



# SLOVENSKI STANDARD

## SIST EN 12452:2012

01-september-2012

Nadomešča:  
SIST EN 12452:2000

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**Baker in bakrove zlitine - Valjane, narebričene, nevarjene cevi za toplotne izmenjevalnike**

Copper and copper alloys - Rolled, finned, seamless tubes for heat exchangers

Kupfer und Kupferlegierungen - Nahtlose, gewalzte Rippenrohre für Wärmeaustauscher

Cuivre et alliages de cuivre - Tubes sans soudure à ailettes pour échangeurs thermiques

**Ta slovenski standard je istoveten z: EN 12452:2012**

### ICS:

23.040.15	Cevi iz neželeznih kovin	Non-ferrous metal pipes
77.150.30	Bakreni izdelki	Copper products

**SIST EN 12452:2012**

**en,de**

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN 12452**

May 2012

ICS 23.040.15; 77.150.30

Supersedes EN 12452:1999

English Version

**Copper and copper alloys - Rolled, finned, seamless tubes for  
heat exchangers**

Cuivre et alliages de cuivre - Tubes sans soudure à ailettes  
pour échangeurs thermiques

Kupfer und Kupferlegierungen - Nahtlose, gewalzte  
Rippenrohre für Wärmeaustauscher

This European Standard was approved by CEN on 20 April 2012.

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.

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

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## Foreword

This document (EN 12452:2012) has been prepared by Technical Committee CEN/TC 133 "Copper and copper alloys", the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by November 2012, and conflicting national standards shall be withdrawn at the latest by November 2012.

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 12452:1999.

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 97/23/EC Pressure Equipment Directive (PED).

For relationship with EU Directive 97/23/EU, see informative Annex ZA, which is an integral part of this document.

In comparison with EN 12452:1999, the following significant technical changes were made:

a) addition of material condition R250 for Cu-DHP;

b) replacement of sampling rate in Table 6.

Within its programme of work, Technical Committee CEN/TC 133 requested CEN/TC 133/WG 3 "Copper tubes (installation and industrial)" to revise the following standard:

EN 12452:1999, *Copper and copper alloys — Rolled, finned, seamless tubes for heat exchangers*

This is one of a series of European Standards for copper and copper alloy tubes. Other products are specified as follows:

- EN 1057, *Copper and copper alloys — Seamless, round copper tubes for water and gas in sanitary and heating applications*
- EN 12449, *Copper and copper alloys — Seamless, round tubes for general purposes*
- EN 12450, *Copper and copper alloys — Seamless, round copper capillary tubes*
- EN 12451, *Copper and copper alloys — Seamless, round tubes for heat exchangers*
- EN 12735-1, *Copper and copper alloys — Seamless, round copper tubes for air conditioning and refrigeration — Part 1: Tubes for piping systems*
- EN 12735-2, *Copper and copper alloys — Seamless, round copper tubes for air conditioning and refrigeration — Part 2: Tubes for equipment*
- EN 13348, *Copper and copper alloys — Seamless, round copper tubes for medical gases or vacuum*
- EN 13349, *Copper and copper alloys — Pre-insulated copper tubes with solid covering*
- EN 13600, *Copper and copper alloys — Seamless copper tubes for electrical purposes*

**EN 12452:2012 (E)**

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, Turkey and the United Kingdom.

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## 1 Scope

This European Standard specifies the composition, property requirements and tolerances on dimensions and form for rolled, finned, seamless copper and copper alloy tubes for heat exchangers. It is applicable to copper and copper alloy tubes supplied in the size range from 6 mm up to and including 35 mm outside diameter; from 1 mm up to and including 3 mm wall thickness of the unfinned section; and with fin height up to and including 1,5 mm.

The sampling procedures and the methods of testing for verification of conformity to the requirements of this European Standard are also specified.

