

**Austenitic, austenitic-ferritic and ferritic longitudinally  
welded stainless steel tubes for the food and chemical  
industry**

## EESTI STANDARDI EESSÖNA

## NATIONAL FOREWORD

See Eesti standard EVS-EN 10357:2013 sisaldab Euroopa standardi EN 10357:2013 inglisekeelset teksti.	This Estonian standard EVS-EN 10357:2013 consists of the English text of the European standard EN 10357:2013.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikole liikmetele kättesaadavaks 11.12.2013.	Date of Availability of the European standard is 11.12.2013.
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile [standardiosakond@evs.ee](mailto:standardiosakond@evs.ee).

ICS 23.040.10

### **Standardite reprodutseerimise ja levitamise õigus kuulub Eesti Standardikeskusele**

Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonsesse süsteemi või edastamine üksikõik millises vormis või millisel teel ilma Eesti Standardikeskuse kirjalliku loata on keelatud.

Kui Teil on küsimusi standardite autorikaltse kohta, võtke palun ühendust Eesti Standardikeskusega:  
Aru 10, 10317 Tallinn, Eesti; [www.evs.ee](http://www.evs.ee); telefon 605 5050; e-post [info@evs.ee](mailto:info@evs.ee)

### **The right to reproduce and distribute standards belongs to the Estonian Centre for Standardisation**

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, without a written permission from the Estonian Centre for Standardisation.

If you have any questions about copyright, please contact Estonian Centre for Standardisation:  
Aru 10, 10317 Tallinn, Estonia; [www.evs.ee](http://www.evs.ee); phone 605 5050; e-mail [info@evs.ee](mailto:info@evs.ee)

ICS 23.040.10

English Version

**Austenitic, austenitic-ferritic and ferritic longitudinally welded  
stainless steel tubes for the food and chemical industry**

Austénitiques, ferritiques et austéno-ferritiques Tubes  
soudés longitudinalement en acier inoxydable pour  
l'industrie alimentaire et chimique

Austenitische, austenitisch-ferritische und ferritische  
längsnahtgeschweißte Röhre aus nichtrostendem Stahl für  
die Lebensmittel- und chemische Industrie

This European Standard was approved by CEN on 5 October 2013.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

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-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of 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 United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

<b>Contents</b>	<b>Page</b>
<b>Foreword</b> .....	<b>3</b>
<b>1 Scope</b> .....	<b>4</b>
<b>2 Normative references</b> .....	<b>4</b>
<b>3 Dimensions and tolerances</b> .....	<b>4</b>
<b>3.1 Dimensions and tolerances for tubes</b> .....	<b>4</b>
<b>3.2 Straightness</b> .....	<b>7</b>
<b>4 Information to be supplied by the purchaser</b> .....	<b>7</b>
<b>4.1 Mandatory information</b> .....	<b>7</b>
<b>4.2 Example of an order</b> .....	<b>7</b>
<b>5 Materials</b> .....	<b>7</b>
<b>6 Manufacturing process, requirements and surface characteristics</b> .....	<b>8</b>
<b>7 Testing and inspection documents</b> .....	<b>8</b>
<b>8 Marking</b> .....	<b>9</b>
<b>9 Packaging and transport</b> .....	<b>9</b>
<b>Annex A (informative) Responsibility on selection of material</b> .....	<b>10</b>
<b>Bibliography</b> .....	<b>11</b>

## Foreword

This document (EN 10357:2013) 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 June 2014, and conflicting national standards shall be withdrawn at the latest by June 2014.

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.

According to the CEN-CENELEC Internal Regulations, the national standards organisations 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.

## 1 Scope

This European Standard specifies dimensions, tolerances, materials, internal and external surface characteristics, and marking of stainless steels longitudinally fusion welded tubes for the food and chemical industry.

## 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 10028-7:2007, *Flat products made of steels for pressure purposes - Part 7: Stainless steels*

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

EN 10217-7, *Welded steel tubes for pressure purposes - Technical delivery conditions - Part 7: Stainless steel tubes*

EN ISO 4288, *Geometrical product specifications (GPS) - Surface texture: Profile method - Rules and procedures for the assessment of surface texture (ISO 4288)*

## 3 Dimensions and tolerances

### 3.1 Dimensions and tolerances for tubes

Dimensions and tolerances for tubes are indicated in Table 1 and Table 2.

