BS EN 13348:2016

BSI Standards Publication

Copper and copper alloys — Seamless, round copper tubes for medical gases or vacuum

bsi.

National foreword

This British Standard is the UK implementation of EN 13348:2016. It supersedes BS EN 13348:2008 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee NFE/34/1, Wrought and unwrought copper and copper alloys.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Date	Text affected

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EN 13348

June 2016

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Supersedes EN 13348:2008

English Version

Copper and copper alloys - Seamless, round copper tubes for medical gases or vacuum

Cuivre et alliages de cuivre - Tubes ronds sans soudure en cuivre pour gaz médicaux ou le vide

Kupfer und Kupferlegierungen - Nahtlose Rundrohre aus Kupfer für medizinische Gase oder Vakuum

This European Standard was approved by CEN on 28 February 2016.

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EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (EN 13348:2016) 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of an identical text or by endorsement, at the latest by December 2016 and conflicting national standards shall be withdrawn at the latest by December 2016.

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 13348:2008.

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 Directive 2014/68/EU, Pressure Equipment Directive (PED).

For relationship with Directive 2014/68/EU, see informative Annex ZA, which is an integral part of this document.

Within its programme of work, Technical Committee CEN/TC 133 requested CEN/TC 133/WG 3 "Copper tubes (installation and industrial)" to revise EN 13348:2008.

In comparison with EN 13348:2008, the following significant technical changes were made:

a) The size range of the outside diameters has been increased from 133 mm to 219 mm;

b) Nominal outside diameters have been added to Table 1;

c) Lubricant residue values for the new outside diameters have been added in 6.5;

d) Sub-clause 8.7 has been revised and a new normative Annex B "Freedom from defects tests" has been added.

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

— EN 12735-1, *Copper and copper alloys — Seamless, round tubes for air conditioning and refrigeration — Part 1: Tubes for piping systems*

— EN 12735-2, *Copper and copper alloys — Seamless, round tubes for air conditioning and refrigeration — Part 2: Tubes for equipment*

— 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*

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, 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.

Introduction

It is recommended that tubes manufactured to this European Standard are certified as conforming to the requirements of this standard based on continuing surveillance which should be coupled with an assessment of a supplier's quality management system such as EN ISO 9001.

Tubes to this European Standard are suitable for capillary soldering, brazing or assembling by mechanical compression or collared fittings.

NOTE It is advised to take appropriate precautions if applying insulating material because it could be detrimental to the copper tube.

1 Scope

This European Standard specifies the requirements, sampling, test methods and conditions of delivery for copper tubes.

It is applicable to seamless round copper tubes having an outside diameter from 6 mm up to and including 219 mm for pipeline systems under vacuum or for distributing the following medical gases intended to be used at operating pressures up to 2 000 kPa:

— oxygen, nitrous oxide, nitrogen, helium, carbon dioxide, xenon;

— medical air;

— specific mixtures of these above mentioned gases;

— air for driving surgical tools;

— anaesthetic gases and vapours.

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 723, *Copper and copper alloys - Combustion method for determination of the carbon content on the inner surface of copper tubes or fittings*

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

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 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 8491, *Metallic materials - Tube (in full section) - Bend test (ISO 8491)*

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

ISO 1553, *Unalloyed copper containing not less than 99,90 % of copper - Determination of copper content - Electrolytic method*

ISO 4741, *Copper and copper alloys - Determination of phosphorus content - Molybdovanadate spectrometric method*

3 Terms and definitions

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

3.1
seamless round copper tube
hollow semi-finished product, circular in cross-section, made of copper, having a uniform wall thickness, which at all stages of production has a continuous periphery

[SOURCE: EN 1057:2006+A1:2010, 3.1]

3.2
brazing
joining process using filler metal with a liquidus temperature above 450 °C

[SOURCE: ISO 857-2:2005, 3.1.2]

3.3
mean diameter
arithmetical mean of the maximum and minimum outside diameters through the same cross-section of the tube

[SOURCE: EN 1057:2006+A1:2010, 3.5]

3.4
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]

3.5
deviation from concentricity
half of the difference between the maximum and minimum wall thicknesses at the same cross-section of the tube

[SOURCE: EN 1057:2006+A1:2010, 3.7]

3.6
production batch
definite quantity of products of the same form, the same material condition and the same cross-sectional dimensions manufactured during the same production sequence under uniform conditions

[SOURCE: EN 1057:2006+A1:2010, 3.8]

3.7
permanently marked
marked in such a way that the marking will remain readable up to the end of the life of the installation, e.g. by stamping, etching or engraving

[SOURCE: EN 1057:2006+A1:2010, 3.9]

3.8
durably marked
marked in such a way that the marking will remain readable up to the time of commissioning of the installation

EXAMPLE Ink marking.

