Für Mensch & Umwelt

Umwelt Bundesamt

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EVALUATION CRITERIA DOCUMENT

Evaluation criteria for metallic materials in contact with drinking water[1,2]

English translation – only the German document version is legally binding

[1] Notified in accordance with Directive (EU) 2015/1535 of the European Parliament and of the Council of 09 September 2015 laying down a procedure for the provision of information in the field of technical standards and regulations and of rules on Information Society services (OJ L 241, 17.09.2015, p.1).

[2] Notified under 2022/74/D

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Abbreviations	
a	Weighing factor indicating the surface area in contact with water for components of a product group in domestic drinking water distribution system and drinking water distribution systems. The figures consider the worst case (dimensionless)
$c_{\mathrm{CL}}(T,t)$	Concentration of the measured chemical element in the sample from control line CL at operating time T after stagnation time t in µg/l
c_{CL}	Arithmetic mean of the concentrations of the measured chemical element in the sample from the control line CL for the stagnation cycle after operating time T
$\tilde{c}\,(Ca)$	Molar calcium concentration in mmol/l
$\tilde{c}\,(O_2)$	Molar oxygen concentration in mmol/l
$c^*_{\mathrm{EP,n}}(T,t)$	As per DIN EN 15664-1:2014-03: equivalent pipe concentration for test pipe n at operating time T after stagnation time t with blank value correction in µg/l
$c^*_{\mathrm{EP}}(T,t)$	Arithmetic mean of the equivalent pipe concentrations of the used test pipes of a material at operating time T after stagnation time t with blank value correction in µg/l
$c^*_{\mathrm{EP,RM}}(T,t)$	Arithmetic mean of the equivalent pipe concentrations of the test pipes used for the reference material tested in a comparative test at operating time T after stagnation time t with blank value correction in µg/l
$K_{B8,2}$	Base capacity up to pH = 8.2 in mmol/l
$K_{S4.3}$	Acid capacity down to pH = 4.3 in mmol/l
$MEP_{\mathrm{n}}(\mathrm{T})$	Arithmetic mean of the equivalent pipe concentrations of the eight stagnation samples from pipe n in µg/l
$MEP_{\mathrm{a}}(\mathrm{T})$	Arithmetic mean of the $MEP_n(T)$ values of the material used in the test pipes in µg/l
$MEP_{\mathrm{a,RM}}(\mathrm{T})$	Arithmetic mean of the $MEP_n(T)$ values of the test pipes of the reference material used in a comparative test in µg/l
n	Number of the test pipe
PW	Reference concentration
S_1	Neutral salt quotient as per DIN EN 12502-3
T	Operating time in weeks
T_b	Operating time preceding operating time T where a complete stagnation sample was taken in weeks
t	Stagnation time in h

TOC	Concentration of total organic carbon in mg C/l
TrinkwV	German Drinking Water Ordinance

Terms [German expression in brackets]	
Absolute test *["Absolutprüfung"]*	Absolute test is a test according to DIN EN 15664-1 that uses all three DIN EN 15664-2 test waters or the most critical test water or the most critical test waters depending on the category (see Positive List), whose results are compared with the reference concentrations.
Range *["Bandbreite"]*	Range refers to the interval between upper and lower limits for the mass percentage of a chemical element in an alloy.
Category *["Kategorie"]*	Category refers to a group of materials with a similar composition which exhibit the same release behaviour of chemical elements in contact with drinking water.
Commercial material *["Kommerzieller Werkstoff"]*	Commercial materials are defined by their composition and are used in this form for products in contact with drinking water.
Product testing *["Produktprüfung"]*	Product testing is a test of the end product, which consists of several components and/or has a plating.
Reference concentration *["Prüfwert"]*	The reference concentration is the maximum permissible concentration of a chemical element transferred from the material to the drinking water. The reference concentration is derived from the respective limit value laid down in the Drinking Water Ordinance [TrinkwV] or another health guide value.
Reference material *["Referenzwerkstoff"]*	A reference material is the comparative material of a category with a narrowly defined composition. The metal release of the test specimens of the reference material should be as high as possible but still allowable in relation to the category limit.
Comparative test *["Vergleichsprüfung"]*	Comparative test according to DIN EN 15664-1 is used when a commercial material of an already existing category is tested in comparison to the reference material.
Materials test *["Werkstoffprüfung"]*	A materials test is used to check whether the material to be tested meets the requirements of these evaluation criteria. The test is carried out in accordance with DIN EN 15664-1 for protective layer forming materials or with DIN EN 16056 for passive materials.

1 Introduction

Materials used for the construction or maintenance of installations for the production, treatment or distribution of drinking water and in contact with drinking water may not

a) directly or indirectly impair the protection of human health envisaged by the TrinkwV,

b) adversely affect the smell or taste of the water; or

c) release substances into drinking water in quantities greater than is unavoidable if the generally accepted rules of technology are complied with

according to Section 17(2)(1) of the TrinkwV.

The present evaluation criteria specify the above-mentioned general hygiene requirements for metallic materials listed in the scope of application in accordance with Section 17(3) of the TrinkwV.

The evaluation criteria contain a final Positive List (Section 17(3)(2)(3) of the TrinkwV) of metallic materials as an appendix. The German Environment Agency (UBA) evaluates the metallic materials for inclusion in the Positive List based on this evaluation criteria.

Manufacturers of products in contact with drinking water must declare whether their products comply with the requirements of the evaluation criteria according to Section 17(3) of the TrinkwV. For this purpose, they can use a conformity attestation according to the UBA recommendation "Konformitätsbestätigung der trinkwasserhygienischen Eignung von Produkten" (Conformity attestation of product hygiene suitability for drinking water). It is usually sufficient to confirm that the materials used for products or components made of metallic materials comply with the Positive List. In this case it is not necessary to check the metal release of the product.

Products with metal platings (e.g. nickel or chrome plating on the outer surface using thermal spraying on the surfaces in contact with drinking water), which cannot be tested as a material, are currently not included in the scope of these evaluation criteria. However, products with such platings can lead to an impairment of the quality of drinking water. It is therefore recommended that the metal release of corresponding products be assessed using a product test according to DIN EN 16058 as part of the conformity attestation. This also applies to the use of solders.

The evaluation criteria become binding within two years after their publication (i.e. since 10th April 2017) pursuant to Section 17(3)(4) of the TrinkwV. Previous changes have led to an extension of the Positive List. Therefore, these amendments have also been binding since 10th April 2017 or from their date of publication. From this date on, entrepreneurs and other owners of water supply facilities must ensure that only those metallic materials that are included in the Positive List of metallic materials suitable for drinking water hygiene contained in these evaluation criteria are used for the construction or maintenance of installations for the production, treatment or distribution of drinking water. This is in accordance with Section 17(2)(2) of the TrinkwV and considers the Restrictions on use (product groups or use with certain drinking waters). Evidence that a product meets the requirements of these evaluation criteria can be provided by a certificate from a certifier accredited for the drinking water sector.

If only the replacement of individual parts of a product is required within the scope of maintenance of existing installations and the necessary part is manufactured from a material that is not specified on the Positive List of the metallic materials hygienically suitable for contact with drinking water or may not be used due to the local water quality, but

nevertheless can be verified to cause no impairment of the drinking water quality, then a replacement of the entire installation is not required. A replacement of the entire installation would pose an undue hardship for the entrepreneur and other proprietors of the existing installation and would be disproportional. A possible verification that it causes no impairment of the drinking water quality can be provided e.g. with a staggered stagnation sampling according to the UBA recommendation "Evaluation of drinking water quality with respect to the parameters lead, copper and nickel".

With the provision in Section 17(3) of TrinkwV and the precise requirements according to these evaluation criteria, the Federal Republic of Germany implements Article 10 of the Council Directive 98/83/EC of 3rd November 1998 on the quality of water intended for human consumption that obliges the Member States of the European Union to regulate the requirements on materials in contact with drinking water. There are currently no harmonised European regulations for products in contact with drinking water. Five EU Member States, Germany, France, the Netherlands, the United Kingdom of Great Britain and Denmark (4MSI Initiative), are working together in order to achieve an alignment of the national requirements. A proposal for a harmonised provision for metallic materials in contact with drinking water was thereby compiled (https://www.umweltbundesamt.de/en/document/part-a-procedure-for-acceptance).

The existing evaluation criteria follows this proposal. The German Environment Agency cooperates also with the competent authorities of the specified Member States on drafting and updating the evaluation criteria.

2 Scope

The evaluation criteria apply to metallic base materials and metallic platings with a general hygienic suitability for contact with drinking water that are used for the construction or maintenance of installations for the abstraction, processing or distribution of drinking water if they are intended for direct contact with drinking water.

The Positive List in the enclosure applies to metallic base materials as well as to platings for which the hygienic suitability of the material to contact with drinking water can be verified and evaluated.

Solders do not currently fall into the scope. The reason is that new alloys can be produced during soldering with the base materials that cannot be measured with a materials test.

3 Requirements on Metallic Materials

3.1 Metallic base materials

Products that are used for the construction or maintenance of installations for the abstraction, processing or distribution of drinking water may be manufactured only from metallic materials that comply with the Positive List of the metallic materials hygienically suitable for contact with drinking water (see Enclosure).

3.2 Metallic platings

3.2.1 Metallic platings with general hygienic suitability for contact with drinking water

UBA can determine the general hygienic suitability for contact with drinking water for the following metallic platings:

- Metallic platings on the inner surface in contact with water for the protection of the base material that are manufactured by a production process that guarantees uniform platings with consistent quality ensured. The evaluation must take into account the durability of the plating for the protection of the base material.
  In this case the metallic plating can be considered as uniform material with the base material.

- Metallic platings that are intentionally applied primarily on the outer surfaces (that do not come in contact with drinking water), but are scattered on the inner surfaces in contact with water and for which it was documented that the metallic plating does not lead to an intensified metal release of the base material nor itself releases substances into the drinking water in concentrations that lead to a rejection of the coated products.

Platings that are evaluated accordingly are in the Positive List of the specified metallic materials hygienically suitable for contact with drinking water. Products with these platings must comply with the requirements that are specified there.

3.2.2 Metallic platings without general hygienic suitability for contact with drinking water

Metallic platings that are not in general hygienically suitable for contact with drinking water do not fall into the scope of these evaluation criteria.

The hygienic suitability for contact with drinking water of these platings can be documented by means of a product test, e.g. in accordance with DIN EN 16058.

3.3 Solders

Solders do not fall into the scope of these evaluation criteria.

When using joining materials, the set of technical regulations must be observed.

4 Classification of Materials

4.1 Protective layer forming materials

Protective layer forming materials are generally copper materials with various chemical compositions. These materials are classified into various categories according to chemical composition.

Protective layer forming materials are tested in accordance with DIN EN 15664-1.

The requirements specified in Section 5.2 on materials testing in accordance with DIN EN 15664-1 ensure that the use of materials evaluated as positive for operation in accordance with regulations of the domestic drinking water distribution system do not lead to exceedances of the limit values of TrinkwV or other health guideline values. To take into account various drinking water properties, a test is carried out in accordance with DIN EN 15664-2 with three different drinking waters.

UBA takes into account in materials evaluation that chemical elements in the drinking water can originate from various sources. The requirements are therefore developed in such a way that the threshold values of TrinkwV may only be reached in part (between 50% and 90% depending on chemical element) through the release of materials in contact with drinking water.

