SLOVENSKI STANDARD
SIST EN 10217-3:2019

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Nadomešča:
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Varjene jeklene cevi za tlačne posode - Tehnični dobavni pogoji - 3. del: Električno varjene in obločno pod praškom varjene legirane jeklene cevi z drobnozrnato mikrostrukturo s specificiranimi lastnostmi za delo pri sobni, povišani in nizki temperaturi

Welded steel tubes for pressure purposes - Technical delivery conditions - Part 3: Electric welded and submerged arc welded alloy fine grain steel tubes with specified room, elevated and low temperature properties

Geschweißte Stahlrohre für Druckbeanspruchungen - Technische Lieferbedingungen - Teil 3: Elektrisch geschweißte und unterpulvergeschweißte Rohre aus legierten Feinkornbaustählen mit festgelegten Eigenschaften bei Raum-, erhöhten und tiefen Temperaturen

Tubes soudés en acier pour service sous pression - Conditions techniques de livraison - Partie 3 : Tubes en acier en acier allié à grains fins, soudés électriquement et soudés à l'arc immergé avec caractéristiques spécifiées à basse température et température élevée

Ta slovenski standard je istoveten z: **EN 10217-3:2019**

ICS:

23.020.32	Tlačne posode	Pressure vessels
77.140.75	Jeklene cevi in cevni profili za posebne namene	Steel pipes and tubes for specific use

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EUROPEAN STANDARD

NORME EUROPÉENNE

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EN 10217-3

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ICS 23.040.10; 77.140.75

Supersedes EN 10217-3:2002

English Version

Welded steel tubes for pressure purposes - Technical delivery conditions - Part 3: Electric welded and submerged arc welded alloy fine grain steel tubes with specified room, elevated and low temperature properties

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

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, 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 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

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European foreword

This document (EN 10217-3:2019) 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 10217-3:2002.

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,

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

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.

1 Scope

This document specifies the technical delivery conditions for two test categories of electric welded and submerged arc longitudinally (SAWL) or helically (SAWH) welded tubes of circular cross section, made from weldable fine grain steel.

NOTE 1 These tube grades are intended to support the essential requirements of EU Directive 2014/68/EU in respect of pressure equipment covered under all relevant Categories as set out in Article 13 of that Directive.

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 643:2012, *Steels — Micrographic determination of the apparent grain size (ISO 643:2012)*

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 6892-2:2018, *Metallic materials — Tensile testing — Part 2: Method of test at elevated temperature (ISO 6892-2:2018)*

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 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 10893-8:2011, *Non-destructive testing of steel tubes — Part 8: Automated ultrasonic testing of seamless and welded steel tubes for the detection of laminar imperfections (ISO 10893-8:2011)*

EN ISO 10893-9:2011, *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 10893-9:2011)*

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

3.2
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).

3.3
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

3.4
HFW
high frequency welded tube
EW tube produced specifically using a welding current frequency equal to or greater than 100kHz

3.5
SAW
submerged-arc welded tube
tubular product having one or two longitudinal seams, or one helical seam, produced using the submerged-arc welding process

3.6
SAWH
submerged-arc helical welded tube
tubular product having one helical weld seam produced using the submerged-arc welding process

3.7
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

5.1.1 This document covers steel grades in four qualities (see Tables 2 and 4):

— the basic quality (P ... N);

— the elevated temperature quality (P ... NH);

— the low temperature quality (P ... NL1);

— the special low temperature quality (P ... NL2).

5.1.2 In accordance with the classification system in EN 10020, the tube grades in this standard are classified as follows:

— P275NL1, P355N, P355NH and P355NL1 are alloy quality steels;

— The other grades are alloy special steels.

5.2 Designation

5.2.1 For the tubes covered by this document, the steel designation consists of:

— the number of this European Standard, e.g. EN 10217-3;

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;

— the indication of the specified minimum yield strength for the lowest applicable wall thickness (*T*) group expressed in MPa (see Table 4);

— one of the additional symbols N, NH, NL1or NL2 (see 5.1.1, Tables 2 and 4).

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, HFW, SAWL or SAWH;

c) the dimensions (outside diameter *D*, wall thickness *T*) (see Tables 8 and 9);

d) the random length range (see 8.8.3);

e) for tubes with a $D/T > 100$, out of roundness limits (see 8.8.4.6).

