BS EN 10217-7:2014

BSI Standards Publication

Welded steel tubes for pressure purposes — Technical delivery conditions

Part 7: Stainless steel tubes

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National foreword

This British Standard is the UK implementation of EN 10217-7:2014. It supersedes BS EN 10217-7:2005 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee ISE/110, Steel Tubes, and Iron and Steel Fittings.

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

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© The British Standards Institution 2014.
Published by BSI Standards Limited 2014

ISBN 978 0 580 68651 1

ICS 23.040.10; 77.140.75

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 October 2014.

Amendments/corrigenda issued since publication

Date	Text affected

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 10217-7

October 2014

ICS 23.040.10; 77.140.75

Supersedes EN 10217-7:2005

English Version

Welded steel tubes for pressure purposes - Technical delivery conditions - Part 7: Stainless steel tubes

Tubes soudés en acier pour service sous pression - Conditions techniques de livraison - Partie 7: Tubes en aciers inoxydables

Geschweißte Stahlrohre für Druckbeanspruchungen - Technische Lieferbedingungen - Teil 7: Rohre aus nichtrostenden Stählen

This European Standard was approved by CEN on 6 September 2014.

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Ref. No. EN 10217-7:2014 E

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Foreword

This document (EN 10217-7:2014) has been prepared by Technical Committee ECISS/TC 110 “Steel tubes, and iron and steel fittings”, the secretariat of which is held by UNI.

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of an identical text or by endorsement, at the latest by April 2015 and conflicting national standards shall be withdrawn at the latest by April 2015.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 10217-7:2005.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive 97/23/EC.

For relationship with EU Directive, see informative Annex ZA, which is an integral part of this document.

This European Standard consists of the following parts, under the general title *Welded steel tubes for pressure purposes – Technical delivery conditions*:

Part 1: Electric welded and submerged arc welded non-alloy steel tubes with specified room temperature properties

Part 2: Electric welded non-alloy and alloy steel tubes with specified elevated temperature properties

Part 3: Electric welded and submerged arc welded alloy fine grain steel tubes with specified room, elevated and low temperature properties

Part 4 : Electric welded non-alloy and alloy steel tubes with specified low temperature properties

Part 5: Submerged arc welded non-alloy and alloy steel tubes with specified elevated temperature properties

Part 6: Submerged arc welded non-alloy steel tubes with specified low temperature properties

Part 7: Stainless steel tubes

Another European Standard series covering tubes for pressure purposes is:

EN 10216, *Seamless steel tubes for pressure purposes.*

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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1 Scope

This Part of EN 10217 specifies the technical delivery conditions in two test categories for welded tubes of circular cross-section made of austenitic and austenitic-ferritic stainless steel which are intended for pressure and corrosion resisting purposes at room temperature, at low temperatures or at elevated temperatures.

NOTE Once this standard is published in the Official Journal of the European Union (OJEU) under Directive 97/23/EC, pressure equipment directive, presumption of conformity to the Essential Safety Requirements (ESR) of Directive 97/23/EC is limited to technical data of materials in this standard and does not presume adequacy of the material to a specific item of equipment. Consequently, the assessment of the technical data stated in this material standard against the design requirements of this specific item of equipment to verify that the ESRs of the Pressure Equipment Directive are satisfied, needs to be done by the designer or manufacturer of the pressure equipment, taking also into account the subsequent manufacturing processes which may affect properties of the base materials.

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 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 10028-7:2007, *Flat products made of steels for pressure purposes - Part 7: Stainless steels*

EN 10052, *Vocabulary of heat treatment terms for ferrous products*

EN 10088-1, *Stainless steels - Part 1: List of stainless steels*

EN 10168:2004, *Steel products - Inspection documents - List of information and description*

EN 10204:2004, *Metallic products - Types of inspection documents*

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

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

EN ISO 148-1:2010, *Metallic materials - Charpy pendulum impact test - Part 1: Test method (ISO 148-1:2009)*

EN ISO 377:2013, *Steel and steel products - Location and preparation of samples and test pieces for mechanical testing (ISO 377:2013)*

EN ISO 1127, *Stainless steel tubes - Dimensions, tolerances and conventional masses per unit length (ISO 1127)*

EN ISO 2566-2, *Steel - Conversion of elongation values - Part 2: Austenitic steels (ISO 2566-2)*

EN ISO 3651-2:1998, *Determination of resistance to intergranular corrosion of stainless steels - Part 2: Ferritic, austenitic and ferritic-austenitic (duplex) stainless steels - Corrosion test in media containing sulfuric acid (ISO 3651-2:1998)*

EN ISO 5173:2010, *Destructive tests on welds in metallic materials - Bend tests (ISO 5173:2009)*

EN ISO 6892-1:2009, *Metallic materials - Tensile testing - Part 1: Method of test at room temperature (ISO 6892-1:2009)*