UBA evaluates metallic materials in compliance with Section 5.2 of these evaluation criteria. The materials evaluated as positive by the German Environment Agency and possible restrictions for use are specified in the following Positive List of metallic materials hygienically suitable for contact with drinking water.

The evaluation takes into account that after the new installation of products made of metallic materials a protective layer generally forms on the surface that can limit any further metal release. For newly installed products, an initially higher release can be tolerated up to the sixteenth week after installation.

4.2 Passive materials

Passive materials are specified in the 'Passive Materials' category.

Passive materials are tested in accordance with DIN EN 16056.

The specified testing requirements in accordance with Section 5.3 of DIN EN 16056 ensure that for operation in accordance with regulations of the domestic drinking water distribution system the materials evaluated as positive will not cause any exceedances of the limit values of TrinkwV or other health guideline values.

4.3 Categories

In order to reduce the cost and effort involved in testing, materials that exhibit the same metal release behaviour with regard to their use in products and their behaviour upon contact with drinking water can be combined into one category.

UBA defines the categories based on the chemical compositions that are then specified in terms of category limits.

At most one reference material can be specified for each category. The reference material ought to exhibit a metal release for the category that is as high as possible but still permissible. The reference material exhibits a restricted range of composition and is tested with all three test waters in accordance with DIN EN 15664-2 for materials forming protective layers.

UBA stipulates the most critical test water or the most critical test waters based on the testing of the reference material for the category. This makes it possible that for the evaluation of further materials in the category the testing continues to be performed only with the most critical test water or test waters.

For the evaluation of materials in the same category, a further possibility is a comparative test with the reference material.

4.4 Specification of the material composition

For the characterisation of the material in line with these evaluation criteria, all elements must be specified that may be present in the material with a mass percentage of greater than or equal to 0.02 %. The specification of the material composition must comply with DIN EN 1982, DIN CEN/TS 13388 (DIN SPEC 9700) or the respective material standards. Mass percentage ranges are to be used for reference materials that are as narrow as possible and still technically feasible.

4.5 Product groups

Products are classified into product groups. The product groups are developed based on the proportion of the surface in contact with water of the associated products and their use. The

products combined in a product group may not exceed in total the accepted area in contact with water of the product group.

Table 1: Product groups

Product group	Definition	Weighing factor a
A	Pipes	1
B	Fittings, pipe connectors, devices and pumps in the domestic drinking water distribution system	0.1
C	1. Components in fittings, pipe connectors, devices and pumps of the domestic drinking water distribution system for which the surface area in contact with water takes up not more than 10% of the entire surface of the product in contact with water 2. Fittings, pipe connectors, devices and pumps in the area of the water supply outside of the domestic drinking water distribution system with a normally permanent flow	0.01
D	Components in fittings, pipe connectors, devices and pumps in the area of the water supply outside of the domestic drinking water distribution system (C2) for which the total surface area in contact with water takes up not more than 10% of the entire surface of the product in contact with water	-

Product group A includes pipes with surface proportion in contact with water of up to 100%. For pipes the same material can be used for all diameters in the domestic drinking water distribution system. A single material can thereby take up almost up to 100% of the surface in contact with water, e.g. copper, stainless steel or hot dipped galvanised ferrous materials. The use of pipe materials can be limited to specific drinking waters. The technical planner or installer must then decide by means of the available water analysis for the respective supply area, taking into account past experience, which pipe materials are usable. Materials of the product group A can also be used for applications of the product groups B, C and D.

Product group B includes fittings, pipe connectors, devices and pumps in the domestic drinking water distribution system with a surface proportion in contact with water of up to 10%. The fittings used in a domestic drinking water distribution system, pipe connectors, devices and pumps can be made of the same but also of different materials. Most of these products in the domestic drinking water distribution system can release the same chemical elements (e.g. lead) into the drinking water. They are therefore combined in one product group. For the evaluation of these products, a surface proportion of 10% is assumed for the total surface area in contact with water of the domestic drinking water distribution system. Materials for the product group B must exhibit a general hygienic suitability for contact with drinking water. They must be usable for all drinking waters. Galvanised pipe connectors are exceptions. They have the same limited area of application as galvanised pipes owing to their purpose, i.e. the connection of pipes made of galvanised steel or as transition connectors to another suitable pipe or fitting material.

Product group C1 includes components in fittings, pipe connectors, devices and pumps of the domestic drinking water distribution system for which the surface in contact with water takes up not more than 10% of the entire surface in contact with water on the product. It can be necessary for technical reasons to produce small-area components made of other materials that are not accepted for product group B. Other chemical compositions can thereby be

accepted with potentially higher metal releases as long as the metal concentration in the drinking water is not significantly elevated due to the use of these products. The use of these alloys is limited to components that (in total) take up not more than 1% of the surface in contact with water on the respective products. Materials for the product group C1 must exhibit a general hygienic suitability for contact with drinking water. They must be usable for all drinking waters.

Product group C2 includes fittings, pipe connectors, devices and pumps in the area of the water supply outside of the domestic drinking water distribution system with a normally permanent flow. These include metallic products that are installed in piping and water treatment plants outside of the domestic drinking water distribution system. A permanent flow must be ensured for these products. The scope for materials in product group C2 can be limited to specific drinking waters.

Product group D includes components in fittings, pipe connectors, devices and pumps in the area of the water supply outside of the domestic drinking water distribution system (C2) for which the total surface area in contact with water takes up not more than 10% of the entire surface of the product in contact with water. The total of the surface areas in contact with water on all components of a product in product group D must be less than 10% of the surface of the product in contact with water. A permanent flow must be ensured for these products. Materials in product group D are not explicitly listed but must fulfil requirements on their chemical composition.

5 Evaluation of Metallic Materials for Inclusion in the Positive List

5.1 Duties and responsibilities of the German Environment Agency

UBA evaluates metallic materials upon request (Section 17(4) (2 and 3) of TrinkwV) of a manufacturer or organisation (‘applicant’). The application procedure is regulated in the rules of procedure of the German Environment Agency for maintaining the Positive List of metallic materials hygienically suitable for contact with drinking water:

https://www.umweltbundesamt.de/en/document/rules-of-procedure-of-the-german-environment-agency

UBA itself does not perform any testing of metallic materials. The required testing is carried out by testing laboratories that are accredited for these tests. UBA evaluates the metallic materials hygienically suitable for contact with drinking water based on the submitted test reports.

Required tests are:

- For protective layer forming materials: material testing according to DIN EN 15664-1
- For passive materials: material testing according to DIN EN 16056
- An evaluation based on an expert opinion is also possible for certain materials.

UBA's evaluation of the materials is limited to their suitability in terms of hygiene. This means that if the tested materials are used in accordance with the standards, the metal release is so low that it will not lead to an avoidable impairment of drinking water quality. The corrosion resistance of the materials and thus the corrosion-specific properties of the materials or the components made from them are not subject to these evaluation criteria.

5.2 Protective layer forming materials

5.2.1 Evaluation options

Protective layer forming materials can be tested according to DIN EN 15664-1 with the following requirements for materials testing: ensure that the use of materials with a positive evaluation will not lead to the limiting values of the TrinkwV or another health-related guideline value being exceeded when the domestic drinking water distribution system is operated as intended.

The tests are carried out on different drinking waters which are representative for the spectrum of all distributed drinking waters. DIN EN 15664-2 provides specifications for three different test waters which permits an evaluation of all drinking waters distributed across Europe.

Testing a reference material

Reference materials are tested using an absolute test according to DIN EN 15664-1 with all three test waters according to DIN EN 15664-2.

Testing a commercial material

Other materials in a category (according to the reference material) can then be tested by:

- a comparative test against the reference material using a suitable test water (e.g. the most critical test water specified for the category in the Positive List) or
- an absolute test with the most critical test water for the category or, where appropriate, the most critical test waters. These are listed in the Positive List (Enclosure) for the respective category.

The evaluation is not based on individual analytical values but on the mean values of the eight stagnation samples determined according to the operating times (T) specified in DIN EN 15664-1:2014-03, Tables B.1 and B.2, and their temporal progressions. Averaging is equivalent to estimating the average weekly intake by humans.

According to DIN EN 15664-1, the mean value of the eight stagnation samples is converted to a concentration corresponding to a value of 100% of the internal surfaces (MEP(T) value) for materials that are not tested as pipes. The evaluation is done by multiplying the MEP(T) values by the assumed maximum surface area ratio of products manufactured from this material that may occur in the domestic drinking water distribution system or distribution network (weighing factor a; see Table 1).

Certain metallic materials can also be evaluated using an expert opinion. The German Environment Agency's rules of procedure about maintaining the Positive List of metallic materials suitable for drinking water hygiene (https://www.umweltbundesamt.de/en/document/rules-of-procedure-of-the-german-environment-agency) describe the prerequisites.

Note:

The evaluation of the test results of a comparative test on a reference material has proven rather difficult due to measurement uncertainties and other inaccuracies. Instead of a comparative test, an absolute test can be performed on commercial materials that are to be included in an existing category using the test water most critical for the category or, if applicable, the most critical test waters as per DIN EN 15664-2. The requirements for an absolute test in accordance

with Section 5.2.2.4 shall be applied. The most critical test water or, if applicable, the most critical test waters of a category are included in the Positive List of metallic materials suitable for drinking water hygiene.

5.2.2 Testing according to DIN EN 15664-1

5.2.1.1 Test specimen composition

For making test specimen as described in DIN EN 15664-1, the material composition shall be selected within the limits specified for the material in such a way that the test samples exhibit the highest possible release of the chemical elements considered. Chemical elements that increase the release of undesirable elements in terms of hygiene must be present in a high percentage and elements that reduce the release of chemical elements into drinking water must be present in a low percentage.

Reference material:

The percentages of constituents and unavoidable impurities (accompanying elements) must be within the upper and lower limits (m/m) specified for the alloy.

Note: The composition of a new reference material should be agreed with UBA before starting the test.

Commercial materials:

Test samples for copper alloys must have the following chemical composition based on the specified composition of the commercial material:

Constituents:

- Cu, Zn, Sn: as specified for the commercial material
- As: the mass percentage of As a constituent must be within a range that is greater than the lower mass percentage limit plus 66% of the specified range of material composition.
- Al, Si and P: the mass percentages of these constituents must be within a range that is smaller than the lower mass percentage limit plus 50% of the specified range of material composition.
- All other constituents: the mass percentages must be within a range greater than the lower mass percentage limit plus 80% of the specified range of material composition.

Impurities:

- The mass percentages of impurities to be determined in contact water in accordance with 5.2.2.2 shall be at least 60% of the upper mass percentage limit of the material composition.

5.2.1.2 Chemical analysis of contact water

All elements that can occur in the material with a mass percentage of more than 0.02% must be determined in contact water according to DIN EN 15664-1. The following elements are excluded from this:

- P, S, Si or Sn if listed as constituents,
- Al, Fe, Mn, P, Si, Sn or Zn if listed as impurities.

The elements to be determined are indicated in the Positive List for the respective category for comparative tests.

5.2.1.3 Reference concentrations

In an absolute test, the MEP_n(T) values determined according to DIN EN 15664-1 and weighted with the weighing factor a are compared with the corresponding reference concentrations (see Table 2).