[SOURCE: EN 1057:2006+A1:2010, 3.10]

4 Designations

4.1 Material

4.1.1 General

The material is designated either by symbol or number (see 6.1).

4.1.2 Symbol

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

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 designation, which is in accordance with the system given in EN 1173, applies for the material condition (see Table 1):

R... Material condition designated by the minimum value of tensile strength requirement for the product with mandatory tensile strength and elongation requirements.

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 European Standard shall consist of:

— denomination (Copper tube);

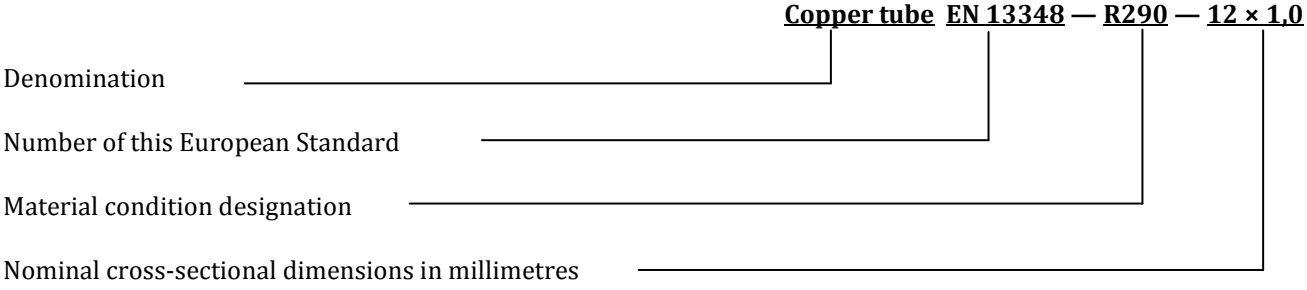
— number of this European Standard (EN 13348);

— material condition designation (see Table 1);

— nominal cross-sectional dimensions in millimetres: Outside diameter × wall thickness.

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

EXAMPLE Copper tube conforming to this European Standard, in material condition R290 (hard), nominal outside diameter 12 mm, nominal wall thickness 1,0 mm, will 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 (in metres);

b) denomination (Copper tube);

c) number of this European Standard (EN 13348);

d) material condition designation (see 4.2 and Table 1);

e) nominal cross-sectional dimensions in millimetres: outside diameter × wall thickness (see Table 3);

f) nominal length (see 10.2);

g) form of delivery (see 10.2).

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

h) whether an inspection document is required, and if so, which type (see Clause 9).

NOTE It is advised that the product designation, as described in 4.3, is used for items b) to e).

EXAMPLE Ordering details for 500 m copper tube conforming to EN 13348, in material condition R290 (hard), nominal outside diameter 12 mm, nominal wall thickness 1,0 mm, nominal length 5 m, straight lengths:

500 m Copper tube EN 13348 — R290 — 12 × 1,0 — 5 m straight lengths

6 Requirements

6.1 Composition

The composition shall conform to the following requirements:

Cu + Ag: min. 99,90 %;

0,015 % ≤ P ≤ 0,040 %.

This copper grade is designated either Cu-DHP or CW024A.

6.2 Mechanical properties

The tensile strength and elongation shall conform to the requirements given in Table 1. The test shall be carried out in accordance with 8.2.

Table 1 — Mechanical properties

Material condition		Nominal outside diameter		Tensile strength	Elongation	Hardness (indicative)
designation	common term	d		R_m	A	
		mm		MPa	%	HV 5
		min.	max.	min.	min.	
R220	annealed	6	108	220	40	(40 to 70)
R250	half hard[a]	6	66,7	250	30	(75 to 100)
		66,7	219		20	
R290	hard[a]	6	219	290	3	(min. 100)

NOTE 1 Hardness figures in parentheses are not requirements of this European Standard but are given for guidance purposes only.

NOTE 2 1 MPa is equivalent to 1 N/mm^2.

NOTE 3 Brittle fracture prevention: Copper, having a face-centred cubic crystal structure, does not suffer a transition from ductile to brittle failure like some other materials.

