SLOVENSKI STANDARD

SIST EN 10224:2003

01-april-2003

Nelegirane jeklene cevi in fitingi za transport vodnih tekoļ in vkljuļ no s pitno vodo - Tehniļ ni dobavni pogoji

Non-alloy steel tubes and fittings for the conveyance of aqueous liquids including water for human consumption - Technical delivery conditions

Rohre und Fittings aus unlegierten Stählen für den Transport wässriger Flüssigkeiten einschließlich Trinkwasser - Technische Lieferbedingungen

Tubes et raccords en acier non allié pour le transport de liquides aqueux, incluant l'eau destinée a la consommation - Conditions techniques de livraison

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Non-alloy steel tubes and fittings for the conveyance of aqueous liquids including water for human consumption - Technical delivery conditions

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This European Standard was approved by CEN on 19 August 2002.

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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 Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

Contents

Foreword

This document EN 10224:2002 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of an identical text or by endorsement, at the latest by June 2003, and conflicting national standards shall be withdrawn at the latest by September 2004.

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.

Annexes A to D are informative.

This document includes a Bibliography.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard : Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

This European Standard applies to tubular products for use with all types of aqueous liquids.

In respect of potential adverse effects on the quality of water intended for human consumption, caused by the product covered by this standard:

a) This standard provides no information as to whether the product may be used without restriction in any of the Member States of the EU or EFTA;

b) It should be noted that, while awaiting the adoption of verifiable European criteria, existing national regulations concerning the use and/or the characteristics of this product remain in force.

In addition to the requirements for the manufacture of tubes and fittings this European Standard contains requirements for the end preparation of tubes and fittings for butt welding and guidance is given in annex C on other types of jointing commonly used in piping systems for carrying aqueous liquids.

A range of commonly used coating and lining materials are identified in annex D of this standard for information. The purchaser may select a coating and/or lining material suitable for the application which should be applied in accordance with the appropriate standard. European Standards for coatings and linings for steel tubes are being prepared in CEN and are listed in a table in annex D.

1 Scope

1.1 This European Standard specifies requirements for the products listed below used for the conveyance of aqueous liquids, including water for human consumption:

— seamless and welded non-alloy steel tubes;

— end preparation of tube ends for butt welding;

— fittings fabricated from the tube;

— fittings fabricated from plate or strip.

NOTE This European Standard contains informative annexes giving guidance on tube sizes relevant to each manufacturing process covered, the relationship between nominal outside diameter (D) and nominal size (DN), on jointing other than butt welding, and on corrosion protection.

1.2 This European Standard covers a range of tube outside diameters from 26,9 mm to 2 743 mm.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 287-1, *Approval testing of welders - Fusion welding — Part 1: Steels.*

EN 288-1, *Specification and qualification of welding procedures for metallic materials — Part 1: General rules for fusion welding.*

EN 288-2, *Specification and approval of welding procedures for metallic materials — Part 2: Welding procedure specification for arc welding of steels.*

EN 288-3, *Specification and approval of welding procedures for metallic materials — Part 3: Welding procedure tests for arc welding of steels.*

EN 571-1, *Non Destructive Testing — Penetrant testing — Part 1: General principles.*

EN 910, *Destructive tests on welds in metallic materials — Bend tests.*

EN 1290, *Non-destructive examination of welds — Magnetic particle examination of welds.*

EN 1435, *Non-destructive examination of welds — Radiographic examination of welded joints.*

EN 1714, *Non-destructive examination of welds — Ultrasonic examination of welded joints.*

EN 10002-1, *Metallic materials - Tensile testing — Part 1: Method of test at ambient temperature.*

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

EN 10021, *General technical delivery requirements for steel and iron products.*

EN 10052, *Vocabulary of heat treatment terms for ferrous products.*

EN 10204, *Metallic products — Types of inspection documents.*

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

EN 10233, *Metallic materials — Tube — Flattening test.*

EN 10234, *Metallic materials — Tube — Drift expanding test.*

EN 10246-1, *Non-destructive testing of steel tubes — Part 1: Automatic electromagnetic testing of seamless and welded (except submerged arc welded) ferromagnetic steel tubes for verification of hydraulic leak-tightness.*