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EN ISO 6892-2:2011, *Metallic materials - Tensile testing - Part 2: Method of test at elevated temperature (ISO 6892-2:2011)*

EN ISO 8492:2013, *Metallic materials - Tube - Flattening test (ISO 8492:2013)*

EN ISO 8493:2004, *Metallic materials - Tube - Drift-expanding test (ISO 8493:1998)*

EN ISO 8495:2013, *Metallic materials - Tube - Ring-expanding test (ISO 8495:2013)*

EN ISO 8496:2013, *Metallic materials - Tube - Ring tensile test (ISO 8496:2013)*

EN ISO 9712:2012, *Non-destructive testing - Qualification and certification of NDT personnel (ISO 9712:2012)*

EN ISO 10893-1, *Non-destructive testing of steel tubes - Part 1: Automated electromagnetic testing of seamless and welded (except submerged arc-welded) steel tubes for the verification of hydraulic leaktightness (ISO 10893-1)*

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 10893-6, *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 14284:2002, *Steel and iron - Sampling and preparation of samples for the determination of chemical composition (ISO 14284:1996)*

ISO 11484:2009, *Steel products — Employer's qualification system for non-destructive testing (NDT) personnel*

ISO 857-1:1998, *Welding and allied processes — Vocabulary — Part 1: Metal welding processes*

3 Terms and definitions

For the purpose of this document, the terms and definitions given in EN 10020, EN 10021, EN 10052 and EN 10266 and the following apply.

3.1
test category
classification that indicates the extent and level of inspection and testing

3.2
employer
organization for which a person works on a regular basis

Note 1 to entry: The employer may be either the tube manufacturer or supplier or a third party organization providing Non- Destructive Testing (NDT) services.

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4 Symbols

For the purpose of this document, the symbols given in EN 10266 and the following apply.

TC test category.

NOTE See also Table 2 for symbols of the delivery condition.

5 Classification and designation

5.1 Classification

According to the classification system in EN 10020, the steel grades are classified as:

— austenitic steels (corrosion resisting);

— austenitic-ferritic steels.

5.2 Designation

For the tubes covered by this Part of EN 10217 the steel designation consists of:

— the number of this Part of EN 10217 (EN 10217-7);

plus either:

— the steel name according to EN 10027-1;

or:

— the steel number allocated according to EN 10027-2.

6 Information to be supplied by the purchaser

6.1 Mandatory information

The following information shall be supplied by the purchaser at the time of enquiry and order:

a) the quantity (mass or total length or number);

b) the term "tube";

c) the dimensions (outside diameter D and wall thickness T) (see 8.8.1);

d) the designation of the steel grade according to this Part of EN 10217 (see 5.2);

e) the test category (see 9.3).

6.2 Options

A number of options are specified in this Part of EN 10217 and these are listed below. 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 tube shall be supplied in accordance with the basic specification (see 6.1).

1) Information about steelmaking process (see 7.1);

2) Tube manufacturing process and/or route (see 7.2.1);

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3) The inside weld is re-melted (see Table 1);

4) The inside weld is worked by rolling, re-melting or grinding (see Table 1);

5) Delivery condition (see 7.2.3);

6) Product analysis (see 8.2.2);

7) Additional verifications of mechanical properties on samples that have undergone a different or additional heat treatment (see 8.3.1);

8) Verification of impact energy at room temperature (see 8.3.1);

9) Agreed mechanical properties at room temperature for austenitic steel tubes with wall thicknesses greater than 60 mm (see Table 6, footnote a);

10) Agreed proof strength at elevated temperatures for austenitic steel tubes with wall thicknesses greater than 60 mm (see Table 8, footnote a);

11) Verification of proof strength $R_{p0,2}$ or $R_{p1,0}$ at elevated temperatures (see 8.3.2);

12) Verification of impact energy at low temperature (see 8.3.3);

13) Intergranular corrosion test (see 8.4);

14) Repair welding (see 8.5.1.5);

15) Selection of method for verification of leak-tightness test method (see 8.5.2.2);

16) Non-destructive testing of tube ends for detection of laminar imperfections (see 8.5.2.3);

17) Non-destructive testing of strip and plate edges for detection of laminar imperfections (see 8.5.2.3);

18) Special ends preparation (see 8.7);

19) Exact lengths (see 8.8.3);

20) Tolerance class D 4 for D ≤ 168,3 mm (see Table 10);

21) The type of inspection certificate 3.2 in place of the standard document (see 9.2.1);

22) Transverse tensile test on the weld (see 10.2.2.3);

23) Test pressure for hydrostatic leak-tightness test (see 11.8.1);

24) Wall thickness measurement away from the ends (see 11.9);

25) Selection of non- destructive testing method for the inspection of the weld seam (see Table 16);

26) Image quality class B of EN ISO 10893-6 for the radiographic inspection of the weld seam (see Table 16);

27) Additional marking (see 12.2);

28) Special protection (see 13);

29) Image quality class B of EN ISO 10893-7 for the digital radiographic testing of the weld (see Table 16).