NOTE 4 Tolerances for tubes with a nominal outside diameter higher than 108 mm in material condition R220 (annealed) are not specified.

[a] Straight lengths only.

6.3 Dimensions and tolerances

6.3.1 General

The geometrical properties of the tube are defined by outside diameter, wall thickness and length. The outside diameter and wall thickness shall conform to the requirements given in Table 2, Table 3 and Table 4.

In cases of dispute, the dimensions shall be measured at a temperature of (23 ± 5) °C.

6.3.2 Nominal dimensions

The standardized nominal outside diameters and nominal wall thicknesses are given in Table 2. The recommended nominal lengths are given in Table 9.

Other dimensions can be supplied upon agreement between the purchaser and the supplier.

NOTE 1 CEN/TC 133 has defined the recommended R marked dimensions as a step towards rationalization aiming for not more than two wall thicknesses for each diameter, and a restricted number of diameters.

NOTE 2 For reference purposes, if DN designation of size for components of a piping system is required, it can be calculated for tubes to this European Standard by:

$$\mathrm{DN} = d - 2e \tag{1}$$

where

d is the nominal outside diameter in millimetres (mm);

e is the nominal wall thickness in millimetres (mm).

DN is a numerical designation of size, which is common to all components in a piping system. It is a convenient round number for reference purposes and is only loosely related to the manufacturing dimensions (see EN ISO 6708).

Table 2 — Nominal outside diameters and wall thicknesses

Dimensions in millimetres

Nominal outside diameter	**Nominal wall thickness** *e*								
d	0,7	0,8	0,9	1,0	1,2	1,5	2,0	2,5	3,0
6	—	—	—	X	—	—	—	—	—
8	—	R	—	R	—	—	—	—	—
10	—	R	—	R	—	—	—	—	—
12	—	X	—	R	—	—	—	—	—
14	—	—	—	X	—	—	—	—	—
15	R	—	—	R	X	—	—	—	—
16	—	—	—	X	—	—	—	—	—
18	—	—	—	R	X	—	—	—	—
22	—	—	R	R	X	R	—	—	—
28	—	—	R	R	X	R	—	—	—
35	—	—	—	X	R	R	X	—	—
42	—	—	—	X	R	R	X	—	—
54	—	—	—	X	R	R	R	—	—
64	—	—	—	—	—	—	R	—	—
66,7	—	—	—	—	R	—	R	—	—
70	—	—	—	—	—	—	X	—	—
76,1	—	—	—	—	—	R	R	—	—
80	—	—	—	—	—	—	X	—	—
88,9	—	—	—	—	—	—	R	—	—
104	—	—	—	—	—	—	X	—	—
108	—	—	—	—	—	R	—	R	—
133	—	—	—	—	—	—	—	—	X
159	—	—	—	—	—	—	R	—	R
219	—	—	—	—	—	—	—	—	R

R Indicates the European recommended dimensions.

X Indicates other European dimensions.

6.3.3 Tolerances on outside diameter

The outside diameter shall conform to the tolerances given in Table 3.

Table 3 — Tolerances on outside diameter

Dimensions in millimetres

Nominal outside diameter *d*		**Tolerances on nominal diameter**		
		applicable to mean diameter	applicable to any diameter[a]	
over	up to and including	all material conditions	R290 (hard) material condition	R250 (half hard) material condition
6[b]	18	± 0,04	± 0,04	± 0,09
18	28	± 0,05	± 0,06	± 0,10
28	54	± 0,06	± 0,07	± 0,11
54	76,1	± 0,07	± 0,10	± 0,15
76,1	88,9	± 0,07	± 0,15	± 0,20
88,9	108	± 0,07	± 0,20	± 0,30
108	159	± 0,2	± 0,70	± 1,0
159	219	± 0,60	± 1,50	± 2,00

NOTE 1 Tolerances for tubes in R220 (annealed) material condition are applicable only to mean diameter.

NOTE 2 In case of dispute, to improve the accuracy when determining the mean diameter, the tube may be re-rounded before measurement.

NOTE 3 Tolerances for tubes with a nominal outside diameter higher than 108 mm in material condition R220 (annealed) are not specified.

[a] Including deviation from circular form.

[b] Including 6.

6.3.4 Tolerance on wall thickness

The tolerance on wall thickness expressed in percentage of the nominal thickness, as measured at any point, shall conform to the requirements given in Table 4.

