BS EN 10217-1:2019
Incorporating corrigenda May 2019 and May 2021

BSI Standards Publication

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

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Full document details: BS EN 10217-1:2019

National foreword

This British Standard is the UK implementation of EN 10217-1:2019. It supersedes BS EN 10217-1:2002, which is withdrawn.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 committee manager.

The UK committee draws users' attention to the fact that BS EN 10217 Parts 1 to 7 are product standards and are therefore intended to assist specifiers, designers and other users of the documents by setting out a series of tube and pipe grades intended for use in pressure applications. The non-alloy and low-alloy grades in Parts 1 to 6 are comparable (interchangeable) with seamless grades of the same designations in BS EN 10216 Parts 1 to 4. Similarly the stainless grades in Part 7 are comparable to seamless grades of the same designations in BS EN 10216 Part 5.

It should be noted that guidance on material suitability for specific applications is not provided in product standards. It is therefore important that specifiers, designers and other users of the documents understand the differences between the types and characteristics of the welded pressure pipes covered in the standards so that the appropriate type and grade can be specified or selected for the application concerned.

In particular, it should be noted that, although BS EN 13480 supports essential requirements of EU Directive 2014/68/EU (the Pressure Equipment Directive or PED), the TR1 grades in BS EN 10217-1 are not suitable for use under the PED (as indicated in Table 4 of the Standard). This is because, in particular, they do not meet the essential requirements of the Directive in respect of ageing (determined by the chemical composition) or ductility (specified as minimum Charpy impact requirements). In addition, most HFW TR1 grades imported into the UK are cold-formed and hence the weld seam will not have been heat-treated which means that the weld area is likely to be highly stressed, which can lead to cracking if the tube is subjected to additional processing. The UK committee therefore recommends that users do not use any HFW products certified or sold as being of BS EN 10217-1 TR1 grade. Instead, to ensure PED compliance, the UK committee recommends that hot-finished HFW tubes in accordance with BS EN 10217-2 should be used for most pressure applications, although BS EN 10217-1 TR2 grades may be considered in some cases.

As BS EN 10217 steel tubes and pipes can be used for a whole range of applications from building services to critical requirements involving gas or chemicals, it is important that the specifier, designer or user selects the most suitable tube or pipe type and grade from the seven parts of the standard provided.

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ICS 23.040.10; 77.140.75

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This publication has been prepared under a mandate given to the European Standards Organizations by the European Commission and the European Free Trade Association and is intended to support essential requirements of the EU legislation detailed in the European foreword. Annex ZA/ZZ describes how the publication relates to the legislation.

For the Great Britain market (England, Scotland and Wales), if the UK Government has designated this publication for conformity with UKCA marking legislation and has not amended the essential requirements of that legislation, Annex ZA/ZZ and any references to EU law in the publication should be read in accordance with the designation as applying to UK legislation in the same way as to EU law. Further information on designated standards can be found at www.bsigroup.com/standardsandregulation.

For the Northern Ireland market, UK law will continue to implement relevant EU law subject to periodic confirmation. References to EU legislation are therefore still valid.

More information on legislation can be found at www.gov.uk.

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 May 2019	Correction to running headers
31 May 2021	National foreword updated

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

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English Version

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

Tubes soudés en acier pour service sous pression - Conditions techniques de livraison - Partie 1 : Tubes en acier non allié, soudés électriquement et soudés à l'arc immergé, avec caractéristiques spécifiées à température ambiante

Geschweißte Stahlrohre für Druckbeanspruchungen - Technische Lieferbedingungen - Teil 1: Elektrisch geschweißte und unterpulvergeschweißte Rohre aus unlegierten Stählen mit festgelegten Eigenschaften bei Raumtemperatur

This European Standard was approved by CEN on 25 February 2019.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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European foreword

This document (EN 10217-1:2019) has been prepared by Technical Committee CEN/TC 459 "ECISS - European Committee for Iron and Steel Standardization"[1], the secretariat of which is held by AFNOR.