## 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 1655, *Copper and copper alloys — Declarations of conformity*

EN 1971-1, *Copper and copper alloys — Eddy current test for measuring defects on seamless round copper and copper alloy tubes — Part 1: Test with an encircling test coil on the outer surface*

EN 1971-2, *Copper and copper alloys — Eddy current test for measuring defects on seamless round copper and copper alloy tubes — Part 2: Test with an internal probe on the inner surface*

EN 10204:2004, *Metallic products — Types of inspection documents*

EN 16090, *Copper and copper alloys — Estimation of average grain size by ultrasound*

EN ISO 196, *Wrought copper and copper alloys — Detection of residual stress — Mercury (I) nitrate test (ISO 196)*

EN ISO 2624, *Copper and copper alloys — Estimation of average grain size (ISO 2624)*

EN ISO 6507-1, *Metallic materials — Vickers hardness test — Part 1: Test method (ISO 6507-1)*

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

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

ISO 6957, *Copper alloys — Ammonia test for stress corrosion resistance*

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

### 3.1

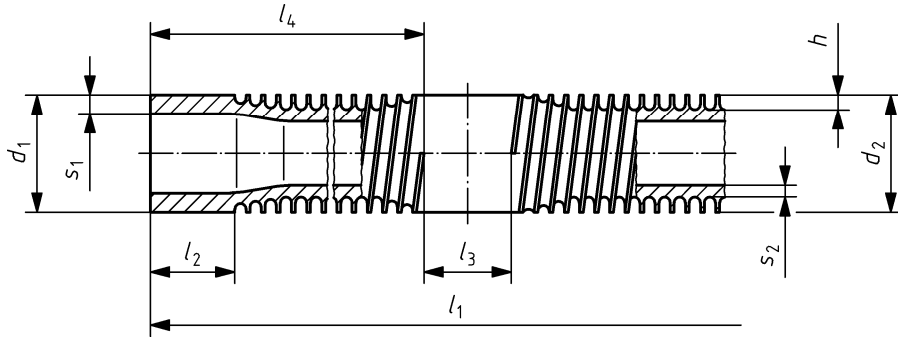
#### **rolled finned tube**

tube having a series of helical integral fins on the outside surface, produced by cold forming

Note 1 to entry: See Figure 1.

The inside surface can be specially shaped.

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where

$d_1$  is the outside diameter of unfinned section;

$d_2$  is the outside diameter of finned section;

$l_1$  is the total tube length;

$l_2$  is the length of unfinned tube end;

$l_3$  is the length of unfinned intermediate section;

$l_4$  is the distance from tube end to the unfinned intermediate section;

$h$  is the fin height;

$s_1$  is the wall thickness of unfinned section;

$s_2$  is the wall thickness of finned section.

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Figure 1 — Rolled finned tube

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### 3.2 deviation from circular form

difference between the maximum and minimum outside diameters measured at any one cross-section of the tube

[SOURCE: EN 1057:2006+A1:2010, 3.6]

## 4 Designations

### 4.1 Material

#### 4.1.1 General

The material is designated either by symbol or by number (see Table 1).

#### 4.1.2 Symbol

The material symbol designation is based on the designation system given in ISO 1190-1.

NOTE Although material symbol designations used in this European Standard might be the same as those in other standards using the designation system given in ISO 1190-1, the detailed composition requirements are not necessarily the same.



### 4.1.3 Number

The material number designation is in accordance with the system given in EN 1412.

## 4.2 Material condition

For the purposes of this European Standard, the following designations, which are in accordance with the system given in EN 1173, apply for the material condition:

R...	Material condition designated by the minimum value of tensile strength requirement for the product with mandatory tensile property requirements;
H...	Material condition designated by the minimum value of hardness requirement for the product with mandatory hardness requirements;
S (suffix)	Material condition for a product which is stress relieved.

NOTE Products in the R... or H... condition can be specially processed (i.e. mechanically or thermally stress relieved) in order to lower the residual stress level to improve the resistance to stress corrosion (see 6.6.2).

Exact conversion between material conditions designated R... and H... is not possible.

Except when the suffix S is used, the material condition is designated by only one of the above designations.

## 4.3 Product

The product designation provides a standardized pattern of designation from which a rapid and unequivocal description of a product can be conveyed in communication. It provides mutual comprehension at the international level with regard to products which meet the requirements of the relevant European Standard.

The product designation is no substitute for the full content of the standard.

The product designation for products to this European Standard shall consist of:

- denomination (Tube);
- number of this European Standard (EN 12452);
- material designation, either symbol or number (see Table 1);
- material condition designation (see Table 2);
- nominal cross-sectional dimensions expressed as outside diameter and wall thickness of the tube before finning (see 6.3);
- fin pitch (N), (number of fins per inch) and fin height (H).

The derivation of a product designation is shown in the following example.