EN 10246-3, *Non-destructive testing of steel tubes — Part 3: Automatic eddy current testing of seamless and welded (except submerged arc-welded) steel tubes for the detection of imperfections.*

EN 10246-5, *Non-destructive testing of steel tubes — Part 5: Automatic full peripheral magnetic transducer/flux leakage testing of seamless and welded (except submerged arc welded) ferromagnetic steel tubes for the detection of longitudinal 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 10246-8, *Non-destructive testing of steel tubes — Part 8: Automatic ultrasonic testing of the weld seam of electric welded steel tubes for the detection of longitudinal imperfections.*

EN 10246-9, *Non-destructive testing of steel tubes — Part 9: Automatic ultrasonic testing of the weld seam of submerged arc welded steel tubes for the detection of longitudinal and/or transverse imperfections.*

EN 10246-10, *Non-destructive testing of steel tubes — Part 10: Radiographic testing of the weld seam of automatic fusion arc welded steel tubes for the detection of imperfections.*

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

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

prEN 10266[1)], *Steel tubes, fittings and structural hollow sections — Definitions and symbols for use in product standards.*

CR 10261, *Iron and steel — Review of available methods for chemical analysis.*

prEN 10168[1)], *Iron and steel products — Inspection documents — List of information and description.*

EN ISO 377, *Steel and steel products — Location and preparation of samples and test pieces for mechanical testing (ISO 377:1997).*

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

EN ISO 14284, *Steel and iron — Sampling and preparation of samples for the determination of chemical composition (ISO 14284:1996).*

3 Terms, definitions and symbols

3.1 General

For the purposes of this European Standard the terms and definitions given in EN 10020, EN 10021, EN 10052 and prEN 10266 and the following apply.

The symbols used in this European Standard are defined in EN 10020, EN 10021, EN 10052 and prEN 10266.

Other symbols for sampling and testing are given in the appropriate sampling and testing standards referenced in clauses 9 and 10.

3.2
effective length
actual length that a tube contributes when correctly assembled in a run of piping

3.3
allowable operating pressure (PFA)
maximum hydrostatic pressure that a component is capable of withstanding continuously in service

3.4
employer
organization for which a person works on a regular basis. The employer may be either the tube or fitting manufacturer or a third party organization providing non-destructive testing (NDT) services

4 Classification and designation

4.1 Classification

All steels covered by this European Standard are classified as non-alloy steels in accordance with EN 10020.

4.2 Designation

4.2.1 For products covered by this European Standard the steel designation consists of the number of this European Standard (EN 10224) and either the steel name in accordance with EN 10027-1 and CR 10260 or the steel number in accordance with EN 10027-2 (see Table 1).

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1) In preparation; until this document is published as a European Standard the corresponding national standard should be agreed at the time of enquiry and order.

4.2.2 The steel name consists of the following:

— the capital letter L for line pipe;

— the specified minimum yield strength of the steel for wall thicknesses less than or equal to 16 mm, expressed in MPa[2] (see Table 3).

5 Information to be supplied by the purchaser

5.1 Mandatory information

The following information shall be supplied by the purchaser at the time of enquiry and order.

5.1.1 Tubes

a) the quantity (mass or total length or number);

b) the term ‘tube’;

c) the designation (see 4.2);

d) the dimensions (see 7.6);

e) the options required (see 5.2).

5.1.2 Fittings

a) the number;

b) the type of fitting (see 7.8);

c) the designation (see 4.2);

d) the dimensions (see 7.8);

e) the maximum and, where vacuum conditions exist, the minimum, allowable operating pressure (see 7.1);

f) the options required (see 5.2)

5.2 Options

A number of options are specified in this European Standard and these are listed below. In the event that the purchaser does not indicate his wish to implement any of these options, at the time of enquiry and order the products shall be supplied in accordance with the basic specification.

Option: 1) The type of tube, seamless or welded shall be as specified (see 6.3.2.1).

Option: 2) The weld area of electric welded tubes shall be heat treated (see 6.3.2.2).

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[2] 1 N/mm^2 = 1 MPa

Option: 3) The maximum copper content shall be specified (see 7.2.1).

