SLOVENSKI STANDARD
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Hladno oblikovani varjeni votli konstrukcijski profili iz jekla - 2. del: Tehnični dobavni pogoji

Cold formed welded structural steel hollow sections - Part 2: Technical delivery conditions

Kaltgeformte geschweißte Hohlprofile für den Stahlbau - Teil 2: Technische Lieferbedingungen

Profils creux de construction soudés formés à froid en aciers - Partie 2 : Conditions techniques de livraison

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

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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 10219-2:2016) 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 CEN Enquiry.

This document will supersede EN 10219-1:2006.

This standard consists of the following parts under the general title 'Cold formed welded structural steel hollow sections’:

— *Part 1: General*

— *Part 2: Technical delivery conditions*

— *Part 3: Tolerances, dimensions and sectional properties*

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

1 Scope

This part of prEN 10219 specifies the technical delivery conditions for electric welded and submerged arc welded cold formed structural steel hollow sections of circular, square, rectangular or elliptical forms and applies to structural hollow sections formed cold without subsequent heat treatment.

The general conditions (product characteristics, test methods and performance criteria that apply under the Construction Products Regulations) are specified in prEN 10219-1 and the requirements for tolerances, dimensions and sectional properties in prEN 10219-3.

NOTE 1 prEN 10219-1 covers provision of the Construction Products Regulations (CPR) to fulfil European law for construction products. The technical delivery conditions are described within prEN 10219-2 in combination with Clauses 2, 3, 4, 5, 7 and 8 of prEN 10219-1.

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

NOTE 3 A range of steel grades is specified in this European Standard and the user should 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 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.

NOTE 4 Hollow sections for offshore structures are covered in EN 10225.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

EN 10021, *General technical delivery requirements for steel and iron products*

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 10219-1:2016, *Cold formed welded structural steel hollow sections - Part 1: General*

prEN 10219-3, *Cold formed welded structural steel hollow sections - Part 3: Tolerances, dimensions and sectional properties*

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

EN 10266:2003, *Steel tubes, fittings and structural hollow sections - Symbols and definitions of terms for use in product standards*

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

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

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

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 10893-8, *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 14713-2:2009)*

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 and definitions

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in prEN 10219-1:2016 and the following apply.

3.1.1
hot-dip zinc coating
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 10266:2003 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 eight 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 general designation of steel grades, see prEN 10219-1:2016, 7.2.

4.2.2 The special designation of steel hollow sections consists of:

a) the number of this European Standard (prEN 10219-2);

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;

v) 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):

prEN 10219-2 — S355H
or
prEN 10219-2 — 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):

prEN 10219-2 — S420MLH
or
prEN 10219-2 — 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 (prEN 10219-3);

d) the dimensions and the type of length, length range or length (see prEN 10219-3);

e) the steel designation (see 4.2).

5.2 Options

A number of options are specified in parts 2 and 3 of this European Standard. These are listed below with appropriate clause references. In the event that the purchaser does not indicate a wish to implement any of these options at the time of enquiry and order, the hollow sections shall be supplied in accordance with the basic specification.

2.1 Internal weld bead trimmed (see 6.4.2);

2.2 Other surface condition than as rolled (see 6.6);

2.3 Product analysis (see 7.1.1);

2.4 Cr, Cu, Mo, Ni, Ti and V cast analysis contents to be reported for non-alloy quality steels (see 7.1.2);

2.5 Verification of impact properties for qualities J0 and JR (see 7.2.1);

2.6 The product shall have a chemical composition required for hot-dip-zinc coating (see 7.3.2);

2.7 Weld repairs to the body of structural steel hollow sections are permitted (see 7.4.4);

2.8 Full peripheral NDT of the circular tube for imperfections – not possible for elliptical, rectangular, square and SAW hollow sections (see 7.5);

2.9 Ultrasonic testing for laminar imperfections (see 7.5);

2.10 Inspection certificate 3.1 for steel grades S235JRH, S275J0H, S355J0H of Annex A and S355J0WH of Annex E instead of the test report (see 8.1);

2.11 Inspection certificate 3.2 instead of the standard document (see 8.1),

2.12 Tensile test in corner region (see 9.3);

2.13 Impact test in corner region (see 9.3).

5.3 Example of an order

10 t cold formed welded square hollow sections in accordance with prEN 10219-3 with specified outside dimensions 100 mm × 100 mm and wall thickness of 8 mm of 12 m standard lengths, made from structural steel S355MH according to prEN 10219-2 including product analysis (Option 2.3) and

suitable for hot dip zinc coating (Option 2.6), supplied with inspection certificate 3.1 and with regulatory marking according to prEN 10219-1.

