



# SLOVENSKI STANDARD

## SIST EN 12168:2011

01-oktober-2011

Nadomešča:

SIST EN 12168:1999

SIST EN 12168:1999/A1:2002

---

**Baker in bakrove zlitine - Votle palice za obdelavo z odrezovanjem na avtomatih**

Copper and copper alloys - Hollow rod for free machining purposes

Kupfer und Kupferlegierungen - Hohlstangen für die spanende Bearbeitung

Cuivre et alliages de cuivre - Barres creuses pour décolletage

[SIST EN 12168:2011](https://standards.iteh.ai/catalog/standards/sist/en-12168-2011/260-47be-9293-876dc9fd9b31/sist-en-12168-2011)

**Ta slovenski standard je istoveten z: EN 12168:2011**

---

**ICS:**

77.150.30

Bakreni izdelki

Copper products

**SIST EN 12168:2011**

**en,fr,de**

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

SIST EN 12168:2011

<https://standards.iteh.ai/catalog/standards/sist/40de1e64-f360-47be-9293-876dc9fd9b31/sist-en-12168-2011>

EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN 12168**

June 2011

ICS 77.150.30

Supersedes EN 12168:1998

English Version

## Copper and copper alloys - Hollow rod for free machining purposes

Cuivre et alliages de cuivre - Barres creuses pour  
décolletage

Kupfer und Kupferlegierungen - Hohlstangen für die  
spanende Bearbeitung

This European Standard was approved by CEN on 14 April 2011.

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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

[SIST EN 12168:2011](https://standards.iteh.ai/catalog/standards/sist/40de1e64-f360-47be-9293-876dc9fd9b31/sist-en-12168-2011)

<https://standards.iteh.ai/catalog/standards/sist/40de1e64-f360-47be-9293-876dc9fd9b31/sist-en-12168-2011>



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

Management Centre: Avenue Marnix 17, B-1000 Brussels

## Contents

Page

Foreword.....	4
Introduction .....	6
1 Scope .....	7
2 Normative references .....	7
3 Terms and definitions .....	7
4 Designations .....	8
4.1 Material .....	8
4.1.1 General.....	8
4.1.2 Symbol .....	8
4.1.3 Number .....	9
4.2 Material condition .....	9
4.3 Product .....	9
5 Ordering information .....	10
6 Requirements .....	12
6.1 Composition.....	12
6.2 Mechanical properties.....	12
6.3 Resistance to dezincification .....	12
6.4 Residual stress level .....	12
6.5 Dimensions and tolerances .....	12
6.5.1 Diameter or width across-flats .....	12
6.5.2 Tolerance on wall thickness .....	12
6.5.3 Eccentricity.....	12
6.5.4 Shape tolerances .....	13
6.5.5 Straightness .....	13
6.5.6 Length .....	13
6.5.7 Corner radii.....	13
6.5.8 Twist of polygonal hollow rod .....	13
7 Sampling .....	14
7.1 General.....	14
7.2 Analysis .....	14
7.3 Mechanical tests .....	14
7.4 Dezincification resistance and stress corrosion resistance tests .....	14
8 Test methods.....	15
8.1 Analysis .....	15
8.2 Tensile test .....	15
8.2.1 General.....	15
8.2.2 Location of test pieces .....	15
8.2.3 Shape and size of test pieces.....	15
8.2.4 Procedure for testing .....	15
8.2.5 Determination of results .....	15
8.3 Hardness test .....	16
8.4 Dezincification resistance test .....	16
8.5 Stress corrosion resistance test.....	16
8.6 Retests .....	16
8.6.1 Analysis, tensile, hardness and dezincification resistance tests.....	16
8.6.2 Stress corrosion resistance test.....	16
8.7 Rounding of results .....	16

9	Declaration of conformity and inspection documentation .....	17
9.1	Declaration of conformity .....	17
9.2	Inspection documentation .....	17
10	Marking, packaging, labelling .....	17
Annex A	(normative) Determination of mean depth of dezincification .....	28
A.1	Introduction .....	28
A.2	Procedure .....	28
A.3	Expression of results .....	28
	Bibliography .....	30

## Figures

Figure 1	— Examples of hollow rod cross-sections .....	8
Figure 2	— Measurement of twist of polygonal hollow rod .....	14
Figure A.1	— Example of contiguous fields .....	29