Option: 4) A product analysis shall be supplied (see 7.2.2).

Option: 5) Rectification of the body of submerged arc welded tubes and fittings by welding shall not be permitted (see 7.4).

Option: 6) The tubes shall be supplied in approximate lengths (see 7.6.2).

Option: 7) The tubes shall be supplied in exact lengths (see 7.6.2).

Option: 8) The ends of tubes and/or fittings shall be prepared for butt welding (see 7.10.1).

Option: 9) An alternative bevel end preparation for butt welding shall be provided (see 7.10.4.2).

Option: 10) Products shall be supplied with specific inspection and testing (see 8.1).

Option: 11) An inspection certificate 3.1.A or 3.1.C or an inspection report 3.2 shall be supplied (see 8.2).

Option: 12) The type of leak tightness test shall be as specified (see 10.3.1).

Option: 13) The hydrostatic test shall be carried out at a pressure of 1,5 x P.F.A. (see 10.3.2).

Option: 14) The method of non-destructive testing for the welds of fittings shall be as specified (see 10.5).

Option: 15) The tubes and fittings shall be supplied with a temporary mill protection (see clause 13).

Option: 16) The tubes shall be supplied with a coating and/or lining (see clause 13).

5.3 Examples of an order

Example 1

5 km of submerged arc welded tubes in accordance with EN 10224 with an external diameter of 914 mm and a thickness of 10,0 mm made from steel L275 with preparation of tube ends for butt welding and subjected to specific inspection and testing.

5000 m - tube - EN 10224 - L275 - 914 × 10,0 - Options 1: SAW, 8 and 10.

Example 2

5 gusseted bends in accordance with EN 10224 with external diameter of 914 mm and thickness of 10,0 mm made from steel L275, with a 30° angle for operation at 10 bar gauge pressure, supplied with an inspection certificate 3.1.C, and temporary mill protection.

5 - gusseted bends - EN 10224 - L275 - 914 x 10,0 - 30° - 10 bar - Options 11, 3.1.C and 15.

6 Manufacturing process

6.1 Steel manufacturing process

The steel manufacturing process is at the discretion of the tube or fittings manufacturer.

6.2 Deoxidation process

The steel shall be fully killed.

6.3 Product manufacture and delivery conditions

6.3.1 General

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

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

NOTE 1 It is recommended that level 3 personnel are certified in accordance with EN 473, 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 individual approved by the employer.

NOTE 2 The definitions of level 1, 2 and 3 can be found in appropriate standards e.g. EN 473 or EN 10256.

6.3.2 Tube

6.3.2.1 Tube shall be manufactured from one of the steels specified in Table 1 and by one of the following processes.

a) Seamless (S);

b) Butt welded (BW);

c) Electric welded (EW);

d) Submerged arc weld (SAW).

The welds of butt welded tubes shall be longitudinal; the welds of electric welded and submerged arc welded tubes shall be either longitudinal or helical.

The tube manufacturing process is at the discretion of the manufacturer unless the type of tube, seamless or welded, is specified by the purchaser.

Option 1 The type of tube, seamless or welded, is specified by the purchaser. The tubes shall then be marked with an S or W as appropriate (see also 12.1e).

NOTE The manufacturing process is related to the tube diameter and thickness. Information on the typical range of sizes and thicknesses available for each process is given in annex A.

6.3.2.2 The tubes shall be supplied as welded, hot finished, cold formed or cold finished at the discretion of the manufacturer. However, to achieve the required properties a heat treatment may be performed.

The purchaser may specify that the weld area of as welded EW tubes shall be heat treated to produce properties similar to those in the body of the tube.

Option 2 The weld area of EW tubes shall be heat treated.

6.3.2.3 The delivered tubes shall not include welds used for joining together lengths of the hot or cold rolled strip prior to forming except as specified in 6.3.2.4.

6.3.2.4 For helically welded submerged arc welded tubes the weld joining lengths of strip may be part of the delivered tube provided that the weld is made by the same method of welding as the helical seam weld.

6.3.3 Fittings

6.3.3.1 Fittings shall be manufactured from tubes manufactured in accordance with this standard or from plate or strip made from one of the steel grades in Table 1.

