



**SLOVENSKI STANDARD**  
**SIST EN 10296-2:2006**

**01-marec-2006**

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**Okrogle varjene jeklene cevi za strojništvo in splošno uporabo v tehniki – Tehnični dobavni pogoji – 2. del: Nerjavna jekla**

Welded circular steel tubes for mechanical and general engineering purposes - Technical delivery conditions - Part 2: Stainless steel

Geschweißte kreisförmige Stahlrohre für den Maschinenbau und allgemeine technische Anwendungen - Technische Lieferbedingungen - Teil 2: Nichtrostende Stähle

Tubes ronds soudés en acier pour utilisation en mécanique générale et en construction mécanique - Conditions techniques de livraison - Partie 2: Tubes en acier inoxydable

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**Ta slovenski standard je istoveten z: EN 10296-2:2005**

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**ICS:**

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  
EUROPÄISCHE NORM

**EN 10296-2**

December 2005

ICS 77.140.75

English Version

**Welded circular steel tubes for mechanical and general  
engineering purposes - Technical delivery conditions - Part 2:  
Stainless steel**

Tubes ronds soudés en acier pour utilisation en mécanique  
générale et en construction mécanique - Conditions  
techniques de livraison - Partie 2: Tubes en acier  
inoxydable

Geschweißte kreisförmige Stahlrohre für den  
Maschinenbau und allgemeine technische Anwendungen -  
Technische Lieferbedingungen - Teil 2: Nichtrostende  
Stähle

This European Standard was approved by CEN on 4 April 2005.

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.

CEN members are the national standards bodies of 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.



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

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

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## Foreword

This document (EN 10296-2:2005) 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 2006, and conflicting national standards shall be withdrawn at the latest by June 2006.

Another part of EN 10296 is:

- Part 1: Non-alloy and alloy steel tubes

Another European Standard series, covering seamless steel tubes for mechanical and general engineering purposes, currently being prepared is:

- EN 10297: Seamless circular steel tubes for mechanical and general engineering purposes — Technical delivery conditions.

Other series of European Standards being prepared in this area are prEN 10294 - hollow bars for machining and EN 10305 - steel tubes for precision applications.

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.

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**EN 10296-2:2005 (E)****Introduction**

The European Committee for Standardisation (CEN) draws attention to the fact that it is claimed that compliance with this document may involve the use of patents applied to steel grades 1.4362 and 1.4854, the compositions of which are given in Tables 1 and 2.

CEN takes no position concerning the evidence, validity and scope of these patent rights.

The holders of these patent rights have assured CEN that they are willing to negotiate licences, under reasonable and non-discriminatory terms and conditions, with applicants throughout the world. In this respect, the statements of the holders of these patent rights are registered with CEN. Information may be obtained from:

Grade 1.4362  
Sandvik AB  
SE-811 81 SANDVIKEN  
Sweden

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Grade 1.4854  
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Attention is drawn to the possibility that some of the elements within this European Standard may be the subject of patent rights other than those indicated above. CEN shall not be responsible for identifying any or all such patent rights.

## 1 Scope

This European Standard specifies the technical delivery conditions for welded tubes, of circular cross section, made from stainless steels, for mechanical and general engineering purposes.

## 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.

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

EN 10002-1, *Metallic materials – Tensile testing – Part 1: Method of test (at ambient temperature)*

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

EN 10021:1993, *General technical delivery requirements for steel and iron products*

EN 10027-1, *Designation systems for steel – Part 1: Steel names, principal symbols*

EN 10027-2, *Designation systems for steel – Part 2: Numerical system*

EN 10052:1993, *Vocabulary of heat treatment terms for ferrous products*

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

EN 10168, *Steel products – Inspection documents – List of information and description*  
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EN 10204, *Metallic products – Types of inspection documents*

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 austenitic-ferritic 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 10246-7, *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 10256, *Non-destructive testing of steel tubes – Qualification and competence of level 1 and 2 non-destructive testing personnel.*

EN 10266:2003, *Steel tubes, fittings and steel structural hollow sections - Symbols and definitions of terms for use in product standards.*

CR 10260:1998, *Designation system for steel – Additional symbols*

**EN 10296-2:2005 (E)**

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

EN ISO 8491, *Metallic materials – Tube (in full section) - Bend test (ISO 8491:1998)*

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

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

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

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)*

**3 Terms and definitions**

For the purposes of this European Standard, the terms and definitions given in EN 10020:2000, EN 10021:1993, EN 10052:1993 and EN 10266:2003 together with the following apply.

