

SLOVENSKI STANDARD

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Seamless circular steel tubes for mechanical and general engineering purposes -
Technical delivery conditions - Part 1: Non-alloy and alloy steel tubes

Nahtlose kreisförmige Stahlrohre für den Maschinenbau und allgemeine technische
Anwendungen - Technische Lieferbedingungen Teil 1: Rohre aus unlegierten und
legierten Stählen

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Tubes ronds sans soudure en acier pour utilisation en mécanique générale et en
construction mécanique - Conditions techniques de livraison - Partie 1: Tubes en acier
non allié et allié

Ta slovenski standard je istoveten z: EN 10297-1:2003

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
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EN 10297-1

February 2003

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English version

**Seamless circular steel tubes for mechanical and general
engineering purposes - Technical delivery conditions - Part 1:
Non-alloy and alloy steel tubes**

Tubes sans soudure en acier pour utilisation en mécanique
générale et en construction mécanique - Conditions
techniques de livraison - Partie 1: Tubes en acier non allié
et allié

Nahtlose kreisförmige Stahlrohre für den Maschinenbau
und allgemeine technische Anwendungen - Technische
Lieferbedingungen - Teil 1: Rohre aus unlegierten und
legierten Stählen

This European Standard was approved by CEN on 16 October 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
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EUROPÄISCHES KOMITEE FÜR NORMUNG

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Contents

	page
Foreword.....	4
1 Scope	5
2 Normative references	5
3 Terms and definitions.....	6
4 Symbols	7
5 Classification and designation	7
5.1 Classification.....	7
5.2 Designation.....	7
6 Information to be supplied by the purchaser.....	8
6.1 Mandatory information	8
6.2 Options.....	9
6.3 Example of an order.....	9
7 Manufacturing process	10
7.1 Steelmaking process	10
7.2 Deoxidation process.....	10
7.3 Tube manufacture and delivery conditions	10
8 Requirements	12
8.1 General.....	12
8.2 Chemical composition.....	12
8.3 Mechanical properties	15
8.4 Hardness requirements.....	22
8.5 Hardenability	22
8.6 Appearance and soundness	23
8.7 Straightness	23
8.8 End preparation.....	23
8.9 Dimensions, masses, tolerances and sectional properties	23
9 Inspection	27
9.1 Types of inspection	27
9.2 Inspection documents.....	27
9.3 Summary of inspection and testing	28
10 Sampling	29
10.1 Frequency of tests	29
10.2 Preparation of samples and test pieces	30
11 Test methods.....	31
11.1 Tensile test	31
11.2 Impact test	31
11.3 Hardenability test.....	32
11.4 Hardness test	32
11.5 Leak tightness test.....	32
11.6 Non-destructive testing.....	33
11.7 Dimensional inspection.....	33
11.8 Visual examination.....	33
11.9 Material identification	33
11.10 Retests, sorting and reprocessing.....	33
12 Marking	33

13	Protection	34
Annex A	(normative) Steels for case hardening	35
Annex B	(informative) Recommended heat treatment temperatures	36
Annex C	(normative) Hardness requirements for heat treated tubes.....	38
Annex D	(normative) Hardenability - Limiting values for C scale Rockwell	39
Annex E	(normative) Formulae for calculation of nominal section properties.....	42
Bibliography	43

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[SIST EN 10297-1:2003](https://standards.iteh.ai/catalog/standards/sist/a7b15594-7d63-4e56-9cdd-e7afc3ccbda9/sist-en-10297-1-2003)

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EN 10297-1:2003 (E)**Foreword**

This document (EN 10297-1:2003) 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 August 2003, and conflicting national standards shall be withdrawn at the latest by August 2003.

In this European Standard the annexes A, C, D and E are normative and annex B is informative.

Another Part of EN 10297 in course of preparation is :

— Part 2 : *Stainless steel tubes*

Another European Standard series covering welded tubes for mechanical and general engineering purposes is currently being prepared.

prEN 10296, *Welded circular steel tubes for mechanical and general engineering purposes — Technical delivery conditions.*

Other European Standard series being prepared in this area are prEN 10294 for hollow bars for machining and prEN 10305 for 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, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This Part of EN 10297 specifies the technical delivery conditions for seamless circular tubes made of non-alloy and alloy steels for mechanical and general engineering purposes.

