SLOVENSKI STANDARD
SIST EN 10305-1:2016

01-oktober-2016

Nadomešča:
SIST EN 10305-1:2010

Jeklene cevi za precizno uporabo - Tehnični dobavni pogoji - 1. del: Nevarjene hladno vlečene cevi

Steel tubes for precision applications - Technical delivery conditions - Part 1: Seamless cold drawn tubes

Präzisionsstahlrohre - Technische Lieferbedingungen - Teil 1: Nahtlose kaltgezogene Rohre

Tubes de précision en acier - Conditions techniques de livraison - Partie 1: Tubes sans soudure étirés à froid

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Ta slovenski standard je istoveten z: **EN 10305-1:2016**

ICS:

77.140.75	Jeklene cevi in cevni profili za posebne namene	Steel pipes and tubes for specific use

SIST EN 10305-1:2016 **en,fr,de**

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 10305-1

March 2016

ICS 77.140.75

Supersedes EN 10305-1:2010

English Version

Steel tubes for precision applications - Technical delivery conditions - Part 1: Seamless cold drawn tubes

Tubes de précision en acier - Conditions techniques de livraison - Partie 1: Tubes sans soudure étirés à froid

Präzisionsstahlrohre - Technische Lieferbedingungen - Teil 1: Nahtlose kaltgezogene Rohre

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Ref. No. EN 10305-1:2016 E

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European foreword

This document (EN 10305-1:2016) has been prepared by Technical Committee ECISS/TC 110 “Steel tubes and iron and steel fittings”, 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of an identical text or by endorsement, at the latest by September 2016 and conflicting national standards shall be withdrawn at the latest by September 2016.

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 10305-1:2010.

In comparison with the previous edition, the following technical changes have been made:

a) References were adapted;

b) The options were renumbered in such a way that now throughout all parts the number of options are the same;

c) Editorial updates.

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EN 10305, *Steel tubes for precision applications — Technical delivery conditions*, consists of the following parts:

— *Part 1: Seamless cold drawn tubes*

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— *Part 2: Welded cold drawn tubes*

— *Part 3: Welded cold sized tubes*

— *Part 4: Seamless cold drawn tubes for hydraulic and pneumatic power systems*

— *Part 5: Welded cold sized square and rectangular tubes*

— *Part 6: Welded cold drawn tubes for hydraulic and pneumatic power systems*

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.

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1 Scope

This European Standard specifies the technical delivery conditions for seamless cold drawn steel tubes of circular cross section for precision applications with specified outside diameter $D \leq 380$ mm.

This document may also be applied to other types of cross sections.

Tubes according to this document are characterized by having precisely defined tolerances on dimensions and a specified maximum surface roughness. Typical fields of application are in the automotive, furniture and general engineering industries.

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

EN 10021:2006, *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*

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

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

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

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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)*

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

EN ISO 4287, *Geometrical product specifications (GPS) - Surface texture: Profile method - Terms, definitions and surface texture parameters (ISO 4287)*

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

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

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

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 leaktightness (ISO 10893-1)*

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EN ISO 10893-2, *Non-destructive testing of steel tubes - Part 2: Automated eddy current testing of seamless and welded (except submerged arc-welded) steel tubes for the detection of imperfections (ISO 10893-2)*

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 10893-10, *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)*

ISO 11484, *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 10020:2000, EN 10021:2006, EN 10052:1993, EN 10266:2003 and the following apply.

3.1
employer
organization for which a person works on a regular basis

Note 1 to entry: The employer can be either the tube manufacturer or a third party organization providing services, such as non-destructive testing (NDT).

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3.2
manufacturer
party to produce and to deliver tubes in accordance with this document

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Note 1 to entry: Where tubes are delivered by an intermediary, see EN 10021:2006, Clause 6.

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3.3
imperfection
discontinuity in the wall or on the pipe surfaces detectable by methods described in this document

Note 1 to entry: Imperfections with a size complying with the acceptance criteria specified in this document are considered to have no practical implication on the intended use of the product.

3.4
defect
imperfection of a size not complying with the acceptance criteria specified in this document

Note 1 to entry: Defects are considered to adversely affect or limit the intended use of the product.

3.5
mother tube
length of tube produced in the final cold drawing process

4 Symbols

For the purposes of this document, the symbols in EN 10266:2003 apply.

NOTE For tubes specified by the outside diameter and by the inside diameter, "*T*" is the specified or the calculated wall thickness in this document.

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5 Classification and designation

5.1 Classification

In accordance with the classification system in EN 10020 the steel grades given in Table 2 are non-alloy quality steels.

The steel grades given in Table A.1 are classified as follows:

a) non-alloy quality steels (E255, E410, 26Mn5, 10S10, 15S10, 18S10 and 37S10);

b) non-alloy special steels (C35E and C45E); and

c) alloy special steels (26Mo2, 25CrMo4 and 42CrMo4).

5.2 Designation

For the tubes covered by this document, the steel designation consists of the number of this document (EN 10305-1) plus either:

a) the steel name in accordance with EN 10027-1; or

b) the steel number in accordance with EN 10027-2.

6 Information to be supplied by the purchaser

6.1 Mandatory information

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The following information shall be obtained by the manufacturer at the time of enquiry and order:

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

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b) term “tube”;

c) dimensions (see 8.5);

d) steel designation (see 5.2);

e) delivery condition (see 7.2.2);

f) type of tube length and, where applicable, the length (see 8.5.2);

g) type of inspection document (see 9.1).

