



SLOVENSKI STANDARD

SIST EN 10305-5:2010

01-marec-2010

Nadomešča:

SIST EN 10305-5:2003

SIST EN 10305-5:2003/AC:2007

Jeklene cevi za precizno uporabo - Tehnični dobavni pogoji - 5. del: Varjene in hladno dimenzionirane kvadratne in pravokotne cevi

Steel tubes for precision applications - Technical delivery conditions - Part 5: Welded and cold sized square and rectangular tubes

iTeh STANDARD PREVIEW

Präzisionsstahlrohre - Technische Lieferbedingungen - Teil 5: Geschweißte und maßumgeformte Rohre mit quadratischem oder rechteckigem Querschnitt

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Tubes de précision en acier - Conditions techniques de livraison - Partie 5: Tubes soudés et calibrés de section carrée ou rectangulaire

Ta slovenski standard je istoveten z: EN 10305-5:2010

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

EN 10305-5

NORME EUROPÉENNE

EUROPÄISCHE NORM

January 2010

ICS 77.140.75

Supersedes EN 10305-5:2003

English Version

Steel tubes for precision applications - Technical delivery conditions - Part 5: Welded cold sized square and rectangular tubes

Tubes de précision en acier - Conditions techniques de livraison - Partie 5 : Tubes soudés calibrés avec section carrée et rectangulaire

Präzisionsstahlrohre - Technische Lieferbedingungen - Teil 5: Geschweißte maßumgeformte Rohre mit quadratischem und rechteckigem Querschnitt

This European Standard was approved by CEN on 22 November 2009.

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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 CEN Management Centre has the same status as the official versions.

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Foreword

This document (EN 10305-5:2010) 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of an identical text or by endorsement, at the latest by July 2010, and conflicting national standards shall be withdrawn at the latest by July 2010.

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 10305-5:2003.

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

- *Part 1: Seamless cold drawn tubes*
- *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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

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1 Scope

This European Standard specifies the technical delivery conditions for welded cold sized steel tubes of square and rectangular cross section for precision applications.

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

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 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*

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*

EN 10246-3¹⁾, *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 10246-8²⁾, *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 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 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 377:1997)*

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

EN ISO 4287, *Geometrical product specifications (GPS) — Surface texture: Profile method — Terms, definitions and surface texture parameters (ISO 4287:1997)*

1) Under revision to become 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/DIS 10893-2:2009)*.

2) Under revision to become EN ISO 10893-11, *Non-destructive testing of steel tubes — Part 11: Automated ultrasonic testing of weld seam of welded steel tubes for the detection of longitudinal and/or transversal imperfections (ISO/DIS 10893-11:2009)*.

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

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

3.2

manufacturer

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

NOTE Where tubes are delivered by a supplier, see EN 10021:2006, Clause 6.

3.3

imperfection

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

NOTE 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 Defects are considered to adversely affect or limit the intended use of the product.

3.5

parent coil

coil originating from the hot rolling process prior to any further operation (pickling, slitting, cold rolling or coating)

4 Symbols

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

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.

5.2 Designation

For the tubes covered by this document the steel designation consists of the number of this document (EN 10305-5) plus either:

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- 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**

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 of pieces);
- b) the term "tube";
- c) the dimensions (see 8.5.1);
- d) the steel designation (see 5.2);
- e) the delivery condition including the surface condition (see 7.2.1 and 7.2.2).

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).

- 1) specification of a steel grade not specified in this document (see 8.2);
- 2) suitability for hot-dip galvanizing (see 8.2);
- 3) surface condition for further processing (see 8.4.1);
- 4) position of the weld line (see 8.4.2);
- 5) removal of internal weld bead (see 8.4.3);
- 6) measurement of surface roughness (see 8.4.5);
- 7) specific surface roughness (see 8.4.5);
- 8) non-destructive testing of the weld seam for the detection of longitudinal imperfections (see 8.4.8);
- 9) reduced wall thickness tolerance (see 8.5.3);
- 10) unilateral wall thickness tolerance (see 8.5.3);
- 11) exact length (see 8.5.5);
- 12) another specified length and/or tolerance (see 8.5.5);
- 13) reduced maximum deviation from straightness (see 8.5.6);
- 14) specified end finishing (see 8.5.10);
- 15) inspection certificate 3.1 (see 9.1 and 9.2.1);

- 16) test unit with tubes from one cast only (see 10.1.1);
- 17) alternative marking (see Clause 12);
- 18) delivery without corrosion protection (see Clause 13);
- 19) specified corrosion protection (see Clause 13);
- 20) unbundled tubes or specific method of packaging (see Clause 13).