The reference concentrations (RC) are based on the limit values of TrinkwV and, if certain substances are not TrinkwV parameters, on the guideline values of the World Health Organisation or the German Environment Agency. The release of metallic materials into drinking water must not exceed the limit values of the TrinkwV or the guideline values when testing the general suitability of a material for drinking water hygiene. The reference concentration usually corresponds to 50% of the limiting or guideline value concerning the evaluation. A release of the materials to within 90% of the limit values of the TrinkwV or the WHO guideline value can be accepted for the parameters copper and zinc (WHO guideline value).

Table 2: Reference concentrations

Parameter	Permissible percentage	Limiting value/ guideline value [Source]	Reference concentration in µg/l
Aluminium	50%	200 µg/l [TrinkwV]	100
Antimony	50%	5 µg/l [TrinkwV]	2.5
Arsenic	50%	10 µg/l [TrinkwV]	5
Lead	50%	10 µg/l [TrinkwV]	5
Bismuth	90%	10 µg/l [UBA]	9
Cadmium	50%	3 µg/l [TrinkwV]	1.5
Chromium	50%	50 µg/l [TrinkwV]	25
Iron	50%	200 µg/l [TrinkwV]	100
Copper	90%	2 mg/l [TrinkwV]	1800
Manganese	50%	50 µg/l [TrinkwV]	25
Molybdenum	50%	20 µg/l [WHO]	10
Nickel	50%	20 µg/l [TrinkwV]	10
Selenium	50%	10 µg/l [TrinkwV]	5
Titanium	50%	15 µg/l [UBA]	7.5
Tin	50%	6 mg/l [Fawell, 2003]	3000
Zinc	90%	3 mg/l [WHO]	2700

5.2.1.4 Evaluation of an absolute test

For the evaluation, arithmetic mean values MEP_a(T) for the elements to be analysed are calculated from the three MEP_n(T) values of the three test pipes of a test water. Arithmetic mean values $c^*_{EP}(T,t)$ are calculated for the elements to be analysed from the three 4-h stagnation values $c^*_{EP,n}(T,t)$ of the three test pipes (see section 5.2.2.2).

The tested material is suitable for contact with drinking water in the relevant product group in terms of hygiene if the following criteria are fulfilled for all elements to be analysed and all test waters:

A The reference concentrations (Table 2) must be observed from week 16 onwards for all elements to be analysed.

B The concentrations (parameters) determined must not increase in order to be able to rule out that the reference concentrations might still be exceeded at a later point in time (after completion of the test).

Criterion A is considered to be safely met if:

(I) $MEP_a(T) * a \leq PW$ for T = 16, 21 and 26 weeks

Criterion B is considered to be safely met if:

(II) $MEP_a(T_b) \geq MEP_a(T)$ for $\{T_b, T\}$ = {12, 16}, {16, 21} and {21, 26} weeks
or

(III) A line of best fit for $c^*_{EP}(T, 4h)$ does not show a rising trend for T > 12 weeks or

(IV) $c^*_{EP}(T, 4h) * a \leq 0.5 * TV$ for T = {16 *to* 26 } weeks

If **Criterion B** is not fulfilled, the test may be extended to 1 year.

In this case **Criterion A** is considered safely met if:

(V) $MEP_a(T) * a \leq TV$ for T = 16, 21, 26, 39 and 52 weeks

In this case **Criterion B** is considered safely met if:

(VI) $MEP_a(T_b) \geq MEP_a(T)$ for $\{T_b, T\}$ = {26, 39} and {39, 52} weeks
or

(VII) A line of best fit for $c^*_{EP}(T, 4h)$ does not show a rising trend for T > 26 weeks or

(VIII) $c^*_{EP}(T, 4h) * a \leq 0.5 * TV$ for T = {26 *to* 52} weeks

In some cases, it is difficult to clearly establish the conformity of the test results with requirements (I) to (VIII), because deviations (outliers) may occur due to inaccuracies in the determination method and/or small variations in the test water composition. In such a case, all available data must be taken into account for the evaluation of a test according to DIN EN 15664-1, as follows:

- Results of the individual test lines,
- 4-h stagnation results,
- Parameters of the test water,
- Temperature of the test waters,
- Further samples, which were possibly taken in addition to the requirements according to DIN EN 15664-1.

It must also be taken into account in the evaluation whether or not the available results are of sufficient quality (e.g. that there are no large deviations between the individual test lines).

5.2.1.5 Evaluation of a comparative test

For the evaluation, arithmetic mean values MEP_a(T) for the elements to be analysed are calculated from the three MEP_n(T) values of the three test pipes of the relevant material. Arithmetic mean values $c^*_{EP}(T, t)$ are calculated for the elements to be analysed from the three 4-h stagnation values $c^*_{EP,n}(T, t)$ of the three test pipes (see section 5.2.2.2).

The tested material is suitable for the relevant product group for contact with drinking water in terms of hygiene if the following criteria are fulfilled for all elements to be analysed:

A The tested material shows a better or equal metal release behaviour compared to the reference material for all elements to be analysed.

B The determined concentrations (parameters) must not increase in order to be able to rule out the possibility that the reference concentrations would be exceeded at a later date (after completion of the test).

Criterion A is considered to be safely fulfilled if:

(I) $MEP_a(T) \leq MEP_{a,RM}(T)$ for T = 16, 21 and 26 weeks

Criterion B is considered to be safely fulfilled if:

(II) $MEP_a(T_b) \geq MEP_a(T)$ for $\{T_b, T\}$ = {12, 16}, {16, 21} and {21, 26} weeks
or

(III) A line of best fit for $c^*_{EP}(T, 4h)$ does not show a rising trend for T > 12 weeks or

(IV) $c^*_{EP}(T, 4h) * a \leq 0.5 * TV$ for T = {16 *to* 26} weeks

If **Criterion B** is not fulfilled, the test may be extended to 1 year.

In this case, **Criterion A** is considered to be safely fulfilled if:

(V) $MEP_a(T) \leq MEP_{a,RM}(T)$ for T = 16, 21, 26, 39 and 52 weeks

In this case, **Criterion B** is considered to be safely fulfilled if:

(VI) $MEP_a(T_b) \geq MEP_a(T)$ for $\{T_b, T\}$ = {26, 39} and {39, 52} weeks
or

(VII) A line of best fit for $c^*_{EP}(T, 4h)$ does not show a rising trend for T > 26 weeks or

(VIII) $c^*_{EP}(T, 4h) * a \leq 0.5 * TV$ for T = {26 *to* 52} weeks

In some cases, it is difficult to clearly establish the conformity of the test results with requirements (I) to (VIII), e.g. because deviations (outliers) may occur due to inaccuracies in the determination method and/or small variations in the test water composition. In such a case, all available data must be taken into account for the evaluation of a test according to DIN EN 15664-1 as follows:

- Results of the individual test lines,
- 4-h stagnation results,
- Parameters of the test water,
- Temperature of the test waters,
- Further samples, which were possibly taken in addition to the requirements according to DIN EN 15664-1.

It must also be taken into account in the evaluation whether or not the available results are of sufficient quality (e.g. that there are no large deviations between the individual test lines).

5.3 Passive materials

The evaluation of passive materials is carried out based on a test according to DIN EN 16056.

For this purpose, the following criterion is to be applied:

The material must meet the following requirement for verification of the passivity:

(I) E_{pit} > free corrosion potential + 500 mV

with: E_{pit}: pitting potential according to DIN EN 16056

free corrosion potential: potential at the beginning of the test (open-circuit voltage)

6 Entry into Force

This announcement enters in to force on the day after its publication in the Federal Gazette (Bundesanzeiger) on 19th January 2023.

Annex 1 (informative)

Test for the determination of the specific hygienic suitability for products in contact with drinking water of a material in a local drinking water

A test according to DIN EN 15664-1 is also suited for determining the specific hygienic suitability for contact with drinking water of a protective layer forming metallic material with a local drinking water.

The test with a local drinking water enables an assessment of the suitability of the tested material (e.g. pipe material without general hygienic suitability for contact with drinking water) for contact with this specific drinking water.

This test can likewise be used for the investigation of the effectiveness of water treatment measures concerning the metal release of the tested material.

The requirement applies that from the 16th week the threshold values of TrinkwV or the guideline values of the WHO or of the UBA may not be exceeded.

The appropriate assessment procedure is the following:

Differing from the assessment procedure for the general hygienic suitability for contact with drinking water, the threshold values of TrinkwV or guideline values of the WHO or of the German Environment Agency are to be used as reference concentrations (RC) in the test of the specific hygienic suitability of a metallic material with a local drinking water. The concentrations of the n elements to be analysed in the processed drinking water (cCL according to DIN EN 15664-1) are to be taken into account.

Arithmetic mean values $MEP_{\mathrm{a}}(\mathrm{T})$ are generated from the three $MEP_{\mathrm{n}}(\mathrm{T})$ values of the three test pipes for the elements to be analysed. From the three 4-h stagnation values $c^{*}_{\mathrm{EP,n}}(T,t)$ of three test pipes, arithmetic mean values $c^{*}_{\mathrm{EP}}(T,t)$ are generated for the elements to be analysed (see Section 5.2.2.2). From the control line(s) of a stagnation cycle cCL(T,t), arithmetic mean values cCL(T) are generated for the elements to be analysed.

The tested material is hygienically suited for contact with the tested drinking water if the following criteria are complied with for the elements to be analysed:

A The reference concentrations (see Table 2) must be complied with from the 16th week for all elements to be analysed.

B The concentrations (parameters) determined must not increase in order to be able to rule out that the reference concentrations might still be exceeded at a later point in time (after completion of the test).

Criterion A is considered safely met if:

(I) $MEP_a(T) * a \ \leq RC$ for T = 16, 21 and 26 weeks

Criterion B is considered safely met if:

(II) $MEP_a(T_b) \geq \ MEP_a(T)$ for $\{T_b, T\}$ = {12, 16}, {16, 21} and {21, 26} weeks

or

(III) A line of best fit for $c^{*}_{\mathrm{EP}}(T, 4h)$ for T > 12 weeks exhibits no rising trend or

(IV) $c^*_{\mathrm{EP}}(T, 4h) * a \ \leq 0.5 * RC$ for T = {16 to 26} weeks

In the event **criterion B** is not met, the test can be extended to one year.

In this case **criterion A** is considered safely met if:

(V) $MEP_a(T) * a \ \leq RC$ for T = 16, 21, 26, 39 and 52 weeks

In this case **criterion B** is considered safely met if:

(VI) $MEP_a(T_b) \geq \ MEP_a(T)$ for $\{T_b, T\}$ = {26, 39} and {39, 52} weeks
or

(VII) A line of best fit for $c^*_{\mathrm{EP}}(T, 4h)$ for T > 26 weeks exhibits no rising trend or

(VIII) $c^*_{\mathrm{EP}}(T, 4h) * a \ \leq 0.5 * RC$ for T = {26 to 52 } weeks

Annex 2 (informative)

Information and calculation examples for the composition of reference and commercial materials for investigations according to DIN EN 15664-1

General information

Elements that can appear with a mass percentage greater than 0.02% must be specified according to Section 5.2.2 for the description (characterisation) of the alloy. The details for this as explained below are listed in the mass percentage specifications of a reference material.

