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Nevarjene jeklene cevi za tlačne posode - Tehnični dobavni pogoji - 4. del: Nelegirane in legirane jeklene cevi s specificiranimi lastnostmi za delo pri nizkih temperaturah

Seamless steel tubes for pressure purposes - Technical delivery conditions - Part 4: Non -alloy and alloy steel tubes with specified low temperature properties

Nahtlose Stahlrohre für Druckbeanspruchungen - Technische Lieferbedingungen - Teil 4: Rohre aus unlegierten und legierten Stählen mit festgelegten Eigenschaften bei tiefen Temperaturen

Tubes sans soudure en acier pour service sous pression - Conditions techniques de livraison - Partie 4 : Tubes en acier non allié et allié avec caractéristiques spécifiées à basse température

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Seamless steel tubes for pressure purposes - Technical delivery conditions - Part 4: Non-alloy and alloy steel tubes with specified low temperature properties

Tubes sans soudure en acier pour service sous pression - Conditions techniques de livraison - Partie 4 : Tubes en acier non allié et allié avec caractéristiques spécifiées à basse température

Nahtlose Stahlrohre für Druckbeanspruchungen - Technische Lieferbedingungen - Teil 4: Rohre aus unlegierten und legierten Stählen mit festgelegten Eigenschaften bei tiefen Temperaturen

This European Standard was approved by CEN on 17 August 2013.

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Foreword

This document (EN 10216-4:2013) has been prepared by Technical Committee ECISS/TC 110 “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of an identical text or by endorsement, at the latest by June 2014, and conflicting national standards shall be withdrawn at the latest by June 2014.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 10216-4:2002.

For the list of the most significant technical changes that have been made in this new edition, see Annex A.

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 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 (the present document);

Part 5 :Stainless steel tubes.

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, 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, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This European Standard specifies the technical delivery conditions in two test categories for seamless tubes of circular cross section, with specified low temperature properties, made of non-alloy and alloy steel.

NOTE Once this standard is published in the Official Journal of the European Union (OJEU) under Directive 97/23/EC, presumption of conformity to the Essential Safety Requirements (ESR) of Directive 97/23/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, needs to 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, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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, *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 10052, *Vocabulary of heat treatment terms for ferrous product*

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*

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

CEN/TR 10261, *Iron and steel - Review of available methods of chemical analysis*

EN ISO 148-1:2010, *Metallic materials - Charpy pendulum impact test - Part 1: Test method (ISO 148-1:2009)*

EN ISO 377:2013, *Steel and steel products - Location and preparation of samples and test pieces for mechanical testing (ISO 377:2013)*

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

EN ISO 6892-1:2009, *Metallic materials - Tensile testing - Part 1: Method of test at room temperature (ISO 6892-1:2009)*

EN ISO 8492:2004, *Metallic materials - Tube - Flattening test (ISO 8492:1998)*

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

EN ISO 8495:2004, *Metallic materials - Tube - Ring expanding test (ISO 8495:1998)*

EN ISO 8496:2004, *Metallic materials - Tube - Ring tensile test (ISO 8496:1998)*

EN ISO 10893-1, *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 leak-tightness (ISO 10893-1)*

EN ISO 10893-3, *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)*

EN ISO 10893-8, *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)*

EN ISO 10893-10, *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)*

EN ISO 14284:2002, *Steel and iron - Sampling and preparation of samples for the determination of chemical composition (ISO 14284)*

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 10052, EN 10266 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 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 EN 10266 and the following apply.

— TC test category

5 Classification and designation

5.1 Classification

In accordance with the classification system in EN 10020, the steel grades P 215NL, P 255QL and P265NL are classified as non-alloy quality steels and the other steel grades are classified as 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 Part of EN 10216;

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 of non-alloy steel grades is designated by:

— the capital letter P for pressure purposes;

— the indication of the specified minimum yield strength at room temperature, expressed in MPa (see Table 4);

— the symbol of the heat treatment for the steel grade concerned (see Table 1);

— the symbol L for low temperature.

5.2.3 The steel name of alloy-steel grades is designated by the chemical composition (see Table 2) and the symbols for the heat treatment, where specified in column 1 and footnote a) of Table 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 or total length or number);

b) the term "tube";

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

d) the designation of the steel grade in accordance with this Part of EN 10216 (see 5.2);

e) the test category for non-alloy steel (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 tubes shall be supplied in accordance with the basic specification (see 6.1).