**employer**

organisation for which the person works on a regular basis

NOTE The employer may be either the tube manufacturer or a third party organisation providing non-destructive testing (NDT) services.

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**4 Symbols**

For the purposes of this European Standard, the symbols given in EN 10266:2003 and CR 10260:1998 apply.

Not applicable.

**5 Classification and designation****5.1 Classification**

In accordance with the classification system in EN 10020, the steel grades listed in Tables 1 and 2 are stainless steels.

**5.2 Designation**

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

— number of this document (EN 10296-2);

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  $D$ , wall thickness  $T$ ) (see 8.7);
- d) steel designation (see 5.2);
- e) delivery condition for austenitic and austenitic-ferritic grades (see 7.2.2).

### 6.2 Options

A number of options are specified in this document and these are listed below with appropriate clause references. 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) process route and /or surface condition (see 7.2.1);
- 2) weld bead finish (see 7.2.1);
- 3) pickled tube (see 7.2.2);
- 4) controlled sulphur content (see Table 1);
- 5) non-destructive testing of the weld (see 8.4.2);
- 6) leak tightness test (see 8.4.2);
- 7) straightness (see 8.5);
- 8) random lengths (see 8.7.2);
- 9) exact lengths (see 8.7.2);
- j) outside diameter tolerances (see 8.7.3.1)
- k) specific inspection and testing (see 9.1);
- l) test report 2.2 (see 9.2.1);
- m) inspection document, 3.2 (see 9.2.1);
- n) leak tightness test method (see 11.7.1).

### 6.3 Example of an order

Fifteen tonnes of welded steel tubes with a specified outside diameter of 60,3 mm, a specified wall thickness of 3,2 mm, in accordance with EN 10296-2, made from steel grade 1.4301, solution annealed, (supplied in 6 m standard length) and with a test report 2.2 (option 12) in accordance with EN 10204.

15 t – Tube - 60,3 x 3.2 - EN 10296-2 - 1.4301+AT- option 12

## EN 10296-2:2005 (E)

**7 Manufacturing process****7.1 Steelmaking process**

The steelmaking process is at the discretion of the manufacturer.

**7.2 Tube manufacturing and delivery conditions**

**7.2.1** Tubes shall be produced from hot or cold rolled strip or plate/sheet, longitudinally welded across the abutting edges, by a continuous automatic process with or without the addition of filler metal. The welding process is at the discretion of the manufacturer.

Acceptable process routes and surface conditions are given in Table A.1. The choice of process route, base material, hot or cold rolled feedstock and the surface condition, is at the discretion of the manufacturer unless Option 1 is specified.

**Option 1:** *The process route and/or surface condition is specified by the purchaser from those in Table A.1.*

Tubes shall be delivered with one of the following weld bead finishes:

- Finish A: Internal and external weld bead not removed;
- Finish B: External weld bead removed internal weld bead not removed;
- Finish C: Internal and external weld bead rolled or removed.

Finish A shall not be used for high frequency (HF) welded tube.

The weld bead finish is at the discretion of the manufacturer unless Option 2 is specified.

**Option 2:** *The weld bead finish; A, B or C is specified by the purchaser.*

The finished tubes shall not include the welds used to join the lengths of strip prior to forming the tube. However jointers are permitted when the purchaser specifies lengths in excess of the production maximum, if agreed at the time of enquiry and order.

**7.2.2** Tubes produced in accordance with 7.2.1 shall be delivered in the following delivery conditions:

- ferritic steels: as welded (+AR) or annealed (+A), at the discretion of the manufacturer;
- austenitic and austenitic-ferritic steels: as-welded (+AR) or solution annealed (+AT), as specified by the purchaser (see 6.1).

See Annex B for guidance on heat treatment following fabrication and further processing.

When Option 3 is specified, the tubes shall be supplied pickled.

**Option 3:** *Tubes shall be supplied pickled.*

**7.2.3** 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 with 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 the appropriate standards, e.g. EN 473 and EN 10256.

## 8 Requirements

### 8.1 General

Tubes, when supplied in a delivery condition in accordance with 7.2.2, using a process route and to a surface condition given in Table A.1 and inspected in accordance with Clause 9, shall conform to the requirements of this document.

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

### 8.2 Chemical composition

The cast analysis reported by the steel producer shall apply and shall conform to the requirements of Tables 1 or 2, as appropriate.

Elements not included in Tables 1 and 2 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 to prevent the addition of undesirable elements from scrap or other materials used in the steelmaking process.

The permissible deviations of a product analysis from the specified limits of the cast analysis are given in Table 3.