Table 3: Constituents (reference material)

A	B	C
57.0% to 59.0%	Remainder	1.9% to 2.1%
Note: Constituent in percent by mass		

Table 4: Impurities (reference material)

D	E	F	G
≤ 0.2%	≤ 0.3%	≤ 0.2%	≤ 0.3%
Note: Impurity in percent by mass			

Example:

Constituent:

Element A 57.0% to 59.0% with:

59.0% upper mass percentage limit

57.0% lower mass percentage limit

2.0% range

Impurity:

Element D ≤ 0.2% upper mass percentage limit

Requirements on the material composition of test specimens for the testing of a reference material

Constituents

The constituents must lie within the mass percentage limits according to Section 5.2.2.

Impurities (mass percentage › 0.02%)

According to Section 5.2.2 the mass percentage of the impurities must be less than or equal to the mass percentage limit.

For the specifications of the reference material, according to Section 5.2.2 it applies that impurities to be analysed in the contact water must exhibit a mass percentage of greater than 60% of the upper mass percentage limit.

Requirements on the material composition of test specimens for the testing of a commercial material

Constituents

a) Cu, Zn: in compliance with the information

b) Al, Si, P: ‹ lower mass percentage limit + 50% of the range

c) As: › lower mass percentage limit + 66% of the range

d) All other constituents according to Section 5.2.2 must be greater than the lower mass percentage limit plus 80% of the range.

Impurities (mass percentage › 0.02% by mass)

Impurities to be analysed in the contact water must exhibit according to Section 5.2.2 a mass percentage of greater than 60% of the upper mass percentage limit.

Impurities that are not to be analysed must exhibit according to Section 5.2.2 a mass percentage of less than or equal to the upper mass percentage limit.

Element analysis in the contact water

All elements that are specified as constituents or impurities for a test material or a reference material are to be analysed in the contact water according to DIN EN 15664-1. Elements Sn, Si, S or P count as exceptions as they do not need to be specified in the contact water. If Fe, Mn or Al are impurities in the material, then also these do not need to be determined in the contact water.

Calculation example

General information

The example calculation considered involves a fictitious composition of the reference material and of the material for comparative tests with a reference material.

Reference material

For a reference material with a composition specified in Table 5 and Table 6.

Table 5: Constituents

Copper	Zinc	Lead	Arsenic	Aluminium
60.0% - 70.0%	Remainder	1.5% - 2.0%	0.05% - 0.2%	3.5% - 5.0%

Table 6: Impurities

Iron	Nickel	Silicon	Manganese
≤0.3%	≤ 0.5%	≤ 0.3%	≤ 0.3%

Table 7 and Table 8 specify the composition of the test samples according to DIN EN 15664-1:

Table 7: Constituents

Copper	Zinc	Lead	Arsenic	Aluminium
60.0% - 70.0%	Remainder	1.5% - 2.0%	0.05% - 0.2%	3.5% - 5.0%
A	A	A	A	A

A = analysis required

Table 8: Impurities

Iron	Nickel	Silicon	Manganese
≤ 0.3%	0.3% - 0.5%	≤ 0.3%	≤ 0.3%
-	A	-	-

A = analysis required

a) The mass percentages of constituents Cu, Zn, Pb, As and Al must be within the mass percentage limits according to 5.2.2.

b) As the only impurity Ni must be analysed in contact water according to 5.2.2. Thus, the mass percentage of Ni must be > 60% of the upper mass percentage limit, i.e. between 0.3% and 0.5%.

c) Fe, Si and Mn are impurities not to be analysed in the contact water according to 5.2.2. Their mass percentages must be below the upper mass percentage limit according to 5.2.2.

Commercial materials

For a commercial material with the composition given in Table 8 and Table 9.

Table 9: Constituents

Copper	Zinc	Lead	Arsenic	Aluminium
60.0% - 70.0%	Remainder	1.5% - 2.0%	0.05% - 0.10%	4.5% - 5.0%

Table 10: Impurities

Iron	Nickel	Silicon	Manganese
≤ 0.3%	≤ 0.5%	≤ 0.3%	≤ 0.3%

The composition of test specimens for testing according to DIN EN 15664-1 is given in Table 11 and Table 12:

Table 11: Constituents

Copper	Zinc	Lead	Arsenic	Aluminium
60.0% - 70.0%	Remainder	1.9% - 2.0%	0.08% - 0.10%	4.5% - 4.75%
A	A	A	A	A

A = analysis required

Table 12: Impurities

Iron	Nickel	Silicon	Manganese
≤ 0.3%	0.3% - 0.5%	≤ 0.3%	≤ 0.3%
-	A	-	-

A = analysis required

a) The mass percentages of Cu and Zn must correspond to alloy specifications in 5.2.2.

b) The mass percentage of Al must be below the lower mass percentage limit plus 50% of the range, i.e. between 4.5% and 4.75% according to 5.2.2 in this example.

c) The mass percentage of As must be above the lower mass percentage limit plus 66% of the range, i.e. between 0.08% and 0.10% (mass percentage) according to 5.2.2 in this example.

d) Pb is an impurity to be analysed in contact water according to 5.2.2. Thus, the mass percentage of Pb must be above the lower mass percentage limit plus 80% of the range, i.e. between 1.9% and 2.0% according to 5.2.2.

e) Ni is an impurity to be analysed in contact water according to 5.2.2. Therefore, the mass percentage of Ni must be greater than 60% of the upper mass percentage limit, i.e. 0.3% to 0.5% according to 5.2.2.

f) Fe, Sn and Mn are impurities not to be analysed in the contact water according to 5.2.2. The only requirement for these elements is that their mass percentage must be below the upper mass percentage limit.

Enclosure

Positive List of metallic materials suitable for use in contact with drinking water

Notes on the Positive List:

The Positive List of metallic materials suitable for drinking water hygiene lists those metallic materials where suitability for drinking water hygiene has been proved.

The suitability of metallic materials for drinking water hygiene is determined for use in the following product groups:

A) Pipes,

B) Fittings, pipe connectors, devices and pumps for domestic drinking water distribution systems,

C) 1. Components in fittings, pipe connectors, devices and pumps in domestic drinking water distribution systems, where the total surface area in contact with water does not exceed 10% of the total surface area of the products in contact with water.

   2. Fittings, pipe connectors, devices and pumps in the field of water supply outside the domestic drinking water distribution system with a normally permanent flow and

D) Components in fittings, pipe connectors, devices and pumps in the field of water supply outside the domestic drinking water distribution system (C2), the total surface area of which in contact with water does not exceed 10% of the total surface area of the products in contact with water.

The use of pipe materials (A) and materials for product group C2 may be restricted to specific drinking water compositions. Materials in product group A (pipe materials) may also be used for applications in product groups B, C and D. Materials for product groups B and C1 must exhibit general suitability for drinking water hygiene and are evaluated accordingly by the German Environment Agency. This means that they can be used for all drinking waters. Galvanised pipe connectors are an exception to this rule. They have the same limited field of use as galvanised pipes for connecting pipes made of galvanised steel or as transition connectors to another suitable pipe or fitting material. Materials for Product Group D are not listed explicitly but must meet specific chemical composition requirements.

To simplify materials testing according to DIN EN 15664-1, materials with similar behaviour in terms of drinking water hygiene may be summarised within categories. Material categories can be established based on their chemical composition. The respective material category is determined in the Positive List based on its constituents and impurities. For each material category a reference material is listed, the composition of which is described in detail. The possible range of composition is much more restricted than for standard materials. The reference material should exhibit the highest possible metal release of critical elements for the category but must comply with the required reference concentrations.

According to the reference material, materials suitable for drinking water hygiene are listed which can be used for the manufacture of products in contact with drinking water. In the case of standardised materials, the standard material notation shall be provided in addition to the constituents and impurities. For some materials, however, the requirements for the material composition go beyond the requirements for the standard composition.

Elements characterised as constituents have a technological function and their minimum mass percentages are listed.

All impurities with a mass percentage exceeding 0.02% (m/m) must be declared. The manufacturer is responsible for ensuring that impurities with a mass percentage of less than 0.02% (m/m) do not cause health hazards.

1 Pipe materials

1.1 Stainless steel

Stainless steels may be used in the passive state for all product groups A-D

Note:

For some stainless steels there is an increased likelihood of local corrosion (e.g. pitting or crevice corrosion) in contact with drinking water or in the case of a disinfection measure with very high chlorine concentration. This corrosion attack can lead to technical failure of the component. The technical rules give information on the corrosion resistance of these types of stainless steels.

1.2 Copper

1.2.1 Cu-DHP (CW024A)

Notation	Product group
Cu-DHP (CW024A)	A - D

Constituents (% (m/m)):

Cu	P
≥ 99,90%	0.015% - 0.040%

1.2.2 Cu-ETP (CW004A)

Notation	Product group
Cu-ETP (CW004A)	C and D

Constituents (% (m/m)):

Cu	O*
≥ 99.90%	≤ 0.040%

* Oxygen has a technological function in the material. However, a minimum content cannot be specified.

1.2.3 Cu-OF (CW008A)

Notation	Product group
Cu-OF (CW008A)	B - D

Constituents (% (m/m)):

Cu
≥ 99.95%

1.2.4 Cu-PHC (CW020A)

Notation	Product group
Cu-PHC (CW020A)	B - D

Constituents (% (m/m)):

Cu	P
≥ 99.95%	0.001% - 0.006%

1.2.5 Cu-HCP (CW021A)

Notation	Product group
Cu-HCP (CW021A)	B - D

Constituents (% (m/m)):

Cu	P
≥ 99.95%	0.002% - 0.007%

1.2.6 Cu-DLP (CW023A)

Notation	Product group
Cu-DLP (CW023A)	B - D

Constituents (% (m/m)):

Cu	P
≥ 99.90%	0.005% - 0.013%

Restrictions:

Copper pipes (product group A) cannot be used for all drinking water systems in Germany. For drinking water meeting the following conditions in addition to the requirements of the Drinking Water Ordinance, it can usually be assumed that either immediately or after a certain time has elapsed (after the 16th week at the latest) after a new installation, given correct operation, the copper limit value of the TrinkwV will be observed:

pH ≥ 7.4

or

7.0 ≤ pH < 7.4 and TOC ≤ 1.5 mg/l [3]

Where there are specific findings regarding copper leaching for a given supply area, this information shall be taken into account in the choice of materials

1.3 Internal tin-plated copper

For internal tin-plated copper, there are no restrictions on the use in contact with drinking water provided the tin plating complies with DVGW Standard GW 392 and DVGW Standard W 534.

[3] The areas of use relate only to the pipe material. They do not apply to components of copper materials which are not pipes (fittings, mountings, appliances, etc.).

Note:

In combination with other materials, the requirements of the technical rules must be taken into account. Thus, for an installation with various pipe materials, the flow rule must be observed.

1.4 Hot dip galvanised steel

Hot dip galvanised steel can be used for all product groups A - D if the zinc protective plating meets the requirements of DIN EN 10240 (coating quality A.1) and the following conditions:

Constituents (% (m/m)):

Zn

Impurities (% (m/m)):

As	Bi	Cd	Pb	Sb
≤ 0.02%	≤ 0.01%	≤ 0.01%	≤ 0.05%	≤ 0.01%

For products of product groups B and C, the zinc protective plating can have a maximum lead content of 0.1%.