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6.3 Examples of an order

6.3.1 Example 1

2000 m of welded tube W1 (see Table 2) with an outside diameter of 168,3 mm, a wall thickness of 4,5 mm, tolerance classes D 3 and T 3, in accordance with this Part of EN 10217, made of steel grade X2CrNi19-11, test category 1, with a 3.1 inspection certificate according to EN 10204:

EXAMPLE 2000 m - Tube – 168,3 × 4,5 - EN 10217-7- X2CrNi19-11 – TC 1 – Option 5: W1

6.3.2 Example 2

300 m of cold finished welded tube WCA (see Table 2) with an outside diameter of 42,4 mm, a wall thickness of 2,6 mm, tolerance classes D 3 and T 3, in accordance with this Part of EN 10217, made of steel grade 1.4301, test category 2, with intergranular corrosion test (EN ISO 3651-2, method A), verification of proof strength at 300 °C, non-destructive testing of strip edges for detection of laminar imperfections, with a 3.2 inspection certificate according to EN 10204 issued by the manufacturer:

EXAMPLE 300 m - Tube – 42,4 × 2,6 - EN 10217-7 — 1.4301 – TC 2 – Option 5: WCA - Option 11: 300 ° C - Option 13: A – Option 17 - Option 21: 3.2 (to be issued by the manufacturer)

7 Manufacturing process

7.1 Steelmaking process

The steelmaking process is at the discretion of the manufacturer, but see Option 1.

Option 1: *The purchaser shall be informed about the steelmaking process used. The process shall be reported in the inspection document.*

7.2 Tube manufacture and delivery conditions

7.2.1 The tubes shall be manufactured from hot or cold rolled plate, sheet or strip in accordance with EN 10028-7. They shall be longitudinally welded by fusion across the abutting edges using either an arc welding or a laser welding or an electron beam welding process, or a combination thereof. The definitions of these respective fusion welding methods are given in 4.2 of ISO 857-1:1998. Welding can be performed with or without the addition of filler metal in accordance with one of the routes as specified in Table 1.

Unless Option 2 is specified, the manufacturing process and/or route are at the discretion of the manufacturer.

Option 2: *The tube manufacturing process and/or route is specified by the purchaser.*

The finished tubes shall not include welds used for joining together lengths of the hot or cold rolled strip prior to forming.

Option 3: *(see Table 1).*

Option 4: *(see Table 1).*

7.2.2 Welding shall be carried out by qualified personnel in accordance with operating procedures. When tubes are being used for pressure equipment in categories II, III, and IV, (of Directive 97/23/EC) the operating procedures and the personnel shall be approved by a notified body in accordance with Article 12 or recognised third party organization in accordance with Article 13 of the Directive.

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Table 1 - Tube manufacturing process, route, starting material, forming operation and weld condition

1	2	3	4	5
Route	Manufacturing process [a]	Starting material	Forming operation	Weld condition [b]
01	Arc welding	Hot or cold rolled strip	Continuous forming from strip	As welded [c e]
02				Welded, outside ground [c e] or bead worked [*]
03				Welded, bead worked [*]
04	Laser welding	Hot or cold rolled strip	Continuous forming from strip	Welded, outside ground [c] or bead worked [*]
05	Arc welding	Hot or cold rolled plate or sheet	Single forming from plate or sheet	As welded [d, e]
06	Laser welding and arc welding [**]	Hot or cold rolled plate or sheet	Single forming from plate or sheet	As welded [d, e]
07	Electron beam welding and arc welding [**]	Hot or cold rolled plate or sheet	Single forming from plate or sheet	As welded [d, e]

* Bead worked = bead rolled or bead hammered

** For these tubes, i.e. tubes welded from plate or sheet, the laser welding and the electron beam welding processes are normally used in combination with an arc welding process.

a Tubes with outside diameter not exceeding 168,3 mm may additionally be brought to the required tube dimensions by cold working[b] (see type of condition WCA and WCR in Table 2).

b The terms "as-welded", "welded, outside ground", "bead worked" and "cold working" apply to the condition of the tube before heat treatment if required in accordance with Table 2.

c On request, the inside weld can be remelted. ***Option 3:*** *The inside weld is remelted.*

d On request, the inside weld can be worked by rolling or remelting. ***Option 4:*** *The inside weld is worked by rolling or remelting.*

e The weld seam can be welded using one or more separate layers.

7.2.3 The types of delivery condition of the tubes are shown in Table 2. Unless Option 5 is specified, the selection of type of delivery condition is at the discretion of the manufacturer.

Option 5: *The type of delivery condition is specified by the purchaser.*

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