BRITISH STANDARD

BS EN 10217-7:2005

Welded steel tubes for pressure purposes — Technical delivery conditions —

Part 7: Stainless steel tubes

The European Standard EN 10217-7:2005 has the status of a British Standard

ICS 23.040.10; 77.140.75

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National foreword

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The UK participation in its preparation was entrusted by Technical Committee ISE/73, Steels for pressure purposes, to Subcommittee ISE/73/1, Steel plates and bars for pressure purposes, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

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

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Foreword

This document (EN 10217-7:2005) has been prepared by Technical Committee ECISS /TC 29, "Steel tubes and fittings for steel tubes", 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of an identical text or by endorsement, at the latest by August 2005, and conflicting national standards shall be withdrawn at the latest by August 2005.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 97/23/EC, see informative Annex ZA, which is an integral part of this document.

Other parts of EN 10217 are:

— *Part 1: 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: Alloy fine grain steel tubes;*

— *Part 4: Electric welded non-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*

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, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and 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 applied for pressure and corrosion resisting purposes at room temperature, at low temperatures or at elevated temperatures.

2 Normative references

The following referenced documents are indispensable for the application 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 473, *Non destructive testing - Qualification and certification of NDT personnel - General principles.*

EN 910, *Destructive tests on weld in metallic materials - Bend tests.*

EN 10002-1, *Metallic materials - Tensile testing - Part 1: Method of test at ambient temperature.*

EN 10002-5, *Metallic materials - Tensile testing - Part 5: Method of test at elevated temperature.*

EN 10020:2000, *Definition and classification of grades of steel.*

EN 10021:1993, *General technical delivery requirements for steel and iron products.*

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

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

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

EN 10045-1, *Metallic materials - Charpy impact test - Part 1: Test method.*

EN 10052:1993, *Vocabulary of heat treatment terms for ferrous products.*

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

EN 10088-2, *Stainless steels – Part 2: Technical delivery conditions for sheet/plate and strip for general purposes.*

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

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

EN 10233, *Metallic materials - Tube - Flattening test.*

EN 10234, *Metallic materials - Tube - Drift expanding test.*

EN 10236, *Metallic materials - Tube - Ring expanding test.*

EN 10237, *Metallic materials - Tube - Ring tensile test.*

EN 10246-2, *Non destructive testing of steel tubes - Part 2: Automatic eddy current testing of seamless and welded (except submerged arc-welded) austenitic and austenitic-ferritic steel tubes for verification of hydraulic leak-tightness.*

EN 10246-3, *Non-destructive testing of steel tubes - Part 3: Automatic eddy current testing of seamless and welded (except submerged arc welded) steel tubes for the detection of imperfections.*

EN 10246-7, *Non destructive testing of steel tubes - Part 7: Automatic full peripheral ultrasonic testing of seamless and welded (except submerged arc welded) steel tubes for the detection of longitudinal imperfections.*

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EN 10246-9, *Non-destructive testing of steel tubes - Part 9: Automatic ultrasonic testing of the weld seam of submerged arc-welded steel tubes for the detection of longitudinal and/or transverse imperfections.*

EN 10246-10, *Non-destructive testing of steel tubes - Part 10: Radiographic testing of weld seam of automatic fusion arc-welded steel tubes for the detection imperfections.*

EN 10246-16, *Non destructive testing of steel tubes - Part 16: Automatic ultrasonic testing of the area adjacent to the weld seam of welded steel tubes for the detection of laminar imperfections.*

EN 10246-17, *Non destructive testing of steel tubes – Part 17: Ultrasonic testing of tube ends of seamless and welded steel tubes for the detection of laminar imperfections.*

EN 10256, *Non destructive testing of steel tubes – Qualification and competence of level 1 and level 2 non-destructive testing personnel.*

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

EN ISO 377 *Steel and steel products - Location of samples and test pieces for mechanical testing. (ISO 377:1997).*

EN ISO 1127, *Stainless steel tubes - Dimensions, tolerances and conventional masses per unit length (ISO 1127:1992).*

EN ISO 2566-2, *Steel - Conversion of elongation values - Part 2: Austenitic steels (ISO 2566-2:1984).*

EN ISO 3651-2, *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 14284, Steel and *iron - Sampling and preparation of samples for the determination of the chemical composition (ISO 14284:1996).*

CR 10260, *Designation systems for steel: Additional symbols.*

CR 10261, *ECISS Information Circular 11 - Iron and steel - Review of available methods of chemical analysis.*

3 Terms and definitions

For the purpose of this Part of EN 10217, the terms and definitions given in EN 10020:2000, EN 10021:1993, EN 10052:1993 and EN 10266:2003 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 The employer may be either the tube manufacturer or supplier or a third party organization providing Non-Destructive Testing (NDT) services.

4 Symbols

For the purpose of this Part of EN 10217, the symbols given in EN 10266:2003 and the following apply.

— C1 and C2 category conformity indicators (see Clauses 7.2.1 and 7.2.3.);

— TC test category.

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

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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.

For more details see EN 10088-1.

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 and CR 10260;

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).

a) Information about steelmaking process (see 7.1);

b) Tube manufacturing process and/or route (see 7.2.2);

c) The inside weld is remelted (see Table 1);

d) The inside weld is worked by rolling or remelting (see Table 1);

e) Delivery condition (see 7.2.4);

f) Product analysis (see 8.2.2);

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g) Additional mechanical tests on samples that have undergone a different or additional heat treatment (see 8.3.1);

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

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

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

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

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

m) Intergranular corrosion test (see 8.4);

n) Repair welding (see 8.5.1.5);

o) Selection of leak-tightness test method (see 8.5.2.2);

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

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

r) Special ends preparation (see 8.7);

s) Exact lengths (see 8.8.3);

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

u) The type of inspection document other than the standard document (see 9.2.1);

v) Transverse tensile test on the weld (see 10.2.2.2);

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

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

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

z) Image quality class R1 of EN 10246-10 for the radiographic inspection of the weld seam (see Table 16);

aa) Additional marking (see 12.2);

bb) Special protection (see 13).

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. B inspection certificate according to EN 10204:

2000 m - Tube – 168,3 X 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

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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:

300 m - Tube – 42,4 X 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 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 according to EN 10256 or, at least, an equivalent to it.

It is recommended that the level 3 personnel be certified according to EN 473 or, at least, an equivalent to it.

The operating authorisation issued by the employer shall be according to a written procedure.

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

NOTE The definition of level 1,2 and 3 can be found in appropriate standards, e.g. EN 473 and EN 10256.

For pressure equipment in categories III and IV (of Directive 97/23/EC) the personnel shall be approved by a recognised third-party organisation. Tubes not conforming to this requirement shall be marked “C 2”, unless a requirement to mark "C 1" (see 7.2.3) applies.

7.2.2 The tubes shall be manufactured from hot or cold rolled plate, sheet or strip in accordance with EN 10028-7, longitudinally arc or laser welded by fusion across the abutting edges, 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).*

7.2.3 Welding shall be carried out by suitably qualified personnel in accordance with suitable operating procedures.

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 competent third-party. Tubes not conforming to this requirement shall be marked “C 1”.

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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	Automatic arc welding	Hot or cold rolled strip	Continuous forming from strip	As welded [c]
02				Welded, outside ground [c]
03				Welded, bead worked
04		Hot or cold rolled plate or sheet	Single forming from plate or sheet	As welded [d, e]
05	Laser welding	Hot or cold rolled strip	Continuous forming from strip	Welded, outside ground[c] or bead worked

[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.

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