Restrictions:

Hot dip galvanised steel can only be used for cold water installations. In addition, they can only be used with drinking water compositions where the properties meet the following requirements:

$K_{B8.2} \leq 0.20$ mmol/l

and for which the neutral salt ratio (S_1) according to DIN EN 12502-3 meets the following condition:

$S_1 < 1$

Note:

If maintenance of existing installations made from hot dip galvanised steel is necessary in water supply areas in which hot dip galvanised steel should no longer be used according to the areas of use indicated above, the replacement of the entire existing installation is not necessary if there is, or will be after maintenance, demonstrably no adverse effect on drinking water quality. In this case, replacement parts made from hot dip galvanised steel may continue to be used for maintenance. If no rusty water has appeared during the use of hot dip galvanised steel, this may be a possible proof that the use of this materials is, in this case, not causing any adverse effect on drinking water quality.

2 Materials for mountings, pipe connections, apparatuses and pumps (B) and for construction parts in mountings, pipe connections, apparatuses and pumps (C)

2.1 Copper-zinc alloys

2.1.1 Category limits

Constituents (% (m/m)):

Cu	Zn
≥ 57.0%	Remainder

Impurities (% (m/m)):

Al	Fe	Ni	Pb	Sn
≤ 0.1%	≤ 0.5%	≤ 0.2%	≤ 0.2%	≤ 0.5%

2.1.2 Reference material

Constituents (% (m/m)):

Cu	Zn
57.0% - 59.0%	Remainder

Impurities (% (m/m)):

Al	Fe	Ni	Pb	Sn
≤ 0.05%	≤ 0.3%	0.15% - 0,25%	0.15% - 0.25%	≤ 0.3%

Elements to be determined in contact water during comparative testing in accordance with DIN EN 15664-1: Lead, copper, nickel, zinc

Most critical test water:

Test water 1 according to EN 15664-2

2.1.3 Materials suitable for the contact with drinking water

2.1.3.1 CW501L-DW (CuZn10)

Designation	Product group
CW501L-DW* (CuZn10)	C and D

* further restrictions on composition (see below) compared to the standardised European composition of CW501L

Constituents (% (m/m)):

Cu	Zn
89.0 % – 91.0 %	Remainder

Impurities (% (m/m)):

Fe	Ni*	Pb	Sn
≤ 0.05 %	≤ 0.2 %	≤ 0.05 %	≤ 0.1 %

2.1.3.2 CW502L-DW (CuZn15)

Designation	Product group
CW502L-DW* (CuZn15)	B–D

* further restrictions on composition (see below) compared to the standardised European composition of CW502L

Constituents (% (m/m)):

Cu	Zn
84.0 % – 86.0 %	Remainder

Impurities (% (m/m)):

Fe	Ni*	Pb	Sn
≤ 0.05 %	≤ 0.2 %	≤ 0.05 %	≤ 0.1 %

2.1.3.3 CW503L-DW (CuZn20)

Notation	Product group
CW503L-DW* (CuZn20)	B–D

* further restrictions on composition (see below) compared to the standardised European composition of CW502L

Constituents (% (m/m)):

Cu	Zn
79.0 % – 81.0 %	Remainder

Impurities (% (m/m)):

Fe	Ni*	Pb	Sn
≤ 0.05 %	≤ 0.2 %	≤ 0.05 %	≤ 0.1 %

2.1.3.4 CW506L-DW (CuZn33)

Notation	Product group
CW506L-DW* (CuZn33)	B – D

* further restrictions on composition (see below) compared to the standardised European composition of CW506L

Constituents (% (m/m)):

Cu	Zn
66.0 % – 68.0 %	Remainder

Impurities (% (m/m)):

Fe	Ni*	Pb	Sn
≤ 0.05 %	≤ 0.2 %	≤ 0.05 %	≤ 0.1 %

2.1.3.5 CW507L-DW (CuZn36)

Notation	Product group
CW507L-DW* (CuZn36)	B – D

* further restrictions on composition (see below) compared to the standardised European composition of CW507L

Constituents (% (m/m)):

Cu	Zn
63.5 % – 65.5 %	Remainder

Impurities (% (m/m)):

Fe	Ni*	Pb	Sn
≤ 0.05 %	≤ 0.2 %	≤ 0.1 %	≤ 0.1 %

2.1.3.6 CW508L-DW (CuZn37)

Notation	Product group
CW508L-DW* (CuZn37)	B – D

* further restrictions on composition (see below) compared to the standardised European composition of CW508L

Constituents (% (m/m)):

Cu	Zn
62.0 % – 64.0 %	Remainder

Impurities (% (m/m)):

Al	Fe	Ni*	Pb	Sn
≤ 0.05 %	≤ 0.1 %	≤ 0.2 %	≤ 0.1 %	≤ 0.1 %

2.1.3.7 CW509L-DW (CuZn40)

Notation	Product group
CW509L-DW* (CuZn40)	B – D

* further restrictions on composition (see below) compared to the standardised European composition of CW509L

Constituents (% (m/m)):

Cu	Zn
59.5 % – 61.5 %	Remainder

Impurities (% (m/m)):

Al	Fe	Ni*	Pb	Sn
≤ 0.05 %	≤ 0.2 %	≤ 0.2 %	≤ 0.2 %	≤ 0.2 %

2.1.3.8 CW510L-DW (CuZn42)

Notation	Product group
CW510L-DW* (CuZn42)	B – D

* further restrictions on composition (see below) compared to the standardised European composition of CW510L

Constituents (% (m/m)):

Cu	Zn
57.0 % – 59.0 %	Remainder

Impurities (% (m/m)):

Al	Fe	Ni*	Pb	Sn
≤ 0.05 %	≤ 0.3 %	≤ 0.2 %	≤ 0.2 %	≤ 0.3 %

2.2 Copper-zinc-aluminium alloys

2.2.1 Category limits

Constituents (% (m/m)):

Cu	Zn	Al
≥ 57.0%	Remainder	0.1% - 0.3%

Impurities (% (m/m)):

Fe	Pb	Sn
≤ 0.3%	≤ 0.2%	≤ 0.3%

2.2.2 Reference material

Constituents (% (m/m)):

Cu	Zn	Al
57.0% - 59.0%	Remainder	0.1% - 0.2%

Impurities (% (m/m)):

Fe	Pb	Sn
≤ 0.3%	0.15% - 0.25%	≤ 0.3%

Elements to be determined in contact water during comparative testing in accordance with DIN EN 15664-1: Aluminium, lead, copper, zinc

Most critical test water:

Test water 1 according to DIN EN 15664-2

2.2.3 Materials suitable for the contact with drinking water

2.2.3.1 CuZn42Al

Notation	Product group
CuZn42Al	B - D

Constituents (% (m/m)):

Cu	Zn	Al
57.0% - 59.0%	Remainder	0.1% - 0.3%

Impurities (% (m/m)):

Fe	Pb	Sn
≤ 0.3%	≤ 0.2%	≤ 0.3%

2.3 Copper-zinc-aluminium-tin alloys

2.3.1 Category limits

Constituents (% (m/m)):

Cu	Zn	Al	Sn
≥ 62.0%	Remainder	0.5% - 2.0%	0.3% - 1.0%

Impurities (%(m/m)):

Fe	Mn	Ni	Pb	Si
≤ 0.5%	≤ 0.1%	≤ 0.3%	≤ 0.2%	≤ 0.2%

2.3.2 Reference material

Constituents (% (m/m)):

Cu	Zn	Al	Sn
64.0% - 66.0%	Remainder	1.40% - 1.50%	0.66% - 0.70%

Impurities (% (m/m)):

Fe	Mn	Ni	Pb	Si
≤ 0.10%	≤ 0.10%	0.06% - 0.10%	0.15% - 0.25%	≤ 0.2%

Elements to be determined in contact water during comparative testing in accordance with DIN EN 15664-1: Aluminum, lead, copper, nickel, zinc

Most critical test water:

Test water 1 according to DIN EN 15664-2

2.3.3 Materials suitable for the contact with drinking water

2.3.3.1 CuZn35Al1,5Sn

Notation	Product group
CuZn35Al1,5Sn	B - D

Constituents (% (m/m)):

Cu	Zn	Al	Sn
64.0% - 66.0%	Remainder	1.40% - 1.60%	0.50% - 0.70%

Impurities (% (m/m)):

Fe	Mn	Ni	Pb	Si
≤ 0.10%	≤ 0.10%	≤ 0.10%	≤ 0.2%	≤ 0.2%

2.4 Copper-zinc-aluminium-silicon-iron alloys

2.4.1 Category limits

Constituents (% (m/m)):

Cu	Zn	Al	Si	Fe
≥ 62.0%	Remainder	0.5% - 0.9%	0.5% - 0.9%	0.04% - 0.2%

Impurities (% (m/m)):

Ni	Pb	Sn
≤ 0.1%	≤ 0.2%	≤ 0.1%

2.4.2 Reference material

Constituents (% (m/m)):

Cu	Zn	Al	Si	Fe
62.5% - 64.5%	Remainder	0.5% - 0.68%	0.5% - 0.68%	0.12% - 0.15%

Impurities (% (m/m)):

Ni	Pb	Sn
0.05% - 0.09%	0.09% - 0.15%	≤ 0.1%

Elements to be determined in contact water during comparative testing in accordance with DIN EN 15664-1: Aluminium, lead, copper, iron, nickel, zinc

Most critical test water:

Test water 1 according to DIN EN 15664-2

2.4.3 Materials suitable for the contact with drinking water

2.4.3.1 CuZn35AlSiFe

Notation	Product group
CuZn35AlSiFe	B - D

Constituents (% (m/m)):

Cu	Zn	Al	Si	Fe
62.5% - 64.5%	Remainder	0.5% - 0.85%	0.5% - 0.8%	0.04% - 0.1%

Impurities (% (m/m)):

Ni	Pb	Sn
≤ 0.09%	≤ 0.15%	≤ 0.1%

2.5 Copper-zinc-arsenic alloys

2.5.1 Category limits

Constituents (% (m/m)):

Cu	Zn	As
≥ 61.0%	Remainder	0.02% - 0.15%

Impurities (% (m/m)):

Al	Fe	Mn	Ni	Pb	Sn
≤ 0.1 %	≤ 0.5 %	≤ 0.1 %	≤ 0.3 %	≤ 0.2 %	≤ 0.5 %

2.5.2 Reference material

Constituents (% (m/m)):

Cu	Zn	As
61.5% - 63.5%	Remainder	0.10% - 0.15%

Impurities (% (m/m)):

Al	Fe	Mn	Ni	Pb	Sn
≤ 0.1%	≤ 0.1%	≤ 0.1%	0.21% - 0.35%	0.15% - 0.25%	≤ 0.1%

Elements to be determined in contact water during comparative testing in accordance with DIN EN 15664-1: Arsenic, lead, copper, nickel, zinc

Most critical test water:

Test water 1 according to DIN EN 15664-2

2.5.3 Materials suitable for the contact with drinking water

2.5.3.1 CW511L (CuZn38As)

Notation	Product Group
CW511L (CuZn38As)	B - D

Constituents (% (m/m)):

Cu	Zn	As
61.5% - 63.5%	Remainder	0.02% - 0.15%

Impurities (% (m/m)):

