Precisionsstålrör – Tekniska leveransbestämmelser –
Del 1: Kalldragna sömlösa precisionsstålrör

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

The European Standard EN 10305-1:2002 has the status of a Swedish Standard. This document contains the official English version of EN 10305-1:2002.
Steel tubes for precision applications - Technical delivery conditions - Part 1: Seamless cold drawn tubes
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Foreword

This document EN 10305-1:2002 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of an identical text or by endorsement, at the latest by May 2003, and conflicting national standards shall be withdrawn at the latest by May 2003.

EN 10305 consists of the following Parts under the general title : Steel tubes for precision applications — Technical delivery conditions :

— Part 1: Seamless cold drawn tubes.
— Part 2: Welded cold drawn tubes.
— Part 4: Seamless cold drawn tubes for hydraulic and pneumatic power systems.
— Part 5: Welded and cold sized square and rectangular tubes.
— Part 6: Welded cold drawn tubes for hydraulic and pneumatic power systems.

In this European Standard the annex A is normative and the annex B is 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.
1 Scope

This Part of EN 10305 specifies the technical delivery conditions for seamless cold drawn steel tubes of circular cross section for precision applications.

NOTE This Part of EN 10305 can also cover other types of cross section.

Tubes according to this Part of EN 10305 are characterized by having precisely defined tolerances on dimensions and a specified surface roughness. Typical fields of application are in the vehicle, furniture and general engineering industries.

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 steels — Part 2 : Numerical system.

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

EN 10204, Metallic products — Types of inspection documents.

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


3 Terms and definitions

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

3.1 employer

organization for which a 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.

NOTE In this Part of EN 10305 "T" is the specified or the calculated wall thickness.

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 non-alloy quality steels (E255, E410, 26Mn5, 10S10, 15S10, 18S10 and 37S10), non-alloy special steels (C35E and C45E) and alloy special steels (26Mo2, 25CrMo4 and 42CrMo4).

5.2 Designation

For the tubes covered by this Part of EN 10305 the steel designation consists of:

— the number of this Part of EN 10305;

plus either:

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

b) the term "tube";

c) the dimensions (see 8.5);

d) the designation of the steel grade in accordance with this Part of EN 10305 (see 5.2);

e) the delivery condition including the surface condition (see 7.2.1 and 7.2.2);

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

6.2 Option

A number of options are specified in this Part of EN 10305 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 Part of EN 10305 (see 8.2);

2) specification of a sulphur range to support machinability (see 8.2);

3) surface condition for further processing (see 8.4.1.1);

4) measurement of surface roughness (see 8.4.1.5);

5) lower surface roughness (see 8.4.1.5);

6) defined removable substances on surface (see 8.4.1.6);

7) non-destructive testing for the detection of longitudinal imperfections (see 8.4.2);

8) non-destructive testing for verification of leak-tightness (see 8.4.2);

9) agreement on a cross section other than circular (see 8.5.1.1);

10) tubes specified by outside or inside diameter and wall thickness (see 8.5.1.1);

11) reduced diameter tolerances (see 8.5.1.2);

12) diameter tolerances unilateral (see 8.5.1.2);

13) reduced concentricity (see 8.5.1.3);

14) reduced wall thickness tolerance (see 8.5.1.4);

15) wall thickness tolerance unilateral (see 8.5.1.4);

16) agreement on a tolerance for exact lengths ≤ 500 mm or > 8 000 mm (see Table 7);

17) specified end finishing (see 8.5.4);
18) specific inspection (see 9.1);
19) inspection certificates 3.1.A or 3.1.C (see 9.2.1);
20) flattening or drift expanding test (see Table 8);
21) test unit with tubes from one cast only (see 10.1);
22) alternative marking (see clause 12);
23) delivery without corrosion protection (see clause 13);
24) specified corrosion protection (see clause 13);
25) specified method of packaging (see clause 13).

6.3 Example of an order

12 000 m tube with an outside diameter of 60 mm and an inside diameter of 56 mm in accordance with this Part of EN 10305, made of steel grade E235 in the normalized condition, delivered in random lengths, with a 3.1.B inspection certificate in accordance with EN 10204:

12 000 m tube - 60 x ID 56 - EN 10305-1 - E235 +N - random length - Option 18

7 Manufacturing process

7.1 Steelmaking process

The steelmaking process is at the discretion of the manufacturer.

Steels shall be fully killed.

7.2 Tube manufacture and delivery conditions

7.2.1 The tubes shall be manufactured from hot finished seamless tubes by cold drawing or other suitable processes.

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 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 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 473 and EN 10256.
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 Part of EN 10305.

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 comply with the requirements of Table 2 (but see options 1 and 2 or Table A.1. A steel grade not specified in this Part of EN 10305 may be specified (see option 1).

**Option 1:** A steel grade not specified in this Part of EN 10305 with a maximum total content of alloying elements of 5 % is specified. Chemical composition, mechanical properties and delivery condition are specified by the purchaser.

**NOTE** When welding tubes are produced in accordance with this Part of EN 10305 account should be taken of the fact that the behaviour of the steel during and after welding is dependent not only on the steel and the delivery condition but also on the conditions of preparing for and carrying out the welding.

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### Table 1 — Delivery conditions

<table>
<thead>
<tr>
<th>Designation</th>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cold drawn / hard</td>
<td>+C</td>
<td>No heat treatment after the final cold drawing process.</td>
</tr>
<tr>
<td>Cold drawn / soft</td>
<td>+LC</td>
<td>After the final heat treatment there is a suitable drawing pass.</td>
</tr>
<tr>
<td>Cold drawn and stress relieved</td>
<td>+SR</td>
<td>After the final cold drawing process there is a stress relief heat treatment in a controlled atmosphere.</td>
</tr>
<tr>
<td>Annealed</td>
<td>+A</td>
<td>After the final cold drawing process the tubes are annealed in a controlled atmosphere.</td>
</tr>
<tr>
<td>Normalized</td>
<td>+N</td>
<td>After the final cold drawing operation the tubes are normalized in a controlled atmosphere.</td>
</tr>
</tbody>
</table>

a Former frequently used corresponding heat treatment symbols are given in Table B.1.

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### Table 2 — Chemical composition (cast analysis) a

<table>
<thead>
<tr>
<th>Steel grade</th>
<th>C max.</th>
<th>Si max.</th>
<th>Mn max.</th>
<th>P max.</th>
<th>S b max.</th>
<th>Al min.</th>
</tr>
</thead>
<tbody>
<tr>
<td>E215</td>
<td>0,10</td>
<td>0,05</td>
<td>0,70</td>
<td>0,025</td>
<td>0,025</td>
<td>0,025</td>
</tr>
<tr>
<td>E235</td>
<td>0,17</td>
<td>0,35</td>
<td>1,20</td>
<td>0,025</td>
<td>0,025</td>
<td>-</td>
</tr>
<tr>
<td>E355 c</td>
<td>0,22</td>
<td>0,55</td>
<td>1,60</td>
<td>0,025</td>
<td>0,025</td>
<td>-</td>
</tr>
</tbody>
</table>

a Elements not included in this Table (but see footnote c) 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 steel making process.

b See option 2.

c Additions of Nb, Ti and V are permitted at the discretion of the manufacturer. The content of these elements shall be reported.