



SLOVENSKI STANDARD
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Nevarjene jeklene cevi za tlačne posode - Tehnični dobavni pogoji - 5. del: Cevi iz nerjavnega jekla

Seamless steel tubes for pressure purposes - Technical delivery conditions - Part 5: Stainless steel tubes

Nahltlose Stahlrohre für Druckbeanspruchungen - Technische Lieferbedingungen - Teil 5: Rohre aus nichtrostenden Stählen

Tubes sans soudure pour service sous pression - Conditions techniques de livraison - Partie 5 : Tubes en aciers inoxydables

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English Version

Seamless steel tubes for pressure purposes - Technical delivery conditions - Part 5: Stainless steel tubes

Tubes sans soudure pour service sous pression -
Conditions techniques de livraison - Partie 5 : Tubes en
aciers inoxydables

Nahtlose Stahlrohre für Druckbeanspruchungen -
Technische Lieferbedingungen - Teil 5: Rohre aus
nichtrostenden Stählen;

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee ECISS/TC 110.

If this draft becomes a European Standard, 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.

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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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

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prEN 10216-5:2018 (E)**European foreword**

This document (prEN 10216-5:2018) 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 document is currently submitted to the CEN Enquiry.

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(s).

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

This document will supersede EN 10216-5:2013.

The following changes have been made in comparison to the previous edition EN 10216-5:2013:

- a) the normative references have been updated;
- b) in Table 6 and Table 7, the footnote "a" has been completed;
- c) in subclause 8.8, the dated reference of the standards has been deleted;
- d) in Table 15, the frequency of testing in test category 2 for tensile test at room temperature has been modified;
- e) the impact testing (subclause 11.4.1) has been modified;
- f) the standard has been editorially revised.

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

- *Part 1: Non-alloy steel tubes with specified room temperature properties;*
- *Part 2: Non-alloy and alloy steel tubes with specified elevated temperature properties;*
- *Part 3: Alloy fine grain steel tubes;*
- *Part 4: Non-alloy and alloy steel tubes with specified low temperature properties;*
- *Part 5: Stainless steel tubes (the present document).*

Another European Standard series covering tubes for pressure purposes is:

- EN 10217, *Welded steel tubes for pressure purposes – Technical delivery conditions*

1 Scope

This document specifies the technical delivery conditions in two test categories for seamless tubes of circular cross section made of austenitic (including creep resisting steel) 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 2014/68/EC, presumption of conformity to the Essential Safety Requirements (ESR) of Directive 2014/68/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 will 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 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.

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

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

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

EN 10168, *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*

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

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

EN ISO 643, *Steels - Micrographic determination of the apparent grain size (ISO 643)*

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 4885, *Ferrous materials - Heat treatments - Vocabulary (ISO 4885)*

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

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

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

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

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 10893-8:2011, *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 10893-10:2011, *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 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*

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3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 10020, EN 10021, EN ISO 4885 and EN 10266 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**

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.

4 Symbols

For the purposes of this document, the symbols given in EN 10266 and the following apply:

TC test category

NOTE See also Table 1 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 or creep resisting steels);
- austenitic-ferritic steels.

For more details, see EN 10088-1.

5.2 Designation

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

- number of this part of EN 10216 (EN 10216-5);

plus either

- steel name in accordance with EN 10027-1;

or

- steel number allocated in accordance with 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) quantity (mass or total length or number);
- b) term "tube";
- c) dimensions (outside diameter D and wall thickness T) (see 8.8.1);
- d) designation of the steel grade according to this part of EN 10216 (see 5.2);
- e) test category (see 9.3).

6.2 Options

A number of options are specified in this part of EN 10216 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) delivery condition (see 7.2.4);
- 3) specified range for sulphur content (see Table 2, footnote b);
- 4) product analysis (see 8.2.2);
- 5) additional verifications of mechanical properties on samples which have undergone a different or additional heat treatment (see 8.3.1);