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 October 2019, and conflicting national standards shall be withdrawn at the latest by October 2019.

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.

This document supersedes EN 10217-1:2002.

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 2014/68/EU.

For relationship with EU Directive 2014/68/EU (formerly 97/23/EC), 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 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 organisations 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, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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[1] Through its subcommittee SC 10 "Steel tubes, and iron and steel fittings" (secretariat: UNI)

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1 Scope

This document specifies the technical delivery conditions for qualities TR1 and TR2 of electric welded and submerged arc welded tubes of circular cross section, with specified room temperature properties, made from non-alloy quality steel.

NOTE 1 Quality TR2 is intended to support the essential requirements of EU Directive 2014/68/EU in respect of pressure equipment with specified room temperature properties (see Table 5).

NOTE 2 Once this standard is published in the Official Journal of the European Union (OJEU), presumption of conformity to the Essential Safety Requirements (ESR) of Directive 2014/68/EU is limited to the technical data for the materials in this standard and does not presume adequacy of the material for a specific item of pressure equipment. Consequently, the assessment of the technical data stated in this material standard against the design requirements of a 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 any subsequent processing procedures which may affect properties of the base materials.

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 10020, *Definition and classification of grades of steel*

EN 10021:2006, *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 10168:2004, *Steel products — Inspection documents — List of information and description*

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

EN 10220, *Seamless and welded steel tubes — Dimensions and masses per unit length*

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 148-1:2016, *Metallic materials — Charpy pendulum impact test — Part 1: Test method (ISO 148-1:2016)*

EN ISO 377:2017, *Steel and steel products — Location and preparation of samples and test pieces for mechanical testing (ISO 377:2017)*

EN ISO 2566-1:1999, *Steel — Conversion of elongation values — Part 1: Carbon and low alloy steels (ISO 2566-1:1984)*

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

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

EN ISO 6892-1:2016, *Metallic materials — Tensile testing — Part 1: Method of test at room temperature (ISO 6892-1:2016)*

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

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

EN ISO 10893-1:2011, *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 10893-1:2011)*

EN ISO 10893-2:2011, *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 10893-2:2011)*

EN ISO 10893-3:2011, *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 10893-3:2011)*

EN ISO 10893-6:2011, *Non-destructive testing of steel tubes — Part 6: Radiographic testing of the weld seam of welded steel tubes for the detection of imperfections (ISO 10893-6:2011)*

EN ISO 10893-7:2011, *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 10893-7:2011)*

EN ISO 10893-10:2011, *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 10893-10:2011)*

EN ISO 10893-11:2011, *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 10893-11:2011)*

EN ISO 14174:2012, *Welding consumables — Fluxes for submerged arc welding and electroslag welding - Classification (ISO 14174:2012)*

EN ISO 14284, *Steel and iron — Sampling and preparation of samples for the determination of chemical composition (ISO 14284)*

EN ISO 17639:2013, *Destructive tests on welds in metallic materials — Macroscopic and microscopic examination of welds (ISO 17639:2003)*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 10020, EN 10021, EN 10266, 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 http://www.iso.org/obp

3.1
employer
organisation for which a person works on a regular basis

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

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3.2
EW
electric welded tube
tubular product having one longitudinal seam weld produced by electric (resistance) welding where the strip edges to be welded are mechanically pressed together and the heat for the welding process is generated by the resistance to flow of low or high frequency electric current applied by either a conduction or induction process

3.3
HFW
high frequency welded tube
EW tube produced specifically using a welding current frequency equal to or greater than 100 kHz

3.4
SAW
submerged-arc welded tube
tubular product having one or two longitudinal seams, or one helical seam, produced using the submerged-arc welding process

3.5
SAWH
submerged-arc helical welded tube
tubular product having one helical weld seam produced using the submerged-arc welding process

3.6
SAWL
submerged-arc longitudinal welded tube
tubular product having one or two longitudinal weld seams produced using the submerged-arc welding process

4 Symbols

For the purposes of this document, the symbols given in EN 10266 apply.