6.3.3.2 All welds of fittings made from plate or strip and all fabrication welds shall be arc welds and the preparation for welding and the welding shall be carried out to qualified procedures using competent welders. Procedures in accordance with EN 288-1, 2 and 3 carried out by welders qualified in accordance with EN 287-1 meet this requirement.

7 Requirements

7.1 General

Tubes and fittings, when inspected and tested in accordance with clauses 9 and 10, shall comply with the requirements of 7.2 to 7.10 as appropriate. In addition to the requirements of this European Standard the general technical delivery conditions specified in EN 10021 apply.

Fittings shall be designed to withstand a pressure of not less than 1,5 times the allowable operating pressure.

7.2 Chemical composition

7.2.1 Cast analysis

The cast analysis of the steel shall comply with the requirements of Table 1.

Table 1 — Chemical composition limits of the cast analysis

Steel grade		C %	Si %	Mn %	P %	S %
Steel name	Steel number	max	max	max	max	max
L235	0252	0,16	0,35	1,20	0,030	0,025
L275	0260	0,20	0,40	1,40	0,030	0,025
L355[a]	0419	0,22	0,55	1,60	0,030	0,025

[a] For steel L355 additions of niobium, titanium and vanadium are permitted at the discretion of the manufacturer. In this case the inspection documents shall state the level of these elements.

Elements not included in Table 1 may be present but shall not be intentionally added to the steel without the agreement of the purchaser, except for elements which may be added for finishing the cast. All appropriate measures shall be taken by the steelmaker to prevent the addition of undesirable elements from scrap or other materials used in the steelmaking process.

A maximum copper content lower than that permitted by EN 10020 may be specified by the purchaser to facilitate subsequent forming operations.

Option 3 The maximum copper content is specified lower than that permitted by EN 10020 for non alloy steel.

7.2.2 Product analysis

For products supplied with specific inspection and testing, and when specified by the purchaser, a product analysis shall be provided for each grade of steel supplied.

Option 4 A product analysis shall be provided for each grade of steel supplied.

Table 2 specifies the permissible deviations of the product analysis from the specified limits for cast analysis given in Table 1.

Table 2 — Permissible deviation of the product analysis from the specified cast analysis limits given in Table 1

Element	Limiting values %	Permissible deviation %
C	≤ 0,20	+ 0,02
	> 0,20	+ 0,03
Si	≤ 0,55	+ 0,05
Mn	≤ 1,60	+ 0,10
P	≤ 0,030	+ 0,005
S	≤ 0,025	+ 0,005
Cu	≤ 0,35	+ 0,05
	> 0,35	+ 0,07

NOTE When welding tubes or fittings produced according to this European Standard 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 conditions of preparing for and carrying out the welding.

7.3 Mechanical properties

7.3.1 Tensile test for tubes and fittings

The minimum yield strength, tensile strength range and minimum elongation for the tubes and fittings covered by this European Standard shall be in accordance with Table 3.

For even curvature bends and fittings made from plate or strip the tensile test properties shall be determined after forming.

NOTE The tensile test properties may be affected by subsequent heating or reheat treatments. Purchasers who intend to heat or reheat treat any of the products are advised to discuss the application and proposed heating or reheat treatment with the manufacturer.

Table 3 — Mechanical properties at room temperatures

Steel name	Tensile strength R_m MPa	Minimum yield strength R_e [a] MPa for thicknesses in mm		Minimum elongation A % ($Lo = 5{,}65 \sqrt{S_o}$)		Diameter of mandrel for the weld bend test	For the drift expanding test[c] % increase in d/D [d] ratio	
		$T \leq 16$	$T > 16$	l [b]	t [b]		≤ 0,8	> 0,8
L235	360 to 500	235	225	25	23	3T	10	12
L275	430 to 570	275	265	21	19	4T	8	10
L355	500 to 650	355	345	21	19	4T	6	8

[a] R_e shall be R_{eH}, or if a yield phenomenon is not present, $R_{p0,2}$ or $R_{t\,0,5}$. See 10.2.1.

[b] l – longitudinal

t – transverse

[c] Applicable only to tubes of diameter less than or equal to 150 mm and thicknesses less than or equal to 10 mm.

[d] d = D-2T