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- 6) verification of impact energy at room temperature (see 8.3.1);
- 7) agreed mechanical properties at room temperature for austenitic corrosion resisting steel tubes with wall thicknesses greater than 60 mm (see Table 6, footnote a);
- 8) agreed mechanical properties at room temperature for austenitic creep resisting steel tubes with wall thicknesses greater than 50 mm (see Table 7, footnote a);
- 9) verification of proof strength $R_{p0,2}$ or $R_{p1,0}$ at elevated temperatures (see 8.3.2.1);
- 10) agreed proof strength values at elevated temperatures for austenitic corrosion resisting steel tubes with wall thicknesses greater than 60 mm (see Table 9, footnote a);
- 11) verification of impact energy at low temperature (see 8.3.3);
- 12) intergranular corrosion test (see 8.4);
- 13) selection of method for verification of leak-tightness test method (see 8.5.2.1);
- 14) Non-Destructive Testing for test category 2 tubes with specified outside diameter less than or equal to 101,6 mm and specified wall thickness less than or equal to 5,6 mm for detection of longitudinal imperfections (see 8.5.2.2);
- 15) Non-Destructive Testing for test category 2 tubes for detection of transverse imperfections (see 8.5.2.2);
- 16) Non-Destructive Testing for test category 2 tubes with specified wall thickness greater than 40 mm for detection of laminar imperfections at tube ends (see 8.5.2.2);
- 17) special ends preparation (see 8.7);
- 18) exact lengths (see 8.8.3);
- 19) sized tube ends for tube of $D > 219,1$ mm (see Table 12);
- 20) tolerance classes D 4 and T 4 for tubes ordered cold finished (see Table 13);
- 21) inspection certificate 3.2 other than the standard document (see 9.2.1);
- 22) test pressure for hydrostatic leak-tightness test (see 11.6.1);
- 23) wall thickness measurement away from the ends (see 11.7);
- 24) additional marking (see 12.2);
- 25) special protection (see 13).

6.3 Examples of an order**6.3.1 Example 1**

2 000 m of hot finished descaled seamless tube with an outside diameter of 168,3 mm, a wall thickness of 4,5 mm, in accordance with this part of EN 10216, tolerance classes D 2 and T 2, made of steel grade X2CrNi19-11, to test category 1, with a 3.1 inspection certificate in accordance with EN 10204:

EXAMPLE 2 000 m - HFD Tube - 168,3 X 4,5 - EN 10216-5 - X2CrNi19-11 - TC 1

6.3.2 Example 2

300 m of cold finished descaled seamless tube with an outside diameter of 42,4 mm, a wall thickness of 2,6 mm, in accordance with this part of EN 10216, tolerance classes D 3 and T 3, made of steel grade 1.4301, to test category 2, with intergranular corrosion test (EN ISO 3651-2:1998, method A), verification of proof strength at 300° C, non-destructive testing for detection of longitudinal and transverse imperfections, with a 3.2 inspection certificate in accordance with EN 10204:

EXAMPLE 300 m - CFD Tube - 42,4 X 2,6 - EN 10216-5 - 1.4301 - TC 2 - Option 9: 300° C - Option 12: A - Option 14 - Option 15 - Option 21: 3.2

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 authorized to operate by the employer.

The qualification shall be in accordance with ISO 11484 or, at least, an equivalent to it.

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

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

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

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

7.2.2 The tubes shall be manufactured by a seamless process, and may be hot finished or cold finished. The terms “ hot finished “ and “ cold finished “ apply to the condition of the tube before it is heat treated in accordance with 7.2.3.

The process of manufacture is left to the discretion of the manufacturer, but see option 2.

7.2.3 The tubes shall be supplied in the solution annealed condition over their full length in either:

- reference heat treatment conditions;
- solution annealed conditions obtained directly by extrusion and subsequent cooling provided the mechanical properties, corrosion resistance and other properties are in accordance with this part of EN 10216. All specified mechanical properties shall be met even after a subsequent reference heat treatment (solution annealing).

Solution treatment shall consist of heating the tubes uniformly to a temperature within the range given for the steel grade concerned in Tables 6, 7 and 8 and cooling rapidly.

7.2.4 The types of delivery condition of the tubes are given in Table 1.

Unless option 2 is specified, the type of delivery condition is at the discretion of the manufacturer.

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Option 2: The delivery condition is specified by the purchaser.

Table 1 — Delivery conditions ^a

Symbol ^b	Type of delivery condition	Surface condition
HFD	Hot finished heat treated, descaled	Metallically clean
CFD	Cold finished heat treated, descaled	Metallically clean
CFA	Cold finished bright annealed	Metallically bright
CFG	Cold finished heat treated, ground	Metallically bright-ground, the type and degree of roughness shall be agreed at the time of enquiry and order ^c
CFP	Cold finished heat treated, polished	Metallically bright-polished, the type and degree of roughness shall be agreed at the time of enquiry and order ^c

^a Combinations of the different conditions may be agreed at the time of enquiry and order.
^b The symbols are abbreviations for type of condition. Example: CFD = Cold Finished Descaled.
^c The enquiry and the order shall indicate whether the roughness requirement applies on the internal or external tube surface, or internal and external.

8 Requirements

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8.1 General

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When supplied in a delivery condition indicated in 7.2.4 and inspected in accordance with Clauses 9, 10 and 11, the tubes shall conform to the requirements of this part of EN 10216.