Table 1 — Preferred dimensions and tolerances (mm)

	13,00	19,00	23,00	29,00	35,00	41,00	53,00	70,00	85,00	104,00	129,00	154,00	204,00
<b>External tube diameter</b>	13,00	19,00	23,00	29,00	35,00	41,00	53,00	70,00	85,00	104,00	129,00	154,00	204,00
External tolerances	±0,10	±0,10	±0,12	±0,15	±0,18	±0,21	±0,27	±0,35	±0,43	±0,78	±0,97	±1,16	±1,53
<b>Internal diameter (theoretical)</b>	10,00	16,00	20,00	26,00	32,00	38,00	50,00	66,00	81,00	100,00	125,00	150,00	200,00
<b>Wall thickness</b>	1,50	1,50	1,50	1,50	1,50	1,50	1,50	2,00	2,00	2,00	2,00	2,00	2,00
Wall tolerances	±0,15	±0,15	±0,15	±0,15	±0,15	±0,15	±0,15	±0,20	±0,20	±0,20	±0,20	±0,20	±0,20

Table 2 — Alternative dimensions and tolerances <sup>a</sup> (mm)

<b>Series B</b>	External tube diameter	12,00	18,00	22,00	28,00	34,00	40,00	52,00								
	External tolerances	±0,10	±0,10	±0,12	±0,15	±0,18	±0,21	±0,27								
	Internal diameter (theoretical)	10,00	16,00	20,00	26,00	32,00	38,00	50,00								
	Wall thickness	1,00	1,00	1,00	1,00	1,00	1,00	1,00								
<b>Series C</b>	Wall thickness tolerances	±0,10	±0,10	±0,10	±0,10	±0,10	±0,10	±0,10								
	External tube diameter	17,20	21,30	26,90	33,70	42,40	48,30	60,30	76,10	88,90	114,30					
	External tolerances	±0,10	±0,11	±0,14	±0,17	±0,21	±0,24	±0,30	±0,38	±0,44	±0,86					
	Internal diameter (theoretical)	14,00	18,10	23,70	29,70	38,40	44,30	56,30	72,10	84,90	110,30					
<b>Series D</b>	Wall thickness	1,60	1,60	1,60	2,00	2,00	2,00	2,00	2,00	2,00	2,00					
	Wall thickness tolerances	±0,15	±0,15	±0,15	±0,20	±0,20	±0,20	±0,20	±0,20	±0,20	±0,20					
	External tube diameter	25,00	25,40	32,00	38,00	38,10	38,10	50,80	50,80	51,00	63,50	63,50	76,10	76,10	76,10	101,60
	External tolerances	±0,13	±0,13	±0,16	±0,19	±0,19	±0,19	±0,25	±0,25	±0,25	±0,32	±0,32	±0,38	±0,38	±0,38	±0,76
<b>Series D</b>	Internal diameter (theoretical)	22,60	22,20	29,60	35,60	35,10	34,90	47,80	47,60	48,60	60,50	60,30	73,10	72,90	72,10	97,60
	Wall thickness	1,20	1,60	1,20	1,20	1,50	1,60	1,50	1,60	1,20	1,50	1,60	1,50	1,60	2,00	2,00
	Wall thickness tolerances	±0,12	±0,16	±0,12	±0,12	±0,15	±0,16	±0,15	±0,16	±0,12	±0,15	±0,16	±0,15	±0,16	±0,20	±0,20

<sup>a</sup> For dimensions different from the ones listed above the tolerances are:  
EN ISO 1127-D4 for external diameter < 90 mm  
EN ISO 1127-D3 for external diameter > 90 mm  
In external diameter tolerances ovality is included  
For wall thickness ± 10 %





### 3.2 Straightness

Straightness deviation for a given length shall be determined by the following formula:

$$0,0015 \times \text{length}$$

and shall not exceed 2 mm/m.

## 4 Information to be supplied by the purchaser

### 4.1 Mandatory information

The following information shall be supplied by the purchaser at the time of enquiry and order:

- a) the quantity (total weight or total metres or number of tubes);
- b) the reference to this standard ;
- c) the term "tube";
- d) manufacturing process symbol and surface characteristics (see Table 3);
- e) the dimensions (outside diameter D and wall thickness T);
- f) single unit length and related tolerance;
- g) the designation of the steel grade according to EN 10217-7 except for ferritic grades;
- h) the designation of the steel grade according to EN 10028-7 only for ferritic;
- i) production and testing according to EN 10217-7 TC1 or TC2; for ferritic grades the reference values shall be agreed;
- j) other options according to EN 10217-7.

### 4.2 Example of an order

1000 m of welded tube according to EN 10357, manufacturing process BC, external diameter = 40 mm, thickness = 1 mm, single unit length 6000 mm (0/+100) mm test category 1 according to EN 10217-7, grade 1.4404 and inspection certificate 3.1 according to EN 10204:

1000 m Tube EN 10357 — BC - 40 × 1 × 6000 (0/+100) mm - TC1 – EN 10217-7/1.4404 - 3.1

## 5 Materials

Materials used for tubes manufacturing according to this standard shall be:

- austenitics and austenitic-ferritics according to EN 10217-7;
- ferritics according to EN 10028-7.