## Tables

Table 1	— Composition of low alloyed copper alloys .....	17
Table 2	— Composition of copper-zinc alloys .....	18
Table 3	— Composition of copper-zinc-lead alloys .....	19
Table 4	— Composition of complex copper-zinc alloys .....	20
Table 5	— Mechanical properties of low alloyed copper alloys .....	21
Table 6	— Mechanical properties of copper-zinc alloys .....	22
Table 7	— Mechanical properties of copper-zinc-lead alloys .....	23
Table 8	— Mechanical properties of complex copper-zinc alloys .....	24
Table 9	— Tolerances on external diameter or width across flats .....	25
Table 10	— Tolerances on wall thickness .....	25
Table 11	— Tolerances on diameter of the bore .....	25
Table 12	— Tolerances on eccentricity .....	26
Table 13	— Tolerances on straightness of hollow rod .....	26
Table 14	— Tolerances on length of hollow rod .....	26
Table 15	— Corner radii for hollow rod with square, hexagonal or octagonal external shape .....	26
Table 16	— Maximum twist for hollow rod with square, hexagonal or octagonal external shape .....	27
Table 17	— Sampling rate .....	27

## EN 12168:2011 (E)

## Foreword

This document (EN 12168:2011) 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 December 2011, and conflicting national standards shall be withdrawn at the latest by December 2011.

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 12168:1998.

Within its programme of work, Technical Committee CEN/TC 133 requested CEN/TC 133/WG 4 "Extruded and drawn products, forgings and scrap" to revise the following standard:

— EN 12168, *Copper and copper alloys — Hollow rod for free machining purposes.*

This is one of a series of European Standards for the copper and copper alloy products rod, wire and profile. Other products are specified as follows:

- EN 12163, *Copper and copper alloys — Rod for general purposes;*
- EN 12164, *Copper and copper alloys — Rod for free machining purposes;*
- EN 12165, *Copper and copper alloys — Wrought and unwrought forging stock;*
- EN 12166, *Copper and copper alloys — Wire for general purposes;*
- EN 12167, *Copper and copper alloys — Profiles and bars for general purposes;*
- EN 13347, *Copper and copper alloys — Rod and wire for welding and braze welding;*
- EN 13601, *Copper and copper alloys — Copper rod, bar and wire for general electrical purposes;*
- EN 13602, *Copper and copper alloys — Drawn round copper wire for the manufacture of electrical conductors;*
- EN 13605, *Copper and copper alloys — Copper profiles and profiled wire for electrical purposes.*

In comparison with EN 12168:1998, the following significant technical changes were made:

a) Removal of four materials:

- 1) CuZn38Pb4 (CW609N) and CuZn37Pb1 (CW605N);
- 2) CuZn36Pb2Sn1 (CW711R) and CuZn37Pb1Sn1 (CW714R);

b) Addition of five new materials:

- 1) CuZn40 (CW509L), CuZn42 (CW510L) and CuZn38As (CW511L) due to market requirements on restriction of lead;

- 2) CuZn32Pb2AsFeSi (CW709R);
  - 3) CuZn21Si3P (CW724R) due to market requirements on restriction of lead;
- c) Revision of the mechanical properties (Tables 5 to 8) to reflect market needs; in particular the tensile strength, the 0,2 % proof strength and the elongation that were previously informative are now mandatory since these are important figures for design purposes;
- d) Modification of the sampling rate (Table 17).

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 and the United Kingdom.

## iTeh STANDARD PREVIEW (standards.iteh.ai)

[SIST EN 12168:2011](https://standards.iteh.ai/catalog/standards/sist/40de1e64-f360-47be-9293-876dc9fd9b31/sist-en-12168-2011)

<https://standards.iteh.ai/catalog/standards/sist/40de1e64-f360-47be-9293-876dc9fd9b31/sist-en-12168-2011>

## Introduction

The European Committee for Standardization (CEN) draws attention to the fact that it is claimed that compliance with this document may involve the use of a patent concerning the alloy CuZn<sub>21</sub>Si<sub>3</sub>P (CW724R) given in 6.1.

CEN takes no position concerning the evidence, validity and scope of this patent right.

The holder of this patent right has assured the CEN that he is willing to negotiate licenses under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the holder of this patent right is registered with CEN. Information may be obtained from:

Wieland Werke AG  
Graf Arco Straße 36  
D-89079 Ulm

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights other than those identified above. CEN shall not be held responsible for identifying any or all such patent rights.

