding procedure specification - Part 1: Arc welding (ISO 15609-1)*

EN ISO 15614-1, *Specification and qualification of welding procedures for metallic materials - Welding procedure test - Part 1: Arc and gas welding of steels and arc welding of nickel and nickel alloys (ISO 15614-1)*

ISO 11484, *Steel products - Employer's qualification system for non-destructive testing (NDT) personnel*

3 Terms, definitions and symbols

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply in addition to or where different from those in EN 10020, EN 10021, EN 10266 and EN ISO 4885.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1.1
cold forming
process where the forming to final shape of the welded hollow section is carried out at ambient temperature

Note 1 to entry: Circular hollow sections produced from normalized strip with a normalized weld seam and with a cold forming ratio of D/T ≥ 20 may be classified as hot-finished hollow sections.

3.1.2
normalizing rolling (for feedstock material)
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 subsequent normalizing

3.1.3
thermomechanical rolling (for feedstock material)
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.

3.1.4
steel with improved atmospheric corrosion resistance (for feedstock material)
steel in which a certain number of alloying elements has been added in order to increase its resistance to atmospheric corrosion, by forming an auto-protective oxide layer on the base metal under the influence of weather conditions

Note 1 to entry: Steel with improved atmospheric corrosion resistance is often called weathering steel.

Note 2 to entry: Additional information for the use of steel with improved atmospheric corrosion resistance is given in prEN 10219-2:—, Annex E.

3.1.5
quenching and tempering (for feedstock material)
process which consists of the following two steps:

— first quenching, where the steel is heated up above AC3 temperature and then rapidly cooled down in liquids to create a process specific grain structure;

— afterwards tempering, during which the steel is heated up to a certain temperature to adjust the desired properties and cooled down in air afterwards

3.1.6
fine grain steel
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.

3.1.7
hot-dip zinc coating
galvanizing
application of a zinc coating by immersing the prepared strip or hollow section in a molten bath containing a zinc content of at least 99%

3.2 Symbols

For the purposes of this document, the symbols defined in EN 10266 apply.

4 Classification and designation

4.1 Classification

4.1.1 Within the grades of the non-alloy steels given in Annex A, four qualities JR, J0, J2 and K2 are specified. These differ in respect of specified impact requirements, limits on values of various elements, with particular reference to sulphur and phosphorus, and the inspection and testing requirements.

In accordance with the classification system in EN 10020, all steel grades Annex A are non-alloy quality steels.

4.1.2 Within the grades of steels given in Annex B, C and D seven qualities N, NL, M, ML, Q, QL and QL1 are specified. These differ in respect of the carbon, sulphur and phosphorus content, low temperature impact properties, production process, heat treatment and grain size.

In accordance with the classification system in EN 10020, steel grades S275NH, S275NLH, S355NH and S355NLH are non-alloy quality steels and all other steel grades are alloy special steels.

4.1.3 Within the grades of steels given in Annex E, three qualities J0, J2 and K2 are specified. These differ in respect of specified impact requirements and limits on values of various elements.

In accordance with the classification system in EN 10020, all steel grades in Annex E are alloy special steels.

4.2 Designation

4.2.1 For the products covered by this document, the steel names are allocated in accordance with EN 10027-1; the steel numbers are allocated in accordance with EN 10027-2.

4.2.2 The designation of steel hollow sections consists of:

a) the number of this document (EN 10219-1);

b) the capital letter S for structural steel;

c) the indication of the minimum specified yield strength for thicknesses ≤ 16 mm expressed in MPa;

d) further designations for either:

   1) non-alloy structural steels:

      i) the capital letters JR for the qualities with specified impact properties at room temperature,

      ii) the characters J0 for the qualities with specified impact properties at 0 °C, and

      iii) the characters J2 or K2 for the qualities with specified impact properties at −20 °C; or

   2) normalized/normalized rolled structural steels:

      i) capital letter N to indicate normalized or normalized rolled with specified impact properties at −20 °C (see 6.4), and

      ii) capital letter NL for qualities with specified impact properties at −50 °C; or

   3) thermomechanical rolled structural steels:

      i) capital letter M to indicate thermomechanical rolled with specified impact properties at −20 °C (see 6.4), and

      ii) capital letter ML for qualities with specified impact properties at −50 °C; or

   4) structural steels in the quenched and tempered condition:

      i) capital letter Q to indicate the quenched and tempered condition with specified impact properties at −20 °C (see 6.4), and

      ii) capital letter QL or QL1 for qualities with specified impact properties at −40 or −50 °C; or

5) steels with improved atmospheric corrosion resistance:

   i) the capital letters JR for the qualities with specified impact properties at room temperature,

   ii) the characters J0 for the qualities with specified impact properties at 0 °C, and

   iii) the characters J2 or K2 for the qualities with specified impact properties at −20 °C,

   iv) and the letter W (weather) for improved atmospheric corrosion resistance, and;

6) the capital letter H to indicate hollow sections.

EXAMPLE 1 Hollow section made of structural steel (S) with a specified minimum yield strength for thickness not greater than 16 mm of 355 MPa, with a minimum impact energy value of 27 J at −20 °C (J2), hollow section (H):

EN 10219-1 — S355J2H

or

EN 10219-1 — 1.0576

EXAMPLE 2 Hollow section made of structural steel (S) with a specified minimum yield strength for thickness not greater than 16 mm of 420 MPa, thermomechanically rolled steel (M), with a minimum impact energy value of 27 J at −50 °C (L), hollow section (H):

EN 10219-1 — S420MLH

or

EN 10219-1 — 1.8848

5 Information to be obtained by the manufacturer

5.1 Mandatory information

The following information shall be contained in the order document at the time of enquiry and order:

a) the quantity (mass or total length);

b) details of the product form:

   1) CFCHS = cold formed circular hollow section;

   2) CFRHS = cold formed square or rectangular hollow section;

   3) CFEHS = cold formed elliptical hollow section;

c) the name of the standard for dimensions and tolerances (EN 10219-2);

d) the dimensions and the type of length, length range or length (see EN 10219-2);

e) the steel designation (see 4.2).