



SLOVENSKI STANDARD
SIST EN 12452:2000
01-november-2000

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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

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Ta slovenski standard je istoveten z: EN 12452:1999

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ICS:

23.040.15

77.120.30

77.150.30

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en

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ICS 77.120.30; 77.140.90

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 14 June 1999.

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 Central Secretariat 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 Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

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Foreword

This European Standard 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 January 2000, and conflicting national standards shall be withdrawn at the latest by January 2000.

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, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

This European Standard 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 standard.

Within its programme of work, Technical Committee CEN/TC 133 requested CEN/TC 133/WG 3.2 "Tubes for general purposes" to prepare the following standard:

EN 12452

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

This European Standard 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 Directives.

For relationship with EU Directives, see Annex ZA (informative), which is an integral part of this standard.

This is one of a series of European Standards for copper and copper alloy tubes. Other products are, or will be, 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

prEN 12735-1

Copper and copper alloys – Seamless, round copper tubes for air conditioning and refrigeration – Part 1: Tubes for piping systems

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prEN 12735-2

Copper and copper alloys – Seamless, round copper tubes for air conditioning and refrigeration – Part 2: Tubes for equipment

prEN 13348

Copper and copper alloys – Seamless, round copper tubes for medical gases

prEN 13349

Copper and copper alloys – Pre-insulated copper tubes with solid covering

prEN 13600

Copper and copper alloys – Seamless copper tubes for electrical purposes

According to CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard:

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 supplied in the size range from 6 mm up to and including 35 mm outside diameter and from 1 mm up to and including 3 mm wall thickness of the unfinned section with fin height up to and including 1,5 mm.

The sampling procedures and the methods of test for verification of conformity to the requirements of this standard are also specified.

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.

EN 1655

Copper and copper alloys – Declarations of conformity

EN 1971

Copper and copper alloys – Eddy current test for tubes

EN 10002-1

Metallic materials – Tensile testing – Part 1: Method of test (at ambient temperature)

EN 10204

Metallic products – Types of inspection documents

EN 10234

Metallic materials – Tube – Drift expanding test

EN ISO 196

Wrought copper and copper alloys – Detection of residual stress – Mercury(I) nitrate test (ISO 196 : 1978)

EN ISO 2624

Copper and copper alloys – Estimation of average grain size (ISO 2624 : 1990)

EN ISO 6507-1

Metallic materials – Vickers hardness test – Part 1: Test method (ISO 6507-1:1997)

ISO 6957

Copper alloys – Ammonia test for stress corrosion resistance

NOTE: Informative references to documents used in the preparation of this standard, and cited at the appropriate places in the text, are listed in a bibliography, see annex A.

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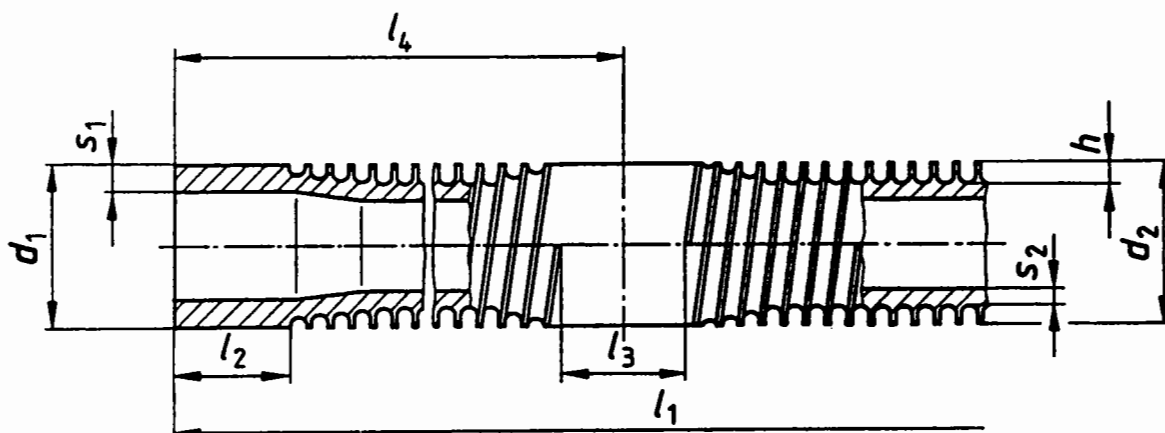
3 Definitions

For the purposes of this standard, the following definitions apply:

3.1 rolled finned tube

Tube having a series of helical integral fins on the outside surface produced by cold forming (see figure 1).

The diameter over the fins will normally not exceed the diameter of the unfinned section. The inside surface can be specially shaped.



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 centre of the unfinned intermediate section to tube end;

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

3.2 deviation from circular form

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

4 Designations

4.1 Material

4.1.1 General

The material is designated either by symbol or 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 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 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, material condition is designated by only one of the above designations.