5 Classification and designation

5.1 Classification

In accordance with the classification system in EN 10020, the steel grades in this standard are classified as non-alloy quality steels.

5.2 Designation

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

— the number of this European Standard, e.g. EN 10217-1;

plus either:

— the steel name in accordance with EN 10027-1;

or:

— the steel number allocated in accordance with EN 10027-2.

5.2.2 The steel name is designated by:

— the capital letter P for pressure purposes;

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— the indication of the specified minimum yield strength for thickness *T* less than or equal to 16 mm, expressed in MPa (see Tables 4 and 5);

plus either:

— the alphanumeric TR1 for qualities without specified aluminium content and specified impact properties and with non-specific inspection requirements (see 9.1);

or:

— the alphanumeric TR2 for qualities with specified aluminium content, specified impact properties and either non-specific or specific inspection requirements (see 9.1);

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, total length or number of tubes of set length);

b) the term 'tube' and tube type, EW / HFW, SAWL or SAWH;

c) the dimensions (outside diameter *D* and wall thickness *T*) (see Table 6);

d) the random length range (see 8.7.3);

e) for tubes with a $D/T > 100$, out of roundness limits (see 8.7.4.6).

f) the designation of the steel grade in accordance with this document (see 5.2);

6.2 Options

A number of options are specified in this document 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 tubes shall be supplied in accordance with the basic specification (see 6.1):

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

2) Selection of the delivery condition (see 7.2.5);

3) Restriction on copper and tin content for quality TR2 (see Table 2);

4) Product analysis for tubes of quality TR2 (see 8.2.2);

5) Additional longitudinal impact test at –10°C for quality TR2 (see Table 5);

6) Selection of method for verification of leak-tightness (see 8.4.3.1);

7) Special end preparation (see 8.6);

8) Exact lengths (see 8.7.3);

9) Specific inspection for quality TR2 (see 9.1);

10) Verification of tensile strength of the weld in the transverse direction for tubes with $219{,}1 < D \leq 508$ mm (see Table 12 and Table 13);

11) Wall thickness measurement away from the ends (see Table 12, Table 13 and 11.9);

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12) Test unit restriction for tubes with $D \leq 76{,}1$ mm of quality TR2 with specific inspection (see 10.1.1);

13) Selection of the Non-Destructive Testing method (see 11.11.1);

14) Additional marking (see 12.2);

15) Protection (see Clause 13).

6.3 Example of an order

100 t of HFW steel tube with an outside diameter of 168,3 mm, a wall thickness of 4,5 mm in accordance with EN 10217-1, made of steel grade P235TR2 in 6 m random lengths, with a 3.2 inspection certificate in accordance with EN 10204:

100 t – HFW - Tube – 168,3 × 4,5 – EN 10217-1 – P235TR2 – 6m - Option 9: 3.2

7 Manufacturing process

7.1 Steelmaking process

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

Steel for quality TR2 shall be fully killed and contain nitrogen binding elements, details of which shall be reported.

NOTE This excludes the use of rimming, balanced or semi-killed steel.

7.2 Tube manufacture and delivery conditions

7.2.1 Tube manufacturing shall be as specified in Table 1.

Unless Option 1 is specified, the manufacturing process and route is at the discretion of the manufacturer.

Option 1: *The manufacturing process and/or route from Table 1 is specified by the purchaser.*

The submerged arc weld of SAW tubes shall be made using at least one weld run on the inside and one weld run on the outside of the tube.

The strip used for the manufacture of SAWH tubes shall have a width of not less than 0,8 times or more than 3,0 times the outside diameter of the tube.

