BS EN 10219-3:2020
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BSI Standards Publication

Cold formed welded steel structural hollow sections

Part 3: Technical delivery conditions for high strength and weather resistant steels

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Full document details: BS EN 10219-3:2020

National foreword

This British Standard is the UK implementation of EN 10219-3:2020.

The UK participation in its preparation was entrusted to Technical Committee ISE/103, Structural Steels Other Than Reinforcements.

A list of organizations represented on this committee can be obtained on request to its committee manager.

Part 1 of this series, EN 10219-1:2006, is published in the Official Journal of the European Union (OJEU) under the Construction Products Regulation (CPR Regulation (EU) No. 305/2011) and therefore allows the CE marking of all the products included in it.

The European technical committee responsible for the development of EN 10219-3 (CEN/TC 459/SC 3) tried to revise EN 10219-1:2006 to extend its scope to include not only higher-strength steel grades and weather-resistant steels but also other new processes, such as quenched and tempered steels (feedstock condition). Unfortunately, a draft revised standard was never published, due to difficulties with it complying with the Regulation.

The European technical committee decided to incorporate these additions to Part 1 into a new Part 3, which is not under the Construction Products Regulation. This new standard, EN 10219-3:2020, is therefore a voluntary standard that can be used if the covered products are to be used in mechanical engineering applications. It will not be possible to CE mark them under the Construction Products Regulation. A comparison between both parts is presented below.

Products	**Grades included in EN 10219-1:2006 (products CE marked under the CPR)**	**Grades included in EN 10219-3:2020 (products not CE marked under the CPR)**
Non-alloy quality steels (Annex A)	S235JRH, S275J0H, S275J2H, S355J0H, S355J2H, S355K2H	Not included (annex is only informative)
Fine grain steels – feedstock condition N (Annex B)	S275NH, S275NLH, S355NH, S355NLH, S460NH, S460NLH	S420NH, S420NLH
Thermomechanical formed steels – feedstock condition M	S275MH, S275MLH, S355MH, S355MLH, S420MH, S420MLH, S460MH, S460MLH (Annex B)	S500MH, S500MLH, S550MH, S550MLH, S600MH, S600MLH, S650MH, S650MLH, S700MH, S700MLH, S900MH, S960MH (Annex C)

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Products	Grades included in EN 10219-1:2006 (products CE marked under the CPR)	Grades included in EN 10219-3:2020 (products not CE marked under the CPR)
Quenched and tempered steels – feedstock condition QT (Annex D)	Not included	S460QH, S460QLH, S460QL1H, S500QH, S500QLH, S500QL1H, S550QH, S550QLH, S550QL1H, S620QH, S620QLH, S620QL1H, S690QH, S690QLH, S690QL1H, S770QH, S770QLH, S770QL1H, S890QH, S890QLH, S890QL1H, S960QH, S960QLH, S960QL1H
Steels with improved atmospheric corrosion resistance (Annex E)	Not included	S355J0WH, S355J2WH, S355K2WH, S420K2WH, S460K2WH, S500K2WH

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Compliance with a British Standard cannot confer immunity from legal obligations.

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31 October 2020	Implementation of CEN correction notice 23 September 2020: correction to DOW in European foreword

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English Version

Cold formed welded steel structural hollow sections - Part 3: Technical delivery conditions for high strength and weather resistant steels

Profils creux de construction en acier, soudés et formés à froid - Partie 3 : Conditions techniques de livraison des aciers à haute limite élastique et des aciers à résistance améliorée à la corrosion atmosphérique

Kaltgeformte geschweißte Hohlprofile für den Stahlbau - Teil 3: Technische Lieferbedingungen für höher- und wetterfeste Stähle

This European Standard was approved by CEN on 10 August 2020.

This European Standard was corrected and reissued by the CEN-CENELEC Management Centre on 23 September 2020.

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. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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European foreword

This document (EN 10219-3:2020) 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 March 2021, and conflicting national standards shall be withdrawn at the latest by March 2021.

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.

EN 10219 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 high strength and weather resistant steels.

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

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, Turkey and the United Kingdom.

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1 Scope

This document specifies the technical delivery conditions for high strength and weather resistant electric welded and submerged arc welded cold formed steel structural hollow sections of circular, square, rectangular or elliptical forms and 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 this document 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 10025-3, 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*

EN 10219-1, *Cold formed welded structural hollow sections of non-alloy and fine grain steels - Part 1: Technical delivery conditions*

EN 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)*

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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)*

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

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

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)*

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 14713-2:2009)*

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)*

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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*

SNT TC-1A, *Personnel Qualification and Certification in Nondestructive Testing*

3 Terms, definitions and symbols

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions given in EN 10020, EN 10021, EN 10266 and EN ISO 4885 and the following apply.

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 https://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 increased cooling rate with or without tempering including self-tempering but excluding direct quenching as well as 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 Annex E.

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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 the Ac_3 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
steel 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
application of a zinc coating by immersing the prepared strip or hollow section in a molten bath containing a zinc content of at least 98%

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 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, all steel grades are alloy special steels.

4.1.2 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.

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4.2.2 The designation of steel hollow sections consists of:

a) the number of this document (EN 10219-3);

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) 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);

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

2) thermomechanical rolled structural steels:

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

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

3) 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);

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

4) steels with improved atmospheric corrosion resistance:

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

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

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

e) 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 460 MPa, quenched and tempered condition (Q), with a minimum impact energy value of 30 J at −20 °C, hollow section (H):

EN 10219-3 — S460QH

or

EN 10219-3 — 1.8608

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EXAMPLE 2 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), weather resistant steel (W), hollow section (H):

EN 10219-3 — S355J2WH

or

EN 10219-3 — 1.8645

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).

5.2 Options

A number of options are specified in EN 10219-2 and this document. 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.

3.1 Internal weld bead trimmed (see 6.5.2);

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

3.3 Product analysis (see 7.1.1);

3.4 Empty;

3.5 Tensile test in corner region (see 7.2.1);

3.6 Impact test in corner region (see 7.2.2);

3.7 Verification of impact properties for quality J0 (see 7.2.3);

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

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

3.10 Full peripheral NDT (non-destructive testing) of the circular tube for imperfections – not possible for elliptical, rectangular, square and SAW (submerged arc welded) hollow sections (see 7.5);

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3.11 Ultrasonic testing for laminar imperfections (see 7.5);

3.12 Inspection certificate 3.1 for steel grade S355J0WH of Annex E instead of a test report 2.2 (see 8.1);

3.13 Inspection certificate 3.2.

5.3 Example of an order

10 t cold formed welded square hollow sections in accordance with EN 10219-2 with specified outside dimensions 100 mm × 100 mm and wall thickness of 8 mm of 12 m approximate lengths, grade S460QH according to this document and chemical composition for hot-dip zinc coating (Option 3.8) and supplied with inspection certificate 3.1:

EXAMPLE 10 t – CFRHS – EN 10219-2 — 100 × 100 × 8 – approximate length 12 m EN 10219-3 — S460QH – Option 3.8

6 Manufacturing process

6.1 General

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.

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

6.3 Grain structure

The steel grades 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 7.2.4).

6.4 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:

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

— thermomechanical rolled for steels of quality M and ML according to Annex C;

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

— as rolled or normalized/normalized rolled or thermomechanical formed for steels with improved atmospheric corrosion resistance W according to Annex E.

6.5 Structural hollow section manufacturing process

6.5.1 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

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