Al	Fe	Mn	Ni	Pb	Sn
≤ 0.05%	≤ 0.1%	≤ 0.1%	≤ 0.3%	≤ 0.2 %	≤ 0.1 %

2.5.3.2 CW707R (CuZn30As)

Notation	Product group
CW707R (CuZn30As)	B - D

Constituents (% (m/m)):

Cu	Zn	As
69.0% - 71.0%	Remainder	0.02% - 0.06%

Impurities (% (m/m)):

Fe	Mn	Pb	Sn
≤ 0.05%	≤ 0.1%	≤ 0.07%	≤ 0.05%

2.6 Copper-zinc-arsenic-aluminium alloys

2.6.1 Category limits

Constituents (% (m/m)):

Cu	Zn	As	Al
≥ 61.0%	Remainder	0.02% - 0.15%	0.2% - 1.0%

Impurities (% (m/m)):

Fe	Mn	Pb	Sn
≤ 0.5%	≤ 0.1%	≤ 0.2%	≤ 0.3%

2.6.2 Reference material

Constituents (% (m/m)):

Cu	Zn	As	Al
63.0% - 64.5%	Remainder	0.11% - 0.14%	0.2% - 0.4%

Impurities (% (m/m)):

Fe	Mn	Pb	Sn
≤ 0.3%	≤ 0.1%	0.15% - 0.25%	≤ 0.3%

Elements to be determined in contact water during comparative testing in accordance with DIN EN 15664-1: Aluminium, arsenic, lead, copper, zinc

Most critical test water:

Test water 1 according to DIN EN 15664-2

2.6.3 Materials suitable for the contact with drinking water

2.6.3.1 CuZn35Al-C

Notation	Product group
CuZn35Al-C	B - D

Constituents (% (m/m)):

Cu	Zn	As	Al
63.0% - 64.5%	Remainder	0.04% - 0.14%	0.2% - 0.7%

Impurities (% (m/m)):

Fe	Mn	Pb	Sn
≤ 0.3%	≤ 0.1%	≤ 0.2%	≤ 0.3%

2.7 Copper-zinc-arsenic-antimony-aluminium alloys

2.7.1 Category limits

Constituents (% (m/m)):

Cu	Zn	As	Sb	Al
≥ 60.0%	Remainder	0.02% - 0.10%	0.02% - 0.10%	0.02% - 1.0%

Impurities (% (m/m)):

Fe	Mn	Ni	Pb	Sn
≤ 0.5%	≤ 0.1%	≤ 0.2%	≤ 0.2%	≤ 0.5%

2.7.2 Reference material

Constituents (% (m/m)):

Cu	Zn	As	Sb	Al
62.0% - 65.0%	Remainder	0.03% - 0.04%	0.04% - 0.05%	0.45% - 0.58%

Impurities (% (m/m)):

Fe	Mn	Ni	Pb	Sn
≤ 0.2%	≤ 0.1%	0.12% - 0.20%	0.15% - 0.25%	≤ 0.3%

Elements to be determined in contact water during comparative testing in accordance with DIN EN 15664-1: Aluminium, antimony, arsenic, lead, copper, nickel, zinc

Most critical test water:

Test water 1 according to DIN EN 15664-2

2.7.3 Materials suitable for the contact with drinking water

2.7.3.1 CC771S (CuZn36AlAsSb)

Notation	Product group
CC771S* (CuZn36AlAsSb)	B - D

* further restrictions on composition (see below) compared to the standardised European composition of CC771S

Constituents (% (m/m)):

Cu	Zn	As	Sb	Al
62.0% - 65.0%	Remainder	0.02% - 0.04%	0.02% - 0.05%	0.45% - 0.7%

Impurities (% (m/m)):

Fe	Mn	Ni*	Pb	Sn
≤ 0.2%	≤ 0.1%	≤ 0.20%	≤ 0.2%	≤ 0.3%

2.8 Copper-zinc-lead alloys

2.8.1 Category limits

Constituents (% (m/m)):

Cu	Zn	Pb
≥ 57.0%	Remainder	0.2% - 3.5%

Impurities (% (m/m)):

Al	Fe	Ni	Si	Sn
≤ 0.3%	≤ 0.5%	≤ 0.2%	≤ 0.2%	≤ 0.5%

2.8.2 Reference material

Constituents (% (m/m)):

Cu	Zn	Pb
57.0% - 59.0%	Remainder	1.9% - 2.2%

Impurities (% (m/m)):

Al	Fe	Ni	Si	Sn
≤ 0.2%	≤ 0.3%	0.05% - 0.15%	≤0.03%	≤ 0.3%

Elements to be determined in contact water during comparative testing in accordance with DIN EN 15664-1: Lead, copper, nickel, zinc

Most critical test water:

Test water 1 according to DIN EN15664-2

2.8.3 Materials suitable for the contact with drinking water

2.8.3.1 CW617N (CuZn40Pb2)/CW612N (CuZn39Pb2)

Notation	Product group
CW617N* (CuZn40Pb2) **CW612N* (CuZn39Pb2)**	B - D

* further restrictions on composition (see below) compared to the standardised European composition of CW617N and CW612N

Constituents (% (m/m)):

Cu	Zn	Pb*
57.0% - 60.0%	Remainder	1.6% - 2.2%

Impurities (% (m/m)):

Al	Fe	Ni*	Si	Sn
≤ 0.05%	≤ 0.3%	≤ 0.1%	≤ 0.03%	≤ 0.3%

2.8.3.2 CW614N (CuZn39Pb3)/CW603N (CuZn36Pb3)

Notation	Product group
CW614N* (CuZn39Pb3) **CW603N* (CuZn36Pb3)**	C and D

* further restrictions of the composition (see below) compared to the standardised European composition of CW614N and CW603N

Constituents (% (m/m)):

Cu	Zn	Pb
57.0% - 62.0%	Remainder	2.5% - 3.5%

Impurities (% (m/m)):

Al	Fe	Ni*	Si	Sn
≤ 0.05%	≤ 0.3%	≤ 0.2%	≤ 0.03%	≤ 0.3%

2.9 Copper-zinc-lead-aluminium alloys

2.9.1 Category limits

Constituents (% (m/m)):

Cu	Zn	Pb	Al
≥ 57.0%	Remainder	0.2% - 1.5%	0.2% - 1.0%

Impurities (% (m/m)):

Fe	Mn	Ni	Si	Sn
≤ 0.3%	≤ 0.05%	≤ 0.2%	≤ 0.05%	≤ 0.5%

2.9.2 Reference material

Constituents (% (m/m)):

Cu	Zn	Pb	Al
58.0% - 63.0%	Remainder	1.2% - 1.4%	0.3% - 0.6%

Impurities (% (m/m)):

Fe	Mn	Ni	Si	Sn
≤ 0.3%	≤ 0.05%	0.15% - 0.25%	≤ 0.05%	≤ 0.5%

Elements to be determined in contact water during comparative testing in accordance with DIN EN 15664-1: Aluminium, lead, copper, nickel, zinc

Most critical test water:

Test water 1 and 2 according to DIN EN 15664-2

2.9.3 Materials suitable for the contact with drinking water

2.9.3.1 CC757S (CuZn39Pb1Al-C)

Notation	Product group
CC757S* (CuZn39Pb1Al-C)	B - D

* further restrictions on composition (see below) compared to the standardised European composition of CC757S.

Constituents (% (m/m)):

Cu	Zn	Pb*	Al
58.0% - 63.0%	Remainder	0.2% - 1.4%	0.3% - 0.9%

Impurities (% (m/m)):

Fe	Mn	Ni	Si	Sn
≤ 0.3%	≤ 0.05%	≤ 0.2%	≤ 0.05%	≤ 0.5%

2.10 Copper-zinc-lead-arsenic-aluminium alloys

2.10.1 Category limits

Constituents (% (m/m)):

Cu	Zn	Pb	As	Al
≥ 61.0%	Remainder	0.2% - 2.2%	0.02% - 0.15%	0.02% - 1.0%

Impurities (% (m/m)):

Fe	Mn	Ni	Sn
≤ 0.5%	≤ 0.1%	≤ 0.2%	≤ 0.5%

2.10.2 Reference material

Constituents (% (m/m)):

Cu	Zn	Pb	As	Al
61.0% - 63.0%	Remainder	1.4% - 1.6%	0.09% - 0.13%	0.5% - 0.7%

Impurities (% (m/m)):

Fe	Mn	Ni	Sn
≤ 0.3%	≤ 0.1%	0.15% - 0.25%	≤ 0.3%

Elements to be determined in contact water during comparative testing in accordance with DIN EN 15664-1: Aluminium, arsenic, lead, copper, nickel, zinc

Most critical test water:

Test water 1 according to DIN EN 15664-2

2.10.3 Materials suitable for the contact with drinking water

2.10.3.1 CC770S (CuZn36Pb-C)

Notation	Product group
CC770S (CuZn36Pb-C)	B - D

Constituents (% (m/m)):

Cu	Zn	Pb	As	Al
62.0% - 64.0%	Remainder	0.2% - 1.6%	0.04% - 0.14%	0.5% - 0.7%

Impurities (% (m/m)):

Fe	Mn	Ni	Sn
≤ 0.3%	≤ 0.1%	≤ 0.2%	≤ 0.3%

2.10.3.2 CW626N (CuZn33Pb1.5AlAs)

Notation	Product group
CW626N (CuZn33Pb1.5AlAs)	B - D

Constituents (% (m/m)):

Cu	Zn	Pb	As	Al
64.0% - 66.0%	Remainder	1.2% - 1.7%	0.02% - 0.15%	0.8% - 1.0%

Impurities (% (m/m)):

Fe	Mn	Ni	Sn
≤ 0.3%	≤ 0.1%	≤ 0.2%	≤ 0.3%

2.10.3.3 CW625N (CuZn35Pb1.5AlAs)

Notation	Product group
CW625N (CuZn35Pb1.5AlAs)	B - D

Constituents (% (m/m)):

Cu	Zn	Pb	As	Al
62.0% - 64.0%	Remainder	1.2% - 1.6%	0.02% - 0.15%	0.5% - 0.7%

Impurities (% (m/m)):

Fe	Mn	Ni	Sn
≤ 0.3%	≤ 0.1%	≤ 0.2%	≤ 0.3%

2.11 Copper-zinc-lead-arsenic-antimony-aluminium alloys

2.11.1 Category limits

Constituents (% (m/m)):

Cu	Zn	Pb	As	Sb	Al
≥ 60.0%	Remainder	0.2% - 1.1%	0.02% - 0.10%	0.02% - 0.10%	0.02% - 1.0%

Impurities (% (m/m)):

Fe	Mn	Ni	Sn
≤ 0.5%	≤ 0.1%	≤ 0.2%	≤ 0.5%

2.11.2 Reference material

Constituents (% (m/m)):

Cu	Zn	Pb	As	Sb	Al
62.0% - 65.0%	Remainder	0.9% - 1.1%	0.03% - 0.04%	0.05% - 0.06%	0.45% - 0.58%

Impurities (% (m/m)):

Fe	Mn	Ni	Sn
≤ 0.2%	≤ 0.1%	0.15% - 0.25%	≤ 0.3%

Elements to be determined in contact water during comparative testing in accordance with DIN EN 15664-1: Aluminium, antimony, arsenic, lead, copper, nickel, zinc

Most critical test water:

