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Steel tubes for precision applications - Technical delivery conditions - Part 4: Seamless cold drawn tubes for hydraulic and pneumatic power systems

Präzisionsstahlrohre - Technische Lieferbedingungen - Teil 4: Nahtlose kaltgezogene Rohre für Hydraulik- und Pneumatik-Druckleitungen

**iTeh STANDARD PREVIEW**

(conditions techniques de livr.)  
Tubes de précision en acier - Conditions techniques de livraison - Partie 4 : Tubes sans soudure étirés a froid pour circuits hydrauliques et pneumatiques

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ICS 77.140.75

English version

Steel tubes for precision applications - Technical delivery conditions - Part 4: Seamless cold drawn tubes for hydraulic and pneumatic power systems

Tubes en acier pour applications de précision - Conditions techniques de livraison - Tubes sans soudure étirés à froid pour circuits hydrauliques et pneumatiques

Präzisionsstahlrohre - Technische Lieferbedingungen - Teil 4: Nahtlose kaltgezogene Rohre für Hydraulik- und Pneumatik-Druckleitungen

This European Standard was approved by CEN on 28 February 2003.

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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  
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 10305-4:2003) 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of an identical text or by endorsement, at the latest by October 2003, and conflicting national standards shall be withdrawn at the latest by October 2003.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative annex ZA, which is an integral part of this document.

This document includes a Bibliography.

EN 10305 consists of the following parts under the general title *Steel tubes for precision applications - Technical delivery conditions* :

- iTeh STANDARD PREVIEW**  
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- *Part 1 : Seamless cold drawn tubes*
  - *Part 2 : Welded cold drawn tubes*
  - *Part 3 : Welded cold sized tubes* [SIST EN 10305-4:2003](https://standards.iteh.ai/catalog/standards/sist/81165b5c-302f-4aeb-9c0a-3d342caf55af/sist-en-10305-4-2003)
  - *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*

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 this European Standard specifies the technical delivery conditions for seamless cold drawn steel tubes of circular cross section used in hydraulic and pneumatic power systems.

Tubes according to this part of this European Standard are characterised by having precisely defined tolerances on dimensions and a specified surface roughness.

The allowed pressure rates and temperatures are the responsibility of the customer in accordance with the state of the art and in application of the safety coefficients specified in the applicable regulations, codes or standards.

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

prEN 10168<sup>1)</sup>, *Steel products — Inspection documents — List of information and description.*

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

prEN 10266<sup>1)</sup>, *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 ISO 2566-1, *Steel — Conversion of elongation values — Part 1: Carbon and low alloy steels (ISO 2566-1:1984).*

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1) In preparation, until this document is published as a European Standard a corresponding national standard should be agreed at the time of enquiry and order.

CR 10260, *Designation system for steel — Additional symbols*.

### 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 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.

### 4 Symbols

See prEN 10266.

### 5 Classification and designation

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#### 5.1 Classification

In accordance with the classification system in EN 10020 the steel grades given in Table 1 are non-alloy quality steels.

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#### 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

— 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) ;
- b) the term "tube" ;
- c) the dimensions (outside diameter and inside diameter or other pair of dimensions) (see 8.5.1.1 and Table 4) ;
- d) the designation of the steel grade in accordance with this part of EN 10305 (see 5.2) ;
- e) the type of tube length (see 8.5.2) ;



f) the type of inspection (see 9.1).