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 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 10027-1, *Designation systems for steel — Part 1: Steel names, principal symbols.*

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

EN 10045-1, *Metallic materials — Charpy Impact test — Part 1: Test method.*

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

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

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

EN 10220, *Seamless and welded steel tubes - General tables of dimensions and masses per unit length.*

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

CR 10260:1998, *Designation systems for steel - Additional symbols.*

prEN 10266, *Steel tubes, fittings and structural hollow sections — Symbols and definition 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 10297-1:2003 (E)

EN ISO 642, *Steel — Hardenability test by end quenching (Jominy test) (ISO 642:1999).*

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

EN ISO 6506-1, *Metallic materials - Brinell hardness test — Part 1: Test method (ISO 6506-1:1999).*

EN ISO 6508-1:1999, *Metallic materials - Rockwell hardness test — Part 1 : Test method (scales A, B, C, D, E, F, G, H, K, N, T) (ISO 6508-1:1999).*

EURONORM 103, *Micrograph determination of the ferritic or austenitic grain size of steels.*

3 Terms and definitions

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 terms and definitions apply.

3.1**fine grain steel**

steel having an austenitic/ferritic grain size equal to or finer than 6 when measured in accordance with EURONORM 103

3.2**normalizing rolling**

a rolling process in which the final deformation is carried out in a certain temperature range leading to a material condition equivalent to that obtained after normalizing so that the specified values of the mechanical properties are retained even after normalizing (+N)

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NOTE Delivery condition of tubes manufactured by a normalizing rolling process or normalized by heat treatment in a furnace are both identified with the same symbol.

3.3**as rolled**

formed after heating into the austenitic region (i.e. above AC 3) without subsequent heat treatment (+AR)

3.4**annealing**

heat treatment at a temperature slightly below AC 1 (+A)

3.5**TH treatment**

heat treatment with the object of achieving a hardness within a specified range (+TH)

3.6**FP treatment**

heat treatment with the object of producing a ferritic and pearlitic structure and achieving a hardness within a specified range (+FP)

3.7**employer**

organization for which the person works on a regular basis

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

4 Symbols

See prEN 10266 and CR 10260.

5 Classification and designation

5.1 Classification

In accordance with EN 10020 the grades in Tables 3, 4 ,5, 6 and A1 are classified as given in Table 1.

5.2 Designation

For tubes covered by this Part of this European Standard the steel designation consists of:

— the number of this Part of this European Standard (EN 10297-1) ;

plus either :

— the steel name in accordance with EN 10027-1 and CR 10260 ;

or

— the steel number allocated in accordance with EN 10027-2.

These are given in Table 1.

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Table 1 — Classification of steel grades and delivery condition

Steel grade		Normal delivery condition ^a	Classification in accordance with EN 10020
Steel name	Steel number		
E235	1.0308	+AR or +N	Non-alloy quality steel
E275	1.0225		
E315	1.0236		
E355	1.0580		
E470	1.0536	+AR	
E275K2	1.0456	+N	
E420J2	1.0599		
E355K2	1.0920		Alloy quality steel
E460K2	1.8891	+N	Alloy special steel
E590K2	1.0644	+QT	Non-alloy special steel
E730K2	1.8893	+QT	Alloy special steel
C22E	1.1151	+N or +QT	Non-alloy special steel
C35E	1.1181		
C45E	1.1191		
C60E	1.1221		
38Mn6	1.1127		
41Cr4	1.7035		
25CrMo4	1.7218	+QT	Alloy special steel
30CrMo4	1.7216		
34CrMo4	1.7220		
42CrMo4	1.7225		
36CrNiMo4	1.6511		
30CrNiMo8	1.6580		
41NiCrMo7-3-2	1.6563		
C10E	1.1121		
C15E	1.1141		
C15R	1.1140		
16MnCr5	1.7131		
16MnCrS5	1.7139	Alloy special steel	
20NiCrMo2-2	1.6523		
20NiCrMoS2-2	1.6526		

^a At the discretion of the manufacturer, the tube may be cold finished. The tube shall then be annealed or normalized, to achieve the required properties.

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 :

- 1) the quantity (mass or total length or number);
- 2) the term "tube";

- 3) the dimensions (outside diameter, wall thickness) (see 8.9.1);
- 4) the designation according to this Part of this European Standard (see 5.2);
- 5) the delivery condition (see 7.3.1).

6.2 Options

A number of options are specified in this Part of this European Standard, and are listed as follows with appropriate clause references. 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 tube shall be supplied in accordance with the basic specification (See 6.1).

- 1) Descaling (see 7.3.1);
- 2) tensile test on sample in condition +N (see 8.3.2);
- 3) tensile test on sample in condition +QT (see 8.3.3);
- 4) tensile test (see 8.3.4);
- 5) impact energy values of Table 13 (see 8.3.5);
- 6) hardness range (see 8.4.2);
- 7) hardness test (see 8.4.3);
- 8) hardenability requirements of Annex D (see 8.5);
- 9) verification of hardenability (see 8.5);
- 10) verification of hardenability by test (see 8.5);
- 11) non-destructive testing (see 8.6.2);
- 12) leak tightness test (see 8.6.2);
- 13) exact lengths (see 8.9.2);
- 14) specific inspection for tubes made of steels from Table 3 (see 9.1);
- 15) inspection document 2.2 (see 9.2.1);
- 16) inspection document 3.1.A, 3.1.C or 3.2 (see 9.2.1);
- 17) hardenability test on a test piece taken from a sample tube (see 11.3);
- 18) supplied tubes shall not contain areas prepared and used for hardness test (see 11.4);
- 19) selection of the leak tightness test method by the purchaser (see 11.5.1);
- 20) coating for transit and storage (see clause 13).