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

g) the test category (see 9.3).

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) Restriction on copper and tin content (see Table 2);

3) Product analysis (see 8.2.2);

4) Determination of grain size according to EN ISO 643 (see 8.3);

5) Verification of elevated temperature mechanical properties for NH-grades (see 8.4);

6) Verification of mechanical properties at elevated temperature for NL-grades (see 8.4 and Annex B);

7) Selection of method for verification of leak-tightness (see 8.5.3.1);

8) Non-Destructive Testing of test category 2 HFW tubes for detection of transverse imperfections (see 8.5.3.2);

9) Non-Destructive Testing of test category 2 tubes for detection of laminar imperfections (see 8.5.3.2);

10) Special end preparation (see 8.7);

11) Exact lengths (see 8.8.3);

12) Inspection document 3.2 in place of the standard 3.1 Inspection Certificate (see 9.2.1);

13) Verification of tensile strength of the weld in the transverse direction for tubes with $219{,}1 < D \leq 508$ mm (see Table 15);

14) Additional verification of impact energy at a temperature different from the standard

15) Agreement of a different test pressure for hydrostatic leak-tightness test (see 11.9.1);

16) Wall thickness measurement away from the ends (see 11.10);

17) Non-Destructive Testing method for the inspection of the weld seam of HFW tubes (see 11.12.1.1);

18) Non-Destructive Testing method for the inspection of the weld seam of SAW tubes (see 11.12.2.1);

19) Additional marking (see 12.2);

20) Protection (see Clause 13).

6.3 Example of an order

500 m of HFW tube with an outside diameter of 168,3 mm, a wall thickness of 4,5 mm in accordance with EN 10217-3, made of steel grade P355N, test category 1, in 6 m random lengths, with a 3.2 inspection certificate in accordance with EN 10204:

500 m – HFW -Tube - 168,3 × 4,5 - EN 10217–3 — P355N -TC 1 - 6m - Option 12: 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.

Steels 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.*

Electric welded tubes shall be manufactured by a process employing high frequency welding (HFW), of minimum frequency 100 kHz.

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 to test category 1, 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 and base material to test category 2 (see 11.12.2.3).

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 HFW tubes shall be qualified and approved under the tube manufacturer's own QA system. Only HFW tubes (see 3.4) 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.

7.2.6 For grades P355N and P355NH full body normalizing may be replaced by normalizing rolling or by a hot (stretch) reduction process carried out within the normalizing temperature range.

7.2.7 For grade P460 it may be necessary to apply accelerated cooling and/or an additional tempering treatment after normalizing.

Table 1 — Tube manufacturing processes, route and delivery condition

Route N° (according to Part 1)	Manufacturing process		Manufacturing route		Acceptable delivery condition [a]	Applicable for Quality [c]
	Process	Symbols	Starting material	Forming operation		
1c	Electric Welded (HFW process) [b]	HFW [b]	Hot rolled strip	Cold formed and welded	NP [d]	A
1d					NR [d]	B
2b			Normalized rolled strip		NW	B
2c					NP [d]	A
2d					NR	B
4b	Submerged arc welded Longitudinal seam or Helical seam	SAW: -SAWL -SAWH	Hot rolled plate or strip		NP [d]	A
5a			Normalized rolled plate or strip		as welded [f]	B
6a			Full body normalized plate or strip			A
7a			Hot rolled plate or strip	Normalized formed and welded [e]	as welded [f]	A
8a			Normalized rolled plate or strip		as welded [f]	A
9a			Full body normalized plate or strip		as welded [f]	A

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

[b] Only HFW tubes (see 3.4), minimum welding frequency 100kHz, (symbol = HFW) are permitted;

[c] A = all steel grades; B = for grades P355N and P355NH only;

[d] see 7.2.6 and 7.2.7;

[e] Only applicable to SAWL tubes;

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

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 for the level 3 personnel to be suitably certified, either 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 this document when supplied in a delivery condition in accordance with Table 1 and inspected in accordance with the specified requirements in Table 15.

Tubes shall be suitable for hot and cold bending.

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 shall 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.