Table 4 — Tolerance on wall thickness

Nominal outside diameter	**Tolerance on wall thickness *e*[a]**	
d	*e* < 1 mm	*e* ≥ 1 mm
mm	%	%
< 18	± 10	± 13
≥ 18	± 10	± 15[b]

NOTE Concentricity (uniformity of wall thickness) is controlled by tolerance on wall thickness.

[a] Including deviation from concentricity.

[b] ± 10 % for R250 (half hard) tubes of 35 mm, 42 mm and 54 mm diameter with a wall thickness of 1,2 mm.

6.3.5 Tolerance on length

The lengths shall be equal to or greater than those ordered.

6.4 Freedom from defects

The tubes shall be free from defects that could be detrimental to their use. Each tube shall be subjected to the eddy current test described in 8.7.

6.5 Surface quality

The inner and outer surfaces of the tubes shall be clean and smooth.

To avoid contamination of the gas passing through the pipeline, the inner surface shall not contain any detrimental residue.

NOTE Experience has shown that some natural lubricants can degrade over time causing unpleasant odours to be generated from residual contamination of the tube inner surface. Synthetic lubricants do not degrade in the same manner and it is advised to use them during the manufacture of tube according to this standard.

Each tube shall be capped, plugged or otherwise closed at both ends so as to maintain the internal cleanliness of the tube under normal conditions of handling and storage.

The inner surface of the tube shall be capable of passing the carbon content test as described in 8.4.

When measured in accordance with 8.4, the lubricant residue on the inner surface of the tube shall conform to the requirements given in Table 5.

Table 5 — Lubricant residue on the inner surface of the tube

Nominal outside diameter		**Value**
mm		mg/dm^2
over	up to and including	max.
6[a]	133	0,20
133	219	0,38
[a] Including 6.		

6.6 Bending

No tear shall be visible to the unaided eye, corrected for normal vision, if necessary, when tubes of the sizes and material conditions given in Table 6 are tested in accordance with 8.5. Lüders bands shall be accepted.

6.7 Drift expanding

No crack, break or tearing of the metal shall be visible to the unaided eye, corrected for normal vision, if necessary, when tubes of the sizes and material conditions given in Table 6 (and agreed between the purchaser and the supplier, where necessary) are tested in accordance with 8.6.

Table 6 — Testing of bending and drift expanding

Nominal outside diameter *d* mm		Material condition	Technological test	
over	up to and including		bending[a]	drift expanding
6[b]	18	R220 (annealed)	—	M
		R250 (half hard)	—	M
		R290 (hard)	M	—
18	54	R220 (annealed)	—	A
		R250 (half hard)	—	A
		R290 (hard)	—	—
54	219	R220 (annealed)	—	—
		R250 (half hard)	—	—
		R290 (hard)	—	—

M Mandatory

A To be agreed upon by the purchaser and the supplier.

[a] For nominal wall thicknesses not less than 1 mm.

[b] Including 6.

7 Sampling

The number of sampling units to be taken at random shall be in accordance with Table 7 and at least one sampling unit per production batch.

Table 7 — Sampling rate

Tube mass per metre kg/m	Quantity for one sampling unit kg
≤ 0,25	1 500
> 0,25	2 500

These sampling rates shall apply when testing for dimensional and surface quality controls; controls of other mandatory properties shall be carried out on each second sampling unit.

Results may be used from analyses carried out at an earlier stage of manufacturing the product, e.g. at the casting or billets inward stage, if product identity is maintained and if the manufacturer has established and maintains a quality management system which should be at least equivalent to EN ISO 9001.

8 Test methods

8.1 Analysis

For composition, analysis shall be carried out on test samples obtained in accordance with Clause 7. The analytical methods used shall be chemical or spectrographic in accordance with appropriate European or International Standards.

In cases of dispute, the reference method shall be by chemical analysis in accordance with ISO 1553 and ISO 4741.

8.2 Tensile test

The tensile test shall be carried out in accordance with the method given in EN ISO 6892-1 on test pieces prepared from the test samples obtained in accordance with Clause 7.

8.3 Hardness test

When required, and after agreement between the purchaser and the supplier, the Vickers hardness test shall be carried out in accordance with EN ISO 6507-1.

8.4 Carbon content test

The determination of lubricant residue as total carbon content shall be carried out on the test samples obtained in accordance with Clause 7 using the reference method described in EN 723.