## 6 Manufacturing process, requirements and surface characteristics

The tubes shall be manufactured from cold rolled plate, sheet or strip, longitudinally fusion welded, with or without the addition of filler metal.

Manufacturing process, requirements and surface characteristics are specified in Table 3

**Table 3 — Manufacturing process, requirements and surface characteristics**

Manufacturing process	Heat treatment	Surface characteristics and roughness			Symbol
		Internal surface	Internal weld bead	External surface and welding area	
From cold rolled material <sup>a</sup>  Welded, welding bead rolled	Not heat treated	$Ra < 0,80 \mu\text{m}$ pickled and passivated	$Ra < 1,60 \mu\text{m}$ pickled and passivated	Pickled and passivated	<b>CC</b>
				Ground, $Ra < 1,00 \mu\text{m}$	<b>CD</b>
From cold rolled material <sup>a</sup>  Welded, welding bead rolled	Heat treated	$Ra < 0,80 \mu\text{m}$ pickled and passivated or bright annealed	$Ra < 1,60 \mu\text{m}$ pickled and passivated or bright annealed	Pickled and passivated or bright annealed	<b>BC</b>
				Ground, $Ra < 1,00 \mu\text{m}$	<b>BD</b>

<sup>a</sup> From cold rolled material according to EN 10028-7:2007, Table 6 finish 2B or 2R

Tubes that are not bright annealed and not heat treated shall be internally and externally pickled and passivated. After rinsing, residual acid or welding discolouration shall not be present. Further cleanliness requirements shall be agreed upon in the order.

The weld is to be worked down so that it is flush with the tube wall and then smoothed. There shall be no overlapping of the weld metal and parent metal. There shall also be no protrusions, root gaps (lack of full penetration), overlapping or misalignment of edges, open pores (porosity) or traces of rolling.

The  $Ra$  roughness values shall be measured longitudinally, while the roughness measurement transversally to the welded bead may be agreed at the time of the order.

For tubes in execution BC and BD in the inspection certificate shall be specified if the tube is bright annealed or heat treated and pickled and passivated.

Tubes ends are to be smooth and free of burrs

## 7 Testing and inspection documents

Tubes according to this standard shall be tested according to:

- EN 10217-7 for test category TC1 or TC2 for austenitic and austenitic-ferritic materials;
- EN 10028-7 for ferritic materials (for  $D > 219,1$  mm, transversal weld tensile test is required.  $R_m$  shall be according to the base material requirements).

Intergranular corrosion testing shall be performed in accordance with EN 10217-7 for austenitic and austenitic-ferritic grades; for ferritic grades the test procedure shall be agreed.

Roughness measurements shall be performed inside the tube at least 5 mm from the end, in accordance with EN ISO 4288 on at least one test run for every 20 tubes per production batch. The measurements shall be recorded.

Measurements shall be performed both on the welded bead and on the base material. The inspection certificate shall report the conformity of the executed measurements.

In the case of CD and BD manufacturing process, additional outside roughness measurements shall be performed at least at 100 mm from the tube end with the same frequency as for the internal one.

The following inspection documents shall be issued:

- 3.1 according to EN 10204

## **8 Marking**

Each tube shall be marked, by suitable and durable methods, with the following information:

- Manufacturer's name or trademark;
- EN 10357 TC1 or TC2 for test categories 1 or 2, respectively, as in EN 10217-7;
- Symbol of the execution process according to Table 3
- Steel grade
- Dimensions
- Heat number
- For TC 2 tubes, the identification number (e.g. order or item number), according to EN 10217-7, which permits the correlation of the product or delivery unit to the related document
- The mark of the inspection representative

Different kind of marking and additional labelling shall be agreed at the time of the order.

## **9 Packaging and transport**

Tubes shall be delivered dry. Ground tubes in CD or BD execution process shall be protected by PE sleeves, unless differently agreed at the time of enquiry and order.

Packaging and transport shall be agreed at the time of the order.

**Annex A**  
**(informative)**

**Responsibility on selection of material**

The responsibility for material selection shall remain with the designer/end user. It is not in the scope of this standard to give guidance for selecting the appropriate material for individual applications. Regulations for materials in contact with drinking water for human use, food and dairy applications apply which may vary across the European Union Member states. For guidance, the most commonly used materials are listed in Table A.1 below.

**Table A.1 — Steel grades**

<b>Steel name</b>	<b>Material number</b>
X5CrNi18-10	1.4301
X2CrNi18-9	1.4307
X2CrNiMo17-12-2	1.4404
X2CrNiMo17-12-3	1.4432
X2CrNiMo18-14-3	1.4435

## Bibliography

EN ISO 1127, *Stainless steel tubes - Dimensions, tolerances and conventional masses per unit length (ISO 1127)*