BSI Standards Publication

Weldable structural steels for fixed offshore structures — Technical delivery conditions

Part 3: Hot finished hollow sections

bsi.

National foreword

This British Standard is the UK implementation of EN 10225-3:2019+A1:2023. Together with BS EN 10225-1:2019, BS EN 10225-2:2019 and BS EN 10225-4:2019, it supersedes BS EN 10225:2009, which is withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to CEN text carry the number of the CEN amendment. For example, text altered by CEN amendment A1 is indicated by A1 A1.

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.

In the UK committee's opinion, because the EN 10225:2019 series specifies technical delivery conditions for some products and product forms that were not included in the previous version, EN 10225:2009, users should be aware of the major changes that have been made.

The EN 10225:2019 series has been drafted purely as a set of material standards and not as design or code standards. As no design guidance is provided, the selection of suitable materials according to the EN 10225:2019 series has therefore been designated to be the responsibility of designers, specifiers and end-users, based on the applicable temperature conditions, the relevant design code, the areas of operation and the fabrication requirements for the application concerned.

The committee's recommendation for the UK is that caution should be applied by designers, specifiers and end-users to ensure that the material grade specified and supplied is suitable for its intended application. Furthermore, as cold formed high frequency welded (HFW) hollow sections have not previously been permitted for offshore use, it is also recommended that such products be used with caution and that cold formed HFW materials according to EN 10225-4:2019 should not be substituted where seamless or HFW hollow sections according to EN 10225-3:2019 have already been specified.

To assist designers and material specifiers in ensuring that material is suitable in accordance with the various parts of the EN 10225:2019 series, note should be taken of the following, which may impinge on design requirements and hence material suitability.

- The minimum design temperature of –10 °C specified for product use in the previous version of the standard has been removed.
- The distinction between primary and secondary applications has been removed (these terms are no longer included).
- New (totally different) grade designations from those previously employed in EN 10225:2009 have been introduced.
- A new annex for prequalification for use in Arctic areas has been included. Not all materials and grades may be suitable for such use.
- In the previous edition, only grades with strength levels up to a specified minimum yield strength (SMYS) of 460 MPa were included. In this current version, grades in some parts with strength levels up

to an SMYS of 960 MPa are present. Such high-strength grades may not be suitable for particular applications.

- The higher-strength normalized grades from EN 10210-1:2006 (S420NH and S460NH) were added to this offshore standard in the amendment A1 from 2023.

- In the previous edition, only requirements for plate but not structural hollow sections produced from plate were included. As submerged arc welded (SAW) structural hollow sections produced from plate are used extensively in offshore applications, it was felt necessary to include these products in EN 10225-4:2019. However, the chemical and mechanical property requirements for these SAW hollow sections link back to the plate feedstock as specified in EN 10225-1:2019. Also, as EN 10225-4:2019 references EN 10219-2:2006 for dimensions and tolerances, the use of EN 10225-4:2019 for the manufacture of large diameter 'cans' produced from plate may not be appropriate.

- In the previous edition, it was specified that only hot finished HFW or seamless hollow sections could be used offshore. However, EN 10225-4:2019 now also allows the use of cold finished HFW hollow sections in strength levels up to an SMYS of 960 MPa. The intention is to permit these to be used in secondary structures rather than for primary (load bearing) or low temperature applications. However, as modifications to the previous version of the standard, set out above, have removed reference to minimum design temperature and to primary and secondary applications, caution should be applied by designers, specifiers and end-users to ensure that the material grade specified and supplied is suitable for its intended application. It is also recommended that cold formed HFW materials according to EN 10225-4:2019 should not be substituted where seamless or HFW hollow sections of similar strength level have been specified according to EN 10225-3:2019.

Contractual and legal considerations

This publication has been prepared in good faith, however no representation, warranty, assurance or undertaking (express or implied) is or will be made, and no responsibility or liability is or will be accepted by BSI in relation to the adequacy, accuracy, completeness or reasonableness of this publication. All and any such responsibility and liability is expressly disclaimed to the full extent permitted by the law.

This publication is provided as is, and is to be used at the recipient's own risk.