## iTeh STANDARD PREVIEW (standards.iteh.ai)

[SIST EN 12168:2011](https://standards.iteh.ai/catalog/standards/sist/40de1e64-f360-47be-9293-876dc9fd9b31/sist-en-12168-2011)

<https://standards.iteh.ai/catalog/standards/sist/40de1e64-f360-47be-9293-876dc9fd9b31/sist-en-12168-2011>



## 1 Scope

This European Standard specifies the composition, property requirements and dimensional tolerances for copper alloy hollow rod, finally produced by drawing or extruding, specifically intended for free machining purposes.

NOTE Hollow products having an outside diameter greater than 80 mm and/or a wall thickness less than 2 mm are specified in EN 12449.

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

## 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 1173, *Copper and copper alloys — Material condition designation*

EN 1412, *Copper and copper alloys — European numbering system*

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

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

EN 14977, *Copper and copper alloys — Detection of tensile stress — 5 % ammonia test*

EN ISO 6506-1, *Metallic materials — Brinell hardness test — Part 1: Test method (ISO 6506-1:2005)*

EN ISO 6509:1995, *Corrosion of metals and alloys — Determination of dezincification resistance of brass (ISO 6509:1981)*

EN ISO 6892-1, *Metallic materials — Tensile testing — Part 1: Method of test at room temperature (ISO 6892-1:2009)*

ISO 1190-1, *Copper and copper alloys — Code of designation — Part 1: Designation of materials*

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

#### **hollow rod**

straight product, of uniform cross-section along its whole length with an enclosed void for which the longitudinal axes of its external contour and its internal contour, which is the boundary with the enclosed void, are coincidental

NOTE The external and internal contours of the rod, at any cross-section, can be that of a circle, square, rectangle, hexagon, or octagon, or with slight modification of those basic shapes by inclusion of detail(s) of relatively small size to the remainder of the cross-section. Examples of hollow rod cross-sections are shown in Figure 1.

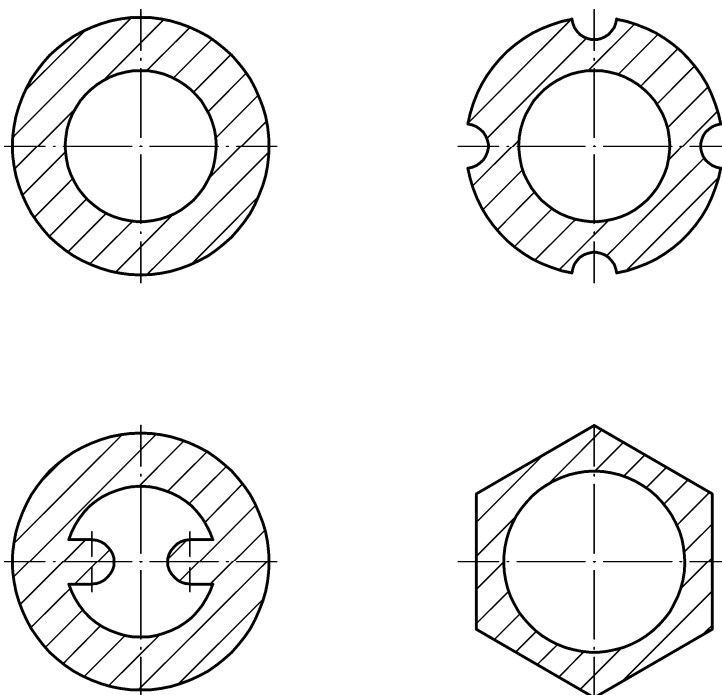


Figure 1 — Examples of hollow rod cross-sections

**3.2 deviation from circular form**  
 difference between the maximum and the minimum outside diameters measured at any one cross-section of the product

[SIST EN 12168:2011](https://standards.iteh.ai/catalog/standards/sist/40de1e64-f360-47be-9293-876dc9fd9b31/sist-en-12168-2011)

NOTE Adapted from EN 12163:2011.

<https://standards.iteh.ai/catalog/standards/sist/40de1e64-f360-47be-9293-876dc9fd9b31/sist-en-12168-2011>

**3.3 eccentricity**  
 difference between the maximum and the minimum wall thickness, measured in the same cross-section perpendicular to the axis of the hollow rod, expressed as a percentage of the sum of the maximum and minimum wall thicknesses ( $s_{max.}$  and  $s_{min.}$ ):

$$e = \frac{s_{max.} - s_{min.}}{s_{max.} + s_{min.}} \times 100$$

NOTE For polygons, wall thickness is measured perpendicular to the mid-points of the flat outside surfaces.