NOTE When subsequently welding tubes produced according to 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 but also on the conditions of preparing for and carrying out the welding. Some of the steels specified in this standard cannot be welded unless specialised techniques are employed by specialist welders.

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Table 1 — Chemical composition (cast analysis) for tubes made from ferritic, austenitic and austenitic-ferritic corrosion resistant steel, in % by mass

Steel grade		C	Si	Mn	P	S	Cr		Mo		Ni		Cu		N		Nb		Ti	
Steel name	Steel number	max.	max.	max.	max.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
Ferritic steels																				
X2CrNi12	1.4003	0,030	1,00	1,50	0,040	0,015	10,5 <sup>c</sup>	12,5			0,30	1,00				0,030				
X2CrTi12	1.4512	0,030	1,00	1,00	0,040	0,015	10,5	12,5								0,030			6x (C+N)	0,65
X6Cr17	1.4016	0,08	1,00	1,00	0,040	0,015 <sup>a</sup>	16,0	18,0												
X3CrTi17	1.4510	0,05	1,00	1,00	0,040	0,015 <sup>a</sup>	16,0	18,0											[4x (C+N) + 0,15]	0,80 <sup>b</sup>
X2CrMoTi18-2	1.4521	0,025	1,00	1,00	0,040	0,015	17,0	20,0	1,80	2,50						0,030			4x (C+N) + 0,15	0,80 <sup>b</sup>
X6CrMoNb17-1	1.4526	0,08	1,00	1,00	0,040	0,015	16,0	18,0	0,80	1,40						0,040	7x(C+N) + 0,10	1,00		
X2CrTiNb18	1.4509	0,030	1,00	1,00	0,040	0,015	17,5	18,5									3xC + 0,30	1,00	0,10	0,69
Austenitic steels																				
X2CrNi18-7	1.4318	0,030	1,00	2,00	0,045	0,015 <sup>a</sup>	16,5	18,5			6,0	8,0			0,10	0,20				
X2CrNi18-9	1.4307	0,030	1,00	2,00	0,045	0,015 <sup>a</sup>	17,5	19,5			8,0	10,5				0,11				
X2CrNi19-11	1.4306	0,030	1,00	2,00	0,045	0,015 <sup>a</sup>	18,0	20,0			10,0	12,0				0,11				
X2CrNi18-10	1.4311	0,030	1,00	2,00	0,045	0,015 <sup>a</sup>	17,0	19,5			8,5	11,5			0,12	0,22				
X5CrNi18-10	1.4301	0,07	1,00	2,00	0,045	0,015 <sup>a</sup>	17,0	19,5			8,0	10,5				0,11				
X6CrNiTi18-10	1.4541	0,08	1,00	2,00	0,045	0,015 <sup>a</sup>	17,0	19,0			9,0	12,0							5xC	0,70
X6CrNiNb18-10	1.4550	0,08	1,00	2,00	0,045	0,015 <sup>a</sup>	17,0	19,0			9,0	12,0					10xC	1,00		
X2CrNiMo17-12-2	1.4404	0,030	1,00	2,00	0,045	0,015 <sup>a</sup>	16,5	18,5	2,00	2,50	10,0	13,0				0,11				
X5CrNiMo17-12-2	1.4401	0,07	1,00	2,00	0,045	0,015 <sup>a</sup>	16,5	18,5	2,00	2,50	10,0	13,0				0,11				
X6CrNiMoTi17-12-2	1.4571	0,08	1,00	2,00	0,045	0,015 <sup>a</sup>	16,5	18,5	2,00	2,50	10,5	13,5							5xC	0,70
X2CrNiMo17-12-3	1.4432	0,030	1,00	2,00	0,045	0,015 <sup>a</sup>	16,5	18,5	2,50	3,00	10,5	13,0				0,11				
X2CrNiMoN17-13-3	1.4429	0,030	1,00	2,00	0,045	0,015	16,5	18,5	2,50	3,00	11,0	14,0			0,12	0,22				
X3CrNiMo17-13-3	1.4436	0,05	1,00	2,00	0,045	0,015 <sup>a</sup>	16,5	18,5	2,50	3,00	10,5	13,0				0,11				
X2CrNiMo18-14-3	1.4435	0,030	1,00	2,00	0,045	0,015 <sup>a</sup>	17,0	19,0	2,50	3,00	12,5	15,0				0,11				
X2CrNiMoN17-13-5	1.4439	0,030	1,00	2,00	0,045	0,015	16,5	18,5	4,0	5,0	12,5	14,5			0,12	0,22				