The recipient is advised to consider seeking professional guidance with respect to its use of this publication.

This publication is not intended to constitute a contract. Users are responsible for its correct application.

Published by BSI Standards Limited 2023

ISBN 978 0 539 20755 2

ICS 77.140.10

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

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 May 2019.

Amendments/corrigenda issued since publication

Date	Text affected
31 July 2023	Implementation of CEN amendment A1:2023

EUROPEAN STANDARD

EN 10225-3:2019+A1

NORME EUROPÉENNE

EUROPÄISCHE NORM

May 2023

ICS 77.140.10

Supersedes EN 10225-3:2019

English Version

Weldable structural steels for fixed offshore structures - Technical delivery conditions - Part 3: Hot finished hollow sections

Aciers de construction soudables destinés à la fabrication de structures marines fixes - Conditions techniques de livraison - Partie 3 : Profils creux finis à chaud

Schweißgeeignete Baustähle für feststehende Offshore-Konstruktionen - Technische Lieferbedingung - Teil 3: Warmgefertigte Hohlprofile

This European Standard was approved by CEN on 23 December 2018 and includes Amendment approved by CEN on 17 April 2023.

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.

CEN members are the national standards bodies of 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 United Kingdom.

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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Ref. No. EN 10225-3:2019+A1:2023 E

Contents

Page

European foreword 5

1 Scope 7

2 Normative references 7

3 Terms and definitions 9

4 Classification and designation 11
4.1 Classification 11
4.2 Designation 11

5 Information to be supplied by the purchaser 12
5.1 Mandatory information 12
5.2 Options 12
5.3 Example of an order 12

6 Manufacturing process 13
6.1 Steel manufacturing process 13
6.2 Structural hollow section manufacturing process 13
6.3 Qualification of personnel for NDT activities 13
6.4 Delivery condition 13

7 Requirements 13
7.1 General 13
7.2 Chemical composition 14
7.2.1 Heat analysis 14
7.2.2 Product analysis 14
7.2.3 Carbon equivalent values (CEV) and P_{cm} 14
7.3 Mechanical properties 14
7.3.1 General 14
7.3.2 Post weld heat treatment (PWHT) 14
7.3.3 Through thickness testing 15
7.3.4 Flattening test 15
7.3.5 Prequalification for arctic areas 15
7.4 Weldability data 15
7.5 Internal soundness and non-destructive testing 15
7.5.1 Non-destructive testing of the weld seam of HFW hollow sections 15
7.5.2 Non-destructive testing of seamless hollow sections for longitudinal imperfections 15
7.5.3 Laminar discontinuities of hollow sections 16
7.6 Surface quality 16
7.7 Dimensions, tolerances, mass 16
7.7.1 Dimensions and tolerances on dimensions and shape 16
7.7.2 Mass of steel 16

8 Inspection 17
8.1 General 17
8.2 Types of inspection documents 17
8.3 Summary of inspections 18
8.4 Intermediary supply 18

9 Frequency of testing and preparation of samples and test pieces 18
9.1 Frequency of test 18
9.1.1 Chemical analysis 18

9.1.2 Tensile test and impact test 19
9.1.3 Testing the weld seam of welded hollow sections 19
9.1.4 Testing of the corner regions for rectangular hollow sections 19
9.2 Selection and preparation of samples for product analysis 19
9.3 Location of samples and orientation of tensile test pieces 19
9.4 Location of samples and orientation of impact test pieces 20
9.5 Preparation of test pieces for mechanical tests 20
9.5.1 General 20
9.5.2 Preparation of tensile test pieces 20
9.5.3 Preparation of impact test pieces 20

10 Test methods 21
10.1 Chemical analysis 21
10.2 Mechanical tests 21
10.2.1 Test temperatures 21
10.2.2 Tensile test 21
10.2.3 Impact test 22
10.3 Visual inspection and dimensional check 22
10.4 Non-destructive tests 22
10.4.1 General 22
10.4.2 NDT for the weld seam of HFW hollow sections 22
10.4.3 Full peripheral NDT for seamless hollow sections 23
10.4.4 Ultrasonic testing for laminar imperfections 23
10.4.5 NDT for surface quality 23
10.5 Retests, sorting and reprocessing 23