8.5 Bending test

When required, the bending test shall be carried out under current operating conditions using appropriate bending machines without internal mandrel in accordance with EN ISO 8491. The test piece shall be bent to an angle of 90° and to the appropriate minimum radius of curvature given in Table 8.

Table 8 — Minimum radius of curvature

Dimensions in millimetres

Nominal outside diameter *d*	**Minimum radius of curvature**	
	internal radius	neutral axis radius
6	27	30
8	31	35
10	35	40
12	39	45
14	43	50
15	48	55
16	52	60
18	61	70

8.6 Drift-expanding test

When required, the drift-expanding test shall be carried out in accordance with EN ISO 8493. The outside diameter of the tube end shall be expanded by 30 % using a conical mandrel having an angle of 45°.

8.7 Freedom from defects test

Each tube shall be subjected to one of the following tests:

— eddy current test for detection of local defects, in accordance with EN 1971-1 or EN 1971-2 and the requirements in B.1;

— hydrostatic test in accordance with the method in B.2;

— pneumatic test in accordance with the method in B.3.

Except for initial type testing, when only the eddy current test shall be used, the choice of the method, selected from the above, is at the discretion of the manufacturer.

NOTE For tubes intended to be used for helium, specific leak testing may be agreed between the purchaser and the supplier at the time of the order.

8.8 Retests

In the event that the sample fails to meet the test requirements, the batch represented by the sample or, in the case of continuous production, all tubes manufactured since the previous check, shall be placed in a bond.

Further samples shall be taken from the bonded tubes at a sampling rate four times more frequent than specified in Clause 7. If any of the retest samples fail to meet the specification requirements, the tubes represented by the samples shall be deemed not to meet the requirements of this European Standard and shall be rejected. If all the retest samples meet the requirements, the tubes represented by the samples shall be deemed to meet the requirements of this European Standard.

9 Inspection documentation

When requested by the purchaser [see Clause 5 h)] and agreed with the supplier, the supplier shall issue for the products the appropriate inspection document in accordance with EN 10204.

When ordering material for pressure equipment applications, the equipment manufacturer has the obligation to request appropriate inspection documentation in accordance with EN 10204:2004, Annex ZA.

10 Packaging, marking and form of delivery

10.1 Packaging and marking

Each tube shall be capped, plugged or otherwise closed at both ends so as to maintain the internal cleanliness of the tube under normal conditions of handling and storage.

NOTE It is advised that plug design be such as to prevent it being forced into the bore of the tube to a depth greater than the length of the plug.

Tubes shall be packaged in such a way that they are effectively protected in normal handling and storage conditions.

Tubes shall be marked at repeated distances along their length of not greater than 600 mm, with at least the following:

a) Permanent marking:

   1) number of this European Standard (EN 13348);

2) nominal cross-sectional dimensions in millimetres: outside diameter × wall thickness;

3) identification for R250 (half hard) material condition by the following symbol: |—|—|;

4) manufacturer's identification;

5) date of production: year and quarter (I to IV) or year and month (1 to 12).

The marking shall not be detrimental to the use of the tube.

b) Durable or permanent marking:

1) nominal cross-sectional dimensions in millimetres: outside diameter × wall thickness;

2) identification for R250 (half hard) material condition by the following symbol: I-I-I;

3) tubes from 6 mm but less than 10 mm, or greater than 54 mm diameter shall be at least similarly marked legibly at both ends.

Durable marking shall be capable of passing the test defined in Annex A.

No sampling frequency for the marking durability test is given; the concept of "capable of" in this context means that the manufacturer has to satisfy himself, by a suitable frequency of in-house testing, that all such markings would satisfy the requirements of the durability test if they were subjected to it. As a minimum, initial type tests should be carried out on first off samples selected from each new combination of marking materials and methods. Tests should be repeated if material formulation or source of supply changes.

10.2 Form of delivery

The recommended form of delivery of tubes is given in Table 9.

Table 9 — Recommended form of delivery

Form of delivery	**Nominal outside diameter** *d* mm		**Nominal length** m	**Material condition**
	over	up to and including		
Coils	6[a]	28	25, 35 and 50	R220 (annealed)
Straight lengths	6[a]	219	4, 5 and 6	R250 (half hard) R290 (hard)
[a] Including 6.				

Annex A
(normative)

Marking durability test

A.1 Abrasion test

A specimen of marked tube, having a length of more than 600 mm shall be rubbed five times in one direction, longitudinally, with a cotton cloth under strong manual pressure.