## 6.2 Options

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 his 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: reduced internal roughness of  $\leq 2 \mu\text{m}$  (see 8.4.1.5) ;
- 2: lengths other than 6 m (see 8.5.2) ;
- 3: alternative marking (see clause 12) ;
- 4: protection by phosphatization (see 13.1) ;
- 5: protection by galvanization and chromatization type blue-white (see 13.1) ;
- 6: protection by galvanization and chromatization type yellow (see 13.1) ;
- 7: protection by galvanization and chromatization type olive green (see 13.1) ;
- 8: protection of tube ends (see 13.1) ;
- 9: special packaging (see 13.2)

## 6.3 Example of an order

1000 m tubes with an outside diameter of 20 mm and an inside diameter of 15 mm in accordance with this part of EN 10305, made of steel grade E235, delivered in standard lengths, with non-specific inspection and protected by phosphatization:

1000 m tubes - 20 x ID 15 - EN 10305-4 - E 235 – in standard lengths with non-specific inspection and testing – option 4.

## 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. Other suitable methods of cold working are permitted.

The tubes shall be delivered in the delivery condition +N which means that after the final cold drawing operation the tubes are normalized in a controlled atmosphere.

**7.2.2** 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.

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

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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.

## 8 Requirements

### 8.1 General

The tubes, when 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 1.

NOTE When welding tubes 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 conditions, but also on the conditions of preparing for and carrying out the welding.

Table 1 — Chemical composition (cast analysis)<sup>a</sup>

Steel grade		% by mass					
Name	Number	C max.	Si max.	Mn max.	P max.	S max.	Al <sub>tot</sub> min.
E215	1.0212	0,10	0,05	0,70	0,025	0,015	0,025
E235	1.0308	0,17	0,35	1,20	0,025	0,015	-
E355 <sup>b</sup>	1.0580	0,22	0,55	1,60	0,025	0,015	-

<sup>a</sup> 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 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.

<sup>b</sup> Additions of Nb, Ti and V are permitted at the discretion of the manufacturer. The content of these elements shall be reported.

Table 2 specifies the permissible deviations of product analysis from the specified limits on cast analysis given in Table 1.

Table 2 — Permissible deviations of the product analysis from the specified limits given in Table 1

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	≤ 1,60	+ 0,10
P	≤ 0,025	+ 0,005
S	≤ 0,015	+ 0,003
Al	≥ 0,025	- 0,005

### 8.3 Mechanical properties

The mechanical properties of the tubes shall conform to the requirements of Table 3 and 11.2 or 11.3.

Table 3 — Mechanical properties at room temperature

Steel grade		Yield strength <sup>a</sup> $R_{eH}$ min. MPa	Tensile strength $R_m$ min. MPa	Elongation A min. %
Name	Number			
E215	1.0212	215	290 to 430	30
E235	1.0308	235	340 to 480	25
E355	1.0580	355	490 to 630	22
<sup>a</sup> For tubes with outside diameter ≤ 30 mm and wall thickness ≤ 3 mm, the $R_{eH}$ minimum values are 10 MPa lower than the values given in this table. NOTE The steel grades defined in this part of EN 10305 have an intrinsic minimum transverse impact energy of 27 J at 0 °C.				

### 8.4 Appearance and soundness

#### 8.4.1 Appearance

**8.4.1.1** The internal and external surface finish of the tubes shall be typical of the manufacturing process and the heat treatment, and it shall be such that any surface imperfections such as ridges, dents or shallow grooves requiring dressing can be identified.

**8.4.1.2** Any surface imperfections, whose depth cannot be clearly identified (i.e. scales, overlaps) shall be either dressed in accordance with 8.4.1.3 or treated in accordance with 8.4.1.4.

**8.4.1.3** It shall be permissible to dress, by grinding or machining, surface imperfections provided that, after doing so, the dimensions are within the specified tolerances. All dressed areas shall blend smoothly into the contour of the tube.

**8.4.1.4** Surface imperfections which encroach on the specified minimum wall thickness shall be considered defects and tubes containing these shall be deemed not to conform to this part of EN 10305.

**8.4.1.5** The tubes shall have smooth outer and inner surfaces with a roughness  $R_a \leq 4 \mu\text{m}$ , unless option 1 is specified.

NOTE In the case of the inner surface this requirement applies to inner diameters  $\geq 15 \text{ mm}$ .