11 Marking and bundling 23
11.1 Die stamping and paint marking 23
11.2 Bundling 23

12 Options 24

Annex A (normative when Option 1 is specified by the purchaser) **Further details of steel manufacturing procedures to be supplied by the manufacturer 37**

Annex B (normative when Option 17 is specified by the purchaser) **Weldability testing and mechanical testing of butt welds 38**

B.1 General requirements 38

B.2 Welding processes and procedure 38

B.3 Butt-weld requirements 39

B.3.1 General 39

B.3.2 Test piece dimensions 39

B.3.3 Bevel detail 40

B.3.4 Welding processes 40

B.3.5 Nominal heat input 40

B.3.6 Heat treatment 41

B.3.7 Dehydrogenation of test pieces 41

B.4 Mechanical testing 42

B.4.1 General 42

B.4.2 Charpy V-notch impact tests 43

B.4.3 Fracture mechanic test **44**
B.4.4 Macrohardness **45**
B.4.5 Cross-weld tensile test **46**
Annex C (normative when Option 17 is specified by the purchaser) **Weldability testing - Bead-on-plate** **51**
C.1 General **51**
C.2 Test material dimension **51**
C.3 Welding method **51**
C.4 Test condition **51**
C.5 Specific test requirements: macrosection and hardness tests **52**
Annex D (normative when Option 17 is specified by the purchaser) **Weldability testing – Controlled thermal severity tests (CTS)** **54**
D.1 General **54**
D.2 Test block dimensions **54**
D.3 General welding details **54**
D.3.1 Anchor welds **54**
D.3.2 Test welds **54**
D.4 Evaluation of the test welds **55**
D.5 Hardness testing **55**
Annex E (informative) **Prequalification of steels for offshore structures operating in arctic areas** **61**
Bibliography **62**

European foreword

This document (EN 10225-3:2019+A1:2023) 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 November 2023, and conflicting national standards shall be withdrawn at the latest by November 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.

EN 10225-3:2019, together with EN 10225-1:2019, EN 10225-2:2019, and EN 10225-4:2019, superseded EN 10225:2009.

This document EN 10225-3:2019+A1:2023 supersedes EN 10225-3:2019.

This document includes Amendment 1 approved by CEN on 7 April 2023.

The start and finish of text introduced or altered by amendment is indicated in the text by tags A1 A1.

This European Standard consists of the following parts, under the general title *'Weldable structural steels for fixed offshore structures – Technical delivery conditions*':

— Part 1: Plates

— Part 2: Sections

— Part 3: Hot finished hollow sections

— Part 4: Cold formed welded hollow sections

In comparison to the previous edition EN 10225:2009 the following technical changes were made:

— split of the standard in four parts;

— the steel names were adapted to EN 10027-1;

— former grades of group 3 are no longer listed, new options with the same enhanced properties have been introduced (*Options 2* and *3*);

— an informative Annex E was added for the prequalification of steels for fixed offshore structures in arctic areas.

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.

1 Scope

This document specifies requirements for weldable structural steels made of hot finished seamless and high frequency welded hollow sections to be used in the fabrication of fixed offshore structures.

The following thickness limitations are given in this standard:

— for seamless hollow sections up to and including 65 mm;

— for HFW hollow sections up to and including 25,4 mm.

Greater thicknesses can be agreed, provided the technical requirements of this European Standard are maintained.

This European Standard is applicable to steels for offshore structures, designed to operate in the offshore sector but not to steels supplied for the fabrication of subsea pipelines, risers, process equipment, process piping and other utilities. It is primarily applicable to the North Sea Sector, but may also be applicable in other areas provided that due consideration is given to local conditions e.g. design temperature.

NOTE This document has an informative Annex E on the prequalification of steels for fixed offshore structures in arctic areas.

Minimum yield strengths up to 770 MPa are specified together with impact properties at temperatures down to –40 °C.

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 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 10079, *Definition of steel products*

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 10210-2, *Hot finished structural hollow sections of non-alloy and fine grain steels — Part 2: Tolerances, dimensions and sectional properties*

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