



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

Nahtlose 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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ICS:

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

Tubes en acier 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 European Standard was approved by CEN on 3 March 2004.

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 Central Secretariat 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 Central Secretariat has the same status as the official versions.

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EN 10216-5:2004 (E)**Foreword**

This document (EN 10216-5:2004) 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of an identical text or by endorsement, at the latest by March 2005, and conflicting national standards shall be withdrawn at the latest by March 2005.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 the EU Directive 97/23/EC.

For relationship with the EU Directive 97/23/EC, see informative Annex ZA, which is an integral part of this document.

Other parts of EN 10216 are:

- *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.*

Another European Standard series covering tubes for pressure purposes is:

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

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.

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 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.

The requirements of this part of EN 10216 rule when they differ from those in the standards and documents referred to below:

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 temperatures.*

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

EN 10021:1993, *General technical delivery conditions 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 systems.*

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

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

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

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

EN 10237, *Metallic materials - Tubes - 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 ferritic-austenitic steel tubes for verification of hydraulic leak tightness.*

EN 10246-6, *Non-destructive testing of steel tubes - Part 6: Automatic full peripheral ultrasonic testing of seamless steel tubes for the detection of transverse 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.*

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

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

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

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 and preparation of samples and test pieces for mechanical testing (ISO 377:1997).*

EN ISO 643, *Steels - Micrographic determination of the apparent grain size (ISO 643:2003)*

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.*

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3 Terms and definitions

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For the purposes of this document, the terms and definitions given in EN 10020:2000, EN 10021:1993, EN 10052:1993 and EN 10266:2003 together with 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 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 part of EN 10216 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 and CR 10260;

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).

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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 mechanical tests on samples which have undergone a different or additional heat treatment (see 8.3.1).
6. Impact test 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. Impact test at low temperature (see 8.3.3).
12. Intergranular corrosion test (see 8.4).
13. Selection 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. Type of inspection document 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).

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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.B inspection certificate in accordance with EN 10204:

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 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, 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:

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.

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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 in accordance with EN 10256 or, at least, an equivalent to it.

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

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

NDT operations shall be authorised 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 473 and EN 10256.

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.

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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 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.

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

8.1 General

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 Tables 2 or 3 for austenitic steels and of Table 4 for austenitic-ferritic steels.

Option 3: *(see Table 2).*

NOTE 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.

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