Afterwards, the marking shall remain legible.

A.2 Climatic test

Specimens of ink-marked tube, 200 mm long, shall be placed vertically in a climatic drying cabinet.

After exposure to a temperature of (80 ± 3) °C and 100 % atmospheric humidity for 24 h and after having been rubbed five times in one direction, longitudinally, with a cotton cloth under strong manual pressure, the marking shall remain legible.

Annex B
(normative)

Freedom from defects test

B.1 Eddy current test

Maximum drill diameters for the production of the reference standard tube which is defined in EN 1971-1 and EN 1971-2 are given in Table B.1.

Table B.1 — Maximum drill diameters for the reference standard tube

Dimensions in millimetres

Nominal outside diameter *d*		**Drill diameter**
over	up to and including	max.
6[a]	26	0,8
26	42	1,2
42	219	2,0
[a] Including 6.		

Signals produced by reference standard tubes shall set the sorting limits for acceptance or rejection. Tubes containing defects which produce signals equal to or greater than the sorting limit shall be rejected.

B.2 Hydrostatic test

The tube under test shall be connected to a source of pressurized water. Water pressure as specified in Table B.2 shall be maintained in the tube for a minimum period of 10 s without evidence of leaking. If one or more leaks are observed, the tube shall be rejected. If no leak is observed, the tube shall be accepted.

Table B.2 — Hydrostatic pressure test

Nominal outside diameter *d* mm		**Hydraulic pressure** MPa
over	up to and including	max.
6[a]	54	3,5
54	108	2,5
108	154	1,5
154	219	1,0
NOTE 1 MPa is equivalent to 10 bar.		
[a] Including 6 mm.		

B.3 Pneumatic test

The tube under test shall be connected to a source of pressurized air. Air pressure at 0,4 MPa (4 bar) shall be maintained in the tube.

The tube shall be completely immersed in water for a minimum period of 10 s and inspected for the issue of bubbles from the tube. Should any bubbles be observed then the tube shall be rejected. If no bubbles are observed then the tube shall be accepted.

Annex ZA
(informative)

Relationship between this European Standard and the Essential Requirements of Directive 2014/68/EU aimed to be covered

This European Standard has been prepared under a Commission's standardization request M/071 to provide one voluntary means of conforming to essential requirements of Directive 2014/68/EU.

Once this standard is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of this standard given in Table ZA.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding essential requirements of that Directive and associated EFTA regulations.

For this harmonized supporting standard for materials, presumption of conformity to the essential requirements of the Directive is limited to technical data of the material in the standard and does not presume adequacy of the material to specific equipment. Consequently, the technical data stated in the material standard should be assessed against the design requirements of the specific equipment to verify that the essential requirements of the Pressure Equipment Directive (PED) are satisfied.

Table ZA.1 — Correspondence between this European Standard and Annex I of Directive 2014/68/EU

Essential Requirements of the Directive 2014/68/EU	Clause(s)/ subclause(s) of this EN	Remarks/Notes
4.1(a)	6.2	Material properties
4.3	Clause 9	Conformity of product and manufacturer's certified documentation

NOTE Brittle fracture prevention: Copper, having a face-centred cubic crystal structure, does not suffer a transition from ductile to brittle failure like some other materials.

WARNING 1 — Presumption of conformity stays valid only as long as a reference to this European Standard is maintained in the list published in the Official Journal of the European Union. Users of this standard should consult frequently the latest list published in the Official Journal of the European Union.

WARNING 2 — Other Union legislation may be applicable to the product(s) falling within the scope of this standard.

Bibliography

ISO 857-2:2005, *Welding and allied processes - Vocabulary - Part 2: Soldering and brazing processes and related terms*

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

EN 1057:2006+A1:2010, *Copper and copper alloys - Seamless, round copper tubes for water and gas in sanitary and heating applications*

EN ISO 6708, *Pipework components - Definition and selection of DN (nominal size) (ISO 6708)*

EN ISO 7396-1, *Medical gas pipeline systems - Part 1: Pipeline systems for compressed medical gases and vacuum (ISO 7396-1)*

EN ISO 7396-2, *Medical gas pipeline systems - Part 2: Anaesthetic gas scavenging disposal systems (ISO 7396-2)*

EN ISO 9001, *Quality management systems - Requirements (ISO 9001)*

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

Directive 2014/68/EU of the European Parliament and of the Council of 15 May 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of pressure equipment

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