EXAMPLE Tube conforming to this European Standard, in material designated either CuNi10Fe1Mn or CW352H, in material condition R290, with nominal outside diameter 22 mm, nominal wall thickness 1,25 mm, number of fins per inch 19 and fin height 1,5 mm, shall be designated as follows:

## EN 12452:2012 (E)

**Tube EN 12452 – CuNi10Fe1Mn – R290 – 22 × 1,25 – N19 × H1,5**

or

**Tube EN 12452 – CW352H – R290 – 22 × 1,25 – N19 × H1,5**

Denomination						
Number of this European Standard						
Material designation						
Material condition designation						
Nominal cross-sectional dimensions in millimetres						
Fin pitch and fin height						

## 5 Ordering information

In order to facilitate the enquiry, order and confirmation of order procedures between the purchaser and the supplier, the purchaser shall state on his enquiry and order the following information:

- quantity of product required (number of pieces or length);
- denomination (Tube);
- number of this European Standard (EN 12452);
- material designation (see Table 1);
- material condition designation (see 4.2 and Table 2);
- nominal cross-sectional dimensions (outside diameter × wall thickness);
- fin pitch (N) and fin height (H);
- lengths: total tube length ( $l_1$  in Figure 1), length of unfinned tube ends, if required ( $l_2$  in Figure 1), length and location of unfinned intermediate section, if required ( $l_3$  and  $l_4$  in Figure 1).

NOTE 1 It is recommended that the product designation, as described in 4.3, be used for items b) to g).

In addition, the purchaser shall also state on the enquiry and order any of the following, if required:

- whether a specially shaped inside surface is required;

NOTE 2 Details should be agreed between the purchaser and the supplier.

- whether the tubes are for subsequent welding applications (see Table 1);
- whether the tubes are for sea water application (see Table 1), and if so, the composition limits required;
- which test method is to be used for the freedom from defects test, if the choice is not to be left to the discretion of the manufacturer;
- whether deburring is required (see 6.5);
- whether eddy current test sensitivity other than that specified in Annex A is required (see A.1.6);

- o) whether a declaration of conformity is required (see 9.1);
- p) whether an inspection document is required, and if so, which type (see 9.2);
- q) whether there are any special requirements for marking, packaging or labelling (see Clause 10).

EXAMPLE Ordering details for 100 tubes conforming to EN 12452, in material designated either CuNi10Fe1Mn or CW352H, in material condition R290, with nominal outside diameter 22 mm, nominal wall thickness 1,25 mm, number of fins per inch 19, fin height 1,5 mm and nominal length 3 000 mm:

**100 pieces Tube EN 12452 – CuNi10Fe1Mn – R290 – 22 × 1,25 – N19 × H1,5  
– nominal length 3 000 mm**

or

**100 pieces Tube EN 12452 – CW352H – R290 – 22 × 1,25 – N19 × H1,5  
– nominal length 3 000 mm**

## 6 Requirements

### 6.1 Composition

The composition shall conform to the requirements for the appropriate material given in Table 1.

### 6.2 Mechanical properties

The properties shall conform to the appropriate requirements given in Table 2. The tests shall be carried out in accordance with 8.2 (tensile test) or 8.3 (hardness test).

NOTE After the fins have been rolled, the finned sections of the tube are in a work-hardened or "as finned" condition. Tubes made from materials liable to stress corrosion cracking [CuZn20Al2As (CW702R) and CuZn28Sn1As (CW706R)] are given a stress relieving anneal after the fins have been rolled (see 6.6.2).

### 6.3 Dimensions and tolerances

#### 6.3.1 General

The geometrical properties of the tubes are defined by outside diameter, wall thickness, fin height, fin pitch and length.

The dimensional tolerances are applied on the outside diameter, wall thickness, fin height, length and fin pitch, if not otherwise agreed between the purchaser and the supplier.

#### 6.3.2 Outside diameter

The outside diameter of the tubes, including deviation from circular form, at any unfinned cross-section, shall conform to the tolerances given in Table 3. The diameter over the fins shall not exceed the permissible outside diameter of the unfinned section of the tubes, at any point.

#### 6.3.3 Wall thickness

The wall thickness, measured at any point, beneath the fins and in the unfinned sections, shall not differ by more than  $\pm 10\%$  from the nominal wall thickness stated on the order [see Clause 5, list entry f)].