10 t – CFRHS – prEN 10219-3 — 100 x 100 x 8 – standard lengths 12 m prEN 10219-2 — S355MH – Options 2.3, 2.6

6 Manufacturing process

6.1 General

Structural welded cold formed hollow sections of non-alloy steels shall conform to the requirements of Annex A. Structural welded cold formed hollow sections of normalized/normalized rolled, thermomechanical rolled and quenched and tempered steels shall conform to Annexes B to D and steels with improved atmospheric corrosion resistance shall conform to the requirements of Annex E.

In addition, the general technical delivery requirements specified in EN 10021 shall apply.

6.2 Steel manufacturing process

6.2.1 The steel manufacturing process shall be at the discretion of the hollow section manufacturer with the exception that the open hearth (Siemens-Martin) process shall not be employed unless in combination with a secondary steelmaking or ladle refining process.

6.2.2 The method of deoxidation shall be as specified in Tables A.1, B.1, C.1, D.1 and E.1.

6.3 Grain structure

The fine grain steels given in Annexes B to D shall have a ferritic grain size equal to or finer than 6 when measured in accordance with EN ISO 643 (see 7.2.2).

6.4 Structural hollow section manufacturing process

6.4.1 Structural hollow sections shall be manufactured by electric welding or submerged arc welding without subsequent heat treatment (see 6.6). Hollow sections manufactured by a continuous process shall not include the welds used to join the lengths of strip prior to forming the hollow section, except that for helically welded submerged arc-welded (SAW) hollow sections, such welds shall be permitted when tested in accordance with 10.4.3.

6.4.2 Electric welded hollow sections shall be supplied with the external weld bead trimmed to an essentially flush condition. Trimming of the internal weld bead is at the discretion of the manufacturer unless Option 2.1 is specified.

Option 2.1 Electric welded hollow sections shall be supplied with the internal weld bead trimmed, the maximum height of the internal weld bead after trimming shall be agreed at the time of enquiry and order.

6.4.3 All NDT activities shall be carried out by qualified and competent level 1, 2 and/or 3 personnel authorised to operate by the employer.

The qualification shall be in accordance with ISO 11484 or, at least, an equivalent to it.

It is recommended that the level 3 personnel be certified in accordance with EN ISO 9712 or, at least, an equivalent to it.

The operating authorisation issued by the employer shall be in accordance with a written procedure.

NDT operations shall be authorised by a level 3 NDT individual approved by the employer.

NOTE The definition of levels 1, 2 and 3 can be found in the appropriate standards, e.g. EN ISO 9712 and ISO 11484.

6.5 Condition of feedstock material

According to the designation given in the order the following delivery conditions apply for the feedstock material used for the manufacture of cold formed hollow sections:

— as rolled (+AR) or normalized/normalized rolled (+N) or thermomechanically rolled (+M) for steels according to Annex A;

— normalized/normalized rolled (N) for steels of qualities N and NL according to B;

— thermomechanically rolled (M) for steels of quality M and ML according to Annex C;

— quenched and tempered (Q) for steels of qualities Q, QL and QL1 according to Annex D;

— as rolled (+AR)) or normalized/normalized rolled (+N) for steels with improved atmospheric corrosion resistance (W) according to Annex E.

6.6 Delivery condition

The hollow sections shall be delivered cold formed without subsequent heat treatment except that the weld seam may be in the as welded or heat treated condition.

NOTE For SAW hollow sections, it may be necessary to perform a warm shaping operation, which does not affect the mechanical properties, in order to meet the out-of-roundness tolerance requirements.

The surface shall be in the as rolled condition.

Option 2.2 Other possible surface conditions are:

a) S1 black;

b) S2 pickled feedstock;

c) S3 pickled hollow section;

d) S4 hot-dip-zinc coated feedstock;

e) S5 hot-dip-zinc coated hollow section.

7 Requirements

7.1 Chemical composition

7.1.1 In addition to prEN 10219-1:2016, 4.1 the following option can be specified by the purchaser at the time of enquiry and order:

Option 2.3 For products supplied with specific inspection and testing, a product analysis shall be reported.

Deviations of the product analysis from the specified limits of the cast analysis shall be in accordance with Table 1.