## 4 Designations

### 4.1 Material

#### 4.1.1 General

The material is designated either by symbol or number (see Tables 1 to 4).

#### 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:

M	Material condition for the product as manufactured without specified mechanical properties;
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 M or H... material condition may 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 and the dimensional stability on machining [see 5.1), 5 m) and 8.4].

Except when the suffix S is used, 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 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:

- a) denomination (hollow rod);
- b) number of this European Standard (EN 12168);
- c) material designation, either symbol or number (see Tables 1 to 4);
- d) material condition designation (see Tables 5 to 8);
- e) external and/or internal cross-sectional shape (the following designations shall be used as appropriate: RND for round, SQR for square, RCT for rectangular, HEX for hexagonal, OCT for octagonal, PFL for profile);
- f) nominal cross-sectional dimensions (see NOTE 1 to Clause 5) or, for profiles, the number of the profile or a fully dimensioned and toleranced drawing, and:
  - 1) tolerance class A, B or C added to the external dimension (see Table 9); and/or
  - 2) tolerance class A or B added to the bore diameter (see Table 11);
- g) wall thickness (the following designation shall be used for wall thickness: WT) (see Table 10);

**EN 12168:2011 (E)**

- h) for square, hexagonal or octagonal external shape, the corner shape (the following designations shall be used as appropriate: SH for sharp, RD for rounded) (see Table 15).

A typical product designation is shown in EXAMPLE 1, and the derivation of a product designation is shown in EXAMPLE 2.

EXAMPLE 1 Hollow rod for free machining purposes conforming to this standard, in material designated either CuZn39Pb3 or CW614N, in material condition H090, round external shape and bore, nominal outside diameter 40 mm, tolerance Class B, and nominal wall thickness 10 mm shall be designated as follows:

**Hollow rod EN 12168 — CuZn39Pb3 — H090 — RND40B × WT10**

or

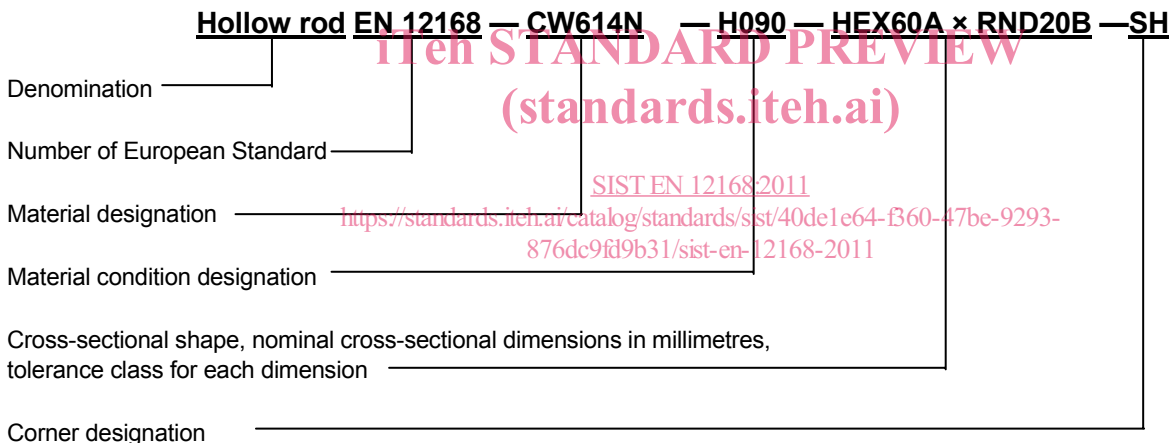
**Hollow rod EN 12168 — CW614N — H090 — RND40B × WT10**

EXAMPLE 2 Hollow rod for free machining purposes conforming to this standard, in material designated either CuZn39Pb3 or CW614N, in material condition H090, hexagonal external shape, 60 mm nominal width across-flats dimension, tolerance Class A, round bore of nominal diameter 20 mm, tolerance Class B sharp corners, shall be designated as follows:

**Hollow rod EN 12168 — CuZn39Pb3 — H090 — HEX60A × RND20B — SH**

or

**Hollow rod EN 12168 — CW614N — H090 — HEX60A × RND20B — SH**



## 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 (mass);
- denomination (hollow rod);
- number of this European Standard (EN 12168);
- material designation (see Tables 1 to 4);
- material condition designation (see 4.2 and Tables 5 to 8) if it is other than M;
- nominal cross-sectional dimensions or, in the case of hollow profiles, by a fully dimensioned and toleranced drawing;