6.2 Options

A number of options are specified in this document 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).

- Option 1: specification of a steel grade not specified in this document (see 8.2);
- Option 2: specification of a sulphur range to support machinability (see 8.2);
- Option 3: suitability for hot-dip galvanizing (see 8.2);

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- Option 4: surface condition for further processing (see 8.4.1);
- Option 8: measurement of surface roughness (see 8.4.3);
- Option 9: specific surface roughness (see 8.4.3);
- Option 10: tube surfaces free from not easily removable substances (see 8.4.6);
- Option 12: non-destructive testing for the detection of longitudinal imperfections (see 8.4.7);
- Option 13: non-destructive testing for verification of leak-tightness (see 8.4.7);
- Option 15: specification of a cross section other than circular (see 8.5.1.1);
- Option 16: reduced diameter tolerances (see 8.5.1.2);
- Option 17: unilateral diameter tolerances (see 8.5.1.2);
- Option 18: reduced eccentricity (see 8.5.1.3);
- Option 19: reduced wall thickness tolerance (see 8.5.1.4);
- Option 20: unilateral wall thickness tolerance (see 8.5.1.4);
- Option 22: reduced maximum deviation from straightness (see 8.5.3);
- Option 23: specified end finishing (see 8.5.4);
- Option 25: flattening or drift expanding test for delivery condition +A or +N (see Table 8);
- Option 26: test unit with tubes from one cast only (see 10.1);
- Option 28: alternative marking (see Clause 12);
- Option 29: delivery without corrosion protection (see Clause 13);
- Option 30: specified corrosion protection (see Clause 13);
- Option 38: unbundled tubes or specific method of packaging (see Clause 13).

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6.3 Example of an order

12 000 m tube with an outside diameter of D = 60 mm and an inside diameter of d = 56 mm in accordance with this document, made of steel grade E235 in the normalized condition, delivered in random lengths, with a 3.1 inspection certificate in accordance with EN 10204:

12 000 m tube – D 60 x d 56 – EN 10305-1 – E235+N – random length – inspection certificate 3.1

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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 The tubes shall be manufactured from hot finished seamless hollows by cold drawing.

7.2.2 The tubes shall be supplied in one of the delivery conditions given in Table 1.

7.2.3 All non-destructive testing (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 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 ISO 9712 and ISO 11484.

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Table 1 — Delivery conditions

Designation	Symbol[a]	Description
Cold drawn / hard	+C	No final heat treatment after final cold drawing.
Cold drawn / soft	+LC	Final heat treatment is followed by a suitable drawing pass (limited reduction of area).
Cold drawn and stress relieved	+SR	After final cold drawing the tubes are stress relieved in a controlled atmosphere.
Soft annealed	+A	After final cold drawing the tubes are soft annealed in a controlled atmosphere.
Normalized	+N	After final cold drawing the tubes are normalized in a controlled atmosphere.
[a] In accordance with EN 10027–1.		

8 Requirements

8.1 General

The tubes, when supplied in a delivery condition indicated in Table 1 and inspected in accordance with Clauses 9, 10 and 11, shall comply with the requirements of this document.

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

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8.2 Chemical composition

The cast analysis reported by the steel producer shall apply and comply with the requirements of Table 2 (but see options 1 to 3) or Table A.1.

NOTE When subsequently welding tubes produced in accordance with this document, it is important to take account of the fact that the behaviour of the steel during and after welding is dependent not only on the steel composition and the delivery condition but also on the conditions of preparing for and carrying out the welding.

Option 1: *A steel grade not specified in this document, with a maximum total content of alloying elements of 5 % and agreed chemical composition, mechanical properties and delivery condition, is specified.*

Table 2 — Chemical composition (cast analysis)

Steel grade		% by mass					
Steel name	**Steel number**	C max.	Si max.	Mn max.	P max.	S[a] max.	Al_{total}[b] min.
E215	1.0212	0,10	0,05	0,70	0,025	0,025	0,025
E235	1.0308	0,17	0,35	1,20	0,025	0,025	0,015
E355	1.0580	0,22	0,55	1,60	0,025	0,025	0,020
Elements not quoted in this table (but see footnote [b]) shall not be intentionally added to the steel without the agreement of the purchaser, except for elements which may be added for the purposes of deoxidation and/or nitrogen binding. All appropriate measures shall be taken to prevent the addition of undesirable elements from scrap or other materials used in the steel making process.							
[a] See option 2. [b] This requirement is not applicable provided the steel contains a sufficient amount of other nitrogen binding elements, such as Ti, Nb or V. If added, the content of these elements shall be reported in the inspection document. When using titanium, the manufacturer shall verify that (Al + Ti/2) ≥ 0,020.							

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Option 2: *For the steel grades E235 and E355 a controlled sulphur content of 0,015 % to 0,040 % is specified to support machinability. It shall be obtained by resulphurizing the steel after maximum desulphurization or alternatively by using a low oxygen process.*

Option 3: *The chemical composition of the specified steel grade shall be such that it is suitable for hot-dip galvanizing (see e.g.* EN ISO 1461 *or* EN ISO 14713-2 *for guidance).*

Table 3 and Table A.2 specify the permissible deviation of product analysis from the specified limits on cast analysis given in Table 2 and Table A.1.