6.3 Example of an order

Twenty five tonnes of tube in accordance with EN 10297-1 with specified outside diameter of 60,3 mm and specified wall thickness of 3,6 mm grade E275 steel in the normalised delivery condition and supplied with specific inspection.

EN 10297-1:2003 (E)

25 t Tube - - 60,3 x 3,6 - EN 10297 - E275 - +N - Option 14

7 Manufacturing process**7.1 Steelmaking process**

The steelmaking process is at the discretion of the manufacturer.

Elements not included in Tables 3, 4, 5, 6 and A1 for the relevant grade 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.

7.2 Deoxidation process

Steels shall be fully killed and additionally those in Tables 4 and 5 shall contain N binding elements and are fine grain steels.

7.3 Tube manufacture and delivery conditions

7.3.1 Tubes shall be manufactured by a seamless process.

Table 2 gives a summary of delivery conditions, hardenability requirements and related mandatory and optional test requirements for mechanical properties and hardness. For hardenability requirements see 8.5.

Tubes made of steels in Table 3 with the exception of E470 are normally supplied as rolled or normalized at the discretion of the manufacturer. However the purchaser may specify +N condition. Grade E470 is supplied as rolled.

Tubes made of steels in Table 4 are supplied in the delivery condition indicated in Table 9.

Tubes made of steels in Tables 5, 6 and A1 are supplied in a delivery condition indicated in Table 2 as specified by the purchaser.

The recommended heat treatment temperatures are given in Table B.1 and Table B.2 as appropriate.

At the manufacturers discretion tube may be cold finished, before the specified heat treatment is given. Cold finished tubes in the +AR condition shall be annealed or normalized to achieve the specified properties.

NOTE The cold drawing process leaves residual oil on the tube which may leave a residue when heat treated.

When specified the tubes shall be supplied descaled (see option 1). The amount of descaling shall be agreed at the time of enquiry and order. The method is at the discretion of the manufacturer.

Option 1 : Tubes shall be supplied descaled.

7.3.2 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 appropriate standards, e.g. EN 473 and EN 10256.

Table 2 — Summary of delivery conditions, related options and requirements

Applicable Table(s)	Applicable Table(s)	Delivery condition	Hardenability requirement	Test requirements ^a						
				Cast analysis	Tensile test			Impact test	Hardenability verification or test	Hardness test
					Standard condition	Simulated +N condition	Simulated +QT condition			
Tables 3 and 8		+AR ^b	-	M	M	-	-	-	-	-
		+N	-	M	M	-	-	-	-	-
Tables 4 and 9		+N	-	M	M	-	-	M	-	-
		+QT	-	M	M	-	-	M	-	-
Table 5	-	+AR	Option 8	M	-	Option 2	Option 3	-	Option 9 or 10	-
	10	+N	Option 8	M	M	-	Option 3	-	Option 9 or 10	-
	11	+QT	Option 8	M	M	-	-	Option 5	-	Option 6
	-	+A	Option 8	M	Option 4	Option 2	Option 3	-	Option 9 or 10	M
Table 6	-	+AR ^c	Option 8	M	-	-	Option 3	-	Option 9 or 10	-
	12	+QT	Option 8	M	M	-	-	Option 5	-	Option 6
	-	+A	Option 8	M	Option 4	-	Option 3	-	Option 9 or 10	M
Table A.1		+AR	Option 8 ^d	M	-	-	-	-	Option 9 or 10	-
		+N	Option 8 ^d	M	Option 4	-	-	-	Option 9 or 10	Option 7
		+A	Option 8 ^d	M	Option 4	-	-	-	Option 9 or 10	M
		+TH ^e	Option 8 ^d	M	Option 4	-	-	-	Option 9 or 10	M
		+FP ^e	Option 8 ^d	M	Option 4	-	-	-	Option 9 or 10	M

^a M = Mandatory, - = Not applicable.
^b At the manufacturers discretion as rolled or normalized except for grade E 470 which is always supplied in +AR condition.
^c +AR condition only applies for 25CrMo4 and 34CrMo4.
^d Option 8 only applies for alloy special steels.
^e +TH and +FP only apply for 16MnCr5, 16MnCrS5, 20NiCrMo2-2 and 20NiCrMoS2-2.