Test water 1 according to DIN EN 15664-2

2.11.3 Materials suitable for the contact with drinking water

2.11.3.1 CC772S (CuZn36Pb1.5AsSbAl)

Notation	Product group
CC772S (CuZn36Pb1.5AsSbAl)	B - D

Constituents (% (m/m)):

Cu	Zn	Pb	As	Sb	Al
62.0% - 65.0%	Remainder	0.2% - 1.1%	0.02% - 0.04%	0.03% - 0.06%	0.45% - 0.7%

Impurities (% (m/m)):

Fe	Mn	Ni	Sn
≤ 0.2%	≤ 0.1%	≤ 0.2%	≤ 0.3%

2.12 Copper-zinc-lead-arsenic-aluminium-silicon alloys

2.12.1 Category limits

Constituents (% (m/m)):

Cu	Zn	Pb	As	Al	Si
≥ 61.0%	Remainder	0.2% - 1.0%	0.02% - 0.10%	0.02% - 1.0%	0.02% - 0.5%

Impurities (% (m/m)):

Fe	Mn	Ni	Sn
≤ 0.5%	≤ 0.1%	≤ 0.2%	≤ 0.5%

2.12.2 Reference material

Constituents (% (m/m)):

Cu	Zn	Pb	As	Al	Si
64.0% - 67.0%	Remainder	0.60% - 0.65%	0.07% - 0.08%	0.1% - 0.25%	0.1% - 0.2%

Impurities (% (m/m)):

Fe	Mn	Ni	Sn
≤ 0.3%	≤ 0.1%	0.15% - 0.25%	≤ 0.3%

Elements to be determined in contact water during comparative testing in accordance with DIN EN 15664-1: Aluminium, arsenic, lead, copper, nickel, zinc

Most critical test water:

Test water 1 and 2 according DIN EN 15664-2

2.12.3 Materials suitable for the contact with drinking water

2.12.3.1 CW725R (CuZn33Pb1AlSiAs)

Notation	Product-group
CW725R* (CuZn33Pb1AlSiAs)	B - D

* further restrictions on composition (see below) compared to the standardised European composition of CW725R

Constituents (% (m/m)):

Cu	Zn	Pb*	As	Al	Si
64.0% - 67.0%	Remainder	0.4% - 0.6%	0.04% - 0.08%	0.1% - 0.4%	0.1% - 0.3%

Impurities (% (m/m)):

Fe	Mn	Ni	Sn
≤ 0.3%	≤ 0.1%	≤ 0.2%	≤ 0.3%

2.13 Copper-tin-zinc-lead-nickel alloys

2.13.1 Category limits

Constituents (% (m/m)):

Cu	Sn	Zn	Pb	Ni
Remainder	4.0% - 13.0%	4.0% - 6.5%	0.2% - 3.0%	0.1% - 0.6%

Impurities (% (m/m)):

Fe	P	S	Sb
≤ 0.30%	≤ 0.04%	≤ 0.04%	≤ 0.10%

2.13.2 Reference material

Constituents (% (m/m)):

Cu	Sn	Zn	Pb	Ni
Remainder	4.0% - 4.2%	5.7% - 6.0%	2.8% - 3.0%	0.5% - 0.6%

Impurities (% (m/m)):

Fe	P	S	Sb
≤ 0.30%	≤ 0.04%	≤ 0.04%	0.09% - 0.15%

Elements to be determined in contact water during comparative testing in accordance with DIN EN 15664-1: Antimony, lead, copper, nickel, zinc

Most critical test water:

Test water 1 according to DIN EN 15664-2

2.13.3 Materials suitable for the contact with drinking water

2.13.3.1 CC499K(CuSn5Zn5Pb2-C)

Notation	Product group
CC499K (CuSn5Zn5Pb2-C)	B - D

Constituents (% (m/m)):

Cu	Sn	Zn	Pb	Ni
84.0% - 88.0%	4.0% - 6.0%	4.0% - 6.0%	0.2% - 3.0%	0.1% - 0-60%

Impurities (% (m/m)):

Fe	P	S	Sb
≤ 0.30%	≤ 0.04%	≤ 0.04%	≤ 0.10%

2.14 Copper-tin-zinc-phosphorus-sulphur alloys

2.14.1 Category limits

Constituents (% (m/m)):

Cu	Sn	Zn	P	S
Remainder	3.0% - 9.0%	1.0% - 5.0%	0.01% - 1.0%	0.2% - 0.7%

Impurities (% (m/m)):

Fe	Ni	Pb	Sb
≤ 0.3%	≤ 0.3%	≤ 0.2%	≤ 0.1%

2.14.2 Reference material

Constituents (% (m/m)):

Cu	Sn	Zn	P	S
Remainder	4.6% - 5.0%	1.0% - 3.0%	0.01% - 0.06%	0.52% - 0.65%

Impurities (% (m/m)):

Fe	Ni	Pb	Sb
≤ 0.3%	0.21% - 0.35%	0.15% - 0.25%	0.09% - 0.15%

Elements to be determined in contact water during comparative testing in accordance with DIN EN 15664-1: Antimony, lead, copper, nickel, zinc

Most critical test water:

Test water 1 according to DIN EN 15664-2

2.14.3 Materials suitable for the contact with drinking water

2.14.3.1 CuSn4Zn2PS

Notation	Product group
CuSn4Zn2PS	B - D

Constituents (% (m/m)):

Cu	Sn	Zn	P	S
90.0% - 96.0%	3.0% - 5.0%	1.0% - 3.0%	0.01% - 0.1%	0.2% - 0.6%

Impurities (% (m/m)):

Fe	Ni	Pb	Sb
≤ 0.3%	≤ 0.3%	≤ 0.2%	≤ 0.1%

Note:

The listed chemical composition includes the material CuSn4Zn2PS-C according to DIN SPEC 2701, whose lead content is restricted to 0.10%.

2.15 Copper-zinc-silicon-phosphorus alloys

2.15.1 Category limits

Constituents (% (m/m)):

Cu	Zn	Si	P
60.0% - 80.0%	Remainder	0.5% - 5.5%	0.01% - 0.3%

Impurities (%(m/m)):

Al	Fe	Mn	Ni	Pb	Sn
≤ 0.1%	≤ 0.5%	≤ 0.05%	≤ 0.2%	≤ 0.1%	≤ 0.5%

2.15.2 Reference material

Constituents (% (m/m)):

Cu	Zn	Si	P
75.0% - 77.0%	Remainder	2.7% - 3.0%	0.02% - 0.06%

Impurities (% (m/m)):

Al	Fe	Mn	Ni	Pb	Sn
≤ 0.05%	≤ 0.3%	≤ 0.05%	0.15% - 0.25%	0.09% - 0.15%	≤ 0.3%

Elements to be determined in contact water during comparative testing in accordance with DIN EN 15664-1: Lead, copper, nickel, zinc

Most critical test water:

Test water 1 according to DIN EN 15664-2

2.15.3 Materials suitable for the contact with drinking water

2.15.3.1 CW724R (CuZn21Si3P)

Notation	Product group
CW724R (CuZn21Si3P)	B - D

Constituents (% (m/m)):

Cu	Zn	Si	P
75.0% - 77.0%	Remainder	2.7% - 3.5%	0.02% - 0.10%

Impurities (% (m/m)):

Al	Fe	Mn	Ni	Pb	Sn
≤ 0.05%	≤ 0.3%	≤ 0.05%	≤ 0.2%	≤ 0.1 %	≤ 0.3%

2.15.3.2 CC768S (CuZn21Si3P)

Notation	Product group
CC768S (CuZn21Si3P)	B - D

Constituents (% (m/m)):

Cu	Zn	Si	P
75.0% - 77.0%	Remainder	2.7% - 3.5%	0.02% - 0.10%

Impurities (% (m/m)):

Al	Fe	Mn	Ni	Pb	Sn
≤ 0.05%	≤ 0.3%	≤ 0.05%	≤ 0.2%	≤ 0.1%	≤ 0.3%

The content of boron and silicon must be below 0.02% in delivered condition.

2.16 Copper-silicon-zinc-manganese-phosphorus alloys

2.16.1 Category limits

Constituents (% (m/m)):

Cu	Si	Zn	Mn	P
≥ 80.0%	0.5% - 5.5%	Remainder	0.01% - 0.2%	0.01% - 0.3%

Impurities (%(m/m)):

Al	Fe	Ni	Pb	Sn
≤ 0.3%	≤ 0.3%	≤ 0.1%	≤ 0.1%	≤ 0.5%

2.16.2 Reference material

Constituents (% (m/m)):

Cu	Si	Zn	Mn	P
Remainder	2.5% - 3.5%	8.0% - 10.0%	0.03% - 0.09%	0.05% - 0.10%

Impurities (% (m/m)):

Al	Fe	Ni	Pb	Sn
≤ 0.3%	≤ 0.3%	0.06% - 0.10%	0.06% - 0.10 %	≤ 0.3%

Elements to be determined in contact water during comparative testing in accordance with DIN EN 15664-1: Lead, copper, manganese, nickel, zinc

Most critical test water:

Test water 1 according to DIN EN 15664-2

2.16.3 Materials suitable for the contact with drinking water

2.16.3.1 CC245E (CuSi4Zn4MnP-C)

Notation	Product group
CC245E (CuSi4Zn4MnP-C)	B - D

Constituents (% (m/m)):

Cu	Si	Zn	Mn	P
Remainder	2.5% - 4.5%	1.0% - 7.0%	0.03% - 0.09%	0.05% - 0.15%

Impurities (% (m/m)):

Al	Fe	Ni	Pb	Sn
≤ 0.3%	≤ 0.3%	≤ 0.10%	≤ 0.10%	≤ 0.3%

2.16.3.2 CC246E (CuSi4Zn9MnP-C)

Notation	Product group
CC246E (CuSi4Zn9MnP-C)	B - D

Constituents (% (m/m)):

Cu	Si	Zn	Mn	P
Remainder	2.5% - 4.5%	7.0% - 11.0%	0.03% - 0.09%	0.05% - 0.15%

Impurities (% (m/m)):

Al	Fe	Ni	Pb	Sn
≤ 0.3%	≤ 0.3%	≤ 0.10%	≤ 0.10%	≤ 0.3%

2.16.3.3 CuSi4Zn4MnP

Notation	Product group
CuSi4Zn4MnP	B - D

Constituents (% (m/m)):

Cu	Si	Zn	Mn	P
Remainder	2.5% - 4.5%	1.0% - 7.0%	0,01 % - 0,09 %	0.05% - 0.15%

Impurities (% (m/m)):

Al	Fe	Ni	Pb	Sn
≤ 0.3%	≤ 0.3%	≤ 0.10%	≤ 0.10%	≤ 0.3%

2.16.3.4 CuSi4Zn9MnP

Notation	Product group
CuSi4Zn9MnP	B - D

Constituents (% (m/m)):

Cu	Si	Zn	Mn	P
Remainder	2.5% - 4.5%	7.0% - 11.0%	0.01% - 0.09%	0.05% - 0.15%

Impurities (% (m/m)):

Al	Fe	Ni	Pb	Sn
≤ 0.3%	≤ 0.3%	≤ 0.10%	≤ 0.10%	≤ 0.3%

2.17 Copper-silicon-zinc-iron-manganese-phosphorus alloys

2.17.1 Category limits

Constituents (% (m/m)):