1) Cold finishing (see 7.2.2);

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

3) product analysis (see 8.2.2);

4) selection of test method for verification of leak-tightness (see 8.4.2.1);

5) Non-Destructive Testing for test category 2 tubes for detection of transverse imperfections (see 8.4.2.2);

6) Non-Destructive Testing for test category 2 tubes for detection of laminar imperfections (see 8.4.2.2);

7) special ends preparation (see 8.6);

8) exact lengths (see 8.7.3);

9) inspection certificate 3.2 other than the standard document (see 9.2.1);

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

11) wall thickness measurement away from the ends (see 11.9);

12) Non-Destructive Testing method (see 11.11.1);

13) additional marking (see 12.2);

14) protection (see 13).

6.3 Example of an order

50 t of seamless tube with an outside diameter of 168,3 mm, a wall thickness of 4,5 mm in accordance with EN 10216-4, made of steel grade P265NL, test category 1, with a 3.2 inspection certificate in accordance with EN 10204:

EXAMPLE 50 t - Tube - 168,3 x 4,5 - EN 10216-4 - P265NL - TC1 - Option 9: 3.2.

7 Manufacturing process

7.1 Steelmaking process

The steelmaking process is at the discretion of the manufacturer with the exception that 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.

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

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 with 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 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.

Unless option 1 is specified, the tubes may be either hot or cold finished at the discretion of the manufacturer. 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.

Option 1: *The tubes shall be cold finished before heat treatment.*

7.2.3 The tubes shall be supplied in the relevant heat treatment conditions as specified in Table 1.

Table 1 — Delivery conditions

Steel grade		Heat treatment [a] [b]	Normalizing temperature ° C	Tempering temperature °C	Quenching and tempering		
Steel name	Steel number				Hardening temperature ° C	Cooling medium [c]	Tempering temperature °C
P215NL	1.0451	+N	900 to 940	--	--	--	--
P255QL	1.0452	+QT	--	--	890 to 930	Water or oil	600 to 680
P265NL	1.0453	+N	880 to 940	--	--	--	--
26CrMo4-2	1.7219	+QT	--	--	830 to 860	Water or oil	600 to 680
11 MnNi5-3	1.6212	+N [d]	890 to 940	(580 to 640)	--	--	--
13 MnNi6-3	1.6217	+N [d]	890 to 940	(580 to 640)	--	--	--
12Ni14	1.5637	+NT	830 to 880	580 to 640	--	--	--
		+QT	--	--	820 to 880	Water or oil	580 to 660
X12Ni5	1.5680	+NT	800 to 850	580 to 640	--	--	--
		+QT	--	--	800 to 850	Water or oil	580 to 660
X10Ni9	1.5682	+N+NT	880 to 915 + 775 to 805	565 to 605 [e]	-	--	--
		+QT [f]	(880 to 930)	--	770 to 820	water or oil	540 to 600

[a] N = Normalizing ; QT = Quenching and Tempering; NT = Normalizing and Tempering.

[b] Where two types of heat treatment are specified for a steel grade, the application depends on wall thickness and T/D ratio. The decision is left to the manufacturer but shall be reported in the inspection document.

[c] When choosing the cooling medium, the influence of other parameters, such as dimensions and quenching temperature, on properties and crack susceptibility should be taken into account. Other cooling media such as synthetic quenchants may also be used.

[d] Tempering can occasionally be necessary after normalizing; the decision shall be left to the discretion of the manufacturer but shall be stated to the customer at the time of enquiry and order. Steel tubes treated in such a way shall be designated by the steel name supplemented by the symbol "+NT ".

[e] Cooling at still air or accelerated cooling.

[f] An additional prenormalizing treatment, in the temperature range indicated may be necessary for this grade. In such a case, the manufacturer shall inform the purchaser.

8 Requirements

8.1 General

When supplied in a delivery condition indicated in 7.2 and inspected in accordance with Clauses 9, 10 and 11, the tubes shall conform to the requirements of this Part EN 10216.

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

Tubes shall be suitable for hot and cold bending provided the bending is carried out in an appropriate manner.

8.2 Chemical composition

8.2.1 Cast analysis

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

When welding tubes are produced in accordance with this Part of EN 10216, account should be taken of 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 3: *A product analysis for the tubes shall be supplied.*

Table 3 specifies the permissible deviations of the product analysis from the specified limits on cast analysis given in Table 2.