4.3 Product

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The product designation provides a standardized pattern of designation from which a rapid and unequivocal description of a product is 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 standard shall consist of:

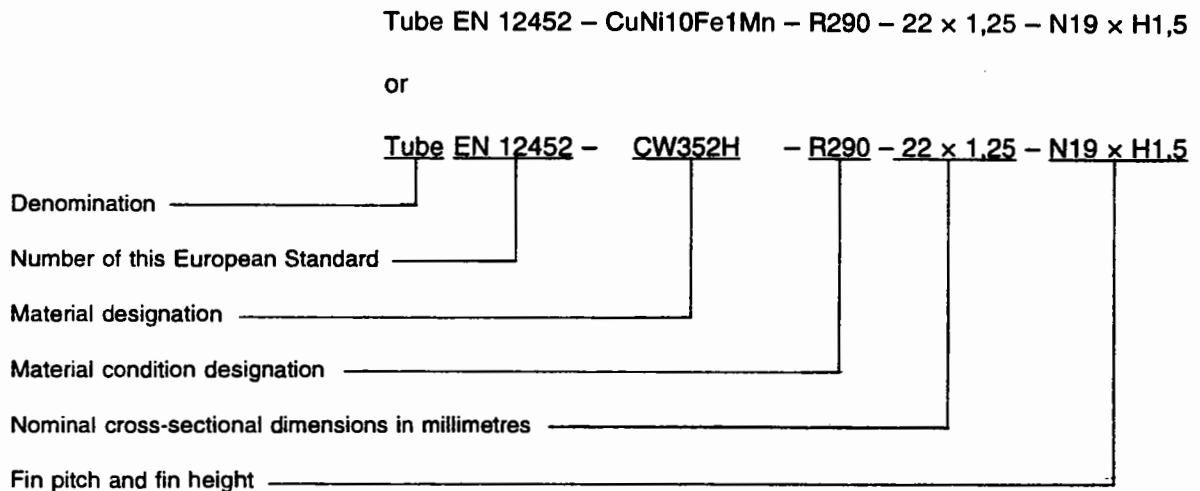
- denomination (Tube);
- number of this European Standard (EN 12452);
- material designation, either symbol or number (see table 1);
- material condition designation (see table 2);
- nominal cross-sectional dimensions expressed as outside diameter and wall thickness of the tube before finning (see 6.3);

– 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 standard, in material designated either CuNi10Fe1Mn or CW352H, in material condition R290, nominal outside diameter 22 mm, nominal wall thickness 1,25 mm, number of fins per inch 19, fin height 1,5 mm, shall be designated as follows:



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:

- a) quantity of product required (number of pieces or length);
- b) denomination (Tube);
- c) number of this European Standard (EN 12452);
- d) material designation (see table 1);
- e) material condition designation (see 4.2 and table 2);
- f) nominal cross-sectional dimensions (outside diameter × wall thickness);
- g) fin pitch (N) and fin height (H);
- 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, is used for items b) to g).

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

- i) whether specially shaped inside surface is required;

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

- j) whether the tubes are for subsequent welding applications (see table 1);
- k) whether the tubes are for sea water application (see table 1). If so, the composition limits required;
- l) 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;

m) whether deburring is required (see 6.5);

n) whether eddy current test sensitivity other than that specified in annex B is required (see B.1.5);

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, nominal outside diameter 22 mm, nominal wall thickness 1,25 mm, number of fins per inch 19, fin height 1,5 mm, 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).

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6.3 Dimensions and tolerances (standards.iteh.ai)

6.3.1 General

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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 section, shall not differ by more than $\pm 10\%$ from the nominal wall thickness stated on the order [see 5 f)].

6.3.4 Fin height

The fin height outside the length of transition taper shall not differ by more than $\pm 10\%$ from the nominal fin height stated on the order [see 5 g)].

6.3.5 Length

The total length (l_1 in figure 1) of the tubes shall conform to the tolerances given in table 4.

The length of the unfinned ends l_2 , as measured from the tube end to the first fin disc impression (i.e. the first detectable deformation by a fin rolling tool), shall not differ by more than $+5_0$ mm from the nominal length stated on the order [see 5 h)].

The length(s) of the unfinned section(s) l_3 , as measured from the first nearest fin disc impression, shall not differ by more than $+5_0$ mm from the nominal length stated on the order [see 5 h)].

The length(s) from the centre of the unfinned intermediate section(s) to the tube end l_4 shall not differ by more than ± 3 mm from the nominal length stated on the order [see 5 h)].

6.3.6 Fin pitch

The number of fins per inch shall conform to the tolerances given in table 5.

6.4 Tolerances of form

6.4.1 Deviation from circular form

The deviation from circular form is included in the tolerance on diameter given in table 3.

6.4.2 Straightness

The depth of the arc measured in any one metre portion of length shall be not greater than 3 mm.

6.5 Surface quality

The external and internal surfaces of the unfinned tubes shall be clean and smooth and shall display neither manufacturing flaws nor mechanical damage which would be detrimental to the intended application.

The tubes may have a superficial film of drawing lubricant or, if annealed or thermally stress relieved, a superficial, dull, iridescent oxide film, securely adherent on both the internal and external surfaces.

Discontinuous irregularities on the external and internal surfaces of the tubes are permitted if they are within the dimensional tolerances. Cracks in the fins are permitted as long as they do not interfere with the thickness of finned section (s_2 in figure 1).

If deburring of the cut ends of the tubes is required it shall be agreed between the purchaser and the supplier [see 5 m)].

6.6 Technological requirements

6.6.1 Drift expanding

No crack shall be visible to the unaided eye, corrected for normal vision if necessary, when the unfinned sections of the tubes in the annealed condition are tested in accordance with 8.4.1.