6.3 Example of an order

12 000 m tube, size 50 mm × 30 mm with a wall thickness of 3 mm in accordance with EN 10305-5, made of steel grade E235 in the normalized condition with strip surface condition S2 (pickled) with a 3.1 inspection certificate in accordance with EN 10204:

12 000 m tubes – 50 × 30 × 3 – EN 10305-5 – E235+N – S2 – Option 15

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 strip by electric welding. The tubes shall not contain strip end welds except for tubes to be supplied coiled for which the delivery conditions +A or +N can be specified.

Possible surface conditions are:

- a) S1 (black);
- b) S2 (pickled);
- c) S3 (cold rolled);
- d) S4 (coated to an agreed condition).

NOTE The surface conditions S1 and S3 apply for the strip. The surface condition S2 and S4 can apply for the strip or the tube; the purchaser should, where necessary, indicate the required condition at the time of enquiry and order.

7.2.2 Tubes made of the steel grades E155, E195, E235, E275 and E355 shall be supplied in one of the delivery conditions given in Table 1, except +CR2.

Tubes made of the grades E190, E220, E260, E320, E370 and E420 shall be supplied in the delivery condition +CR2.

7.2.3 All non-destructive testing (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.

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It is recommended that the level 3 personnel be certified in accordance with EN 473, or, at least, an equivalent to it.

The operation 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 1 — Delivery conditions

Designation	Symbol ^a	Description
Welded and cold sized	+CR1	Normally not heat treated, but suitable for final annealing. ^b
	+CR2	Not intended for heat treatment after the welding and sizing process. ^c
Soft annealed	+A	After welding and sizing the tubes are annealed in a controlled atmosphere.
Normalized	+N	After welding and sizing the tubes are normalized in a controlled atmosphere.
^a In accordance with EN 10027-1. ^b After annealing or normalizing, the resulting mechanical properties meet the requirements specified in Table 4 for the delivery condition +A or +N, respectively are normally obtained. ^c If further heat treatment is applied, the resulting mechanical properties may be outside the specified requirements.		

8 Requirements

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8.1 General

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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.

8.2 Chemical composition

The cast analysis reported by the steel producer shall apply and comply with the requirements of Table 2. A steel grade not specified in this document may be specified (see option 1).

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.

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 composition, but also on the conditions of preparing for and carrying out the welding.

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

Table 2 — Chemical composition (cast analysis)^a

Steel grade		% by mass					
Steel name	Steel number	C max.	Si max.	Mn max.	P max.	S max.	Al _{total} ^b min.
E155	1.0033	0,11	0,35	0,70	0,025	0,025	0,015
E190	1.0031	0,10					
E195	1.0034	0,15	0,35	0,70	0,025	0,025	0,015
E220	1.0215	0,14					
E235	1.0308	0,17	0,35	1,20	0,025	0,025	0,015
E260	1.0220	0,16					
E275	1.0225	0,21	0,35	1,40	0,025	0,025	0,015
E320	1.0237	0,20					
E355	1.0580	0,22	0,55	1,60	0,025	0,025	0,020
E370	1.0261	0,21					
E420	1.0575	0,16	0,50	1,70	0,025	0,025	0,020

^a Elements not included 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.

^b This requirement is not applicable provided the steel contains a sufficient amount of other nitrogen binding elements such as Ti, Nb or V. When using titanium, the manufacturer shall verify that $(Al + Ti/2) \geq 0,020$. Additions of Nb, Ti and V are permitted at the discretion of the manufacturer. The content of these elements shall be reported.

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

Table 3 — Permissible deviations of the product analysis from the specified limits given in Table 2

Element	Specified limit of the cast analysis % by mass	Permissible deviation of the product analysis % by mass
C	≤ 0,22	+ 0,02
Si	≤ 0,55	+ 0,05
Mn	≤ 1,70	+ 0,10
P	≤ 0,025	+ 0,005
S	≤ 0,025	+ 0,005
Al	≥ 0,015	- 0,005

8.3 Mechanical properties

The mechanical properties of the tubes covered by this document shall conform to the requirements of Table 4 or 5.

NOTE Subsequent processing (cold or hot) can change the mechanical properties.