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 manufacturer shall apply and conform to the requirements of Table 2 or Table 3 for austenitic steels and of Table 4 for austenitic-ferritic steels.

Option 3: (see Table 2).

When welding tubes produced in accordance with this part of EN 10216, account should be taken to the fact that the behaviour of the steel during and after welding is dependent not only on the steel, but also on the applied heat treatment and the conditions of preparing for and carrying out the welding.

8.2.2 Product analysis

Option 4: Product analysis for the tubes shall be supplied.

Table 5 specifies the permissible deviation of the product analysis from the specified limits on cast analysis given in Tables 2, 3 and 4.

Table 2 — Chemical composition (cast analysis) ^a of austenitic corrosion resisting steels, in % by mass

Steel grade		C max	Si	Mn	P max	S max	N	Cr	Cu	Mo	Nb	Ni	Ti	Others
Steel name	Steel number													
X2CrNi18-9	1.4307	0,030	≤ 1,00	≤ 2,00	0,040	0,015 ^b	≤ 0,10	17,5 to 19,5	-	-	-	8,0 to 10,0 ^c	-	-
X2CrNi19-11	1.4306	0,030	≤ 1,00	≤ 2,00	0,040	0,015 ^b	≤ 0,10	18,0 to 20,0	-	-	-	10,0 to 12,0 ^d	-	-
X2CrNi18-10	1.4311	0,030	≤ 1,00	≤ 2,00	0,040	0,015	0,12 to 0,22	17,0 to 19,5	-	-	-	8,5 to 11,5	-	-
X5CrNi18-10	1.4301	0,07	≤ 1,00	≤ 2,00	0,040	0,015 ^b	≤ 0,10	17,0 to 19,5	-	-	-	8,0 to 10,5	-	-
X6CrNiTi18-10	1.4541	0,08	≤ 1,00	≤ 2,00	0,040	0,015	-	17,0 to 19,0	-	-	-	9,0 to 12,0 ^d	5xC to 0,70	-
X6CrNiNb18-10	1.4550	0,08	≤ 1,00	≤ 2,00	0,040	0,015	-	17,0 to 19,0	-	-	10xC to 1,00	9,0 to 12,0 ^d	-	-
X1CrNi25-21	1.4335	0,020	≤ 0,25	≤ 2,00	0,025	0,010	≤ 0,10	24,0 to 26,0	-	≤ 0,20	-	20,0 to 22,0	-	-
X2CrNiMo17-12-2	1.4404	0,030	≤ 1,00	≤ 2,00	0,040	0,015 ^b	≤ 0,10	16,5 to 18,5	-	2,0 to 2,5	-	10,0 to 13,0 ^e	-	-
X5CrNiMo17-12-2	1.4401	0,07	≤ 1,00	≤ 2,00	0,040	0,015 ^b	≤ 0,10	16,5 to 18,5	-	2,0 to 2,5	-	10,0 to 13,0	-	-
X1CrNiMoN25-22-2	1.4466	0,020	≤ 0,70	≤ 2,00	0,025	0,010	0,10 to 0,16	24,0 to 26,0	-	2,00 to 2,50	-	21,0 to 23,0	-	-
X6CrNiMoTi17-12-2	1.4571	0,08	≤ 1,00	≤ 2,00	0,040	0,015 ^b	-	16,5 to 18,5	-	2,00 to 2,50	-	10,5 to 13,5 ^c	5xC to 0,70	-
X6CrNiMoNb17-12-2	1.4580	0,08	≤ 1,00	≤ 2,00	0,040	0,015	-	16,5 to 18,5	-	2,00 to 2,50	10xC to 1,00	10,5 to 13,5	-	-
X2CrNiMoN17-13-3	1.4429	0,030	≤ 1,00	≤ 2,00	0,040	0,015	0,12 to 0,22	16,5 to 18,5	-	2,50 to 3,0	-	11,0 to 14,0 ^d	-	-
X3CrNiMo17-13-3	1.4436	0,05	≤ 1,00	≤ 2,00	0,040	0,015 ^b	≤ 0,10	16,5 to 18,5	-	2,50 to 3,0	-	10,5 to 13,0 ^d	-	-
X2CrNiMo18-14-3	1.4435	0,030	≤ 1,00	≤ 2,00	0,040	0,015 ^b	≤ 0,10	17,0 to 19,0	-	2,50 to 3,0	-	12,5 to 15,0	-	-
X2CrNiMoN17-13-5	1.4439	0,030	≤ 1,00	≤ 2,00	0,040	0,015	0,12 to 0,22	16,5 to 18,5	-	4,0 to 5,0	-	12,5 to 14,5	-	-