The finished tubes shall not include the welds used to join together the strip or plate prior to forming, except for SAWH tubes where this is permitted only when the welding procedure for the weld joining the strip or plate has been qualified in accordance with Annex A and has also been subjected to the same inspection and testing regime as the helical pipe welds (see 11.11.4).

7.2.2 Tube production welding shall be carried out by qualified personnel in accordance with documented procedures. For tubes to be used in pressure equipment under European legislation, manufacturers shall employ an established procedure for the approval of welding operatives.

7.2.3 The welding procedure for SAW tubes shall be qualified in accordance with Annex A.

7.2.4 The production (welding) process for EW and HFW tubes shall be qualified and approved under the tube manufacturer's own QA system. Only HFW tubes (see 3.3) shall be supplied for pressure equipment under European legislation.

7.2.5 The delivery conditions for tubes covered by this document are shown in Table 1.

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Unless Option 2 is specified at the time of enquiry and order the choice of the delivery condition is at the discretion of the manufacturer.

Option 2: *The delivery condition is chosen by the purchaser.*

Table 1 — Tube production processes, manufacturing routes and permitted delivery conditions

Route Nº	Tube production process		Manufacturing route		Acceptable delivery condition [a]	Applicable for Quality	
	Process	Symbol	Starting material	Forming operation		TR1	TR2
1a	Electric Welded [b]	EW HFW	Hot rolled strip	Cold formed and welded	As welded	Yes	No
1b					NW	Yes	No
1c					NP	Yes	Yes
1d					NR	Yes	Yes
2a			Normalized rolled strip		As welded	Yes	No
2b					NW	Yes	Yes
2c					NP	Yes	Yes
2d					NR	Yes	Yes
3c			Cold rolled and stress relieved strip		NP	Yes	Yes
3d					NR	Yes	Yes
4a	Submerged arc welded Longitudinal seam or Helical seam	SAW: — SAWL — SAWH	Hot rolled plate or strip		As welded [d]	Yes	No
4b					NP	Yes	Yes
5a			Normalized rolled plate or strip		As welded [d]	Yes	Yes
5b					NP	Yes	Yes
6a			Full body normalized plate or strip		As welded [d]	Yes	Yes
7a			Hot rolled plate or strip	Normalized formed and welded [c]	As welded [d]	Yes	Yes
7b					NP	Yes	Yes
8a			Normalized rolled plate or strip		As welded [d]	Yes	Yes
8b					NP	Yes	Yes
9a			Full body normalized plate or strip		As welded [d]	Yes	Yes

[a] As welded = as formed with no subsequent heat treatment; NP = tube full body normalized; NW = normalized weld zone; NR = normalized rolled or hot (stretch) reduced within the normalizing temperature range;

[b] See definition of EW and HFW in 3.2 and 3.3. For tubes of quality TR2, only HFW tubes, minimum welding frequency 100kHz, (symbol = HFW) are permitted;

[c] Only applicable to SAWL tubes;

[d] Stress relieving treatment on the weld is permissible.

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7.3 Non Destructive Testing Personnel Requirements

7.3.1 All NDT activities shall be carried out by qualified and competent level 1, 2 and/or 3 personnel, authorized to carry out this work by the employer.

7.3.2 The qualification for levels 1 and 2 personnel shall be in accordance with ISO 11484 or, at least, an equivalent to it.

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

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

7.3.5 All NDT operations shall be authorised by a level 3 NDT technician approved by the employer.

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

8 Requirements

8.1 General

The tubes shall conform to the requirements of document when supplied in a delivery condition in accordance with Table 1 and inspected in accordance with the specified requirements in Table 12 or Table 13, as applicable.

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

8.2 Chemical composition

8.2.1 Cast analysis

The cast analysis reported by the steel producer shall apply and conform to the requirements of Table 2.

When welding tubes produced in accordance with this document, account should be taken of the fact that the behaviour of the steel during and after welding is dependent not only on the steel analysis, but also on the welding process, including heat input, any applied heat treatment and the conditions of preparing for and carrying out the welding.

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