Cu	Si	Zn	Fe	Mn	P
≥ 80.0%	2.0% -5.0%	Remainder	0.3% - 1.0%	0.02% - 0.2%	0.01% - 0.03%

Impurities (%(m/m)):

Al	Ni	Pb	Sn
≤ 0.2%	≤ 0.05%	≤ 0.05%	≤ 0.2%

2.17.2 Reference material

Constituents (% (m/m)):

Cu	Si	Zn	Fe	Mn	P
80.0% - 88.0%	2.4% - 3.25%	Remainder	0.46% - 0.55%	0.18% - 0.25%	0.01% - 0.02%

Impurities (% (m/m)):

Al	Ni	Pb	Sn
≤ 0.2%	0.03% - 0.05%	0.03% - 0.05%	≤ 0.2%

Elements to be determined in contact water during comparative testing in accordance with DIN EN 15664-1: Lead, iron, copper, manganese, nickel, zinc

Most critical test water:

Test water 1 according to DIN EN 15664-2

2.17.3 Materials suitable for the contact with drinking water

2.17.3.1 CuSi3Zn12FeMnP

Notation	Product group
CuSi3Zn12FeMnP	B - D

Constituents (% (m/m)):

Cu	Si	Zn	Fe	Mn	P
80.0% - 88.0%	2.4% - 4.1%	Remainder	0.3% - 0.5%	0.1% - 0.2%	0.01% - 0.03%

Impurities (% (m/m)):

Al	Ni	Pb	Sn
≤ 0.2%	≤ 0.05%	≤ 0.05%	≤ 0.2%

2.18 Copper-tin-phosphorus alloys

2.18.1 Category limits

Constituents (% (m/m)):

Cu	Sn	P
Remainder	1.5% - 9.0%	0.02% - 0.4%

Impurities (% (m/m)):

Fe	Ni	Zn
≤ 0.1%	≤ 0.2%	≤ 0.2%

2.18.2 Reference material

CW453K (CuSn8) was accepted only for product group C based on a scientific dossier. For the acceptance of this material or another material belonging to this category for product group A or B a complete test according to EN 15664-1 with all three test waters according to EN 15664-2 is required. A reference material will be defined when a material is accepted for product group A or B.

2.18.3 Materials suitable for the contact with drinking water

2.18.3.1 CW453K (CuSn8)

Notation	Product-Group
CW453K (CuSn8)	C and D

Constituents (% (m/m)):

Cu	Sn	P
Remainder	7.5% - 8.5%	0.02% - 0.4%

Impurities (% (m/m)):

Fe	Ni	Zn
≤ 0.1%	≤ 0.2%	≤ 0.2%

2.19 Copper-tin-lead-phosphorus alloys

2.19.1 Category limits

Constituents (% (m/m)):

Cu	Sn	Pb	P
Remainder	9.0% - 13.0%	0.2% - 1.0%	0.01% - 1.0%

Impurities (% (m/m)):

Fe	Mn	Ni	S	Sb	Zn
≤ 0.2%	≤ 0.2%	≤ 0.2%	≤ 0.05%	≤ 0.1%	≤ 0.5%

2.19.2 Reference material

Constituents (% (m/m)):

Cu	Sn	Pb	P
Remainder	10.6% - 11.0%	0.84% - 1.0%	0.01% - 0.10%

Impurities (% (m/m)):

Fe	Mn	Ni	S	Sb	Zn
≤ 0.2%	≤ 0.1%	0.15% - 0.25%	≤ 0.05%	0.09% - 0.15%	≤ 0.5%

Elements to be determined in contact water during comparative testing in accordance with DIN EN 15664-1: Antimony, lead, copper, nickel, zinc

Most critical test water:

Test water 1 according to DIN EN 15664-2

2.19.3 Materials suitable for the contact with drinking water

2.19.3.1 CuSn10-C

Notation	Product group
CuSn10-C*	B - D

* further restrictions on composition (see below) compared to the standardised European composition of CuSn10-C

Constituents (% (m/m)):

Cu	Sn	Pb	P
88.0% - 90.0%	9.0% - 11.0%	0.2% - 1.0%	0.01% - 0.2%

Impurities (% (m/m)):

Fe	Mn	Ni*	S	Sb*	Zn
≤ 0.2%	≤ 0.10%	≤ 0.2%	≤ 0.05%	≤ 0.1%	≤ 0.5%

2.20 Cast iron

2.20.1 Category limits

Not necessary

2.20.2 Reference material

Not necessary

2.20.3 Materials suitable for the contact with drinking water

2.20.3.1 Cast iron

Notation	Product-Group
Cast iron according to EN 1561 / EN 1563	C2

Constituents (% (m/m)):

Fe	C	Cu	Cr	Mo	Mn	Ni	Si
	0.02% - 4.0%	0.02% - 1.0%	0.02% - 1.0%	0.02% - 1.0%	0.02% - 1.0%	0.02% - 1.0%	1.5% - 3.5%

Impurities (%(m/m)):

As	Mg	P	S	Sn	V
≤ 0.05%	≤ 0.1%	≤ 0.15%	≤ 0.1%	≤ 0.1%	≤ 0.1%

2.20.3.2 Carbon steel

Notation	Product group
Carbon steel according to EN 10025 / EN 10213 / EN 10222	C2

Constituents (% (m/m)):

Fe	C	Cr	Mo	Mn	Ni
	0.02% - 0.25%	0.02% - 0.30%	0.02% - 0.12%	0.02% - 1.65%	0.02% - 0.50%

Impurities (% (m/m)):

Al	Cu	Nb	P	S	Si	Ti	V
≤ 0.05%	≤ 0.55%	≤ 0.05%	≤ 0.03%	≤ 0.03%	≤ 0.6%	≤ 0.05%	≤ 0.12%

Restrictions:

Ferrous materials may be used in contact with drinking water for components in the area of water supply outside of drinking water systems in the case of a continuous flow of over 0.1 m/s.

In order to form a protective layer, the water must also meet the following conditions:

a) $\tilde{c}(O_2)$ > 0.1 mmol/l

b) pH value > 7.0

c) $K_{S4.3}$ > 2 mmol/l

d) $\tilde{c}(Ca)$ > 1 mmol/l

It can be assumed that in case of exposed pipe surface layers of welded joints resp. cutting surfaces or bores of cement-mortar lining pipes made of carbon steel or cast iron in the scope of DIN 2880, in general a protective layer is built. Further assessment of the hygienical suitability for the contact with drinking water is not necessary.

2.21 Copper alloys for product group D

In addition to the materials listed for the Product Groups A, B and C for components of the Product Group D further passive metallic materials and copper alloys can be used.

The copper alloys have to comply with:

- Cu, Zn, Si, Sn, P: no restrictions
- Al, Fe, Mn: max. 3.0 % (w/w)
- Pb: max. 3.5 % (w/w)
- Ni: max. 3.0 % (w/w)
- As, Sb: max. 0.25 % (w/w)
- All other: max. 0.1 % (w/w)

3 Platings

3.1 Electroplating of the outer surface for optical reasons

Components made of copper alloys according to Section 2 “materials for mountings, pipe connections, apparatuses and pumps (B) and for construction parts in mountings, pipe connections, apparatuses and pumps (C)” can be plated galvanically with a layer composition of copper and tin.

Restrictions:

- Bulk material of components to be tinned:
  - Copper alloys corresponding to section 2 “Materials for Product group B - C”
- Layer composition: 1.) Cu 2.) Sn
- applied process: galvanic tin plating
- Purity of the used anodes: ≥ 99.90 %

Additional requirement:

For the respective production process, it has to be proven that the manufactured products are not contaminated with organic substances used in the galvanic process baths. This can be demonstrated by a migration test according to EN 12873-1.

Evidence can be provided in the course of an approval/certification process of respective plated products. In this process a test of the metal release is not required. Additionally, a quality assurance scheme for the production process is required.

3.2 Sn/Ni platings applied by a galvanic process on external surfaces

Components made of copper alloys according to Section 2 “materials for mountings, pipe connections, apparatuses and pumps (B) and for construction parts in mountings, pipe connections, apparatuses and pumps (C)” can be plated galvanically with a layer composition of tin and nickel.

Restrictions:

- Layer composition: Sn 66 (± 1) % and Ni 34 (± 1) % (molar ratio 1:1)
- Purity of the used nickel anodes: ≥ 99.90 %
- applied process: galvanic plating

Additional requirement:

For the respective production process, it has to be proven that the manufactured products are not contaminated with organic substances used in the galvanic process baths. This can be demonstrated by a migration test according to EN 12873-1.

Evidence can be provided in the course of an approval/certification process of respective plated products. In this process a test of the metal release is not required. Additionally, a quality assurance scheme for the production process is required.

4 Passive Materials

4.1 Category limits

Not determined

4.2 Reference material

Not determined

4.3 Materials suitable for the contact with drinking water

4.3.1 NiCr7030

Notation	Product group
NiCr7030	B - D

Constituents (% (m/m)):

Ni	Cr	Si
≥ 60.0%	29.0% - 32.0%	0.50% - 2.0%

Impurities (%(m/m)):

Al	C	Co	Cu	Fe	Mn	P	S
≤ 0.30%	≤ 0.10%	≤ 1.5%	≤ 0.50%	≤ 5.0%	≤ 1.00%	≤ 0.020%	≤ 0.015%

4.3.2 Ni55Ti45

Notation	Product-group
Ni55Ti45	C and D

Constituents (% (m/m)):

Ni	Ti
54.0% - 56.0%	Remainder

4.3.3 Titan Grade 1

Notation	Product group
Titan Grade 1 according to ASTM B265	B - D

Constituents (% (m/m)):

Ti
Remainder

Impurities (%(m/m)):

C	O	N	H	Fe
≤ 0.08%	≤ 0.18%	≤ 0.03%	≤ 0.015%	≤ 0.20%

4.3.4 Titan Grade 2

Notation	Product group
Titan Grade 2	B - D

according ASTM B265	

Constituents (% (m/m)):

Ti
Remainder

Impurities (%(m/m)):

C	O	N	H	Fe
≤ 0.08%	≤ 0.25%	≤ 0.03%	≤ 0.015%	≤ 0.30%

4.3.5 Titan Grade 3

Notation	Product group
Titan Grade 3 according to ASTM B265	B - D

Constituents (% (m/m)):

Ti
Remainder

Impurities (%(m/m)):

C	O	N	H	Fe
≤ 0.08%	≤ 0.35%	≤ 0.05%	≤ 0.015%	≤ 0.30%

4.3.6 Titan Grade 4

Notation	Product group
Titan Grade 4 according to ASTM B265	B - D

Constituents (% (m/m)):

Ti
Remainder

Impurities (%(m/m)):

C	O	N	H	Fe
≤ 0.08%	≤ 0.40%	≤ 0.05%	≤ 0.015%	≤ 0.50%

4.3.7 Titan Grade 5

Notation	Product group
Titan Grade 5 according to ASTM B265	B - D

Constituents (% (m/m)):

Ti	Al	V
Remainder	5.5% - 6.75%	3.5% - 4.5%

Impurities (%(m/m)):

C	O	N	H	Fe
≤ 0.08%	≤ 0.20%	≤ 0.05%	≤ 0.015%	≤ 0.40%

4.3.8 Further passive materials for Product group D

For product group D further passive metallic materials can be used in contact with drinking water. These materials do not need to be listed in this positive list.